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THE PROFESSIONAL IDENTITY OF ADVENTIST TEACHERS

Edgar Beskow¹

Abstract

Adventist education is grounded in a strong philosophical framework, yet empirical research on the professional selves of its educators remains limited. This qualitative study explores Adventist teachers' professional experiences and proposes a model to explain their identities. Seven outstanding high school teachers from three Adventist schools in Argentina, nominated by their principals, participated voluntarily. They narrated their careers through interviews, aesthetic portrayals, curriculum vitae, and classroom shadowing. A six-step thematic analysis with data triangulation revealed two interrelated dimensions of professional identity: an ongoing, current identity and a shared ideal identity. The ideal professional self-envisioned by these teachers is to become authentic role models who embody the values they teach. To reach this ideal, they strive to be more student-centered and to cultivate their character, taking the person of Jesus as the prototype of their professional self. The gap between who they are and who they aspire to be sustains an ongoing—and essential—quest for identity coherence.

Keywords

Professional identity, Adventist teachers, ideal identity, professional self-coherence, narrative inquiry

INTRODUCTION

The study of teachers' professional identities has expanded significantly over the past two decades, largely driven by the adoption of narrative approaches. Research has linked

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teachers' identities to teaching effectiveness, readiness for professional development, commitment, and a strong sense of purpose.

According to the most recent official report (Office of Archives, Statistics, and Research, 2024), the Seventh-day Adventist (SDA) educational system operates 10,364 institutions worldwide, employing 120,485 teachers and professors. These educators are recruited and trained under an educational philosophy that portrays teachers as agents of salvation and reconciliation, ministers by divine calling, and exemplars of character (Gallusz, 2016; Knight, 2006, 2010; White, 1952)—a professional profile that may foster the development of a distinctive professional identity.

Within this framework, Adventist education regards teachers' own selves as the primary medium for modeling the values and lifestyle the system seeks to impart. Nevertheless, existing literature on Adventist teachers' professional identity remains largely theoretical or limited to descriptions of the traits expected of SDA educators. Building on this context, the present study aims to bridge the gap between theoretical religious frameworks and empirical research on the professional identities of Adventist teachers.

REVIEW OF LITERATURE

The study of teachers' professional identity has been primarily addressed by European researchers. The most prolific period was between 1980 and 2015 (Day et al., 2006; Eros, 2011; Goodson, 2014; Guskey, 2002; Hayes, 2014; MacLure, 1993; Sikes, 1985). These decades, rich in academic production, enabled the establishment of models that explain how teachers' institutional contexts, critical incidents, and significant individuals (mentors) shape their professional identities (Kelchtermans, 1993).

The implications of studying teachers' professional identity were unexpectedly identified by Sammons et al. (2007) when they were commissioned to conduct a nationwide study on teaching effectiveness in the United Kingdom. Although the research did not focus on teacher identity but rather on teaching effectiveness, the researchers concluded that a balanced professional identity is the primary factor in maintaining teachers' motivation and commitment to their work (Sammons et al., 2007). This study also identified three dimensions of teacher identity: (a) professional, (b) situated (contextual), and (c) personal. These three dimensions or spheres gain prominence at different stages of the teaching career cycle but must coexist in balance; otherwise, teachers become vulnerable, ineffective, or at risk (Sammons et al., 2007; Sikes, 1985). For instance, Huberman (1989) explains that when teachers focus excessively on their professional sphere while neglecting their personal dimension, they tend to experience a more stressful career and a higher rate of attrition.

Similarly, Ivanova and Skara-MincLne (2016) linked teachers' professional identity to their professional development. This is because the teaching profession requires a continuous learning process. To advance in their careers, teachers must invest time and effort, which necessitates a well-defined professional identity that provides them with a sense of purpose for engaging in this ongoing effort toward professional growth (Ivanova & Skara-MincLne, 2016). Therefore, teachers' commitment to their professional development is also the result of a professional identity that generates the necessary incentive to avoid stagnation in their careers (Goodson, 2014).

Teachers' professional identity also influences their perception of role and associated responsibilities (Kelchtermans, 2017). In fact, teachers interact with educational authorities, students, colleagues, parents, and the curriculum according to

their interpretation of their role and the scope of their responsibilities (Caza & Creary, 2016).

The findings mentioned thus far associate teachers' professional identity with their sense of purpose, perception of role and responsibilities, professional development, and teaching effectiveness. However, educators in faith-based institutions constitute a distinct group of professionals. Adventist teachers, in particular, are expected to embody and model the values and lifestyle they teach (Knight, 2016). Such professional expectations are deeply intertwined with their personal lives (Raveloharimisy, 2017), shaping a professional identity that distinguishes them from teachers in secular educational contexts (Korniejczuk & McGarrell, 2025). Despite this uniqueness, research exploring how Adventist teachers experience and perceive their professional identity remains in its early stages.

METHODOLOGY

This section outlines the methodological approach adopted in the study. It includes a detailed description of the research objectives, the guiding research question, the chosen design, data collection methods, sampling strategy, and ethical considerations.

Objective

Through narrative inquiry, this study aims to understand and describe the professional identity of a group of Seventh-day Adventist teachers who work at the secondary level.

Research question

The research question that this study seeks to answer is: How can the professional identity of Adventist teachers be described?

Research design

This study employs a qualitative approach, well-suited to exploring teachers' professional identity (Clandinin, 2007; Creswell & Poth, 2024). The epistemological foundation of this research is pragmatism, as articulated by Dewey (1958). The researcher's worldview is grounded in a biblical-Christian perspective, which informs the interpretation of reality throughout the study.

A narrative inquiry design was chosen for this research. Within narrative inquiry, the interactional-pragmatic framework proposed by Clandinin (2007, 2016) guided the study. In this tradition, narratives are treated as co-constructed, emerging through the ongoing interaction between researcher and participants in a dynamic process of living, telling, and retelling experiences (Kim, 2016; Merriam & Tisdell, 2016).

Riessman (2008) notes that this co-construction arises from a natural human impulse to narrate. To transform storytelling into a rigorous scientific practice, however, it is essential to minimize power asymmetries between interviewer and interviewee. Authentic narrative inquiry therefore requires relational dialogue (Daiute, 2014), in which both parties engage as equals.

Clandinin (2016) further underscores the centrality of narrative in human life, arguing that people both live by and live in stories. They live by stories because narratives provide coherence and meaning—changing one's story can, in turn, change one's life. Simultaneously, they live in stories shaped by institutions, cultures, and social contexts. These broader narratives are internalized and selectively adopted as part of personal identity (Straub, 2006). Consequently, if individuals live both by and in stories, they must believe in them and sustain their coherence to preserve a stable identity and make sense of their experiences (Lieblich et al., 1998).

Data collection methods

This study employed four data sources to facilitate triangulation, thereby enhancing the study's trustworthiness. The data collection methods included:

Interviews. Recognized as a primary data source in narrative research, interviews aim to elicit participants' lived experiences rather than merely obtaining answers. The goal was to encourage and facilitate a fluid narrative. Each participant engaged in three semi-structured interviews, each lasting about 90 minutes. Interviews were audio-recorded and conducted in interruption-free offices within the schools.

Curriculum Vitae (CV). Participants' CVs served as a documentary source of information. Participants received a template outlining the expected sections in their CVs to ensure data richness. The primary objective was to obtain a detailed timeline of significant professional events throughout teachers' careers.

Shadowing. This data collection technique is considered a form of in-depth observation, distinguished from traditional observation by its itinerant nature; the observer follows the participant throughout their daily routine. By immersing in the participants' workday, the researcher is able to gather richer and more contextualized data about the institutional environment in which their activities unfold. Shadowing took place between the first and third interviews. Descriptive and reflective field notes were recorded in accordance with established observation protocols.

Aesthetic portrayal. A distinctive feature of narrative research is that participants often gain new insights about themselves as they reflect on and reconstruct their lived experiences during interviews. These insights supported the creation of an aesthetic portrayal, which served as the fourth source of data. This portrayal could take various artistic forms such as poems, photographs, videos, metaphors, collages, or paintings. These

aesthetic representations offered participants an alternative medium through which to express and explore their professional identity.

Artistic engagement plays a crucial role in narrative inquiry, providing a multisensory and nonlinear pathway to understanding experience. Participants presented and explained their aesthetic portrayals during the final interview, allowing time for both the creative process and the articulation of its significance.

Participants and sampling procedure

A sample of seven teachers from SDA secondary schools in Argentina was selected through purposive criterion sampling (Creswell & Poth, 2024). According to Kim (2016), in narrative inquiry, a sample of five to ten participants is often sufficient to achieve thematic redundancy in the narratives.

Sampling criteria were established based on previous research on teachers' professional identities (Schutz et al., 2018), as well as the particular characteristics of the Adventist educational system in Argentina.

Given the influence of gender on the trajectory of teaching careers (Parameswari & Kadiravan, 2014) and the gender distribution in the target population, five of the selected participants were female teachers and two were male teachers. All participants had at least 18 years of teaching experience, as most critical professional events tend to occur within the first 15 years of the teaching career (Huberman, 1989). The participants represented three different institutions located in both rural areas and state capitals to capture diverse organizational and social settings. Teachers were selected by the principals of the three secondary schools based on the following criteria:

- Teachers with more than 18 years of experience in secondary education.

- Teachers who had worked within the Adventist educational system throughout their entire careers.
- Teachers willing to participate in the study and to dedicate the necessary time and effort to complete the various data collection tasks.
- Teachers considered exemplary by school leadership based on the standards of Adventist education (Gallusz, 2016; Taylor, 2016).

Data analysis

The data were analyzed using the six-phase thematic analysis framework developed by Braun and Clarke (2013). The process involved the following phases:

1. Familiarization with the data collected. During this phase, the researcher reviewed transcripts, field notes, and documents to develop preliminary insights.
2. Generation of initial codes, guided by the research question. Relevant segments of data were labeled to begin organizing the material systematically.
3. Identification of themes and categories by grouping the initial codes into broader conceptual patterns. This step involved clustering all quotes that reflected each emerging theme.
4. Review and refinement of themes and categories through an iterative process of comparing them with the original narratives to ensure coherence and consistency.
5. Development of a theme book, which compiled the final themes and categories along with illustrative quotes and their references within the data corpus.
6. Report writing, in which findings were presented using vivid direct quotes to support interpretations and answer the research question.

The analysis of aesthetic portrayals followed the interpretive framework proposed by Lawrence-Lightfoot and Davis

(1997), which involves two main components. The first is the context in which the aesthetic piece was created; in this study, interviews and field observations offered rich contextual data to support interpretation. The second component is the voice of the creator, referring to the meaning assigned to the portrayal by the participant. To address this, participants were asked to describe themselves as Adventist teachers through their aesthetic portrayals.

Given the substantial volume of data generated, HyperResearch software was used to support phases two and three of the thematic analysis. Phases one, four, five, and six were completed manually without the use of software tools.

Ethical considerations

Given the relational nature of narrative inquiry (Clandinin, 2007, 2016; Daiute, 2014) and its close engagement with participants' lived experiences, this study adhered to the highest ethical standards (Clandinin et al., 2018). The following measures were implemented to uphold these commitments.

Formal Approvals. Ethics approval was obtained from the Ethics Review Board (ERB) before data collection. Authorization to access schools was granted by the education director of the Argentine Union and the directors of the respective local conferences. Formal requests to conduct the study were submitted to the principals of the chosen schools.

Informed Consent. All participants voluntarily signed a printed informed consent form describing the study's purpose, participant activities, the right to withdraw at any time without consequences, and the possibility of discussing sensitive topics. It also detailed measures to ensure anonymity, confirming that participation or withdrawal would not affect employment. The form specified the number and duration of interviews, the timeline of the shadowing process, and participation in preparing a curriculum vitae and an aesthetic portrayal.

Consent to audio-record interviews was explicitly obtained, and data confidentiality procedures were explained.

Confidentiality. Access to participant data was restricted to a single research collaborator who audited the analysis process using anonymized information. All personal names, institutions, and geographic locations were replaced with pseudonyms to prevent identification.

Minimization of Harm. To avoid emotional distress, interviews were conducted in private spaces designated by school principals. Participants chose the dates and times of interviews and shadowing. They were not required to discuss experiences that caused discomfort or that they preferred to omit, preventing unnecessary emotional exposure.

Independence from Sponsorship. Although sponsored by the Adventist educational system in Argentina, the study maintained full independence. The sponsor did not influence topic selection, participant recruitment, data analysis, or the writing of results and conclusions, and received only the final research report.

RESULTS

This section presents the study's results. Data analysis revealed three main themes that illustrate the participants' professional identities.

Theme 1. The ideal professional identity

Participants envisioned an ideal professional self that served as a benchmark for their current identity. Their narratives revealed three categories describing this ideal: (a) a desire to be more student-centered, (b) an effort to acquire core values, and (c) the person of Jesus as the model for their ideal professional self.

Being Student-Centered. The participants pursued an ideal identity that was student-centered. As Victoria stated, *our work is not all about teaching content but to show interest in the life and the person of our students* (Victoria, Interview, lines 447–448). Their actions and reflections consistently revolved around the student. Yet the participants' goal was not to fulfill their requirements but to guide students away from inherent negative tendencies. Nahuel noted that he engaged students *through missionary outreach or sports* (Nahuel, Interview, line 254) to encourage focus on studies and positive behavior. Martha likewise emphasized:

Teachers must think if what they do is beneficial to their students. If they [teachers] don't do so, they should find another job... If you are no longer able to give your best to your students, you should leave your place for another teacher. Otherwise, we are shortchanging our students. (Martha, Interview, lines 1416–1423)

Martha's statement may sound extreme, yet it reflects the selfless commitment required to attain a student-centered professional identity. For the participants, students' well-being was paramount, and they admired colleagues who embodied this closeness. As Victoria observed,

I admire the relationship that Teacher Marisa has with her students. She is considerate with them. When some students approach her to tell her something, she is all ears to them. (Victoria, Interview, lines 443–445)

Acquiring Core Values. Campbell (2003) argues that teachers should be assessed by the clarity of their conscience and values. As Sophia noted, *being a Christian teacher requires extra care. We must pay attention to what we say or how we say things. This is an extra work we have to do* (Sophia, Interview, lines 736–738).

Participants identified honesty, trustworthiness, fairness, patience, love, and equity as essential to their ideal professional identity. Dana emphasized that a teacher *should be a righteous and honest person, someone who can say something without hurting, one who is trustworthy with good values* (Dana, Interview, lines 646–647). She further stressed that students should *see in you [teacher] not a rigid or hard person. There has to be a little more patience and love* (Dana, Interview, lines 194–195).

Martha argued that high moral standards alone are insufficient for Christian teachers. Using justice as an example, she explained that applying it blindly is unfair when students have different backgrounds and needs. As she stated, an *Adventist teacher has to be equitable with the students and a consistent example* (Martha, Interview, lines 1268–1267). For Martha, equity requires understanding students' motives before enforcing rules because rigid application of school regulations can distort their intent. For this reason, she preferred to be identified with love rather than blind justice as a hallmark of her ideal professional self.

Being Like Jesus. *Our model is Jesus* (Dana, Interview, line 641), Dana affirmed, reflecting on how she seeks to treat her students: *I want to treat them as Jesus did. He gave opportunities to the people. He was not judgmental but empathetic* (Dana, Interview, lines 483–484).

Emulating the Master Teacher was the participants' highest aspiration. Victoria shared, *I would like people to remember me saying: 'Yes, for sure, she had Jesus in her heart'* [she shed tears] (Victoria, Interview, lines 469–470). Similarly, Jahaziel, a music teacher, presented a drawing and explained, *if you see carefully, you will see the image of a choir conductor, but it is also a Jesus conductor* (Jahaziel, Aesthetic Portrayal). Dana added, *my main goal is to leave to them [students], as much*

as I can, an example of who Jesus was (Dana, Interview, lines 480–481).

The participants viewed Jesus as an exemplary teacher in practice, not merely as an abstract theory or religious doctrine (Taylor, 2025). As Nahuel stated,

An Adventist teacher must be Christian. Because there are a lot of Adventist teachers who believe in the second coming of Jesus, but they don't necessarily reflect Jesus in their lives. (Nahuel, Interview, lines 755–757)

He further distinguished a Christian teacher from any teacher:

When there is no patience or love, there is nothing... There is just a teacher there... Jesus put me here to tell others that Jesus will come. So, I must reflect Jesus. (Nahuel, Interview, lines 764–767)

For Nahuel, embodying Jesus was inseparable from his missionary calling to announce Jesus' return.

Theme 2. The ongoing professional identities

Kelchtermans (1993) identifies two key components that explain how teachers describe themselves: their belief system (assumptions) and their task perception. The participants spontaneously addressed both in their narratives. Within beliefs and assumptions, two subcategories emerged: (a) the fallen nature of the students and (b) generational changes. Within task perception, two subcategories were identified: (a) competency-based curriculum and (b) holistic education.

Teachers' beliefs and assumptions. A belief system can also be described as a worldview that acts as lens through which teachers interpret reality. In the participants' narratives, the Adventist educational worldview framed reality as a cosmic controversy between good and evil. They noted a progressive distortion of God's image in students across generations and

positioned themselves as central actors in the holistic restoration of their students.

Assumption of students' fallen nature. Participants described students as struggling with a fallen nature. Martha illustrated this perception regarding her teenage students:

I have also learned that we never should believe our students when they say that they don't want to have class. Students want to learn, even though they may feel lazy and they prefer to talk about something else. But when the year is over, they are quite quick to say: 'The teacher didn't teach us well'. (Martha, Interview, lines 1115–1118)

For Martha, students' untrustworthiness stems not from intent to deceive but from their inherent laziness. She explained, *Actually, what students say doesn't match with what they need* (Martha, Interview, lines 1144–1146). Thus, teachers should prioritize students' real needs over their expressed desires. Similarly, Gabriela observed,

I still consider that a human being works better under pressure. There are very few people who are self-motivated. People need something to push them [laughs mischievously]. (Gabriela, Aesthetic Portrayal)

To address what Martha described as laziness and Gabriela as lack of self-motivation, Dana redefined her role: *One day I understood, I can't be the kids' friend. I'm the teacher* (Dana, Interview, lines 469–470). Collectively, these teachers recognized students' imperfect nature and the need to implement measures to guide them toward growth.

Assumption of generational worsening. Participants observed negative generational changes in their students, comparing current students with those from 15–20 years ago and concluding that previous generations were better. They noted, for example, a decline in self-discipline. Dana remarked, *the kids today don't understand much about effort and self-discipline*

(Dana, Interview, line 211), while Sophia added, *[the students] have changed... Fifteen years ago, students did whatever may take to get books about a topic... Now, it is almost impossible to put them to work in a science fair* (Sophia, Interview, lines 333–343).

Teachers' task perception. Teachers' task perception can be defined as a sense of purpose that drives their professional actions (Lavy & Bocker, 2018). For the participants, this purpose focused on students' needs, prompting them to consider what content and skills were most essential for this generation and how to address students' fallen nature.

Competence-based curriculum. In response to perceived generational changes, participants favored a competency-based curriculum over a traditional, content-focused approach. Sophia explained,

The teacher's role was different. It was a role where you had to provide a lot of information... Today, information is already at hand, so our role has changed. (Sophia, Interview, lines 169–170)

The shared sense of purpose was to equip students with competencies and skills needed for future challenges. As Sophia noted,

They [the students] need to develop skills, such as logical reasoning and the ability to interpret information. When they go to college, they will need these skills. (Sophia, Interview, lines 480–484)

This shift—from information provider to skill developer—redefined the participants' professional identities. Sophia stated, *our role has changed. We are now more like facilitators of learning* (Sophia, Interview, lines 170–171). The quotation illustrates their willingness to adjust task perception to meet

students' evolving needs, even when this implied changes in their professional identities.

Holistic education. The second subcategory in participants' narratives highlighted their conviction that their primary responsibility is to provide holistic education. Martha explained, *I see students as a whole. My role is not only to teach them but also ensure the other parts of their person are attended* (Martha, Interview, lines 338–339), illustrating her approach with an example: *This is not my subject matter, but when there is a possibility, I talk about family and how to choose a life partner* (Martha, Interview, lines 783–785).

Holistic education extends beyond cognitive and academic aspects to include the spiritual dimension. Dana stated,

I have two main goals. One is to teach knowledge, this is why I have studied, and the second one is to share the gospel with my students. (Dana, Interview, lines 653–654)

Similarly, Gabriela prioritized the spiritual growth of her students: *The main task we have is to draw them closer to Jesus* (Gabriela, Interview, line 707). Jahaziel echoed this view, noting that Christian education is meaningless if teachers do *not help students to meet Jesus* (Jahaziel, Aesthetic Portrayal), and he encouraged students to *have an appointment [with Jesus] under the tree of life* (Jahaziel, Aesthetic Portrayal) in heaven.

According to the participants, holistic education should also address students' daily challenges. Victoria explained,

I realize that many of them [students] come to our school with problems, and we should pay attention to see what's behind these problems. (Victoria, Interview, lines 361–363)

To support students with personal, family, and emotional issues, participants dedicated time to listening and talking with them. As Sophia noted, *I always try to listen and to talk with*

them about their personal struggles (Sophia, Interview, line 492).

The participants adopted a holistic approach not only as educators but as agents of a divine mission: *My responsibility is not with the school principal or with my colleagues. It is with God* (Gabriela, Aesthetic Portrayal). This accountability to God for students' holistic well-being gave participants a profound sense of purpose and responsibility.

A teaching task perception,

requires more than teaching in the classroom... That's why I think we need extracurricular activities, although it is a little difficult for some teachers. But I think the teaching task has to go beyond the classroom. (Martha, Interview, lines 1150–1153)

Such commitment can have consequences. Nahuel, in middle age, experienced burnout, and his doctor advised spending less time playing sports with students and more time cycling alone. Nahuel's experience was not isolated, Martha collapsed physically and emotionally in her forties, Jahaziel faced similar issues before his fifties, and Victoria lost her sense of purpose in middle age. These experiences reflect an imbalance among personal, professional, and institutional spheres of their identities (Day et al., 2006). In her words, Sophia explained this pattern of burnout symptoms,

Adventist teachers, I think, have even more pressure, much more pressure. You are not a common teacher... I have in mind that I have to restore the image of God in our students... It's a very demanding task. (Sophia, Interview, lines 729–732)

Theme 3. Quest for identity coherence

Participants acknowledged being engaged in an ongoing, yet essential, quest for coherence between their ideal professional identity—modeled on the person of Jesus—and their

actual selves. Three main categories emerged within this theme: (a) modeling a coherent identity, (b) developing a Christlike character, and (c) striving for an unreachable ideal. These categories illustrate how participants experienced their pursuit of professional identity coherence.

Modeling a coherent identity. Participants aimed to achieve coherence between their teachings and actions. Martha emphasized, *we must be consistent between what we do and what we say* (Martha, Interview, lines 1389–1390), while Victoria described a lack of integrity as blatant hypocrisy: *if I am in this institution but I am not showing the expected way of life, I am hypocritical* (Victoria, Interview, lines 461–462). Dana framed identity incoherence as a moral failure:

A teacher who labels herself Adventist must display who she actually is as a person. We can't represent something we are not. (Dana, Interview, lines 648–650)

When participants felt they did not meet the moral standards they were expected to model, they perceived their work as meaningless. Nahuel reflected,

I would like the students to say that teacher Nahuel does what he says, that he is consistent with what he preaches... Or this is part of my mission or I should go to work at a public school. (Nahuel, Interview, lines 677–680)

Martha illustrated how identity coherence influences the effectiveness of teaching values:

We should be an example of those values we teach... If I want you to be generous, I also have to be generous. If I want my students to treat their classmates well, I also have to treat my students and my colleagues well. If I ask you to arrive on time, I also have to arrive on time. (Martha, Interview, lines 1247–1252)

Developing a Christlike character. For the participants, improving character represented progress toward their ideal professional self. Dana stated, *I want to improve my character because that is what God asks me to do* (Dana, Interview, line 643). Participants attributed their character development to God's work in their lives. Dana reflected, *maybe God put me in the classroom just to polish my character* (Dana, Interview, lines 257–258), while Gabriela explained, *God has worked hard in my character. He is still working on me* (Gabriela, Aesthetic Portrayal).

The participants openly described their efforts to improve their character, viewing such development as essential to connect with their students. Although this process may span years or even decades, they perceived gradual progress with enthusiasm. Nahuel illustrated his transformation vividly:

Before, when a student misbehaved, I reacted with harsh words and gestures... I have changed these reactions during these 25 years. (Nahuel, Interview, lines 790–796)

He added,

I changed a lot... I was too reactive in the classroom. I could not stand a daring student. (Nahuel, Interview, lines 271–275)

In his aesthetic portrayal, Nahuel depicted his early teaching years as an espinillo tree:

God changed me. He changed me as far as I allowed Him to do so. As the espinillo tree has thorns, I had a lot of thorns. When a student approached me, I would prick him... It took a lot of time because I had many thorns... [he laughs] But the Lord transformed me. (Nahuel, Aesthetic Portrayal)

After 25 years of dedicated character development, Nahuel exemplifies participants who drew closer to their ideal professional identity through the quest for professional identity coherence.

Striving for an unreachable ideal. Although the participants approached their ideal professional self, they felt continuously scrutinized by their students. Nahuel explained,

Not everyone can be an Adventist teacher because kids don't just passively listen to what you say... They quickly detect any error or anything that does not match with what you are saying. (Nahuel, Interview, lines 724–727)

Sophia echoed this perception, emphasizing the persistent vulnerability of teachers:

Teachers have a very exposed position. One is constantly being analyzed by 30 students staring at him or her. They analyze and study you from all possible angles. Adventist teachers, I think, have even more pressure, much more pressure. (Sophia, Interview, lines 727–730)

Sophia and Nahuel recognized that their students keenly observed any gap between the teachers' evolving professional identities and the values and moral standards they were expected to embody (Raveloharimisy, 2017). This scrutiny served as a mirror, prompting continual self-evaluation of their identity coherence. At times, this led to harsh self-assessment:

I don't feel that I am a model to follow. I would like to be closer to the ideal. I recognize that there are times when I feel far from God... I think I need more of Him to get closer to the ideal that I should be. (Victoria, Interview, lines 455–459)

Victoria's reflection, together with other participants' concerns, underscores that the quest for identity coherence is their central challenge (see Figure 1). This struggle is both unreachable—because the ideal is the perfect person of Jesus—and spiritual, as the participants acknowledged that only God can resolve their perceived identity gaps.

DISCUSSIONS

The participants' professional experiences closely mirrored those documented in prior research (Kelchtermans, 2017; Sammons et al., 2007). Even though educators in faith-based institutions form a distinctive professional group, they were hardly spared from tensions with school leaders, colleagues, parents, and students. They likewise encountered periods of vulnerability and disequilibrium between their professional and personal lives at some points in their career trajectories (Raveloharimisy, 2017). Despite these shared challenges, however, the participants' professional identity bears no direct parallel with that of their counterparts in non-faith-based educational settings.

The ideal professional identity. Teachers typically hold an ideal image of their professional self (Vokatis & Zhang, 2016). For the participants in this study, however, the ongoing pursuit of coherence between their present professional identity and the teacher they aspire to become appears to have no clear precedent in the existing literature. At the root of this distinction lies a markedly different worldview (Taylor, 2025). Whereas most teachers adopt a predominantly student-centered stance, the participants did not aim primarily to satisfy students' immediate desires; rather, they sought to steer students away from what they regard as innate negative inclinations. In contrast to humanistic, person-centered approaches that deliberately reduce constraints in order to foster unrestricted personal growth (Crumly et al., 2015; Weimer, 2013), these faith-based educators feel compelled to direct students firmly toward what they understand to be the right path.

This caring, student-centered perspective also aligns with theoretical work on Christian education. Raveloharimisy (2017) identifies students as the core of faith-based education, while Linhart (2016) and Li et al. (2022) emphasize the

importance of teacher–student relationships and support. White (1952) likewise urged teachers to view students as *the most valuable children of God and as potential citizens of heaven*, entrusted to their care. Similarly, Narinasamy and Logeswaran (2015) highlight the need for teachers to demonstrate a caring attitude. Such literature mirrors the ideal self the participants strive to embody.

Regarding the participants’ quest to acquire core values and to be like Jesus, Campbell (2003) argues that teachers should be assessed not only by technical competence or students’ academic performance but also by the clarity of their conscience and values. However, while these values are shared by non-Christian teachers, the participants sought to embody them as part of their redemptive mission.

This link between teaching and ministry is also highlighted in the literature (Knight, 2016; Pazmiño, 2008). Markowski (2008) notes that New Testament descriptions of Christian teachers reveal an intrinsic bond between the roles of teacher and minister, identifying Jesus—called Rabbi or teacher—as the ultimate model.

It is important to clarify how the participants came to share a common ideal professional identity. How could seven teachers from different backgrounds and institutions all seek to be more student-centered, develop similar core values, and model themselves on Jesus? Research shows that teachers pursue personal “dreams” shaping a prospective professional identity (Vanassche & Kelchtermans, 2016; Vokatis & Zhang, 2016). When such an ideal is embraced by multiple teachers, it becomes a collective dream.

Burke and Stets (2009) note that individuals adjust their behavior based on context and feedback, aligning with a shared professional identity. In this study, the participants developed a collective ideal professional identity by intentionally

adapting their aspirations to the model expected in Adventist schools.

The ongoing professional identities. Defining teachers' professional identities remains a complex endeavor, as these identities are inherently dynamic and subject to continual evolution. They emerge from the interplay of contextual factors (Burke & Stets, 2009; Cohen, 2017; Smagorinsky et al., 2003), critical incidents (Vanassche & Kelchtermans, 2016), significant people (Ibarra, 1999), and the distinct phases of a career trajectory (Sikes, 1985). This multiplicity of forces accounts for the characterization in the present study of participants' professional identities as *ongoing*.

Kelchtermans (1993) highlights two core dimensions that shape *how teachers identify themselves as teachers* (Vokatis & Zhang, 2016, p. 59): their belief system, comprising tacit assumptions about teaching and learning, and their task perception, or understanding of what the role demands. Both components surfaced spontaneously and repeatedly in the participants' narratives—a pattern also noted by other researchers (Clandinin et al., 2006; Nias, 1985, 1989; Schutz et al., 2018).

Among the various elements of professional identity, teachers' belief systems stand out as the most stable and enduring (Beijaard et al., 2004). Several scholars frame this system as a worldview: a relatively coherent, though not always fully conscious, constellation of convictions that serves as an interpretive lens for making sense of experience and guiding practice (DeWitt, 2018; Hufford, 2014). Within faith-based educational settings, such a worldview frequently takes the form of an explicit philosophy of education shared across the school community (Rasi, 2011).

In the participants' narratives, the Adventist educational worldview consistently framed human existence within a cosmic controversy between good and evil (Knight, 2016). Consequently, they regarded students as bearers of a fallen nature

inclined toward progressive moral deterioration across generations. This stance transcends mere intergenerational misunderstanding. Research indicates that each cohort develops distinctive traits influenced by its socio-political and technological contexts (Perna, 2018). For instance, Seemiller and Grace (2019) observe that Generation Z tends to prioritize social justice, equity, and activism over the traditional emphasis on hard sciences that characterized earlier generations. Such shifts may account for Dana's and Sophia's observations of student apathy toward rigorous research and an overreliance on non-scholar Internet sources.

With respect to task perception, participants uniformly articulated their core duty as the provision of holistic education aimed at restoration. This understanding directly reflects Adventist philosophy, which casts teachers as agents of human redemption (Gallusz, 2016). Although many secular schools also embrace holistic aims (Forbes & Wilson, 2003), the participants interpreted their mandate through the lens of cosmic controversy (Knight, 2007), positioning themselves not merely as instructors but as participants in a divine mission. For these Adventist educators, teaching is fundamentally a redemptive vocation entrusted by God (Rasi, 2010).

A notable consequence of framing teaching as a redemptive calling centered on holistic development is the difficulty of establishing clear professional boundaries (Beijaard et al., 2004). When emotional, social, spiritual, and cognitive growth all fall within the teacher's role, the scope of responsibility can feel boundless (Jacobs & Struyf, 2015). This expansive identity imposes additional obligations, including extensive involvement in extracurricular activities that compound already demanding classroom responsibilities (Johari et al., 2018). Work-life balance and personal well-being, therefore, may come under strain.

When teachers perceive themselves as inadequately equipped to fulfill what they understand as a divinely appointed redemptive role, transitional and situational crises can become acutely intensified (Schutz et al., 2018). Longitudinal research documents widespread physical and emotional exhaustion among dedicated teachers at various career stages (Day et al., 2006). Huberman (1989), however, observed that many educators, after navigating mid-career difficulties, experience a renewed sense of purpose that sustains them through their later years (Lavy & Bocker, 2018).

In the present study, most participants preserved a resilient sense of mission despite acknowledging significant emotional and physical tolls. What sets them apart from colleagues in secular settings is their profound commitment to students' comprehensive well-being and eternal destiny. Informed by an apocalyptic reading of their vocation (Knight, 2015), these faith-based teachers often feel that both the present lives and eternal fates of their students rest, quite literally, in their hands. This distinctive task perception introduces an additional source of professional stress.

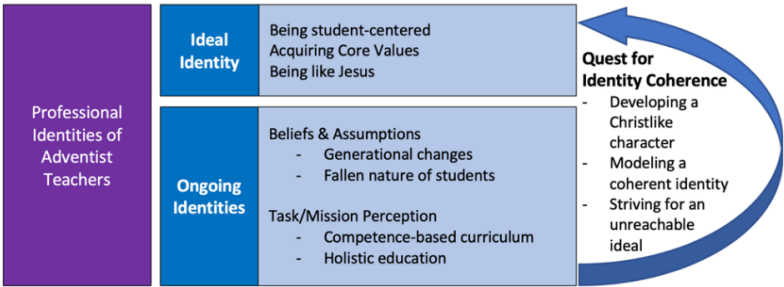
Quest for identity coherence. Teachers in SDA schools are expected to exemplify a distinctive lifestyle and manifest Christ-like qualities in their daily conduct (Raveloharimisy, 2017). Fulfilling this modeling role demands that their actions remain congruent with the beliefs they are commissioned to impart (Knight, 2006; Taylor, 2016). When participants sensed a discrepancy between their own behavior and the moral standards they were called to embody, they often experienced their professional efforts as devoid of authentic meaning.

A primary consequence of such identity incoherence is the diminished capacity to transmit values and principles with conviction (Korniejczuk & McGarrell, 2025). As Campbell (2003) observes, teaching stands apart from many professions

precisely because educators cannot avoid the obligation to live out the very values they seek to instill.

The principal pathway participants identified toward greater identity coherence was the deliberate cultivation of Christlike character. Psychological literature describes character as the moral dimension of personality—comprising traits that are learned and can be modified (Hand, 2018). Throughout their narratives, participants frequently expressed a desire to change or improve their character, a concept traditionally associated with moral education (Taylor, 2025). Within Adventist educational philosophy, character development is repeatedly highlighted as an ideal for both students and teachers alike (Gallusz, 2016; Raveloharimisy, 2017). Campbell (2003) accordingly maintains that Christian educators should be judged not merely by pedagogical skill or student outcomes but by the sharpness of their conscience and the integrity of their character.

Figure 1
Model of professional identities of the participants



CONCLUSIONS

The study discloses three overarching themes that describe the participants’ professional identities. These themes revealed the coexistence of an ongoing (current) identity and an ideal (prospective) identity, along with a continuous quest to

achieve coherence between the two. Participants also perceived that their ongoing professional identities gradually approached their ideal identity as their teaching careers progressed.

Teachers expressed their ongoing identities through their beliefs and task perceptions. They share the conviction that students have a fallen nature they are called to elevate to the original image God gave humanity.

They also observe generational changes that, in their view, further exacerbate this fallen nature. From these assumptions, participants feel compelled to provide holistic education and a competency-based curriculum, considering both essential for students to thrive and have meaningful lives.

The ideal professional identity they attempt is becoming authentic role models capable of embodying the values they teach. To achieve this, participants aim to be more student-centered and to refine their character, taking the person of Jesus as the prototype of their ideal professional self.

The gap between who they are and who they aspire to be drives them into an ongoing, yet necessary, quest for identity coherence. Although they acknowledge that their ideal self is ultimately unattainable, they remain committed to modeling a consistent identity that reflects their teachings. They regard any discrepancy between their actions and their instruction as a breach of integrity and a loss of moral authority, which they believe disqualifies them as educators. As a result, for these teachers, lifelong character development emerges as the primary means to close this gap and move toward true professional identity coherence.

REFERENCES

- Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education*, 20(2), 107–28.

- Braun, V., & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners*. SAGE.
- Burke, P. J., & Stets, J. E. (2009). *Identity theory*. Oxford University Press.
- Campbell, E. (2003). *The ethical teacher*. Open University Press.
- Caza, B. B., & Creary, S. J. (2016). The construction of professional identity. In A. Wilkinson, D. Hislop, & C. Coupland (Eds.), *Perspectives on contemporary professional work: Challenges and experiences* (pp. 259–285). Edward Elgar Publishing.
- Clandinin, J. (2016). *Engaging in narrative inquiry*. Routledge.
- Clandinin, J. (Ed.). (2007). *Handbook of narrative inquiry: Mapping a methodology*. SAGE.
- Clandinin, J., Huber, J., Huber, M., Murphy, M. S., Orr, A. M., Pearce, M., & Steeves, P. (2006). *Composing diverse identities: Narrative identities into the interwoven lives of children and teachers*. Routledge.
- Clandinin, J., Lessard, S., & Caine, V. (2018). *The relational ethics of narrative inquiry*. Routledge.
- Cohen, D. B. (2017). Managing change before it drives you out of teaching: Change is teachers' constant companion. *Educational Leadership*, 74(9), 34–38.
- Creswell, J. W., & Poth, C. N. (2024). *Qualitative inquiry and research design: Choosing among five approaches* (5th ed.) SAGE.
- Crumly, C., D'Angelo, S., & Dietz, P. (2015). *Pedagogies for student-centered learning: Online and on-ground*. Fortress Press.
- Daiute, C. (2014). *Narrative inquiry: A dynamic approach*. SAGE.
- Day, C., Stobart, G., Sammons, P., Kington, A., Gu, Q., Smees, R., & Mujtaba, T. (2006). *Variations in teachers' work, lives and effectiveness* (Research Report RR743). <http://dera.ioe.ac.uk/6405/1/rr743.pdf>
- Dewey, J. (1958). *Experience and nature*. Dover.
- DeWitt, R. (2018). *Worldviews: An introduction to the history and philosophy of science* (3rd ed.). Wiley.

- Eros, J. (2011). The career cycle and the second stage of teaching: Implications for policy and professional development. *Arts Education Policy Review*, 112(2), 65–70.
- Forbes, S. H., & Wilson, J. (2003). *Holistic education: An analysis of its ideas and nature*. Foundation for Educational Renewal.
- Gallusz, L. (2016). The teacher par excellence: Matthew's Jesus as a role model for teachers. *Journal of Adventist Education*, 78(5), 12–15.
- Goodson, I. F. (2014). *Eesti Haridusteaduste Ajakiri* [Investigating the life and work of teachers]. *Estonian Journal of Education*, 2(2), 28–47.
- Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching*, 8(3), 381–91.
- Hand, M. (2018). *A theory of moral education*. Routledge.
- Hayes, J. (2014). *The theory and practice of change management* (4th ed.). Palgrave Macmillan.
- Huberman, M. (1989). The professional life cycle of teachers. *Teacher College Record*, 91(1), 31–80.
- Hufford, D. (2014). Worldview understandings and teacher authenticity. *Journal of Philosophy & History of Education*, 64(1), 135–148.
- Ibarra, H. (1999). Provisional selves: Experimenting with image and identity in professional adaptation. *Administrative Science Quarterly*, 44(4), 764–791.
- Ivanova, I., & Skara-MincLne, R. (2016). Development of professional identity during teacher's practice. *Social and Behavioral Sciences*, 232, 529–536.
- Jacobs, K., & Struyf, E. (2015). A first step toward a comprehensive model of integrated socio-emotional guidance: Investigating the effect of teachers' task perception and a supportive network at school. *Journal of Educational Research*, 108(2), 95–111.
- Johari, J., Yean Tan, F., & Tjik Zulkarnain, Z. I. (2018). Autonomy, workload, work-life balance and job performance among teachers. *The International Journal of Educational Management*, 32(1), 107–120.

- Kelchtermans, G. (1993). Getting the story, understanding the lives: From career stories to teachers' professional development. *Teaching and Teacher Education*, 9(5), 443–456.
- Kelchtermans, G. (2017). Studying teachers' lives as an educational issue: Autobiographical reflections from a scholarly journey. *Teacher Education Quarterly*, 44(4), 7–26.
- Kim, J. (2016). *Understanding narrative inquiry: The crafting and analysis of stories as research*. SAGE.
- Knight, G. R. (2006). *Philosophy & education: An introduction in Christian perspective* (4th ed.). Andrews University Press.
- Knight, G. R. (2007). Adventist education and the apocalyptic vision – Part II. *Journal of Adventist Education*, 69(5), 4–10.
- Knight, G. R. (2010). Redemptive education part III: Implications of philosophy for Adventist education (Continued). *Journal of Adventist Education*, 73(1), 38–58.
- Knight, G. R. (2015). The aims of Adventist education: A historical perspective. *Journal of Adventist Education*, 77(4), 4–7.
- Knight, G. R. (2016). *Educating for eternity: A Seventh-day Adventist philosophy of education*. Andrews University Press.
- Korniejczuk, R. & McGarrell, F. A. (2025). Stages of IFL in the academic disciplines. In S. Vyhmeister, S. Wa-Mbaleka, & P. Gaikwad (Eds.), *Integrating faith and learning* (pp. 117–147). Safeliz.
- Lavy, S., & Bocker, S. (2018). A path to teacher happiness? A sense of meaning affects teacher–student relationships, which affect job satisfaction. *Journal of Happiness Studies*, 19(5), 1485–1503.
- Lawrence-Lightfoot, S., & Davis, J. H. (1997). *The art and science of portraiture*. Jossey-Bass.
- Li, X., Bergin, C., & Olsen, A. A. (2022). Positive teacher-student relationships may lead to better teaching. *Learning and Instruction*, 80, 101581.
- Lieblich, A., Tuval-Mashiach, R., & Zilber, T. (1998). *Narrative research: Reading, analysis and interpretation*. SAGE.
- Linhart, T. (ed.). (2016). *Teaching the next generations: A comprehensive guide for teaching Christian formation*. Baker Academic.

- MacLure, M. (1993). Arguing for yourself: Identity as an organizing principle in teachers' jobs and lives. *British Educational Research Journal*, 19(4), 311–322.
- Markowski, M. (2008). Teachers in early Christianity. *Journal of Research on Christian Education*, 17(2), 136–152.
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey-Bass.
- Narinasamy, I., & Logeswaran, A. K. (2015). Teacher as moral model: Are we caring enough? *World Journal of Education*, 5(6), 1–13.
- Nias, J. (1985). Reference group in primary teaching: Talking, listening, and identity. In S. Ball & I. Goodson (Eds.), *Teachers' lives and careers* (pp. 106–119). The Falmer Press.
- Nias, J. (1989). *Primary teachers talking a study of teaching as work*. Routledge.
- Office of Archives, Statistics, and Research. (2024). *Annual council statistical report*. <https://documents.adventistarchives.org/Statistics/ASR/ASR2024.pdf>
- Parameswari, J., & Kadhiravan, S. (2014). Quality of work life and hardness of school teachers. *Indian Journal of Health & Wellbeing*, 5(4), 457–460.
- Pazmiño, R. W. (2008). *Foundational issues in Christian education: An introduction in evangelical perspective* (3rd ed.). Baker Academic.
- Perna, M. C. (2018). *Answering why: Unleashing passion, purpose, and performance in younger generations*. Greenleaf Book Group Press.
- Rasi, H. (2010). Adventist education in the 21st century: 8 significant trends. *Journal of Adventist Education*, 72(5), 6–10.
- Rasi, H. (2011). Why do different scientists interpret reality differently? *Journal of Adventist Education*, 74(2), 4–10.
- Raveloharimisy, J. (2017). Belief and practice: Spiritual imperatives for the Adventist teacher. *Journal of Adventist Education*, 79(4), 4–8.
- Riessman, C. K. (2008). *Narrative methods for the human sciences*. SAGE.

- Sammons, P., Day, C., Kington, A., Gu, Q., Stobart, G., & Smees, R. (2007). Exploring variations in teachers' work, lives and their effects on pupils: Key findings and implications from a longitudinal mixed-method study. *British Educational Research Journal*, 33(5), 681–701.
- Schutz, P. A., Hong, J., & Francis D. C. (2018). *Research on teacher identity*. Springer Berlin Heidelberg.
- Seemiller, C., & Grace, M. (2019). *Generation Z: A century in the making*. Routledge.
- Sikes, P. (1985). The life cycle of the teacher. In S. Ball, & I. Goodson (Eds.), *Teachers' lives and careers* (pp. 27–61). The Falmer Press.
- Smagorinsky, P., Cook, L. S., Moore, C., Jackson, A. Y., & Fry, P. G. (2003). Tensions in learning to teach: Accommodation and the development of a teaching identity. *Journal of Teacher Education*, 55(1), 8–24.
- Straub, J. (2006). *Narration, identity, and historical consciousness*. Berghahn Books.
- Taylor, J. W. (2016). The Christian teacher in a secular society. *Journal of Adventist Education*, 78(5), 4–11.
- Taylor, J. W. (2025). Teaching like Jesus. In S. Vyhmeister, S. Wambaleka, & P. Gaikwad (Eds.), *Integrating faith and learning* (pp. 509–531). Safeliz.
- Vanassche, E., & Kelchtermans, G. (2016). A narrative analysis of a teacher educator's professional learning journey. *European Journal of Teacher Education*, 39(3), 355–367.
- Vokatis, B., & Zhang, J. (2016). The professional identity of three innovative teachers engaging in sustained knowledge building using technology. *Frontline Learning Research*, 4(1), 58–77.
- Weimer, M. (2013). *Learner-centered teaching: Five key changes to practice*. Jossey-Bass.
- White, E. G. (1952). *Education*. Pacific Press.

EMPOWERING STUDENTS AS AGENTS OF CHANGE IN SOLID WASTE MANAGEMENT PRACTICES: A PHOTOVOICE CASE STUDY

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Abstract

This qualitative photovoice case study explored how students can be engaged as agents of change in solid waste management. The aim was to empower students to promote social change and maintain a clean environment. While existing literature covers solid waste management, it often overlooks the role of school children. The study reviewed the literature on solid waste management and the curriculum. The theories of empowerment, responsible action, behavioral change, documentary photography, and learning guided this study. The study revealed how educationists can promote effective waste management practices and suggested policy formulation for a clean environment. Given the negative impacts of poor solid waste management, students are seen as key to bringing about change. Training for teachers, headteachers, and education officials on solid waste management and sanitation is recommended to support this initiative.

Keywords

Curriculum, documentary photography, environment, empowerment, Photovoice, solid waste management

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INTRODUCTION

Solid waste management has been a source of worry to many countries globally. Ghana is not exempted from this menace. Through the District, Municipal, and Metropolitan Assemblies, the government spends huge sums of money now and then to collect tons of waste from the cities and towns. Private companies are also engaged in this solid waste collection and sweeping of places in Ghana. Despite all the efforts, such places still see a lot of rubbish daily.

Studies have been conducted to solve this problem of littering and indiscriminate waste dumping, but the problem persists. The numerous attempts only look at areas like providing proper waste bins, clearing this waste, creating more dumping sites, and expanding the existing dumping ones (Addaney & Oppong, 2015; Adu-Boahen et al., 2014; Twumasi, 2017). Efforts have proved futile. Regarding this effortlessness in solid waste control and management has resulted in the need to turn to students for advocacy as agents of change.

This study seeks to address the need to inculcate solid waste management practices in the curriculum of Ghanaian schools to sensitize students right from the basic level. Students must be empowered to become agents of change. They can do so by educating their peers and community members to ensure environmental cleanliness.

As urbanization continues in most parts of the continent, the trend is estimated to continue. The alarm is on town and country planning, using solid waste management projections (Samwine et al., 2017). The study's findings aim to empower students to become agents of change in their communities.

REVIEW OF LITERATURE

In search of the literature for this study, there was a deep look into the available literature on solid waste management,

its effects, and how students can be empowered through the curriculum to be effective agents of the three stages of reviewing literature proposed by Joyner et al. (2018). These stages were broad scan, focused review, and comprehensive critique. The aim of using the broad scan was to help in identifying the research problem clearly and to be able to narrow down the smaller areas of focus for easy management, as stated by Joyner et al. (2018). The broad scan enabled us to discover the quantity of concepts that are included in the study.

Solid waste management practices adapted in Ghanaian communities

Like every other country, Ghana generates waste and must practice waste management methods. The most common waste management practice is landfilling. In most communities, waste is collected at a central point and disposed of in landfills. In other communities, waste management companies offer house-to-house services at a fee. Recently, there has been a surge of recycling plants, mainly on a small scale. Examples of these plants include COLIBA Ghana and Accra compost and recycling plant. Several benefits can be derived from recycling and composting. The current subsection paints a picture of waste management practices that currently pertain to the country.

Waste exists in two main forms: solid waste and liquid waste (Samwine et al., 2017). Solid waste comprises four main categories: municipal waste, industrial waste, agricultural waste, and hazardous waste. Solid waste has been linked to air, soil, and water pollution (Brunner, 2013). Solid waste also contributes about 800 tons of carbon dioxide into the atmosphere each year. It has also been found that leachate from solid waste not only contaminates surface water but also seeps into groundwater (Das et al., 2019).

In addition to environmental and health implications, solid waste also has economic impacts. Globally, an estimated cost of USD 205.4 is spent on managing every ton of waste (Hoornweg & Bhada-Tata, 2012). There has been a significant growth of the human population, coupled with increased industrialization and urbanization. This has triggered massive waste generation. An annual production of 1.3 billion tons is produced yearly, which is expected to double by 2025 (Das et al., 2019; Samwine et al., 2017). According to Srivastava et al. (2014), solid waste management is usually central and based mostly on the economic status of the country.

Recycling, another waste management method, has been cited as an important strategy in waste reduction (Gaikwad & Obaya, 2018). Due to this method alone, in California, the amount of waste going to landfills was reduced by 25% (Os-kamp et al., 1991). The process of recycling follows waste separation, which is often done in homes. Types of materials that are usually recycled are aluminium, glass, paper, metal, and plastic. Geiger et al. (2019) found that individual as well as contextual factors that aid or hinder recycling. An example of such factors is the possession of bins. The benefits of recycling have also been documented in the literature. Farzadkia et al. (2021) found that recycled municipal solid waste reduced up to 3 million tons of air pollutant emissions.

Despite the benefits of recycling, it is noteworthy that it has some downsides. Presorting plastics is costly and time intensive. Furthermore, vast quantities of energy are usually employed in processing used materials (Robertson, 2021). Farzadkia et al. (2021) conducted a cost-benefit analysis of recycling and landfilling. They found that construction waste recycling could generate an environmental benefit of ¥1.21 per ton, whereas landfilling will lead to an environmental loss of ¥12.04 per ton.

Landfilling is the most common method of solid waste management system in developing countries, including Ghana (Kamaruddin et al., 2017; Samwine et al., 2017). This method is preferable to other forms of waste management because of its apparent simplicity in operation and execution (Kamaruddin et al., 2017). The most notable is the damage landfills cause to the waterbed and its spiraling consequences. When it rains, water washes chemicals from the landfills, which seep into the underground water which has implications on health and economics.

In summary, improper solid waste management is inevitable as solid waste is generated daily. Developed countries have come up with more efficient methods of managing solid waste. Recycling and composting are among the methods used. Although landfilling has an adverse impact on the environment, literature has shown that it is inevitable (Vaverková, 2019). Certain waste cannot be recycled, reused, or composted. These wastes end up in landfills.

In Ghana, landfilling is the most common waste disposal system because it is convenient to execute (Das et al., 2019; Samwine et al., 2017). Households in Ghana produce less than 30 million tons of municipal solid waste (Miezah et al., 2015). Alhassan et al. (2019) reported that the increase in urbanization and population is a contributor to the excessive waste generation in the country. Assemblies privatized some of the waste management in some communities to manage solid waste. Cobbinah and Darkwah (2016) add that poor solid waste management is an urbanization problem. The more people clutter around the same place, the worse the solid waste management activities. Obviously, the presence of poor waste management in Ghana is the presence of improper waste management. The main method of waste disposal, landfilling, is cited as harmful to the environment.

Causes and effects of poor solid waste management practices

Although it has previously been mentioned that landfilling is less cumbersome and less costly compared to other waste management methods, the repercussions can be grave (So et al., 2019). The same authors have reported that open dumping can breed viruses and germs in the environment. The evidence of poor solid waste management practice in Ghana is displayed in the frequency and types of ailments that are reported in the hospitals.

Notably, apart from water and environmental pollution, poor health results from poor waste management. Addaney and Oppong (2015) found that 72% of households were affected by malaria and cholera. Surprisingly, people who are directly affected by waste management are also part of the waste management problem. According to Samwine et al. (2017), some of the waste management challenges experienced in the country are directly linked with citizen's poor sanitation attitude. A clean environment influences good health, and good health further affects productivity (Adogu et al., 2015; Addaney & Oppong, 2015). When health is affected, productivity is also affected. There is a call for the country to put measures in place to encourage citizens to comply with proper waste disposal methods. This will prevent some ailments and create a healthy workforce for the country.

Poor waste management has environmental effects. Samwine et al. (2017) reiterated that the repetitive annual flooding experienced in the country was primarily due to poor waste management practices. Flooding has proved to be destructive to the environment, people, and property. On the 3rd of June 2015, a major flooding incident happened in the country and claimed the lives of over a hundred citizens. Dozens of properties get destroyed when there is flooding. People have been unwillingly ejected from their homes due to flooding. Poor

solid waste management is among the many causes of flooding in Ghana. Figure 1 in the appendix shows the repercussions of poor solid waste management on the 3rd of June 2015, which claimed many lives and properties.

Another cause of poor waste management in the country is the lack of communication channels between key stakeholders. Jambeck et al. (2015) identified a need to provide a clear definition of the problem and a roadmap to solve the problem. There seems to be a disconnect in addressing the waste problem within the country. Major stakeholders may have different ideas for solving the waste problem. According to Jambeck et al. (2015), identifying a road map to proper waste management will benefit its citizens. In addition to improper communication is a nonexistence of awareness of the responsibility of citizens in municipal solid waste management (Cobbinah & Darkwah, 2016).

The curriculum to empower students to become agents of change

The school system is crucial in the development of character for the youth. Gaikwad and Obaya (2018) observed that “environmental stewardship is a rather neglected area in the curriculum” (p. 136). Attention must be paid to what students learn in schools. The curriculum guides school administrators to direct teachers in executing their duties. When students are taught environmental sustainability, they will become knowledgeable and become agents of change in their communities.

The study of Gaikwad and Obaya (2018) in the Philippines focused on a successful school initiative of environmental care through the project WISHCRAFT. Their findings showed that with the holistic support of school stakeholders such as teachers, administrators, and communities, students experienced a change of perception towards environmental care. The

integration of environmental stewardship into the curriculum was seen as an important success factor in their study.

A closer look at the individual teacher and their commitment level to teach environmental studies shows that commitment levels of the teacher are low. Cutter-Mackenzie and Smith (2003) identify content knowledge as general pedagogical knowledge, knowledge of the learners and their characteristics, knowledge of educational contexts, curriculum knowledge, content pedagogical knowledge, and knowledge of educational ends, purposes, and moral values". For the purpose of the study, focus was placed on content knowledge. The authors discovered that primary school teachers have low levels in content knowledge of environmental theories. They also found that primary school teachers especially did not consider content on environmental study as overly important. Teaching conditions border on the physical, emotional, and social environment in which the teacher operates. It is the responsibility of a supervisor or headmaster to improve teaching conditions.

Solid waste management practices in the curriculum

Waste management and environmental study have crucial implications for our education system. First, students, the future leaders, will grasp this knowledge earlier in their lives. The formation of sanitary habits at a young age will have a better influence on decisions as an adult. The school system has been mandated to promote and maintain programs that will ensure student safety and success (Scaletta & Hughes, 2020). As part of its curriculum, the school system has many interventions to reduce challenging behavior while enhancing learning opportunities for students.

The duties of school administrators are to maintain a working awareness of expertise and skills to handle problems. They must make good decisions for students. Scaletta & Hughes add that school administrators must be active agents of

change. They can do this by allocating resources and soliciting other stakeholders' perspectives. Administrators must reflect on the best teaching and learning methods. This is accomplished through the preparation and amendment of the curriculum.

Curriculum is about all that goes on in school or the learning environment, and it is planned by the school for learning. This includes co-curricular activities. Curriculum is also seen as all the experiences, planned and unplanned, that learners go through under the guidance of a teacher to become holistic beings and useful citizens. It also comprises the course of study in a school. It is a plan for learning (Nehal & Saeed, 2023; Taba, 1962). In areas where environmental studies are instituted in the curriculum, educators normally adopt a constructive, student-directed, and experiential orientation method.

Educators face challenges when trying to run an environmental studies curriculum. Cutter-Mackenzie and Smith (2003) found that time constraints were a major factor in implementing a successful environmental education program. Other teachers who participated in their study claimed that an 'overcrowded' curriculum hindered their progress with environmental education. In Ghana, attempts can be made to incorporate environmental education in our school curriculum, preferably as standalone courses since there are implications yet to be discovered when it is merged with other programs.

Environmental awareness and education

Ghana is among the African countries that have recently increased recycling of electronic waste (Asibey et al., 2021). The problems of electronic waste have been linked with urbanization. The past few decades have increased the number of electronic and electrical gadgets. This has further increased the amount of e-waste and its associated risks. Some of these

risks include the open burning of e-waste items. This contaminates the atmosphere with carbon monoxide.

Attention needs to be paid to the degradation of the environment. One method of keeping the environment safe from waste is urban planning (Asibey et al., 2021). The increase in waste has been positively linked with urbanization. Therefore, improvement of our urban space will curb some waste churn out. Town and country planning involves policies, decrees of action, decisions by national and city governments to address public concerns, and stakeholder relations (Cobbinah & Darkwah, 2016).

METHODOLOGY

Qualitative research was used for this study. Qualitative research is an authority over a selection of informational procedures which seek to define, interpret, decode, and then come to agreement with the connotation, not the occurrence, of convinced relatively obviously striking spectacles in the societal domain (Merriam & Tisdell, 2015). According to Hesse-Biber and Leavy (2010), qualitative research is a set action that discovers the observer in the world. It has to do with explanatory facts which make them observable.

Research design

The design used for this study is a photovoice case study. Photovoice is a visual research methodology which has an intention of fostering social change. It is used in investigating change to empower the vulnerable. Photovoice empowers education and contributes to the formulation of policies and conscious change in attitude and life (Budig et al., 2018).

Wang and Burris (1997), proponents of photovoice, state that photovoice is an innovative data collection method which enables participatory action among research participants and

their communities. Photos can be employed alongside descriptions compiled by members' photos to bring about the experiences of their lives at home to the known, which prompts policymakers to make a change (Rosario et al., 2016).

A case study is an in-depth study of a person, a group, or an event. In a case study, almost every part of the life of the focus and its antiquity is discussed to obtain patterns of the causes of actions. It directs attention to a distinctive description of a group. It addresses an occurrence like a unique case, condition, program, or motion. Case study research gives a rich description due to its grounding in an intense and contrasted source of information (Hancock & Algozzine, 2017).

According to Gaikwad (2017), case study, a qualitative research design, has tapped the attention of researchers due to its uniqueness and traits. Case study shows various design concerns which researchers need to hold fast to. She points out that case studies have been among the initial known types of qualitative research since the middle of 19th century and they are among the most widely used qualitative research designs in social sciences since the late 1960s. Case study “has become increasingly popular in several related fields such as psychology, sociology, anthropology as well as in professions such as Education, Business, Social Work, and Public Health” (Gaikwad, 2017, p. 3431).

Purpose of the study

The purpose of this photovoice case study was to explore the best solid waste management practices that are adopted in Ghanaian communities. It was to create awareness of the effect of poor solid waste management in Ghanaian schools and communities. It also looked at how to empower students to become agents of change in solid waste management. This study was again to address what teachers and heads of schools can also do to empower the promoting and implementing

effective solid waste management. Moreover, the study looked at the formulation of policies on environmental cleanliness.

Research questions

The main purpose of this photovoice case study was to answer the following:

1. What are the adapted solid waste management practices in Ghanaian communities?
2. How can the curriculum empower students to become agents of change?
3. What policies can be formulated to promote effective waste management in Ghanaian communities?

Sampling procedure and sample

This study used a purposive, maximum variation sampling (Lopez & Whitehead, 2013; Merriam & Tisdell, 2015). Purposive sampling, also called judgmental, is a type of non-probability sampling. Participants' views were depended on in their selection for this study. This is because we wanted to access a particular group of people who matter most in our study of making students agents of effective waste management. Selected participants in the study fit a particular profile. Two schools from the same community were used. The participants in this study were junior high school students, heads of schools, teachers, and policymakers from the selected community who were willing to participate in this research. Each category of participants was in a range, and after the data collection, there was a total number of 25, as shown in Table 1 in the appendices. This number was as a result of the need to collect data from different sources as possible. The categories of these participants for this study were the following:

1. Seventeen students from the two selected schools were willing to participate in this research.

2. Six teachers from the two selected schools were concerned about solid waste management and were willing to participate in this research.

3. Two headteachers from the two schools were willing to participate in this research.

4. Policymakers: The paramount chief and his elders, a representative from the regional and municipal directorate of education and his officers, and the municipal chief executive's representative participated in the exhibition.

Data collection method

Before we collected data for this study, two pilot studies were conducted: one using in-depth interviews with a head teacher, a teacher, two students, and a community member were conducted; The other, focus group discussion with the two students. The design for the second pilot study was photovoice. To collect data is “all watching, asking, and reviewing” (Merriam, 1998, p. 4; Merriam 2015, p. 125). Data for the Photovoice case study can be collected from photo taking, observation, interviews, archival records, and documents (Merriam, 2015; Yin, 2015). Table 2 in the appendix shows the triangulation matrix for data collection.

Among the methods used in collecting data, the following were used to gather information for the photovoice design. They were observations by researchers and two community members. I also used the photos that were taken by the students as well as interviews from all the other participants on research question one.

Data collection instruments

Three instruments were used in the data collection for this study. The instruments were in-depth interviews, focus group discussion and photo taking. They are stated below.

In-depth interviews: An in-depth interview was conducted with all the participants to gather data for the study. They were students, teachers, and head teachers. Each interview lasted for about 30 to 35 minutes.

Focus group discussions: There was a focus group discussion. This was with four teachers. The focus group discussion aimed to gain comprehensive knowledge and insight into the situation or the responses from the in-depth interviews. This session lasted for 45 minutes.

Data analysis method

Data analysis took place in stages. Here we describe the stages. In collecting our data for this research, the students were put in groups of two in the photo taking the best ten photos for each theme during the selection and discussion of their choice of photos with their partners. The photo interpretation was done one theme at a time while we facilitated the discussion of the photos. The presentation of photos was achieved in a meeting with all participants. The stories of the participants were written, and a schedule was made for all the participants to come together and organize the photos according to the themes that were guided by the research questions (Rosario et al., 2016).

This photo interpretation was done using the SHOWED framework as (Tubang-Delgado, 2023; Wallerstein & Bernstein, 1988):

S – What do you SEE?

H – What is HAPPENING here?

O – How does it relate to OUR lives?

W – WHY does this problem exist?

E – How can we be EMPOWERED? and

D – What can we DO about this?

The participant students were put in groups of two to choose the best ten photos for each theme during the selection

and discussion of their choice of photos with their partners. The photo interpretation was done one theme at a time. The photos were then discussed. The presentation of photos was done in a meeting with all participants. The participants were assisted in the writing of their stories. When all photos had been presented and interpreted, a time was scheduled for all the participants to come together and organize the photos according to themes as guided by the research questions (Rosario et al, 2016; Wallerstein & Bernstein, 1988; Wang & Burris, 1997; Yin, 2015).

In the second stage of data analysis focusing on the case study design, the transcriptions of the recordings from the interviews were made. Next, we addressed the research questions by analyzing the data by using number coding, themes, and categories from each research question for each participant. We employed Saldana's (2012) data analysis guide. Data gathered from in-depth interviews and focused group discussions were manually analyzed by reflecting and writing on how we related with our participants on solid waste management. The process included reflections on emerging themes and categories, possible networks, links, connections, overlaps, and flows among the codes, themes, and categories. The related writings and existing theories that connected with the findings were written at the final stage.

Ethical considerations

The framework adopted for this study was that of Creswell and Poth (2016). The ethical principles were that we obtained permission from the institution's ethics review board to collect data for the study. We also had to obtain informed consent from our participants and the parents of the minors by letting them read, understand, and sign. To those who could not read, we read, interpreted the information, and asked them to sign. We also sought the welfare of our participants

by minimizing the risk of harm. We had to protect their anonymity and confidentiality in the interviews by giving them pseudonyms. For the photovoice participants, maintaining anonymity was not possible due to each group's presence at the photo exhibition venue. We also gave our participants the right to decide whether they were willing to participate in the research and continue during the process. They also had the right to tell when they would be available for the interviews. Below are the ethical considerations used (Creswell & Poth, 2016; Nyaga 2021):

1. Approval from the Ethics Review Board for our study.
2. Informed consent form for participants.
3. Explanation of the nature of the study to the participants and informed them that they may opt out of the study if they wish.
4. Respect for the participants' privacy and consent by constantly asking for their willingness to continue participating.
5. Care about their welfare by making sure there is no harm or risk.
6. Treating participants with equity and enhancing inclusiveness for everyone.
7. Protection of participants' anonymity by giving them pseudonyms.

PRESENTATION AND DISCUSSION OF FINDINGS

The findings from this study were discussed and analyzed using the students' photos, students' stories, the speeches delivered at the exhibition, and the themes and categories that emerged from the interviews. Also incorporated into the findings were the participants' quotations and views from the in-depth interviews and the focus group discussions. We compared our findings with what other authorities have said in the literature and came up with the themes below.

The findings of the study came up with how students can be empowered to become agents of change in solid waste management in their communities. The following themes emerged: (a) Incorporation of proper solid waste management practices in the curriculum, (b) empowering students, (c) raising awareness for environmental care, and (d) changing attitudes.

Incorporation of proper solid waste management practices in the curriculum

The theme of *Incorporating proper solid waste management practices in the curriculum* had two categories. They are teaching and visuals. Below are the discussions on the findings under the categories.

Teaching. The participants came out with information such as,

Teachers must make time to teach this solid waste management thing we are talking about. This should not be just one day's lesson. They must make it a routine and with conscious effort. (Folder 2, IdI, Ls 21-22)

Teachers or Ghana Education Service should add that to what they teach in schools so that students can become effective agents of change. *This will help them to promote it effectively* (Folder 2, IdI, Ls 27-29). In an interview with students, it was mentioned that students should educate their friends not to litter indiscriminately (Folder 2, IdI ST1, L 17). One of the headteachers said that there should be public education on proper solid waste management. *Students can be taught at school. If they learn this at school, they will also teach others* (Folder 1, IdI, Ls 16 & 17, p1).

To confirm this, Akudo (2024) reported in a study about factors affecting teachers' commitment to teaching. One central duty of the teacher is to nurture and foster students'

growth in environment-related knowledge, skills, and attitudes. Teaching is the art of imparting knowledge to learners. **Visuals.** Visuals are the second category under the theme of incorporating proper solid waste management practices in the curriculum. It simply means seeing. According to Tidwell and Jónsdóttir (2021), visual images assist us to make meaning. The assembly should erect a giant billboard with pictures on it at the entrance to every community.

When this is done, even the illiterates will see the pictures and read the meaning into them (Folder 3, IdI, T1, Ls 36 & 37, p. 15). Pictures should be posted on how to keep the environment clean all over the community. (Folder 5, FGD, Ls 53-57, p. 23)

The participants were referring to how effectively pictures communicate. Pictures on giant boards will convey great messages to anyone who sees them including those who cannot read written words.

Students' empowerment

Empowerment is a license, right, or authority given to a person to do something. Under this theme, we had:

This will empower us to go out and tell others why they should not throw rubbish around or why they should not throw their rubbish into gutters (Folder 2, IdI, ST2, Ls 29-31). I want our teachers to give us special days aside from their regular teaching period to organize special training for us (Folder 2, IdI, ST2, Ls 27-29). I think we the teachers have greater responsibility in this. If we empower the students, they can greatly help solve this problem of littering and improper dumping of refuse (Folder 3, IdI, T2, Ls 17-19, p. 16). These will empower the students to be courageous and gain some facts and vocabulary to transform their peers and the people in the community (Folder 3, IdI, T2, L 27-29).

At school, teachers should help the students to form clubs and meet with their mates to discuss issues on solid waste management and why they should not pour their rubbish into gutters. (Folder 2, IdI, ST1, Ls 14-25)

This is important because self-checking among peers to stop indiscriminate littering is critical. During the club meetings, a lot of educative videos can be displayed among the members or students to help them learn and caution themselves from littering. *Policies should allow students like my friends and me to speak in a public place to condemn this behavior* (Folder 2, IdI, ST4, Ls 26-27, p. 11). These interview responses align with the study by Kaza et al. (2018), which states that campus clubs are one of the many ways to help improve student sanitation.

Headteachers ought to support students' clubs in dealing with the issue of indiscriminate littering. One headteacher indicated, *Sanitation clubs should also be formed in every school or community where people will learn how to properly manage solid waste* (Folder 4, IdI, H/AT1, L 40–45, p. 19). This is in line with the study from Fadhullah et al. (2022), who indicated that headteachers should enforce the effective participation of students in clubs to give much authority to the student clubs.

Slogans play a critical role in reinforcing students' learning about sanitation into practice. Thus, providing an effortless reminder through slogans has proven to be essential. One of the student interviewees indicated that a song or slogan should be on keeping the environment clean for students to sing or respond to when we meet in or outside school (Folder 2, IdI, ST3, Ls 17-21).

Practically, *students are to learn some slogans so that they use them as often as possible*. Some of them are the following: *Take Action! Reduce Your Waste Fraction! / No More Trash! Let's Make a Dash!* These interview findings are supported by

the study conducted by Asiedu-Ayeh et al. (2023), who identified specific slogans that call for action to improve students' awareness about sanitation and their environment. Another study by Puopiel (2010) indicated that slogans reinforce the knowledge of students' practices and the catchphrase for how to improve on specific performances. The following are some suggested slogans:

1. *A cleaner world starts with you - Be the change in solid waste management!*

2. *Cleaner streets, healthy life - Join the solid waste management uprising!*

3. *Keep calm and reuse your solid waste - A small step for you, a massive leap for our environment!*

4. *Less waste, more happiness - Together, we can create a cleaner and healthier community!*

5. *One world, one chance - Let's prioritize accountable solid waste management!*

6. *Reduce, Reuse, Recycle - Our Planet's Lifeline!*

7. *Waste not, want not - Together, we can make a difference!*

Figure 1

Rubbish dumped into a gutter



Figure 2

Rubbish dumped into gutters and drained into water



Figure 3 and Figure 4

Rubbish dumped behind houses



Awareness of environmental care

Raising awareness for environmental care formed another theme in the findings and analysis of the study. The theme comprises two categories: The formation of clubs and community awareness. Awareness refers to knowledge or perception of a situation or fact. The categories that make up this theme are elaborated below.

Figure 5

Group 1 photo presentation at the exhibition



Formation of clubs

Teachers should help students form clubs.

At school, teachers should help the students to form clubs and meet with their mates to discuss issues on solid waste management (Folder 2, IdI, ST1, Ls 18–19). During the club meetings, we can show videos of where people have dumped the ‘bolla,’ and we will talk about it (Folder 2, IdI, ST1, Ls 19–21). I will, through the club meetings, educate other people who are not members of the club. (Folder 2, IdI, ST1, Ls 33–34)

Students must learn among themselves based on their actions and other related activities in sanitation’s short- and long-term goals. One of the Headteachers mentioned that *sanitation clubs should be formed in every school or community* (Folder 4, IdI, H/AT1, Ls 41–43).

In support of these responses, the study by Samwine et al. (2017) remarked that sanitation clubs, also known as hygiene

or health clubs, are student-led initiatives. They promote good sanitation practices, hygiene, and health in schools and communities. Miezah et al. (2015) documented that student-led initiatives have a higher chance of influencing behavior change among their fellow students and community members.

Some of the proposed names of clubs on solid waste management are as follows:

1. Club Green Earth. This club aims to educate students on sustainable solid waste management. The club members apply and form community clean-up events to promote a cleaner environment. Club Green Earth ensures a clean and green environment for sustainable living.

2. Eco Warriors Club. The focus of this club is to create awareness about the importance of proper solid waste disposal. Members do so through cooperative drives. They work with opinion leaders in the community.

3. Trash Talkers Club. This club aims to engage in open deliberations and debates on solid waste management issues. Members do so by promoting a better understanding of community challenges. They also come up with effective solutions for a cleaner future.

4. Waste Warriors Club. This club aims to bring together students and individuals passionate about reducing solid waste. Members advocate for policies that promote waste reduction in their communities. As the name implies, they are fighters of waste.

Community awareness

Community awareness has proven to be critical in improving sanitation. The findings from the interview ascertained that schools should also be given, maybe on the last Friday of every month, to throw the town in labelled T-shirts with plaque cards to sensitize the community members (Folder 2, IdI, ST2, Ls 32–33). *If we are aware or know the health*

implications, we will stop pouring waste anywhere we get, and our community will be clean (Folder 2, IdI, Ls 43–44).

To support this interview finding, the study by Kaza et al. (2018) noted that community sensitization refers to raising awareness and consciousness among community members about a particular issue, cause, or initiative. Community sensitization aims to educate and inform community members about specific topics. The theory of empowerment education supported our findings. This theory expresses the need to permit people who have been marginalized. According to Freire (1970), empowerment encompasses shattering the quietness and allowing people to identify their interests to influence change.

Changing attitude

Changing attitudes among the community members, students, and other stakeholders were ascertained to be another theme from the findings. Attitudinal change refers to any alteration in an attitude that affects active efforts by others to change. Attitudinal change can happen when individuals change from positive to negative. A teacher indicated that, as a community, they need a serious mindset (Folder 3, IdI, T1, Ls 24–26). *The change of mindset comes when we stop pouring our solid waste anywhere for a clean community* (Folder 2, IdI). There is a need to ensure a change of attitude by enforcing punishments flout the rules of littering. *People should stop pouring rubbish anywhere they get, such as gutters and people's uncompleted buildings* (Folder 2, IdI, ST2, Ls 27–28).

Another information given at the interview about attitudinal change was: *Unless we change our attitude because we also doing the same thing. If we change, we can also help to bring change* (Folder 2, IdI, ST3, Ls 17–18). Furthermore, the teachers have the responsibility to improve their attitude. Attitudinal change and law enforcement will help (Folder 3, IdI, T1,

Ls 27–28). Student participant 3 indicated that they must change their way of littering. (Folder 2, IdI, ST2, Ls 21–22). They noted that the teachers must produce proper rules for the students to follow to prevent littering.

In a discussion, these interview findings were in line with the assertions from Owusu–Ansah et al. (2022), that there is a need for schools and GES to provide accurate information and raise awareness about solid waste management. This is supported by Kwarteng et al. (2020), that teachers need to change the process of littering by providing students with the appropriate means of disposing of rubbish. Hence, there is a need to enforce attitudinal change to help enforce some of the rules.

These findings are connected to cognitive learning theory which is about linking concepts, real-world examples, discussions, problem-solving, and imagery, among others, as applications. It helps in making sense of the world and serves as a tool for the brain (Piaget, 1952). There is also a connection of the findings to the theory of reason/responsible action. Fishbein and Ajzen (1977) suggest that human behavior is rooted in reasonable thinking.

DISCUSSION

In a discussion, the interview findings were in line with the assertions from the study made by Owusu–Ansah et al. (2022) who ascertained that there is a need for schools and GES to provide accurate information and raise awareness about solid waste management, which includes the appropriate disposal of solid waste and their segregation. Thus, this will improve a change of mindset among students and other related stakeholders. Additionally, Addo and Agba (2018) noted that change in mindset and attitudinal change go hand in hand to influence positive impact on environmental sanitation among others in solid waste management.

These participant responses from the interview are in line with the studies conducted by Ampofo (2020) findings were in line with the interview responses which noted that the need for students to have an equal change in attitude towards the environment should influence the school and teachers' ability to set specific rules and that are enforceable. Additionally, it is also supported by Kwarteng et al. (2020), which says teachers need to change the process of littering and provide students with the appropriate means of disposing of rubbish. Hence, the need to enforce attitudinal change is to help enforce some of the rules.

To empower students to become agents of change, the study revealed that children learn and practice what they are taught. Education is necessary for reinforcement. Teachers must be given the necessary curriculum to teach so that students can become effective agents of change. One of the head teachers identified public education on proper solid waste management as a means of education. Hence, they need to organize symposiums and seminars. Students' empowerment was also identified as a means of becoming agents of change. The study noted that students requested teachers to provide them with special days for training and outreach. Students should be empowered to form clubs where they will learn how to influence the community on proper solid waste management. Learning and practicing appropriate vocabulary and slogans will serve as the basis for imparting to the community. The study also found that the clubs present an opportunity for a lot of educational videos to be displayed to enlighten the students.

Awareness creation has been identified as a critical means for driving change in communities led by students. The study realized that branded T-shirts with messages about solid waste management practices positively influence and remind the community of appropriate solid waste management practices. Aside from T-shirts, there should be signposts in the

community centers to help create awareness and consciousness among members of the community.

CONCLUSIONS

Students can be agents of change through education, empowerment, awareness creation, and attitudinal change. The Ministry of Education and the Ghana Education Service must include solid waste management strategies in their curriculum. Suggestions were found to incorporate environmental stewardship into the school curriculum. Heads of schools and teachers must be committed to teaching their students lessons on solid waste management. They should also see to the formation of clubs in their schools where solid waste management strategies will be learned.

The study's findings revealed that students must be taught proper solid waste management practices at school. Teachers must also be committed to teaching issues on appropriate solid waste management practices. This conclusion is tied to the theory of cognitive learning. It is again concluded that schools must form clubs to discuss issues on proper solid waste management practices.

The study again revealed that schools should also organize clean-up exercises for students to clean the communities at least once a month. There should also be slogans on solid waste management practices that students will always use. Organizing floats regularly will help draw people's attention to proper waste management practices. Again, the conclusion of the findings regarding the creation of billboards in the communities is tied to the theory of documentary photography. All the findings on making students effective agents of change are tied to the theories of empowerment education, reason and responsible action, and behaviorist learning.

RECOMMENDATIONS

Recommendations for Ghana Education Service

1. The research suggests that the Ghana Education Service (GES) needs to deeply integrate into the school's curriculum student outreach in every school in different communities.

2. To ensure, as part of their curriculum and learning, schools engage community members on best solid waste management practices. This practice is important since they will also learn through this pragmatic.

3. As part of the academic calendar, GES should institute cleaning campaign week. This will help schools, teachers, and students to practice how to improve knowledge concerning the need to improve solid waste management and reduce dumping of rubbish in areas around houses, incomplete buildings, gutters, and water bodies. As this activity goes on, people in the community will in turn learn from it.

Recommendations for teachers

1. Since teachers are the implementers of curriculum, this study recommends that they do their best to take issues of solid waste management practices as keen as possible.

2. They can do so by assisting with the formation of clubs in their schools.

3. Teachers are to set days aside from what they teach in the classroom to organize clean up exercise in the communities.

4. The recommendation is that teachers should be committed to helping students to become effective agents of change in solid waste management practices.

Recommendations for schools/students

1. Schools across the country and beyond cannot be left out.

2. It is recommended that every school take a keen interest in curbing this solid waste management menace.

3. There should be a formation of clubs in every school where issues of solid waste management are discussed.

4. Equally, there should be a day set every month for schools to campaign through floats to sensitize the public.

5. During this activity, there should be clean-up exercises in every school community.

6. The study further recommends that students serve as environmental ambassadors of effective solid waste management practices and agents of change in the long term. This is due to the fact that students can spread information fast, thereby making them good and effective agents of change.

Recommendations for policy makers/implementors/ law enforcement agents

1. The study recommends that policy implementations need to be backed with strict enforcement. However, this can be evaluated from two different points of view.

2. There is the need to reinforce community solid waste management teams that can assess the level of solid waste disposal within specific areas of communities.

3. The personnel in the teams must be provided with adequate resources to visit communities and areas prone to indiscriminate disposal of solid waste.

4. The team or personnel should be authorized to punish and act against those who are found to be culprit. This looks at the implementation aspect. When they can identify culprits, they must make sure punishment is meted up with such persons.

Recommendations for the Ministry of Environment and Sanitation/Environmental Protection Agency

1. The study recommends that the Ministry of Environment and Sanitation (MoES) and the Environmental Protection Agency (EPA) organize sensitization and outreach programs at the community level on a regular basis to help drive attitudinal change. The programs can include the use of banners, signposts, and customized T-shirts to help drive the knowledge and awareness necessary for effective solid waste management. In the long run, such sensitization practices can advocate for a reward system where those who are identified to be effective in solid waste management can be rewarded and promoted to be part of the leadership to drive attitudinal change in the communities.

2. These agencies or departments should institute community watchdogs to check on cleanliness.

3. Since cleanliness is next to Godliness, MoES and EPA should join hands with the opinion leaders in making sure that the communities are clean.

Recommendations for future researchers

1. The study recommends the need for future research in this field to explore the various effective community and school-level engagements on effective solid waste management strategies. Such studies could explore the intricate details and challenges that curtail the implementation of solid waste practices that lead to community littering and indiscriminate dumping of solid waste in different parts of the community.

2. Future researchers will investigate whether effective strategies for implementing solid waste management policies have been adhered to at the community and school levels.

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We are most grateful to the Almighty God for His sustenance, grace, and mercy on us. It is by His grace that we have come this far. He has been our guide up to this stage. He, being the source of all wisdom and knowledge, has helped us throughout this study. We are thankful to Him.

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REFERENCES

- Addaney, M., & Oppong, R. A. (2015). Critical issues of municipal solid waste management in Ghana. *Journal of Environmental and Natural Resource Management*, 2(1), 30–36.
- Addo, D. E., & Agba, P. U. (2018). Awareness strategies and attitude towards sewage disposal among the inhabitants of Calabar Education Zone in Cross River State, Nigeria. *Journal of Environmental and Tourism Education*, 1(1), 15–27.
- Adogu, P. O. U., Uwakwe, K. A., Egenti, N. B., Okwuoha, A. P., & Nkwocha, I. B. (2015). Assessment of waste management practices among residents of Owerri Municipal Imo State, Nigeria. *Journal of Environmental Protection*, 6(5), 446–456.
- Adu-Boahen, K., Atampugre, G., Antwi K. B., Osman A., Osei K. N., Mensah E. A., & Adu-Boahen A. O. (2014). Waste management practices in Ghana: Challenges and prospect, Jukwa Central Region. *International Journal of Development and Sustainability*, 3(3), 530–546.
- Akudo, F. U. (2024). Environmental factors promoting teachers' job commitment in secondary schools in Anambra State. *UNIZIK Journal of Educational Management and Policy*, 6(3), 40–50.
- Alhassan, K. A., Abdullahi, B. T., & Shah, M. M. (2019). A review on biogas production as an alternative source of fuel. *Journal of Applied and Advanced Research*, 4(2), 61–65.

- Ampofo, J. A. (2020). Implications of poor waste disposal management practices on senior high schools within the Wa Municipality of Ghana. *International Journal of Applied Research in Social Sciences*, 2(3), 53–70.
- Asibey, M. O., King, R. S., Lykke, A. M., & Inkoom, D. K. B. (2021). Urban planning trends on e-waste management in Ghanaian cities. *Cities*, 108, Article 102943.
- Asiedu-Ayeh, E., Guangyu, C., Obiora, S. C., & Asiedu-Ayeh, L. O. (2023). Assessing social responsibility initiatives for public-private partnership success based on multi-criteria decision making: Evidence from municipal solid waste management in Ghana. *Journal of Environmental Planning and Management*, 66(13), 2713–2738.
- Brunner, P. H. (2013). Cycles, spirals and linear flows. *Waste Management & Research*, 31(10), 1–2.
- Budig, K., Diez, J., Conde, P., Sastre, M., Hernán, M., & Franco, M. (2018). Photovoice and empowerment: Evaluating the transformative potential of a participatory action research project. *BMC Public Health*, 18(1), 1–9.
- Cobbinah, P. B., & Darkwah, R. M. (2016). African urbanism: the geography of urban greenery. *Urban Forum*, 27, 149–165.
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE.
- Cutter-Mackenzie, A., & Smith, R. (2003). Ecological literacy: The ‘missing paradigm’ in environmental education (part one). *Environmental Education Research*, 9(4), 497–524.
- Das, S., Lee, S. H., Kumar, P., Kim, K. H., Lee, S. S., & Bhattacharya, S. S. (2019). Solid waste management: Scope and the challenge of sustainability. *Journal of Cleaner Production*, 228, 658–678.
- Fadhullah, W., Imran, N. I. N., Ismail, S. N. S., Jaafar, M. H., & Abdullah, H. (2022). Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. *BMC Public Health*, 22, 1–20.

- Farzadkia, M., Mahvi, A. H., Norouzian Baghani, A., Sorooshian, A., Delikhoon, M., Sheikhi, R., & Ashournejad, Q. (2021). Municipal solid waste recycling: Impacts on energy savings and air pollution. *Journal of the Air & Waste Management Association*, 71(6), 737–753.
- Fishbein, M., & Ajzen, I. (1977). Belief, attitude, intention, and behavior: An introduction to theory and research. *Contemporary Sociology*, 6, 244.
- Freire, P. (1970). *Pedagogy of the oppressed*. Continuum.
- Gaikwad, P., & Obaya, B. (2018). Wish to WISHCRAFT: A peek into an environmentally friendly school. *International Forum Journal*, 21(1), 134–149.
- Gaikwad, P. (2017). Including rigor and artistry in case study as a strategic qualitative methodology. *The Qualitative Report*, 22(13), 3431–3447.
- Geiger, J. L., Steg, L., Van Der Werff, E., & Ünal, A. B. (2019). A meta-analysis of factors related to recycling. *Journal of Environmental Psychology*, 64, 78–97.
- Hancock, D. R., & Algozzine, B. (2017). *Doing case study research: A practical guide for beginning researchers* (4th ed.). Teachers College Press.
- Hesse-Biber, S. N., & Leavy, P. (2010). *The practice of qualitative research*. SAGE.
- Hoornweg, D., & Bhada-Tata, P. (2012). *What a waste: A global review of solid waste management*. The World Bank.
- Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science*, 347(6223), 768–771.
- Joyner, R. L., Rouse, W. A., & Glatthorn, A. A. (2018). *Writing the winning thesis or dissertation: A step-by-step guide*. Corwin Press.
- Kamaruddin, M. A., Yusoff, M. S., Rui, L. M., Isa, A. M., Zawawi, M. H., & Alrozi, R. (2017). An overview of municipal solid waste management and landfill leachate treatment: Malaysia and Asian perspectives. *Environmental Science and Pollution Research*, 24(35), 26988–27020.

- Kaza, S., Yao, L., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. The World Bank.
- Kwarteng, A., Amoako, C., & Osei, A. (2020). Promoting responsible waste disposal in schools: A role for teachers. *Journal of Environmental Education*, 51(3), 187–195.
- Lopez, V., & Whitehead, D. (2013). Sampling data and data collection in qualitative research. In Z. Schneider, D. Whitehead, G. Lo-Biondo-Wood & J. Haber (Eds.), *Nursing & midwifery research: Methods and appraisal for evidence-based practice* (4th ed., pp. 123–140). Elsevier Mosby.
- Merriam, S. B. (2015). Qualitative research: Designing, implementing, and publishing a study. In V. Wang (Ed.), *Handbook of research on scholarly publishing and research methods* (pp. 125–140). IGI Global.
- Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.
- Merriam, S. B. (1998). *Qualitative research and case study applications in education*. Jossey-Bass.
- Miezah, K., Obiri-Danso, K., Kádár, Z., Fei-Baffoe, B., & Mensah, M. Y. (2015). Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana. *Waste Management*, 46, 15–27.
- Nehal, N. B., & Saeed, A. (2023). Application of Taba's model in effective lesson planning at private primary schools of Karachi. *Jahane-Tahqeeq*, 6(4), 385–393.
- Nyaga, D. (2021). Critical research methodologies. In R. A. Torres & D. Nyaga (Eds.), *Critical research methodologies* (pp. 7–23). Brill.
- Oskamp, S. Harrington, M. J., Edwards, T. C., Sherwood, D. L., Okuda, S. M., & Swanson, D. C. (1991). Factors influencing household recycling behavior. *Environment and Behaviour*, 23(4), 494–519.
- Owusu-Ansah, P., Obiri-Yeboah, A. A., Nyantakyi, E. K., Woangbah, S. K., & Yeboah, S. I. I. K. (2022). Ghanaian inclination towards household waste segregation for sustainable waste management. *Scientific African*, 17, Article e01335.

- Piaget, J. (1952). *The origins of intelligence in children* (M. Cook, Trans.). W. W. Norton & Company.
- Puopiel, F. (2010). *Solid waste management in Ghana: The case of Tamale Metropolitan Area* [Master's Thesis, Kwame Nkrumah University of Science and Technology]. College of Art and Built Environment. <https://ir.knust.edu.gh/handle/123456789/146>
- Robertson, G. L. (2021). Recycling of aseptic beverage cartons: A review. *Recycling*, 6(1), 20.
- Rosario, A. H., Domocmat, M. C., & Oniashvili, S. (2016). Still a teen, already a mother: Understanding the teen motherhood phenomenon through Photovoice. *International Forum*, 19(2), 47–63.
- Saldana, J. (2012). *The coding manual for qualitative researchers* (4th ed.). SAGE.
- Samwine, T., Wu, P., Xu, L., Shen, Y., Appiah, E., & Yaoqi, W. (2017). Challenges and prospects of solid waste management in Ghana. *International Journal of Environmental Monitoring and Analysis*, 5(4), 96.
- Scaletta, M., & Hughes, M. T. (2020). Administrators' perception of their role in school-wide positive behavior interventions and supports implementation. *Journal of School Leadership*, Article 1052684620972062.
- So, W. W. M., Lee, J. C. K., & Chow, C. F. (2019). Environmental sustainability and education for waste management. In W. So, C. Chow & J. Lee (Eds.), *Environmental Sustainability and Education for Waste Management. Education for Sustainability* (pp. 1–11). Springer.
- Srivastava, R., Krishna, V., & Sonkar, I. (2014). Characterization and management of municipal solid waste: A case study of Varanasi city, India. *International Journal of Current Research and Academic Review*, 2(8), 10–16.
- Taba, H. (1962). *Curriculum development*. Harcourt, Brace & World.
- Tidwell, D., & Jónsdóttir, S. R. (2021). Visuals as meaning making. In J. Kitchen (Ed.), *Writing as a method for the self-study of practice* (pp. 155–180). Springer.

- Tubang-Delgado, M. B. (2023). A photovoice and psychological study on the realities of teachers in simultaneous onsite-online teaching-learning modality. *Journal for Re Attach Therapy and Developmental Diversities*, 6(9s): 497–503.
- Twumasi A. K (2017). Awareness and practice of solid waste management in the Winneba Municipality of Ghana. *European Journal of Earth and Environment*, 4(1), 39–47.
- Vaverková, M. D. (2019). Landfill impacts on the environment. *Geosciences*, 9(10), 431.
- Wallerstein, N., & Bernstein, E. (1988). Empowerment education: Freire's ideas adapted to health education. *Health Education Quarterly*, 15(4), 379–394.
- Wang, C., & Burris, M. A. (1997). Photovoice: Concept, methodology, and use for participatory needs assessment. *Health Education & Behavior*, 24(3), 369–387.
- Yin, R. K. (2015). *Qualitative research from start to finish*. Guilford.

APPENDICES

Table 1

Categories of participants

Category of participants	Number participated
Junior high school students	5 for IdI and 10 for photo taking making 15 in all
Teachers	2 for Id. Int. and 4 for FGD making 6 in all
Heads or assistant heads	2 in all
Policymakers	1 Paramount chief, 5 Sub-chiefs, 1 Magajia, 1 MCE representative, 1 representative from the Regional/Municipal Directorate of education
Total	25

Table 2

Triangulation matrix for data collection

Research Questions	Data Sources				
1	2	3	4	5	6
What are the solid waste management practices in schools?	In-depth interview (Students in 15-20 minutes)	In-depth interview (teachers 15-20 minutes)			Participants' speeches (Students)
How can the curriculum empower students to become agents of change?	In-depth interview (Students to 15-20 minutes)	In-depth interview (15-20 minutes)	FGD for case study (Teachers 15-20 minutes)	In-depth interview (Headteachers 15-20 minutes)	

What can be formulated to promote effective waste management in Ghanaian communities?	In-depth interview (Students 15-20 minutes)	In-depth interview (Teachers 15-20 minutes)	Participants' speeches (Policymakers)
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Figure 1
Effects of poor solid waste management–flood after a short rain



Note. From Myjoyonline (2015, June 3). Ghana Floods: 154 dead in Accra explosion and fire.



Accra marks June 3 disaster tomorrow as ...
 graphic.com.gh



1st Anniversary of June 3 disaster; how ...
 emsog.org



Ghana mourns 'fire and flood' victims ...
 africanews.com



June 3: Lots of lessons must be taken ...
 newshana.com.gh



Note. From *Graphic Online* (2016, June 1). *A year after the June 3 twin disaster.*

Figure 2
Rubbish dumped behind houses



STUDENTS' STORIES

First speech

Mr. Chairman, invited guest, chiefs present, teachers, parents, fellow students, ladies and gentlemen, good morning.

My name is Adam Royan and my friend's name is Mudassir. We are from Ridge Junior High School. We are here to talk about solid waste management. When we say solid waste is the unwanted waste or substance that is litter around our environment.

What do you SEE?

Gutters choked with pure water rubbers and other rubbish. This is what we call improper disposal of waste. It is the disposal of rubbish in such a way that will affect us.

Some people dispose of their waste into the gutters. When we do this, the gutters and drains can get choked. When it rains heavily, floods can occur.

What is HAPPENING?

When we throw our solid waste anywhere and anyhow, we sometimes release harmful substances into the environment.

How does it Relates to OUR Lives?

It is dangerous to our lives because it can easily bring mosquitoes that can cause malaria. When we get malaria, we will not be able to go about our duties. We students cannot go to school. It can also result in death.

It relates to our lives because it can cause floods and floods can take people's lives very easily.

WHY does this Exist?

Human Carelessness and Human Factors

How can we be EMPOWERED?

Please Headteachers, Chiefs, MPs, MCE, give us the empowerment that whoever eats or drinks and throws the rubbish in the flood will be punished and even sent to the chief's palace or court. Look at these pictures! What are we doing to ourselves and our environment?

What can we DO About this?

My dream is that we should take action now! We should reduce our waste fraction!

I want our community to be like this, when it looks like this, we will be happy and healthy. No one will take anyone to court, Chief Palace or punish anyone.

THANK YOU.

Figure 3
Group 1 Photo presentation at the exhibition



Figure 4

Group 2 Photo presentation at the exhibition



Second Speech

Mr. Chairman, invited guests, chiefs present, teachers, parents, fellow students, ladies and gentlemen, good morning.

My name is Osman Mariam. I attend Ridge Junior High School. I am here with my friend to talk about how we are treating our environment with solid waste. When you hear about solid waste what does you understand by solid waste. In my own understanding, solid waste is the unwanted substances that we litter in around in our communities. Right now, I am going to show you some pictures of it.

What did you SEE?

For me I see rubbish all over the streets and in our gutters.

What is HAPPENING Here?

The things that make this happen are the rubbish, foreign materials, and waste materials that litter on the street.

How does it Relate to OUR Live?

It makes our lives very dangerous, boarded and it makes our lives miserable and very unhappy it even causes evilness when I say evilness it means when it rains heavily it make the bridge chocked with unwanted substances it also causes flooding.

The flooding can enter somebody's home and kill the people there. It is also evil.

WHY does this Problem Exist?

It is caused by us human beings. When we eat, we throw the rubbish on the streets. We even throw it anyhow and when it rains heavily it makes the waste disposal choke on the sheets and gutters.

How can we be EMPOWERED?

Mr. Chairman, invited guest, my chiefs, and all authorities present, we the students need power from you all to help us stop this problem.

What can we DO About this?

It is our dream that our streets become beautiful like what we are seeing in these pictures. When we come together, we can make the community as beautiful as we can see here.

NO MORE TRASH LET'S MAKE A DASH

Thank you.

Third Speech

Mr. Chairman, invited guests, chiefs present, teachers, parents, fellow students, ladies and gentlemen, good morning.

Yahaya Amina, I attend Ridge Junior High School. I am called Alice, and I attend Bagabaga Demonstration Annex Junior High School. We are here to talk about solid waste management. When they say solid waste what does it mean? Solid waste is unwanted substances that are litter around in our environment. Now we are going to talk about some pictures here that we took right from our community.

What do you SEE?

We see rubbish around our homes, behind our buildings, in uncompleted buildings and everywhere you cast your eyes.

What is HAPPENING Here?

We, the community members, are causing all this. It is becoming too much.

How does it Relate to OUR Lives?

It relates to our lives very badly. We will be very unhappy, and very miserable. When I say evilness, it means when the gutters and bridge on the road are choked, and it rains heavily the water will overflow and will not get anywhere to pass. So, when you are passing beside the gutter or on the bridge, you may think that is the way that you will pass but the time you realise, you are carried away by the flood and that will be your end.

WHY does this Problem Exist?

It exists by us human beings. We pour or throw waste into the gutters and rivers.

How can we be EMPOWERED?

MPs, Teachers, Chiefs, district assembly, we need you to empower us, the students, in such a way that we will become agents to change this attitude of the people in our community.

What can we DO About this?

We all have to change our behavior and come together to clean up the mess we have created. We have to come together to make it real in our community and country.

Thank you.

Figure 5
Group 3 Photo presentation at the exhibition



IMPACTS OF GROUP-INVESTIGATION AND HEURISTIC-DISCOVERY STRATEGIES ON CELLULAR RESPIRATION ACHIEVEMENT IN NIGERIAN SECONDARY SCHOOLS

Ahmed Tijjani Dikko¹, Abdulmalik Sabitu²,
Umar Usman Shehu³

Abstract

This study investigated the effectiveness of Group-Investigation Strategy (GIS) and Heuristic-Discovery Strategy (HDS) compared to the traditional Lecture Method (LM) in improving students' achievement in cellular respiration. A quasi-experimental pretest-posttest control group design was employed, involving 165 SSII students drawn from 4,525 in Katsina State, Nigeria. The Cellular Respiration Achievement Test (CRAT) with a reliability coefficient of $r = 0.816$ was used. Results analyzed using mean, standard deviation, and ANCOVA ($p \leq 0.05$) revealed that both GIS and HDS significantly enhanced achievement compared to LM, with GIS showing the highest effectiveness. Gender had no significant effect on achievement across strategies. The study concludes that GIS and HDS are superior to the lecture method in teaching complex biology topics and recommends their integration into classroom practice and teacher professional development programs.

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Keywords

Cellular respiration, group investigation, heuristic discovery, lecture method, student achievement

INTRODUCTION

Globally, students face persistent challenges in mastering complex science concepts, with cellular respiration being particularly difficult due to its abstract biochemical processes. Traditional lecture-based teaching has been widely criticized for failing to foster critical thinking, collaboration, and deep understanding (Freeman et al., 2014; Schneider & Preckel, 2017). In Nigeria, performance in science subjects continues to lag behind global standards, as reflected in examinations such as Trends in International Science and Mathematics Study [TIMSS] and West African Examination Council [WAEC] (Martin et al., 2020; WAEC, 2022). Locally, Katsina State has recorded poor performance in biology, with students struggling particularly in abstract topics like cellular respiration (Katsina State Ministry of Education, 2022).

These challenges call for the adoption of contemporary, student-centered instructional strategies. Group-Investigation Strategy (GIS) and Heuristic-Discovery Strategy (HDS) are two approaches grounded in constructivist theory (Vygotsky, 1978) and experiential learning principles (Bruner, 1961). Both emphasize active engagement, collaboration, and independent problem-solving, which may help students better grasp abstract scientific processes. However, limited research in Nigeria directly compares GIS, HDS, and LM in teaching cellular respiration. Moreover, the role of gender differences under these strategies remains inconclusive (Adewumi & Adejoke, 2023; Akinwumi & Falemu, 2020).

Few studies have provided a comparative analysis of GIS and HDS in resource-constrained Nigerian classrooms, particularly on cellular respiration. In addition, existing findings on

gender effects remain inconsistent. This study addresses these gaps by examining the relative effectiveness of GIS, HDS, and LM, while investigating gender dynamics.

LITERATURE REVIEW

Cellular respiration is a foundational yet abstract biological process involving glycolysis, the Krebs cycle, and oxidative phosphorylation (Alberts et al., 2022). Lecture-based approaches have been shown to hinder long-term retention and conceptual understanding (Freeman et al., 2014; Prince, 2004). In contrast, active learning strategies promote deeper engagement and achievement (Bonwell & Eison, 1991; Theobald et al., 2020).

GIS emphasizes group collaboration and democratic inquiry, enabling students to co-construct knowledge through dialogue (Johnson & Johnson, 2009; Sharan & Sharan, 1992). HDS emphasizes guided discovery, fostering independent reasoning and experiential learning (Alfieri et al., 2011; Bruner, 1961). Both strategies align with Vygotsky's (1978) social constructivism and Kolb's (1984) experiential learning framework.

Globally, studies confirm the effectiveness of these strategies in enhancing achievement (Darling-Hammond et al., 2020; Springer et al., 1999). In Nigeria, research indicates that GIS fosters collaboration and motivation (Ebele & Abubakar, 2019; Usman, 2017), while HDS promotes problem-solving and retention (John, 2023; Tofi et al., 2022). However, comparative studies in cellular respiration remain limited. Furthermore, gender-related findings are mixed, with some showing no differences (Akinwumi & Falemu, 2020), while others report slight female advantages (Adewumi & Adejoke, 2023). This study builds on these theoretical and empirical insights to provide a direct comparison of GIS, HDS, and LM within Nigerian secondary schools.

METHODOLOGY

Objectives of the study

The study aims to determine the effect of GIS and HDS on students' achievement in cellular respiration compared with the lecture method. Specific Objectives:

1. Determine the effect of GIS, HDS, and LM on students' achievement in cellular respiration.
2. Examine the effect of GIS on male and female students' achievement in cellular respiration.
3. Examine the effect of HDS on male and female students' achievement in cellular respiration.

Hypotheses

Based on these objectives, the following null hypotheses were tested at $p \leq 0.05$:

H01: There is no significant difference in the mean achievement scores of students taught using GIS, HDS, and LM.

H02: There is no significant difference in the achievement of male and female students taught using GIS.

H03: There is no significant difference in the achievement of male and female students taught using HDS.

Materials and methods

A pretest-posttest quasi-experimental control group design was employed, involving two experimental groups (GIS and HDS) and one control (LM). This design was deemed appropriate because it controls baseline differences while allowing the evaluation of instructional interventions in intact classroom settings (Creswell, 2014).

Population and sampling

The population consisted of 4,525 SSII science students in co-educational public schools in Katsina State. Multi-stage sampling was used to select 165 students from three schools, with intact classes serving as groups (GIS = 60, HDS = 58, LM = 47). Stratification ensured representation across local governments.

Instruments

Data was collected using the Cellular Respiration Achievement Test (CRAT), validated by experts and piloted for reliability ($r = 0.816$). Instructional materials were standardized across schools, ensuring consistency.

Ethical considerations

Approval was obtained from the Katsina State Ministry of Education. School principals, teachers, and parents consented to participation. Confidentiality and anonymity were maintained.

Data analysis

Descriptive statistics (mean and mean difference) and inferential statistics (ANCOVA) were used to analyze the data collected.

RESULTS

H01: There is no significant difference in the mean achievement scores of students taught using GIS, HDS, and LM.

Results from Table 3 reveals that GIS students ($M=25.03$, $SD=2.84$) significantly outperformed both HDS ($M=17.09$, $SD=2.73$) and LM ($M=12.77$, $SD=2.50$). ANCOVA in Table 1 confirms significant group differences, $F(2,158)=254.55$, p

< 0.05. Pairwise comparisons in Table 3 indicated that GIS > HDS (MD=7.95), GIS > LM (MD=12.28), and HDS > LM (MD=4.32).

Table 1
One-way analysis of students’ achievement scores in cellular respiration between the experimental and control groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	4258.251a	6	709.709	98.100	.000
Intercept	3646.509	1	3646.509	504.041	.000
Groups	3683.100	2	1841.550	254.550	.000
CRAT Pretest	10.191	1	10.191	1.409	.285
Group * Gender	32.943	2	12.454	1.721	.182
Gender	8.321	1	8.321	1.150	.237
Error	1143.058	158	7.235		
Total	63381.000	165			
Corrected Total	5401.309	164			

Table 2
Univariate tests of the mean score of the groups

Source	Sum of Squares	Df	Mean Square	F	Sig.
Contrast	3683.100	2	1841.550	254.550	.000
Error	1143.058	158	7.235		

Table 3
Pairwise comparison of the students’ achievement scores in cellular respiration

(I) Group	(J) Group	MD (I-J)	SME	p-Value
GIS (M= 25.03 SD= 2.84)	HDS	7.95	0.499	0.00
HDS (M= 17.09 SD= 2.72)	LM	4.32	0.528	0.00
LM (M= 12.77 SD= 2.50)	GIS	-12.28	0.532	0.00

H02: There is no significant difference in the achievement of male and female students taught using GIS.

Table 4 shows that Male ($M = 24.61$) and female ($M = 25.77$) students showed no significant differences, $MD = 1.16$, $p > 0.05$.

Table 4

Male and female students' achievement scores in cellular respiration of GIS

Variable	Gender	N	M	SD	SEM	MD
GIS	Male	38	24.61	3.12	0.50	1.16
	Female	22	25.77	2.18	0.47	

H03: There is no significant difference in the achievement of male and female students taught using HDS.

Table 5 implies that Male ($M=17.29$) and female ($M=16.56$) students also showed no significant differences, $MD=0.73$, $p > 0.05$.

Table 5

Male and female students' achievement scores in cellular respiration of HDS

Variable	Gender	N	M	SD	SEM	MD
HDS	Male	41	17.29	2.65	0.41	0.73
	Female	17	16.56	2.94	0.71	

DISCUSSION

Findings demonstrate that GIS and HDS significantly improve achievement compared to LM, supporting evidence that active learning fosters deeper understanding (Freeman et al., 2014; Theobald et al., 2020). The higher effectiveness of GIS aligns with studies highlighting the power of group

collaboration in promoting problem-solving and critical thinking (Sharan & Sharan, 1992; Usman, 2017). HDS, while less effective than GIS, still proved superior to LM, consistent with the findings of John (2023) and Tofi et al. (2022). On the other hand, Gubera and Aruguete (2013) offer a different opinion, contradicting this finding. They revealed that collaborative courses had lower quiz/exam scores and lower student satisfaction compared to lecture courses in introductory psychology. Maceiras et al. (2025) took a dual opinion, agreeing with the present finding on one aspect and contradicting the finding on another aspect. They found out that active methods improved short-term outcomes (immediate tests, engagement), but in long-term retention, the lecture (traditional) group sometimes performed as well or better. Another different viewpoint is that of Wilson et al. (2018), who suggested that group work/group collaboration is less beneficial for simpler tasks (like recall, definitions) compared to individual work/lecture.

While the findings show no significant gender differences under GIS and HDS which aligned with (Akinwumi & Falemu, 2020; Rashid et al., 2023), other research indicates gendered patterns in active-learning contexts that complicate this conclusion. Several studies report that men are more likely to dominate visible participation behaviors in active classrooms and that women often report lower scientific self-efficacy or heightened gender salience when group activities are not deliberately structured for equity. For example, Aguillon et al. (2020) observed greater male participation and lower female self-efficacy in an active-learning biology course, and follow-up analyses emphasize that instructor setup and group norms strongly mediate these patterns. Other research, such as Wilcox and Lewandowski (2022), indicates that the gender composition and group-formation strategies influence who benefits from collaborative assessments. Together, these

studies suggest that the absence of a gender gap in the data does not guarantee equitable experiences under GIS/HDS more broadly. Instead, careful design feature explicit role assignments, accountability structures, inclusive facilitation, and monitoring of participation are required to ensure that active methods produce equitable outcomes for all genders (Adewumi & Adejoke, 2023).

CONCLUSION AND RECOMMENDATIONS

This study concludes that GIS and HDS are both significantly more effective than the lecture method in teaching cellular respiration, with GIS showing the highest impact. Both strategies were equally effective across gender.

However, the study recommends that:

1. Biology teachers should adopt GIS and HDS in teaching cellular respiration and other complex concepts.
2. STAN and NERDC should organize workshops to build teachers' capacity in constructivist strategies.
3. Policymakers should provide resources and training to adapt these strategies in large, resource-constrained classrooms.

REFERENCES

- Adewumi, G. S., & Adejoke, A. A. (2023). Effect of two instructional strategies on students' science process skills in abstract Biology concepts in Kwara State, Nigeria. *Journal of Science, Technology and Mathematics Pedagogy*, 1(1), 242–258.
- Aguillon, S. M., Siegmund, G., Petipas, R. H., Drake, A. G., Cotner, S., & Ballen, C. J. (2020). Gender differences in student participation in an active-learning biology classroom. *CBE—Life Sciences Education*, 19(2), ar1- ar10.

- Akinwumi, I. O., & Falemu, F. A. (2020). Effects of Biology practical on academic performance of secondary school students in Biology. *International Journal of Educational Research*, 4(10), 10–23.
- Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2022). *Molecular biology of the cell* (7th ed.). Garland Science.
- Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2011). Does discovery-based instruction enhance learning? *Journal of Educational Psychology*, 103(1), 1–18.
- Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom* (ASHE-ERIC Higher Education Report No. 1). George Washington University, School of Education and Human Development.
- Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review*, 31(1), 21–32.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE.
- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 24(2), 97–140.
- Ebele, F. U., & Abubakar, Z. (2019). Effects of group investigation strategy on secondary school students' academic achievement in Biology. *International Journal of Innovative Research and Development*, 8(12), 113–119.
- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23), 8410–8415.
- Gubera, C., & Aruguete, M. S. (2013). A comparison of collaborative and traditional instruction in higher education. *Social Psychology of Education*, 16(4), 651–659.
- John, F. N. (2023). Effect of heuristic method on students' performance in shorthand in colleges of education in Kano State, Nigeria. *Nigerian Journal of Business Education*, 9(3), 117–125.

- Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational Researcher*, 38(5), 365–379.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- Maceiras, R., Feijoo, J., Alfonsin, V., & Perez-Rial, L. (2025). Effectiveness of active learning techniques in knowledge retention among engineering students. *Education for Chemical Engineers*, 51, 1–8.
- Martin, M. O., von Davier, M., & Mullis, I. V. S. (Eds.). (2020). *Methods and procedures: TIMSS 2019 technical report*. TIMSS & PIRLS International Study Center, Boston College. <https://timss-andpirls.bc.edu/timss2019/methods.html>
- Ministry of Education, Katsina State. (2022). *Education Sector Performance Report*.
- Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, 93(3), 223–231.
- Rashid, A. A., Muhammad, J., & Tsauri, A. S. (2023). Effectiveness of cooperative learning strategy on academic performance and retention in Biology among secondary school students in Katsina Metropolis. *Multidisciplinary International Journal of Research and Development*, 3(1), 80–87.
- Schneider, M., & Preckel, F. (2017). Variables associated with achievement in higher education: A systematic review of meta-analyses. *Psychological Bulletin*, 143(6), 565–600.
- Sharan, Y., & Sharan, S. (1992). *Group investigation: Expanding cooperative learning*. Teachers College Press.
- Springer, L., Stanne, M. E., & Donovan, S. S. (1999). Effects of small-group learning on undergraduates in science, mathematics, engineering, and technology: A meta-analysis. *Review of Educational Research*, 69(1), 21–51.
- Theobald, E. J., Hill, M. J., Tran, E., Agrawal, S., Arroyo, E. N., Behling, S., Chambwe, N., Cintrón, D. L., Cooper, J. D., Dunster, G., Grummer, J. A., Hennessey, K., Hsiao, J., Iranon, N., Jones, L., 2nd, Jordt, H., Keller, M., Lacey, M. E., Littlefield, C. E., Lowe, A., ... Freeman, S. (2020). Active learning narrows achievement gaps for underrepresented students in undergraduate science,

technology, engineering, and math. *Proceedings of the National Academy of Sciences*, 117(12), 6476–6483.

- Tofi, M., Achor, E. E., & Eje, V. I. (2022). Effect of guided discovery method on secondary school students' academic performance in Biology in Makurdi, Benue State, Nigeria. *European Journal of Training and Development Studies*, 9(1), 32–40.
- Usman, Z. Y. (2017). *Effect of group-investigative strategy on motivation and performance in ecology among senior secondary school Biology students in Gumel, Jigawa State, Nigeria* [Unpublished Master's thesis]. Ahmadu Bello University, Zaria.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- West African Examinations Council (2022). *Chief examiners' report: West African Senior School Certificate Examination*.
- Wilcox, B., & Lewandowski, H. J. (2022). How gender composition and group formation impact collaborative exam performance. *Physical Review Physics Education Research*, 18(2), 020137-1-020137-9.
- Wilson, K. J., Brickman, P., & Brame, C. J. (2018). Group work (Evidence-Based Teaching Guides). *CBE—Life Sciences Education*, 17(1), fe1-5.

RELIGIOUS FACTORS AFFECTING TEACHING COMPREHENSIVE SEXUALITY EDUCATION IN EARLY CHILDHOOD EDUCATION CLASSES IN CHIPINGE, ZIMBABWE

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Abstract

Child sexual abuse is a global threat to child optimal development. Strategies such as making laws that criminalize it and that legalize the provision of Comprehensive Sexuality Education (CSE) in schools have been put in place but is still escalating. This study was undertaken to explore the religious factors affecting the delivery of CSE in Early Childhood Education (ECE) in order to determine strategies of mitigating it. This qualitative case study design, located in the interpretive paradigm used semi-structured interviews to gather data from five religious leaders, ten parents and ten teachers who were purposefully selected. Data were analyzed thematically with Bronfenbrenner's ecological system's theory as the theoretical framework. Religious beliefs, doctrines, values and customs were found to inhibit the provision of CSE in ECE classes, leaving children uninformed about how to protect themselves from sexual abuse. The study recommended the integration of CSE into training curricula for religious leaders and the provision of in-service training for religious leaders already in practice to help religious leaders recognize the importance of CSE and support its implementation in the ECE classes.

Key words

Compressive Sexuality Education (CSE), child sexual abuse, Early Childhood Education (ECE), religious factors

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INTRODUCTION

Child sexual abuse is a global scourge and a threat to child optimal development. Several nations applied various strategies to address this problem, but its prevalence continues to rise (Muridzo & Chikadzi, 2020). These strategies include crafting laws that criminalize child sexual abuse and legalize the provision of Comprehensive Sexuality Education (CSE). Children are vulnerable to this predicament due to a myriad of factors, which include lack of knowledge about what constitutes sexual abuse, ignorance on how to avoid it and their physical weaknesses, which render them defenseless (Bagattini, 2019; Lohan & López, 2023; Santrock, 2018; Wangamati, 2020). The perpetrators of child sexual abuse often physically coerce children to obtain sexual gratification from them (Mugabe, 2021).

Provision of CSE to children, is regarded as the most efficacious strategy for empowering children to deal with challenges pertaining to sexuality (Lohan & López, 2023). It is believed to equip them with knowledge, skills and attitude that can enable them to tackle challenges that lead to sexual abuse. It also informs them about where to seek help if they encounter issues related to sexuality (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2018). According to Venketsamy and Kinear (2020), knowledge of what constitutes child sexual abuse empowers children to protect themselves from such exploitation, thus it is essential to teach children CSE to reduce vulnerability to sexual abuse.

In Zimbabwe, child sexual abuse is rampant and is on the rise (Mahoso et al., 2024; Mukau, 2023; Shambare & Mapolisa, 2020). Statistics reveal that one in three girls and two in five boys are survivors of sexual abuse with more than one hundred girls sexually abused daily (Mahoso, 2020; Mugabe, 2021). Perpetrators of sexual abuse show no regard for age, because even infants as young as three months old have

been documented as victims (Shambare & Mapolisa, 2020). Effort to deliver to children in Zimbabwe is made. However, religion compromises its delivery (Muridzo & Chikadzi, 2020; Wangamati, 2020). Some religious practices are often exploited to facilitate child sexual abuse (Shambare & Mapolisa, 2020). For example, a girl child may be taken to a forest or mountain under the guise of receiving prophetic healing, only to be sexually abused.

Additionally, some prophets claim that they would have been given a child by God as a wife, thereby sexually abusing that child under religious pretense (Mahoso & Finestone, 2023). Furthermore, some traditional healers of the African Traditional Religion (ATR) in Zimbabwe prescribe sexual intercourse with a virgin as a cure for HIV and AIDS, or as a ritual for wealth accumulation, animal fertility and bumper harvest of crops. Such practices further expose children to sexual abuse (Mugabe, 2021; Mukau, 2023).

The absence of CSE in Early Childhood Education (ECE) classes in Zimbabwean schools deprives children of essential knowledge on how to protect themselves from sexual abuse. These harmful religious practices are further promoted by children's lack of knowledge about what constitutes sexual abuse, a direct consequence of failure to teach them CSE (Mugabe, 2021; Mukau, 2025). It is crucial to recognize that religion acts as a double-edged sword concerning child sexual abuse. On one hand, it is exploited by perpetrators to abuse children; on the other hand, it is used to hinder the implementation of CSE, which could otherwise protect children. This dual effect contributes to the rising prevalence of child sexual abuse in Zimbabwe, designating the urgent need to teach CSE. CSE can equip children emotionally, socially, physically and cognitively with effective strategies to minimize their risk of sexual abuse (Amo-Adjei, 2024; UNESCO, 2018).

The high prevalence of child sexual abuse, driven by religious factors and its devastating consequences, justifies the prioritization of strategies for combating this form of abuse. Although CSE is a scientifically proven strategy for reducing child sexual abuse (Lohan & López, 2023), the implementation at the ECE level in Zimbabwe is also obstructed by religious factors. This obstruction leaves children vulnerable to continued sexual abuse and highlights the urgent need to address these religious barriers to ensure the protection of young learners. Successful control of child sexual abuse could consequently make Zimbabwe a safe environment for children in ECE classes which may enable them to optimally develop. Consequently, this study is undertaken to succinctly establish these religious factors that impede the effective teaching of CSE in early grades in Zimbabwe which could help to determine effective strategies of promoting the teaching of CSE. This could lead to effective delivery of CSE in early grades thereby promoting the protection of children from sexual abuse.

The following research questions guided this study:

The main research question:

What are the religious factors that affect the teaching of CSE to children in ECE classes in Zimbabwe?

The main research question was analyzed to derive the following sub-research questions:

- What religious beliefs affect the teaching of CSE to children in ECE classes in Zimbabwe?
- What religious situations in schools compromise the teaching of CSE in ECE classes in Zimbabwe?
- How do religious doctrines affect the teaching of CSE to children in ECE classes in Zimbabwe?
- What religious practices hinder the teaching of CSE in ECE classes?

- What strategies can be implemented to mitigate the religious factors that obstruct the teaching of CSE to children in ECE classes in Zimbabwe?

LITERATURE REVIEW

Comprehensive sexuality education

Comprehensive sexuality education (CSE) refers to education that addresses the cognitive, social, physical and emotional aspects of human sexuality (Amo-Adjei, 2024; Ketting & Ivanova, 2018). It provides learners with age-appropriate sexual information that is both scientifically and medically accurate, while the primary aim of CSE is to effectively address challenges arising from human sexual behaviors (Chavula et al., 2022; UNESCO, 2018). Additionally, it educates learners on the importance of promoting gender equality and the respect of human dignity as strategies to prevent sexual abuse linked to gender inequality and disrespect for human dignity in society. CSE is tailored to align with the learners' cultural contexts, it is delivered through a human rights approach, and it should be introduced from early childhood and continue throughout the learner's educational journey (UNESCO, 2018).

In Europe, CSE is offered starting from early childhood (Ketting & Ivanova, 2018; Mukau, 2023). It stretches through adolescence to adulthood and is bearing dividends notably in Finland, Germany, Kazakhstan, the Netherlands and Estonia. Reduction of health problems that are associated with a lack of knowledge on CSE is visible in these countries. The implementation of CSE in Europe, began in Sweden, where it became a compulsory subject in 1995. Several policies have been established to legalize and guide the implementation of CSE across Europe (Ketting & Ivanova, 2018). These policies may play a crucial role in decriminalizing the provision of CSE to

children, addressing to its delivery to young children and promoting the effective implementation of CSE programs.

In the US, CSE is offered; however, abstinence-only education is more commonly preferred, and consequently, it receives greater funding than CSE. Yet, abstinence-only education is less effective than CSE in addressing health problems linked to a lack of education on sexuality. Abstinence-only education falls short by prioritizing fear-based messaging about sexual activity rather than providing scientifically accurate information on sexuality. Such information is essential for equipping children with the knowledge they need to protect themselves from abuse (Mishra, 2021).

In Zimbabwe, the rate of child sexual abuse is shameful (Mahoso, 2020; Mahoso & Finestone, 2023). An estimated one hundred girls are sexually victimized daily in Zimbabwe (Mugabe, 2021), partly due to a lack of CSE. Some of these children are sexually victimized by relatives or guardians they trust, leaving them uncertain about where to seek help. This is partly due to a lack of CSE, which should empower them with knowledge on how to minimize the risk of sexual abuse and how to counter if they experience such abuse (Mukau, 2023; Ndhlovu & Mfoafo-M'Carthy, 2022).

In Zimbabwe, the fear of punishment from perpetrators and the fear of social stigmatization prevents victims from reporting sexual abuse, allowing abusers to continue molesting children (Mugabe, 2021; Ndhlovu & Mfoafo-M'Carthy, 2022). It is crucial to note that these fears could be dealt with through the teaching of CSE.

Although CSE is recognized for its effectiveness in alleviating children's vulnerability to sexual abuse (Vengetsamy & Kinear, 2020), its implementation in Zimbabwe is hindered by religious factors that obstruct efforts to provide it (Bhana & Matswetu, 2023; Mugabe, 2021). In Zimbabwe, religious beliefs dictate that CSE is intended for adults, not children based

on the notion that children are asexual; consequently, they are not permitted to receive CSE (Mukau, 2023). However, research indicates that children often exhibit sexually risky behaviors which can be mitigated through CSE (American Academy of Pediatrics, 2023; Mukau, 2023). According to Mahoso (2020), some children display inappropriate sexual behaviors, such as sexually stimulating themselves in the presence of others or exposing their genitals to peers. Some children exhibit a strong curiosity about nudity and, in some cases, may even force their peers into sexual acts. Others show a particular interest in touching the genitals of others (Barnett et al., 2017).

It is essential to recognize that such behaviors can be managed effectively through CSE (AAP, 2023). Early-grade learners should be taught to distinguish between appropriate and inappropriate touch (AAP, 2023; Vengetsamy & Kinear, 2020). Furthermore, they need to learn the correct anatomical names for the human genital organs (Mahoso & Finestone, 2023). Tracy (2021) advises that teaching children about the body parts that should not be touched can help them to realize attempts to abuse them and can also empower them to take protective actions. It is crucial to note that such vital education can be effectively delivered through CSE (AAP, 2023; Vengetsamy & Kinear, 2020). Unfortunately, in Zimbabwe, religious beliefs prohibit children of this age from receiving CSE. Therefore, it is necessary to develop a strategy to ensure that children in Zimbabwe receive this essential education to safeguard their well-being.

The effect of religion on the teaching of CSE

Religions can thwart endeavors to provide CSE to ECE children by prohibiting the teaching of CSE to them. Such religions regard the delivery of CSE to ECE children as a sin before God (Mukonka et al., 2023; Reimers, 2025; Wangamati,

2020). In Madagascar, talking about anything related to sexuality especially with children, is religiously regarded as the mother of all sins (Mukonka et al., 2023). Teachers who are members of such religions are uncomfortable to teach CSE content that conflicts with their religious beliefs, values and doctrines. Some teachers who may make attempts to teach CSE to children from families that belong to such religions could be victimized by these families. This victimization even happens in societies where the teaching of CSE could have been made compulsory. For example, some teachers in Zambia, Iran and India opt to avoid teaching CSE content that conflict with their religious beliefs, values and doctrine (Mukonga et al., 2024; Mukonka et al., 2023). Additionally, some parents withdraw their children from schools that may attempt to teach CSE; hence some of these children become dropouts.

Theoretical framework

This study was guided by Bronfenbrenner's ecological systems theory which takes the development of a child as taking place at the center of five nested systems which are the microsystem, mesosystem, exosystem, macrosystem and chronosystem. Factors within each of these settings may either promote child development or stifle it (Bronfenbrenner, 1979; Santrock, 2018). This study pertains to religion; hence the focus is dominantly given to the fourth setting which is the macrosystem where the region is enshrined.

METHODOLOGY

This study was carried out in Chipinge district in Zimbabwe. A qualitative case study approach in the interpretive paradigm was applied in this study. It was utilized because it allowed the researcher not to consider the whole of Zimbabwe

for data collection but to be confined to Chipinge district which enabled an in-depth study of religious factors that affect the teaching of CSE in ECE classes in Zimbabwe (Pedamkar, 2023) which helped to yield an insightful understanding of the religious factors affecting the teaching of CSE in Zimbabwe.

The population of this study comprised religious leaders from the local religious institutions, ECE class teachers affiliated with local religions, and parents belonging to local religions who had children in ECE classes in Chipinge District. From this population, a sample of five religious leaders, ten parents, and ten ECE teachers was selected.

Purposive sampling was employed to select participants who were rich sources of information, enabling the researcher to gather comprehensive and relevant data to answer the research questions (DeJonckheere & Vaughn, 2019; Makwana et al., 2023; Pedarmkar, 2023).

Semi-structured interviews were used as the primary data collection method. This instrument was chosen because it allowed the researcher to ask follow-up questions to clarify vague responses, thereby enhancing the understanding of participants' perspectives (DeJonckheere & Vaughn, 2019). Additionally, participants were allowed to seek clarification on questions they did not fully understand, which improved their ability to provide accurate and informed responses. To ensure data validity, triangulation was employed by collecting data from three different sources: religious leaders, teachers and parents (Morgan, 2024). Data from these three sources were compared to confirm authenticity and consistency.

The researcher adhered to ethical principles throughout the study. Participants were fully informed about the study's purpose, as recommended by Laryeafio and Ogbewe (2023), Mirza et al. (2023), and Miteu (2024). Anonymity was ensured by using pseudonyms for the following participants:

- Religious leaders were labelled as RLA, RLB, up to RLE (for five participants).
- Parents were labelled as PA, PB, PC, up to PJ (for ten participants).
- Teachers were also labelled as TA, TB, TC, up to TJ (for ten participants).

Participation was entirely voluntary. Participants were informed that they were free to withdraw from the study at any time without penalty, promoting the principle of informed consent (Arafat, 2024; Miteu, 2024). Additionally, the researcher obtained ethical clearance from the University of Pretoria before conducting the study.

RESULTS AND DISCUSSIONS

The qualitative data collected for this study were analyzed thematically. Themes were derived from the data in line with the research questions and are discussed below, with participant quotes labelled (e.g., TA, RLA) and supported by relevant literature.

The findings are organized under five themes as given subsequently:

- Religious beliefs that impede the teaching of CSE to ECE classes
- Religious situations that compromise the teaching of CSE
- Religious doctrines that are inhibitive to the teaching of CSE in ECE classes
- Religious practices that compromise the teaching of CSE in ECE classes
- Strategies for mitigating religious factors that militate the teaching of CSE in ECE classes

Religious beliefs that impede the teaching of CSE to ECE classes

The data collected for this study revealed several religious beliefs that conflict with the teaching of CSE to young children in Zimbabwe. Some individuals believe that teaching CSE to children is ungodly, as reflected in information from TB and TC respectively:

TB: Christian parents in our community believe that talking about sexuality with children is unholy.

TC: Christian parents do not want their children to be taught sexuality saying it is immoral. It is believed to be ungodly to talk about sexuality with children.

What TB and TC stated aligns with the information provided by TG, who advised that:

Concerning religion, especially African Traditional Religion, it does not allow us to talk about sexuality with children as it is religiously considered as giving children dirty information. Even the other religions we have around us believe that the moment we talk about sexuality to children, we are imparting to them unreligious information which is against their religious beliefs.

The information provided by these participants highlights the prevailing religious belief that teaching CSE to children in ECE classes is considered an unholy practice. Consequently, attempts to introduce CSE to young children are likely to face strong religious opposition. Such views, as expressed by the Zimbabwean teachers, are not unique to Zimbabwe. Similar sentiments have been observed in Zambia, as described by Mukonka et al (2023). According to these scholars, many Christians in Zambia believe that discussing sexuality with children undermines Christian values, which must be preserved since Zambia was declared a Christian nation in 1991. In religious contexts, anything deemed unholy is perceived as

offensive to God and therefore, must be rejected. This belief contributed to the strong resistance against the introduction of CSE by Christians in Zambia in 2020.

A comparable situation occurred in Madagascar when an attempt was made to introduce CSE to upper-grade learners. Since discussing sexuality is regarded as the "mother of all taboos" in Madagascar, some learners dropped out of school to avoid exposure to sexuality-related topics (Mukonka et al., 2023). In Madagascar, those who violate such taboos risk becoming social outcasts and misfits within their communities. Similarly, in Zimbabwe, efforts to introduce CSE to young children by educators or advocates, may lead them to be viewed as outcasts and to face social isolation. As Santrock (2018) observes, human beings are inherently social, and social acceptance is highly valued. Consequently, the fear of being ostracized discourages individuals from supporting CSE initiatives.

Furthermore, sentiments from other participants in this study revealed a religious belief that teaching CSE is not only perceived as unholy but also as a form of defilement to children. This perspective is reflected in the information provided by RLA, TJ, and TI, respectively:

RLA: It is believed that talking about sexuality in church can defile children. Any attempt to teach CSE to children is construed as corrupting the innate goodness of children.

TJ: The belief is that teaching them about sex can offend God since it spoils the innocence of the children that they are born with.

TI: This Christianity does not take the teaching of sexuality as crucial, but they are against it. They believe that it makes people unrighteous before God.

Due to religious beliefs, the teaching of CSE is also perceived as a sin that invites punishment from God. This is evidenced by the statement made by RLA who said:

Any attempt to teach CSE to children is construed as corrupting the original nature of children which can attract punishment from God just like other immoral deeds. This punishment from God could be in the form of drought to the whole nation.

Some people, influenced by their religious beliefs, hold that it is God's responsibility to teach about sexuality, as reflected in the information from PE:

It is God's duty to teach a person about sexuality. It is also believed that God chooses a wife for a person.

Some religious beliefs align cultural values regarding the teaching of CSE with culture when it comes to the teaching of CSE. This is reflected in the statement made by TC who said:

Some religious sects see it as too early to educate or talk about it to early grade learners which is similar to the Zimbabwean culture which also prohibits the teaching of CSE to young children.

This belief mirrors the Zimbabwean cultural notion that children are too young to be taught CSE. However, the argument that children are not ready to learn about sexuality is flawed, as their behaviors often indicate otherwise. These behaviors include asking questions about their gender and the names of sexual organs, exposing their sexual organs to one another, imitating sexual behaviors they have observed, and engaging in role-play that involves simulating sexual acts or coercing peers into such behaviors during play (AAP, 2019).

Religious situations that compromise the teaching of CSE

School contexts were also found to compromise CSE teaching. Teachers themselves often resisted due to religious affiliation:

Some teachers themselves are Christians. Remember Christianity does not allow that. (TB)

At my school, most teachers are Christians, the rest belong to ATR. These teachers are unwilling to deliver CSE lessons. (TC)

TI added:

At the school where I teach, most children are from Christian families which do not allow children to be taught about sexuality.

This aligns with Bronfenbrenner's mesosystem concept, where home and school environments reinforce one another (Santrock, 2018). Christian-owned schools, common in Zimbabwe (Mudumo & Makonye, 2023), further institutionalize this resistance, undermining CSE delivery.

Religious doctrines that are inhibitive to the teaching of CSE in ECE classes

Religious doctrines are among the key impediments to the teaching of CSE to children in early grades, as highlighted by RLB, who stated:

Some church members and leaders are not allowed by their church doctrines to watch TV and read newspapers. Those people do not know what is taking place around them with regards to child sexual abuse due to a lack of access to information. As such, they do not see the need for CSE for young children.

The inability of adult religious members to stay informed about issues related to child sexual abuse, due to a lack of access to relevant information, prevents them from understanding the importance of CSE to young children. Some people oppose the teaching of CSE to their young children, believing that CSE promotes inappropriate behavior that is homosexuality, masturbation, having premarital sex and pro-abortion ideas (UNESCO, 2018). These misperceptions could be due to a lack of access to journalistic media, which could otherwise inform them. Additionally, it should be noted that such individuals often do not engage in discussions about sexuality, as their religion perceive it as ungodly.

Africans are often described as deeply religious, signifying their strong adherence to religious beliefs, practices and doctrines, which they rarely alter, regardless of circumstances (Sanni, 2016). Some of the participants – RLC, a religious leader, PE and PF who were parents, argued that:

RLC: The doctrine of my church only allows children who are 14 years old to be taught CSE. You cannot teach children in ECE classes because you will be violating the church doctrine.

PE: In our church, this is a nonstarter. We do not teach children about sexuality; it's prohibited by the church doctrine. We don't teach them. It's God's duty.

PF: The doctrine of our family religion does not allow teaching CSE to children in early grades.

The excerpts indicate the doctrines that restrict ECE children's access to CSE. They show that such religions do not permit the teaching of CSE to children who have not reached adolescence. Such religious doctrines jeopardize the security of children in ECE, as perpetrators of child sexual abuse do not wait for children to reach the age of fourteen to abuse them.

They even sexually abuse babies as young as three months, as indicated by Shambare and Mapolisa (2020).

Religious practices that compromise the teaching of CSE in ECE classes

Several religious practices in Zimbabwe, negatively impact the teaching of CSE. A teacher participant named TB said:

Churches prohibit the teaching of CSE to early-grade children.

What TB said resonates with the information provided by one of the religious leaders, RLC who stated:

In our church when people talk about anything related to sexuality, children are not included. When talking about such issues in church, children are taken out.

These two excerpts indicate that churches explicitly instruct their members not to teach CSE to children, succinctly highlighting the prohibition of CSE as a religious practice. This implies that all the loyal members of such religions adhere to this practice, thereby denying children access to vital knowledge on CSE, which could help to protect them from sexual abuse. As a result, children are left vulnerable to various forms of child sexual exploitation. Failure to comply with these religious directives results in punishment, as confirmed by RLC, one of the religious leaders who stated:

If you go against it, you will be put under discipline by the church and lose your religious position.

This highlights the severity with which religions prohibit the teaching of CSE to children at the ECE level. It demonstrates that religious institutions enforce this prohibition punishing those who violate their directives. Additionally, they indoctrinate their members to normalize child sexual abuse, as reflected by RLE, who also said:

Again, women in our churches have been indoctrinated to accept sexual abuse of a girl child as normal whilst other church leaders just believe that it is unholy to talk about sexuality to children. This results in avoiding the teaching of this subject.

This practice of brainwashing people to accept child sexual abuse as something ordained by God resonates with literature. Muridzo and Chikadzi (2020) report that in Zimbabwe, prophets may take a child to a forest or mountain for so-called prophetic healing or deliverance, which involves sexually abusing the child. Similar practices are observed in Nigeria, where prophets are known to groom children for sexual abuse (Funmilola, 2024; Omiunu, 2020). These Nigerian prophets deceive both the children's parents and the wider community, manipulating them into believing in false prophecies (Raine & Kent, 2019).

In both Zimbabwe and Nigeria, church members are not only programmed to believe that withholding CSE from young children is appropriate, but that they may also face punishment from their religious institutions for attempting to teach it. However, in Zimbabwe, some individuals attempt to teach CSE through more culturally acceptable methods such as using colloquial language, as indicated by RLE:

Those who attempt to teach CSE use colloquial language making it difficult for young learners to understand it.

Nevertheless, the effectiveness of imparting CSE to the young learner is compromised by this strategy, as effective CSE must be accurate and clear. The use of colloquial language in teaching CSE hinders children's understanding and contradicts the principle of accuracy in CSE instruction.

Another practice that hinders the effective teaching of CSE is instructing children not to report instances of abuse, as highlighted by PA, who stated:

In our church, children are not allowed to be taught anything pertaining to sexuality. They are even taught not to report elders if sexually abused by them.

The practice of teaching children not to report sexual abuse, as enforced by some religious institutions, is corroborated by literature on child sexual abuse, which highlights how perpetrators often employ this strategy of discouraging reporting sexual abuse. In Zimbabwe, perpetrators of child sexual abuse also condition children to remain silent, which is akin to grooming strategies observed in the United States and some Christian churches in Nigeria. Such grooming strategies not only targets children but also extends to parents and the wider community, convincing them to accept the abuse as appropriate and refrain from reporting it (Krinkin & Dekel, 2023)

Strategies for mitigating religious factors that militate the teaching of CSE in ECE classes

In this study, the participants managed to provide approaches that can be applied to promote the teaching of CSE to ECE children as a way of controlling sexual abuse that most children are vulnerable to. RLA said:

To deal with this issue of child sexual abuse, the provision of education is best. There is a need to educate church leaders about the importance of CSE in early grades so that they get enlightened.

The suggestions provided above could contribute to addressing the problem as religious leaders play a pivotal role in instilling and enforcing religious beliefs, doctrines and practices among their followers (Chitando & Moyo-Bango, 2016). Given their influential roles, religious leaders could be instrumental in encouraging communities to abandon religious beliefs, doctrines and practices that hinder the teaching of CSE in ECE classes. It should also be noted that religious leaders

determine what is considered religiously right or wrong for their followers and can easily influence the perceptions of their subordinates as their authority is uniquely regarded as unquestionable and their teachings are often accepted as the gospel truth. Religious leaders are often trusted more than politicians by their followers (Chitando & Moyo-Bango, 2016). RLA's suggestion, discussed above, aligns with the perspectives shared by RLE who successively stated:

We, pastors, should be taught by specialists about CSE and its significance to children for us to then teach other people. They must be educated and be trained on CSE. They should get this education as they train in bible schools because if they then teach other people, they can easily convince them because they are trusted by them.

Again, this idea of teaching religious leaders first so that they cascade the information to the people they lead may work in Zimbabwe because religion is found in every society (Mahoso, 2020; Mukau, 2023). This implies that if the religious leaders are taught about it to secure their consent and cooperation, the whole of Zimbabwean society could be influenced from every corner to also consent and cooperate. Mahoso (2020) further advise that the religious beliefs that hamper the acceptance of the teaching of CSE such as the acceptance that CSE could contaminate children can best be addressed by teaching them about the significance of CSE because in a study that was carried out in Africa, religious leaders who were taught about the importance of CSE to children were able to discard such beliefs. They surprisingly became very supportive of the teaching of CSE whilst those not taught resisted it (Choobe & Yanailo, 2024). This shows that resistance to the teaching of CSE to children emanates from people's ignorance of its significance.

Some participants also supported the same notion as reflected by RLE's contribution:

Pastors must be educated too and be trained on CSE. They should get this education as they train in Bible schools.

RLD also asserted that:

CSE should be factored into the pastors training program to ensure that they are taught before they start working as pastors. This ensures that churches will be led by people who value CSE who will then promote it.

Including CSE in the curriculum for training religious leaders is a crucial strategy, as it can foster a positive attitude towards the teaching of CSE among trainees. Consequently, after completing their training, these leaders will assume their leadership roles with a supportive outlook on teaching CSE to children. Moreover, if CSE is taught and assessed during their training, the religious leaders will be equipped to provide scientifically and medically accurate information as required by CSE standards. Such accurate information is vital, as it prevents misleading learners and provides them with a reliable foundation for making informed decision about sexuality. Moreover, if religious leaders are taught CSE by their lecturers during their training, they may cease to take it as unholy and as something that defiles anyone. When it comes to teaching the people, they will lead and may stop perceiving it as unholy or defiling. This experience could reduce their reluctance to teach CSE to their congregations, as they would be more comfortable emulating their lecturers' examples without embarrassment or hesitation.

RLA's suggestion of teaching CSE to parents in churches about its importance can promote acceptance of CSE right from a family level which is the microsystem which the child is always according to Bronfenbrenner's theory (Bronfenbrenner, 1979; Santrock, 2018). Promoting CSE in the family setting is highly effective. Encouraging church members to support CSE also implies persuading some teachers who may be

members of these churches to embrace and actively participate in teaching CSE to young children.

RLE further suggested that religious leaders should be educated about CSE through workshops. According to Amo-Adjei (2024) and Mukau (2023), workshops are effective platforms for imparting new knowledge and skills.

Another strategy for promoting CSE in ECE classes was proposed by RLD:

The government must come up with a policy that requires every church to accept the teaching of CSE. The same policy should require schools to teach CSE to children who are in early grades. Parents should be instructed by the government not to interfere with the teaching of CSE.

According to Bronfenbrenner's theory, policies originate from the parliament, which is part of the macrosystem. What emerges from this level is pervasive, as it cascades down to influence the child, who is situated at the center of the microsystem (Bronfenbrenner, 1979; Santrock, 2018). Therefore, policies from the macrosystem can have a powerful and far-reaching impact. Implementing a policy that legalizes the teaching of CSE to young children in Zimbabwe could create an enabling environment for teachers to teach CSE and also provide them with both the authority and support necessary for delivering CSE effectively. Such a policy could also standardize CSE implementation, removing barriers and uncertainties, which would, in turn, enhance teachers' confidence and maximize their effectiveness in educating young learners about sexuality.

CONCLUSIONS

Based on the findings of this study, several conclusions can be drawn. Firstly, the high and escalating rate of sexual abuse is largely attributed to the lack of CSE, which could otherwise

equip children with strategies to protect themselves from abuse. Additionally, resistance to CSE among religious leaders and their followers stems from ignorance about its significance in safeguarding children. The study further concludes that religion has a detrimental impact on the teaching of CSE in ECE classes. Various religious beliefs are barriers to CSE delivery. Notably, the perception that discussing sexuality with children is immoral and unholy hinders efforts to provide CSE to ECE learners. Some religious members believe that CSE exposes innocent children to inappropriate information, thereby corrupting their purity; as a result, they reject CSE to preserve children's innocence.

Religious doctrines also pose significant challenges to the teaching of CSE. Certain doctrines prohibit followers from accessing informative media such as newspapers, radio and television, thereby depriving them of crucial knowledge about child sexual abuse and the protective role of CSE. Furthermore, some doctrines only permit the teaching of CSE to children aged 14 years and above. However, this restriction is a cause of concern, as perpetrators of child sexual abuse in Zimbabwe have been documented to target children who are even as young as three months, as highlighted in the literature reviewed in this study. Moreover, some religious doctrines place the responsibility of teaching sexuality solely on God, thereby neglecting the necessity of providing children with age-appropriate, protective knowledge. Such beliefs escalate children's vulnerability to sexual abuse by discouraging proactive education and awareness.

Certain religious practices hinder the teaching of CSE. These practices include prohibiting children from hearing about sexuality, indoctrinating communities to perceive child sexual abuse as a normal and acceptable religious practice, demoting individuals from religious positions for discussing sexuality with children and committing sexual abuse under the

pretext of prophetic healing. Although some churches forbid their members from talking about sexual matters with children, some prophets manipulate children, parents and communities into believing that child sexual abuse is acceptable and desirable.

Additionally, some religious conditions within schools suppress the teaching of CSE to children in ECE classes. Such environments are hostile to CSE instruction. In Zimbabwe, some schools are affiliated with churches that prohibit the teaching of CSE to young children. Furthermore, some teachers in these schools are members of religious groups that forbid CSE instruction in ECE classes. As a result, children attending these schools have limited opportunities to receive CSE, leaving them vulnerable to sexual abuse.

To deal with religious factors that impede the teaching of CSE to children in ECE classes as reflected by the findings of this study, there is a need to educate religious leaders on the significance of CSE to children's protection. If these are convinced, they can promote change in people's church doctrines, religious beliefs and values that inhibit the teaching of CSE in ECE classes. Consequently, schools-communities' partnership could be strengthened which may promote effective delivery of CSE in ECE Classes in Chipinge, Zimbabwe.

RECOMMENDATIONS

CSE should be integrated into the training programs for religious leaders, to ensure that CSE becomes part of their training curriculum. Moreover, religious leaders already serving in churches should be provided with opportunities to learn about CSE through workshops. Properly organized workshops can significantly benefit pastors by enhancing their understanding of the importance of CSE in their religious leadership roles. Furthermore, these workshops will equip them to teach CSE to young children and advocate its importance within their

congregations. Workshops for religious leaders should focus on educating them about the significance of CSE for young children and providing them with the skills necessary to teach it effectively. These workshops should deliver comprehensive information on CSE, ensuring that religious leaders are prepared to provide learners with scientifically and medically accurate knowledge. Religious institutions should be encouraged to revise their doctrines to accommodate the teaching of CSE to children, recognizing that children within churches are also vulnerable to risks arising from a lack of CSE knowledge. Additionally, the government should mandate the teaching of CSE in churches by introducing a policy that requires all religious institutions to teach CSE to young children as a measure to protect them from sexual abuse. The government should also introduce a policy that enforces strict penalties for individuals who groom children for sexual abuse and for those who influence parents and communities to accept such abuse as normal or necessary. Public awareness campaigns should be conducted to caution Zimbabweans against false prophets who promote or normalize child sexual abuse. Furthermore, reporting any incidents of child sexual abuse should be made mandatory. Schools that prohibit the teaching of CSE in ECE classes should be compelled to implement it.

Study limitations

This study was limited to Chipinge District, which restricts the generalizability of findings to other contexts in Zimbabwe and beyond. Data collection relied on self-report interviews, which may be influenced by social desirability bias. Future research could employ longitudinal designs and comparative studies across districts or countries to provide broader insights.

REFERENCES

- American Academy of Pediatrics (2023). *Sexual behaviours in young children: what's normal, what's not?* Healthy Children. <https://www.healthychildren.org/English/ages-stages/pre-school/Pages/Sexual-Behaviors-Young-Children.aspx>
- Amo-Adjei, J. (2024). Resistances to the implementation of comprehensive sexuality education curriculum in Ghana's educational institutions. *International Journal of Adolescence Youth*, 29(1), Article 2398038.
- Arafat, M. Y. (2024). Research ethics: Meaning and principles. *International Journal of Academic Multidisciplinary Research*, 8(1), 139–144.
- Bagattini, A. (2019). Children's well-being and vulnerability. *Ethics and Social Welfare*, 13(3), 211–215.
- Barnett, M., Giaquinto, A., Hunter, L. & Worth, C. A. M. (2017). *Age appropriate sexual behaviour in children and young people* (2nd ed.). South Eastern Centre Against Sexual Assault & Family Violence (SECASA). <https://www.ncsby.org/sites/default/files/2022-08/Age-appropriate-behaviours-book.pdf>
- Bhana, D., & Matswetu, V. (2023). Girls under surveillance: Engaging Zimbabwean parents on young people's sexual health. *Health Education Journal*, 82(6), 623–635.
- Chavula, M. P., Zulu, J. M., & Hurtig, A. (2022). Factors influencing the integration of comprehensive sexuality education into educational systems in low- and middle-income countries: a systematic review. *Reproductive Health*, 19(1), 196.
- Chitando, E. & Moyo-Bango, B. (2016). *Religion & sexuality: A report on faith-based responses to Children's Comprehensive Sexuality Education and Information*. Save the Children.
- Choobe, M., & Yangailo, T. (2024). Factors affecting the teaching of comprehensive sexuality education among secondary school teachers. *Population and Economics*, 8(3), 46–69.
- DeJonckheere, M., & Vaugh, L.M. (2019). Semistructured interviewing in primary care research: a balance of relationship and rigour. *Family Medicine and Community Health*, 7(2), Article e00057.

- Funmilola, A. (2024). Online sexual abuse of children in Nigeria. *Open Journal for Legal Studies*, 7(2), 37–52.
- Ketting, E & Ivanova, O. (2018). *Sexuality education in Europe and Central Asia: State of the art and recent developments*. BZgA; IPPF EN. https://whocc.bioeg.de/fileadmin/user_upload/Dokumente/BZgA_ComprehensiveCountryReport_EN.pdf
- Krinkin, Y., & Dekel, R. (2023). Sexual grooming processes carried out by offending rabbis toward religious men and their families. *Child Abuse & Neglect*, 146, 106491, 1–15.
- Laryeafio, M. N., & Ogbewe, O. C. (2023). Ethical consideration dilemma: Systematic review of ethics in qualitative data collection through interviews. *Journal of Ethics in Entrepreneurship and Technology*, 3(2), 94–110.
- Lohan, M., & López, A. (2023). *Comprehensive sexuality education: an overview of the international systematic review evidence*. UNESCO. <https://share-netinternational.org/wp-content/uploads/2024/04/385849eng.pdf>
- Mahoso, T. (2020). *Ecosystemic factors affecting comprehensive sexuality education in early grades in Zimbabwean school* [Doctoral thesis, University of Pretoria]. <https://repository.up.ac.za/server/api/core/bitstreams/3b8dada7-2188-4ec1-90fe-f8d54f53e1ea/content>
- Mahoso, T., & Finestone, M. (2023). Teachers’ perceptions on teaching Comprehensive Sexuality Education in early grades in Chipinge, Zimbabwe. *Journal of Education*, 91, 52–69.
- Mahoso, T., Venketsamy, R., & Hu, Z. (2024). Parents’ views on teaching Comprehensive Sexuality Education to their young children in Zimbabwean schools. *The Independent Journal of Teaching and Learning*, 19(1), 145–159.
- Makwana, D., Engineer, P., Dabhi., & Chudasama, H. (2023). Sampling methods in research: A review. *International Journal of Trend in Scientific Research and Development*, 7(3), 762–768.
- Mirza, H., Bellale, F., & Mirza, C. (2023). Ethical consideration in qualitative research: Summary guidelines for novice social science researchers. *Social Studies and Research Journal*, 5(2), 442–449.

- Mishra, E. (2021). Effectiveness and impact of Abstinence-Only Programming in the United States. *Undergraduate Journal of Public Health*, 5.
- Miteu, G. D. (2024). Ethics in scientific research: a lens into its importance, history, and future. *Annals of Medicine and Surgery*, 86(5), 2395–2398.
- Morgan, H. (2024). Using triangulation and crystallization to make qualitative studies trustworthy and rigorous. *The Qualitative Report*, 29(7), 1844–1856.
- Mudumo, E., & Makonye, F. (2023). Using indigenous knowledge to enhance Comprehensive Sexuality Education among adolescents. *African Journal of Religion, Philosophy and Culture*, 4(2) 25–42.
- Mugabe, M. (2021). *Psychosocial effects of child sexual abuse on the holistic development of the girl child in Zimbabwe* [Doctoral thesis, University of the Free State, South Africa]. <http://hdl.handle.net/11660/11648>
- Mukanga, B., Dlamini, S. B., & Taylor, M. (2024). Process evaluation of comprehensive sexuality education programme in Zambia: a focus on contextual factors, mechanisms of impact, quality of development and implementation process. *BMC Health Services Research*, 24(1), 840.
- Mukau, K. (2023). *Ecosystemic factors affecting Comprehensive Sexuality Education in junior grades in Zimbabwe* [Doctoral thesis, University of the Free State, South Africa]. <http://hdl.handle.net/11660/12605>
- Mukau, K. (2025). Re-imagining comprehensive sexuality education delivery: The role of peer-led education in youth empowerment. *International Journal of Studies in Inclusive Education*, 2(1), 29–36.
- Mukonka, R., C., Mushibwe, C., & Jacobs, C. (2023). The effect of culture and religion on the implementation of comprehensive sexuality education in selected primary schools of Zambia. *Journal of Educational Research*, 2(1), 1–14.
- Muridzo, N. G., & Chikadzi, V. (2020). Some impediments to child sexual abuse interventions and corresponding social work Implications: Reflections on the Zimbabwean victim friendly system. *Journal of Human Rights and Social Work*, 5(4), 257–266.

- Ndhlovu, G. N., & Mfofo-M'carthy, M. (2022). Exploring the culture of silence on child sexual abuse within the family in Zimbabwe: A review of the literature. *African Journal of Social Work*, 12(5), 239–248.
- Omiunu, O. G. (2020). Online sexual grooming among female secondary school students: A Nigerian case study. *Journal of Information Science, Systems and Technology*, 4(3), 64–77.
- Pedamkar, P. (2023). *Types of research methodology*. EDUCBA. <https://educba.com/types-of-research-methodology.odology>.
- Raine, S., & Kent, S. A. (2019). The grooming of children for sexual abuse in religious settings: Unique characteristics and select case studies. *Aggression and Violent Behavior*, 48, 180–189.
- Reimers, E. (2025). Sex education and religion—resistance and possibilities. *British Journal of Religious Education*, 47(1), 52–62.
- Sanni, J. S. (2016). Religion: A new struggle for African identity. *Phronimon*, 17(1), 71–83.
- Santrock, J. W. (2018). *Educational psychology*. McGraw-Hill.
- Shambare, J. & Mapolisa, T. (2020). The child sexual abuse causal model in the Zimbabwean context. *IOSR Journal of Humanities and Social Science*, 25(3), 31–46.
- Tracy, N. (2021). *Effects of child sexual abuse on children*. Healthy Place. <https://www.healthyplace.com/abuse/child-sexual-abuse/effects-of-child-sexual-abuse-on-children>
- United Nations Educational, Scientific and Cultural Organization. (2018). *Comprehensive sexuality education: education for a healthy future*. <https://unesdoc.unesco.org/ark:/48223/pf0000376721>
- Venketsamy, T., & Kinear, J. (2020). Strengthening comprehensive sexuality education in the curriculum for the early grades. *South African Journal of Childhood Education*, 10(1), 1–12.
- Wangamati, C. K. (2020). Comprehensive sexuality education in sub-Saharan Africa: adaptation and implementation challenges in universal access for children and adolescents. *Sexual and Reproductive Health Matters*, 28(2), 56–61.

INVESTIGATING THE STEM EDU-PRENEURSHIP TRAINING AND INTENTIONS OF PRE-SERVICE SCIENCE TEACHERS

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Abstract

The study analyzed preservice science teachers' STEM entrepreneurship training and intentions based on their knowledge and awareness. The study hence adopted a descriptive survey research design. Using a mixed-study approach, the study collected data on the perceived prospects, challenges faced, and strategies to enhance the knowledge of STEM among preservice teachers. The findings show that 65.4% of the respondents have a moderate level of STEM knowledge, underscoring the need for improvement to significantly impact STEM entrepreneurship knowledge which was seen to be 50%. The findings indicate no significant relationship between STEM knowledge and awareness of STEM entrepreneurship ($\chi^2(4, .) = 3.663$, $p = .056$, $p > 0.05$), nor between the program of study and the level of knowledge and awareness of STEM entrepreneurship ($\chi^2(4, .05) = 3.663$, $p > 0.05$). Additionally, there is no significant difference in STEM scores across different programs such as Biology, Chemistry, and Physics, reaffirming the lack of influence between these variables ($F(2, .73) = 0.688$, $p = .506$).

Keywords

STEM, edupreneurship, preservice teachers, universities, science

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INTRODUCTION

STEM is an acronym for “Science, Technology, Engineering and Mathematics”. STEM education integrates these four fields of study into a coherent learning paradigm, focusing on real-world applications (Kim et al., 2018). STEM education is a holistic approach that tends to integrate Science, Technology, Engineering, and Mathematics to prepare students for future challenges and opportunities. The goal is to provide students with the adequate knowledge and abilities necessary to thrive in a technologically advanced world. According to the theory behind STEM education, the integration of STEM translates academic concepts into onsite real-world application, thereby representing a multidisciplinary and interdisciplinary approach to learning (Chalmers et al., 2017; Hoachlander & Yanofsky, 2011). STEM education seeks to facilitate a seamless transition for students from academic institutions to the workforce. It also seeks to cultivate a profound comprehension of the global economy to enhance their competitiveness in the future labor market (Guyotte et al., 2014). This knowledge finds alignment with the theory of planned behavior by Ajzen (1991) where the rationale for a behavior is motivated by the reasons, intentions and understanding of such behaviors. This explains that for the development and understanding of STEM edupreneurship, the knowledge and awareness may be important factors.

With innovation and entrepreneurship seen as the key drivers of economic growth, STEM education can play a significant role in building entrepreneurial mindsets, especially among pre-service teachers, referred to as “STEM edupreneurship”. STEM education and entrepreneurship have implications that could revolutionize education and business. Despite the many benefits of integrating STEM and entrepreneurship, we must address challenges like curriculum launch, resource allocation, and teacher training. The advantages, however, are

tremendous, including enhanced student engagement, real-world problem-solving skills, and future economic contributions. The extent of this achievement remains uncertain, particularly in Nigerian higher institutions, as most students remain unaware of the potential benefits of higher education.

Preservice teachers are in training to serve as custodians of future hope in science teaching and learning. Therefore, their profound affinity for STEM edupreneurship could have a significant impact on future learning and the attainment of STEM edupreneurship. Given the current realities in Nigeria, most universities encourage preservice teachers to consider other professions. It is crucial to gather relevant information about STEM education and entrepreneurship from these teachers. One needs to emphasize the importance of preservice teachers to STEM edupreneurship: its potential exposure of those whom the preservice teachers would later teach to the understanding of STEM, thereby producing aspiring students that will intellectually and scientifically contribute to the development of Nigerian society following the national requirements for a scientifically literate society.

The National Research Council (2013) delineated three objectives for inclusive STEM education: augmenting the quantity of STEM innovators and experts, enhancing the STEM workforce, and elevating STEM literacy within society at large. Therefore, it is clear from the foregoing that STEM programs are essential for preparing STEM educators for their future careers. Firdaus and Rahayu (2019) asserted that educational programs have shown effectiveness in enhancing students' cognitive, emotional, and psychomotor skills, as well as shaping their attitudes towards STEM fields and vocations (Guzey et al., 2014).

The STEM field offers a growing number of entrepreneurial career options. However, colleges and universities typically do not include an entrepreneurial component in their STEM

programs. Moreover, it is possible that STEM students of today are training for occupations that do not seem to exist due to certain factors, including overpopulation, digital transformation, economic policies, environmental factors, globalization, and many others. Therefore, the most effective way for students in STEM/STEM education to prepare for the workforce of the twenty-first century could be to equip them with a strong foundation in entrepreneurship, emphasizing invention and innovation.

Interestingly, entrepreneurship is a subject of growing importance worldwide because of its potential in reaching the goals of social development and economic growth. Because it involves change, new ideas, and taking the lead. Entrepreneurship is a good way to effect economic changes (Hess, 2006). We expect entrepreneurs to be creative thinkers who generate new ideas for products and technologies and diligently work towards their realization. Their goal is to make money in the market by taking risks. It is not far-fetched to begin to see how closely linked educational inputs may be instrumental in building entrepreneurial abilities in people. Hence, education should scaffold entrepreneurial attainment. This assertion, therefore, dispels the recent misconceptions held by learners in developing countries who believe there is a mismatch between education and entrepreneurial potential. Many education experts call the present a time of "educational entrepreneurship" because schools have become places for new ideas and projects.

Although we hold schools to high standards, they don't always meet them. People think that education can help with many important economic and social problems, such as increasing output, competitiveness, social justice, positive citizenship, technology, knowledge, and the effectiveness of democratic systems. As a result, there is constant pressure on schools to adapt.

Critics often raise issues such as uneven and poor results, unfair practices, and the quality of the workforce when criticizing schools (Rafique et al., 2025; Sainz et. al., 2023). Traditionally, attempts to enhance education have primarily concentrated on altering the operational structure of schools. However, a comprehensive shift in the perception of school management could enhance the overall performance of learners, and intensifying efforts to enhance entrepreneurial education could play a crucial role in this regard.

The concept of edupreneurship refers to the blend of entrepreneurship and education with the goal of developing new educational initiatives and innovations (Lăcătuș & Stăiculescu, 2016). It seeks to support economic growth, foster lifelong learning, and creatively meet educational needs. The development of edupreneurial abilities via STEM education is associated with economic advancement and the nation's environmental and social outcomes (Kelley & Knowles, 2016). Global economies and societies must amalgamate knowledge and skills in STEM to address essential societal and economic issues.

The current patterns of future employment opportunities result in increasing need for understanding and exploration of entrepreneurial skills in STEM. According to Dawha and Medugu (2016), the majority of graduates from higher institutions of learning lack the necessary entrepreneurial abilities and capabilities to translate acquired knowledge into a business venture. On the other hand, Chekole (2014) observed that one of the main barriers to the expansion and development of SMEs is the lack of alignment between the university curriculum and the requisite skills needed in the workplace. In light of this, Enombo and colleagues (2015) proposed the necessity of incorporating the teaching of entrepreneurial education in the curriculum. Doing so would help pre-service teachers and other university students, particularly in STEM, to

appreciate and embrace the entrepreneurial opportunities in their fields.

The potential inherent in STEM education towards fostering entrepreneurial mindsets and abilities, especially among pre-service teachers, cannot be overemphasized, especially in a time where innovation and entrepreneurship are crucial for economic success. This combination, often referred to as STEM edupreneurship, has the potential to completely transform both the field of education and the corporate world as potential educators are furnished with the knowledge, skills and attitude that they may convert to tangible resources for themselves while awakening the potentials from the same in their students. Although the integration of STEM and entrepreneurship in teacher training offers various benefits, such as increased student engagement, development of real-world problem-solving abilities, and significant contributions to future economic growth, it also encounters significant obstacles. The problems encompass curricular initiation, allocation of resources, and sufficient teacher preparation.

In Nigeria, this situation may be perceived as more intricate, as many pre service teachers are more inclined to pursue careers in other fields, and this may be due to several reasons, among which may be a lack of awareness among pre-service teachers about the opportunities in STEM edupreneurship. The feasibility of implementing STEM edupreneurship in Nigerian higher institutions is yet questionable. An individual's knowledge and awareness are thought to have an impact on both the quality of their training and their aspirations to participate in STEM entrepreneurship. Put simply, those who possess a higher amount of knowledge and awareness are more inclined to actively seek or obtain high-quality training. Additionally, they are more likely to engage in entrepreneurial endeavors within the domains of STEM. Therefore, it is necessary to evaluate the level of training they have received based

on their knowledge in order to determine their readiness for STEM edupreneurship in this study area.

This research aims to investigate the extent to which pre-service teachers are involved in STEM edupreneurship, as this may help to analyze the perceived opportunities and obstacles as well as bolster knowledge on the extent of these potentials among different science fields. The findings of this study would be significant in various ways. It may help to provide valuable information on the level of knowledge and awareness of the pre service teachers on STEM and STEM edupreneurship. This may help to develop and suggest methods for improving their knowledge and will assist in identifying deficiencies and areas of proficiency in existing training programs.

This information is crucial for curriculum planners and educators to improve and become deliberate about inculcating the rudiments of STEM education and edupreneurship, hence better equipping future instructors. It is essential to address these problems since pre-service teachers are the future caretakers of science education. Their interest in STEM entrepreneurship could have a big influence on achieving educational and entrepreneurial objectives in Nigeria. This may help to improve the influence and curriculum offerings of the preservice science teacher education to include content on STEM eduprenuership.

Furthermore, it could motivate curriculum planners as well as trainers of preservice teachers to develop innovative teaching methods and the establishment of new educational enterprises, benefiting both the education and business industries. Making this comparison across various disciplines may provide knowledge on the disciplines that may require greater emphasis or alternative methodologies, so providing valuable insights to policymakers and educational institutions in formulating more efficacious, discipline-specific training programs

It is crucial to identify the primary obstacles encountered by science teachers in training on STEM entrepreneurship. Tackling these difficulties can result in the implementation of supportive legislation, allocation of resources, and development of training programs that enable teachers to overcome obstacles and thrive as educational entrepreneurs.

REVIEW OF LITERATURE

In recent times, academic research in Africa has been primarily concerned with investigating entrepreneurial prospects as a means of addressing the issue of youth unemployment on the continent (Dzomonda & Fatoki, 2017; Gamede & Uleanya, 2020; Olaniran & Mncube, 2018). The objective of any entrepreneurship program is to provide participants with the information and skills required to become entrepreneurs and effectively tackle urgent societal problems. Hess (2008) defines an edupreneur as an entrepreneur who enters the field of education to establish public or private firms that address persistent issues in education. Sometimes, people use the terms edupreneur and teacherpreneur interchangeably to describe educators who adopt an entrepreneurial mindset to effect changes in the education sector (Bayus, 2013). Examining edupreneurship, from Shulman's standpoint reveals that the backing of private organizations and inventive individuals is vital for the success of any educational system (Shulman, 1986). The government alone is insufficient to accomplish nation-building and development. This shows the importance of collaborative efforts towards the development of education system. The situation also shows that education and its systems cannot be developed in isolation without the integration of various components that may be beneficial for development.

Students develop entrepreneurial skills and promote STEM by engaging in science- and engineering-focused activities

within the STEM disciplines of the science curriculum, which interconnects STEM concepts with entrepreneurship. These activities explore the influence of STEM endeavors (Hansen, 2014). People view STEM education as a solution to the issue of low academic achievement among students and the declining interest in science and technology employment.

To maintain its global competitiveness, the United States of America has implemented a comprehensive strategy to increase the number of graduates in STEM fields. Similarly, the Thai government advocates for STEM education in response to declining enrollment in science programs, poor international test scores in science and mathematics, and an insufficient STEM workforce (Chulavatnatol, 2013). It places a strong emphasis on fostering creativity, promoting innovation, and harnessing the power of technology. Successful STEM teaching depends on highly skilled instructors and requires professional development programs that emphasize the incorporation and interrelationships among science, technology, engineering, and mathematics (Pearson, 2017).

Different studies have been carried out to express the importance of STEM education and different information in science teaching and its impact on the development of the learners. Obaje et al. (2023) report that the results from the project countries on the development of connected learning for STEM indicate a transition from traditional classroom practices to innovative instructional and assessment methods integrated within the CL4STEM modules. This was explained in the studies that innovative strategies for teaching are important for improving the outlook of teaching and science education and this was also agreed on by studies like Wu and colleagues (2021), where the skill of the teachers at using innovative strategies also becomes a key factor in improving learners.

Similarly, Twaddle and Smith (2023) explained that effective STEM instruction requires educators to possess

pedagogical content knowledge. Teachers significantly influence students, and K-12 public schools often serve as the initial exposure to STEM education for learners. Students, regardless of their career paths, acquire valuable communication, collaboration, critical thinking, and problem-solving skills through STEM education, explaining how preservice teacher training may be important in training teachers to be progenitors of effective dissemination of STEM education. Nadelson and colleagues (2013) identified reduced STEM knowledge in pre-service teachers from rural regions, linking this deficiency to restricted access to professional development opportunities. These findings call attention to the need to be aggressive in STEM education to meet goal 4 of the SDG for quality and easy educational access to all.

Also, Sahin and colleagues (2014) from their findings, indicated that activities-oriented teaching highlights open-ended and collaborative scientific investigations within the fields of Science, Technology, Engineering, and Mathematics (STEM), offering students a platform to exhibit diverse applications of 21st-century skills. The findings indicate that STEM-related activities can enhance collaborative learning and inquiry, while also fostering the development of 21st-century skills.

Agoro and Adeboye (2023), and Ergün (2019) findings indicate that pre-service teachers in colleges of education possess a high level of awareness regarding STEM education and demonstrate favorable attitudes towards its role in national development. The study recommends that teacher training schools restructure their curricula to incorporate STEM education, thereby informing trainee teachers of their significant roles in national development through STEM and promoting its knowledge in their classrooms.

Ogbondah and Nwogu (2017) explained that youth empowerment in Nigeria has been determined to be unsustainable, and the level of entrepreneurship education is notably low.

The study recommended that the school curriculum be redesigned to facilitate and sustain youth empowerment. Shekar and Huand-Saad (2021) and Ewim (2023), in their own study, explained that integrating entrepreneurial training within STEM and other university programs significantly enhances students' preparedness for innovation and entrepreneurship.

This study highlights the importance of focusing on teacher education to enhance both teaching and learning. This study calls for urgent attention to give the right support to teachers and teacher education. For instance, Chisom and colleagues (2024) examined the role of AI in enhancing teacher support, professional development, and administrative functions, thus contributing to the overall enhancement of the educational ecosystem. This will work and provide necessary support as teaching and teacher efficacy is supported and improved upon. Blotnick et al. (2018) and Wachsmuth et al. (2017) showed that the emotional satisfaction of teacher subject matter and subject knowledge may facilitate the identification of differences among learners, assess the malleability of learners' emotional satisfaction with subject matter, and evaluate the impact of interventions designed to enhance life science majors' attitudes.

Theory of planned behavior

Ajzen (1991) explained the theory of planned behavior to show how individual's behavior can best be predicted by one's intention, as these intentions then proceed to predict attitudes about behavior. The subjective norms, defined as an individual's impression of the beliefs of significant others regarding the appropriateness of a behavior, together with the person's perspective of their control over that behavior, influence its execution. This means that the perception and belief a person may have about STEM edupreneurship may affect their STEM edupreneurship intentions.

According to the theory, intentions to engage in certain behaviors can be accurately forecasted based on attitudes towards the behavior, subjective norms, and perceived behavioral control; these intentions, along with perceptions of behavioral control, significantly explain the variance in actual behavior. In this vein, perception about STEM and eduprenuership may significantly impact on the intentions and engagement of the preservice teachers. Attitudes, subjective norms, and perceived behavioral control are correlated with certain sets of prominent behavioral, normative, and control beliefs on the behavior; nevertheless, the precise nature of these relationships remains ambiguous, and this may be explained by the findings of this study.

METHODOLOGY

Objectives of the study

1. Assess the level of knowledge of Preservice Teachers on STEM education in the Study area
2. Assess the level of knowledge and awareness of preservice teachers towards STEM edurepuership in the study area
3. Compare the knowledge and awareness of preservice teachers across various science fields towards STEM eduprenuership
4. Identify major challenges encountered by preservice science teachers towards STEM eduprenership.

Research questions

1. What is the level of Knowledge of Preservice Teachers on STEM education in selected study area

2. What is the level of knowledge and awareness of preservice teachers towards towards STEM eduprepuership in the study area
3. What are the major challenges identified by Pre-Service teachers on STEM eduprenurship in the Study area.

Research hypothesis

There is no significant relationship between the level of knowledge and awareness of preservice teachers across various science fields towards STEM eduprenuership

Variables

The variables to be included in the study are stem edupreneurship, knowledge and awareness, different STEM fields. The independent variables for the study include the knowledge and awareness of preservice teachers while the STEM edupreneurship serves as the dependent variables for the study.

Methods

The study adopted descriptive survey research design with the population comprising of all preservice science students from 100 level to 400 level in the Obafemi Awolowo University for the study. The study adopted a mixed method research design as the analysis was both qualitative and quantitative in nature.

Tools

The online questionnaire given was titled the Preservice Teachers STEM Edupreneur Questionnaire which elicited responses for the study. The instrument contained two sections. The first section elicited response on the demographic information of the respondents while the second section was on the

knowledge and awareness on STEM. The last section of the questionnaire was to elicit information regarding the STEM Eduprenurship among the respondents in the study area. The reliability for sections B and C using Cronbach Alpha coefficient yielded a score of 0.73 and 0.75 respectively. For the qualitative aspect of the study, open ended questions were asked at the end of the questionnaire to allow the respondents freely express their opinions on the variables under study. The question was asked directly and there were allowed to respond with as many words as possible.

Population

The target population for the study comprised of 300 level and 400 level preservice students. This was chosen because these categories of pre service teachers have gone through every aspect of the pedagogical training of preservice which includes teaching practice exercise as well as the classroom teaching. The science courses covered included Biology, Chemistry and Physics. This was considered as the common pure sciences offered in Nigerian Secondary Schools as they are believed to be core science courses for different professions. The sample of the study was selected via convenience sampling technique as the instrument was given to the respondents online. This was done as the preservice teachers were sent the online questionnaire via google forms and those who were willing to fill had their responses collated. A total of 148 respondents filled the online google form used for the study. All the 148 were also expected to respond to the qualitative part of the study, giving their diverse opinions on the issues relating to eduprenuership.

Data analysis

Data was analyzed using appropriate descriptive and inferential statistics. Descriptive statistics of frequency, percentages

and mean was used for the study while inferential statistics adopted Chi square. For the qualitative analysis, the responses were all copied, collated and divided into different codes and subthemes by the researchers. This was done by collating responses relating to each other under the same section. Thereafter, these codes and subthemes were collated into singular themes by the researcher. Thematic analysis was adopted for the qualitative analysis as responses from the respondents were coded and grouped into different themes to ascertain the challenges mitigating against effective STEM edupreneurship.

RESULTS

What is the level of Knowledge of Preservice Teachers on STEM education in selected study area?

To answer this research question, the responses were coded such that 'Strongly Agree was 4, Agree (3), Disagree (2) and Strongly Disagree (1)'. The average response score was calculated for each respondent and the grand mean was determined. Respondents with average response scores north of the grand mean was classified to have high knowledge level of STEM education and those with scores south were assigned the converse. The summary of the analysis is presented in Table 1.

Table 1 reveals that the majority of preservice teachers (64.5%) have an average level of knowledge about STEM education, while 35.5% have a low level of knowledge. The average level of knowledge is 1.6447, with a standard deviation of 0.4818, indicating that the knowledge levels are moderately dispersed around the mean. Hence, there is only a moderate variability in the responses. This shows a moderate level of STEM knowledge by the respondents in the study area. It depicts a need to improve on the level of knowledge of STEM as an increase in an area of knowledge would have significant impact on the level of STEM edupreneurship. It is then

important to ascertain the level of STEM edupreneurship among the respondents in the study area.

What is the level of knowledge and awareness of preservice teachers towards STEM edupreneurship in the study area?

To answer this research question, the responses were coded such that 'Strongly Agree was 4, Agree (3), Disagree (2) and Strongly Disagree (1)'. The knowledge and awareness response values were aggregated and the average score calculated for each respondent. It is believed that the knowledge and awareness could impact on the training received as well as their intentions in STEM edupreneurship. The grand mean was also determined and used to group the respondents as in Table 2.

Table 2 shows that the majority of preservice teachers (50.0%) have a moderate level of knowledge and awareness about STEM edupreneurship, while 47.4% have a high level, and only 2.6% have a low level of knowledge and awareness. The average level of knowledge and awareness is 2.4474, with a standard deviation of 0.55123, indicating that the knowledge and awareness levels are moderately dispersed around the mean. This may mean a form of congruence between the STEM knowledge and STEM edupreneurship among the respondents in the study area, hence, to improve STEM edupreneurship may mean to improve the STEM knowledge of the preservice teachers in the study area.

This was further checked by ascertaining if a significant relationship exists between STEM knowledge and STEM edupreneurship of respondents in the study area. Table 3 reveals a $\chi^2_{(4, .)} = 3.663$, $p = .056$ at the .05 significant level. Subsequently, the null hypothesis is retained, indicating that there is no significant relationship between the STEM knowledge and the level of knowledge and awareness of STEM edupreneurship, as the p-value is greater than 0.05. This shows a need to

improve the synergy between knowledge and awareness of STEM edupreneurship in the study area.

To test the research hypothesis, the three levels of aggregated knowledge and awareness scores were recalled (check Table 2). Relative to the distribution of programs in the sampled pre-service teachers (Biology, Chemistry, and Physics), a cross-tabulation of the aggregated scores was done and used to calculate a Chi-square test of contingency as shown below:

Table 4 reveals a $\chi^2(4, .05) = 3.663$, $p = .454$ at the .05 significant level. Subsequently, the null hypothesis is retained, indicating that there is no significant relationship between the program of study and the level of knowledge and awareness of STEM edupreneurship, as the p-value is greater than 0.05.

Since the test involves one independent variable and one dependent variable (level of knowledge and Awareness of STEM edupreneurship) calculated as a composite score with three levels – low, medium and high), a One-way Analysis of Variance (ANOVA) was calculated for reconfirmation of the relationship test as shown in Table 5.

Table 5 reveals an $F(2, .73) = 0.688$, $p = .506$ at the .05 significant level. Subsequently, the null hypothesis is retained, indicating that there is no significant difference in STEM scores across different programs (Biology, Chemistry, Physics) since the p-value is 0.506, which is greater than 0.05. This further reconfirms the lack of relationship (and or influence) between the two variables.

The qualitative research

What are the major challenges identified by Pre-Service teachers on STEM edupreneurship in the Study area?

Thematic analysis was conducted to identify the major challenges faced by preservice teachers in STEM edupreneurship. This involved collecting qualitative responses from the participants and thoroughly reading through the data to gain

a comprehensive understanding. Initial coding was performed by highlighting key phrases and sentences that indicated specific challenges. These codes were then grouped into broader themes that represent significant aspects of the data. These themes were reviewed to ensure accuracy and relevance, and further refined by merging similar themes or creating sub-themes. Each theme was clearly defined and given a descriptive name to encapsulate its essence. Finally, the themes were analyzed in detail, supported by modified quotes from the responses to illustrate the identified challenges as shown below:

Funding and resources

One of the most pressing challenges identified by sampled preservice teachers is the lack of adequate funding and resources. In their responses, participants expressed frustration over the insufficient financial support that hampers the advancement of STEM education in Nigeria. In fact, one particular participant lamented that funding and resources is especially an issue in African countries like Nigeria as they do not prioritize funding STEM education. This lack of investment extends to essential educational materials and facilities, such as textbooks and laboratories, which are crucial for effective STEM learning. In line with that, another participant pointed out that in Nigeria, not all schools have the standard tools to facilitate future innovation and entrepreneurship in science. This scarcity of proper educational facilities, as the participant rightly noted, severely impacts the quality of education and diminishes students' interest in pursuing STEM fields.

Personnel handling

The challenge of retaining qualified personnel in the STEM field was another significant theme identified in the responses. Therein, participants highlighted the global competition for talent, which often results in a brain drain as skilled individuals seek better opportunities abroad. One participant

explained that globally, STEM is a competitive field and talents/personnel are being recruited daily. As such, talents are more likely to go for global opportunities with better pay and incentives. This migration of talented professionals, as the participant exuded, can exacerbate the already challenging situation in Nigeria. This eventually leaves schools with a shortage of capable teachers and mentors who can effectively guide students in STEM subjects.

Curriculum

In the responses as well, the outdated curriculum was a recurrent issue raised by preservice teachers. In fact, many participants emphasized that the current curriculum does not keep pace with the rapid advancements in STEM fields. As a result, it is difficult for students to acquire relevant and up-to-date knowledge. One participant succinctly put it, “STEM is a dynamic field and curriculum development needs to catch up. The severe gap between the curriculum and advancements in the field make STEM edupreneurship difficult for those who might be interested”. Furthermore, the inadequate dissemination of knowledge within the curriculum limits students’ understanding and engagement with STEM subjects, preventing them from fully realizing their potential.

Regulations and policies

Regulations and policies were also identified as significant barriers to STEM edupreneurship. In the popular view, participants noted that restrictive regulations and inadequate policies stifle innovation and progress in STEM education. As one participant observed, “regulations and policies can also impede innovation”. In his view, the bureaucratic hurdles and lack of supportive policies create an environment that is not conducive to fostering STEM entrepreneurship. Hence, there is a clear need for a review and reform of existing regulations

and policies to promote a more enabling environment for STEM education and entrepreneurship.

From the thematic analysis above, it is obvious, based on the participants responses, that several critical challenges are faced by preservice teachers in STEM edupreneurship. These challenges include inadequate funding and resources, issues related to personnel handling and talent retention, an outdated curriculum, and restrictive regulations and policies. These obstacles highlight the urgent need for substantial investment in educational infrastructure, continuous curriculum updates, and the development of supportive policies. Addressing these challenges is essential for improving the quality of STEM education and fostering innovation among preservice teachers. Ultimately, it enables them to contribute more effectively to the field of STEM edupreneurship.

DISCUSSIONS

The study's findings provide a comprehensive view of preservice teachers' knowledge and awareness of STEM education and edupreneurship, alongside the challenges they face in these fields. The results highlight several important insights. In line with its objectives, the study found that the majority of preservice teachers possess a high level of knowledge about STEM education while some have a low level of knowledge with a moderate variability. This high level of knowledge among preservice teachers aligns with the findings of Obaje et al. (2023) who demonstrated in Nigeria, using the Teachers Capacity Development in STEM (CL4STEM) modules, that preservice teachers with robust training programs exhibit significant knowledge in STEM fields. This is also true in Twaddle and Smith (2023) and Wu et al. (2021). This suggests that educational institutions in the study area might be implementing effective knowledge-building training programs. But the moderate variability shows that not all preservice teachers

benefit equally from these programs, possibly due to differences in resource access or instruction quality. In contrast, a study by Nadelson et al. (2013) found lower levels of STEM knowledge among preservice teachers in rural areas, attributing this to limited access to professional development opportunities. The differences in findings may be due to variations in educational infrastructure and investment in different regions and much advancements that could have happened since the work was published.

Extending this inquiry to knowledge and awareness about STEM edupreneurship, the study found that the majority of preservice teachers exhibit moderate levels of knowledge and awareness, with some having a high level, and very few possessing a low level with moderate dispersion. This finding is supported by recent studies such as those by Agoro and Adeboye (2023), Ergün (2019) and Sahin et al. (2014) and which highlight the growing awareness and interest in STEM entrepreneurship among preservice teachers. The high and moderate levels of knowledge and awareness suggest a general understanding of the importance of integrating entrepreneurial skills with STEM education. However, the small percentage of preservice teachers with low awareness indicates a gap that requires targeted educational initiatives to address. This discrepancy might be due to differences in the emphasis placed on edupreneurship in the curriculum. Studies by Ewim (2023), Ogbondah and Nwogu (2017), and Shekar and Huand-Saad (2021) emphasized that integrating entrepreneurial training within STEM and other university programs significantly enhances students' readiness for innovation and entrepreneurship. The findings align well with these insights, though the moderate dispersion indicates a need for more uniform educational strategies across different institutions.

As for the challenges faced by preservice teachers in STEM edupreneurship, the thematic analysis uncovered several

critical issues including inadequate funding and resources, issues related to personnel handling and talent retention, an outdated curriculum, and restrictive regulations and policies. Participants expressed frustration over the insufficient financial support, with one noting that funding and resources is very lacking especially in African countries like Nigeria as they do not prioritize funding STEM education. This aligns with Aina (2022) and Chisom et al. (2024), which found that lack of financial resources is a significant barrier to STEM education in developing countries. The challenge of retaining qualified personnel, highlighted by participants who mentioned the global competition for talent, mirrors findings by Kerr et al. (2016) and Ziker et al. (2022), who reported similar issues in other developing nations. The outdated curriculum, as mentioned by several participants, reflects the findings of Bybee (2013) and Chisom et al. (2024) who argued for the need to constantly update STEM curricula to keep pace with technological advancements. The issue of restrictive regulations and policies, noted by participants as stifling innovation, is consistent with Marginson et al. (2013) and Chisom et al. (2024) who independently and in different parts of the world emphasized the need for policy reforms to promote STEM education. These challenges educate the urgent need for substantial investment in educational infrastructure, continuous curriculum updates, and supportive policy development.

The study also considered the relationship between the program of study and the level of knowledge and awareness of STEM edupreneurship. The chi-square test found no significant relationship between the program of study and the level of knowledge and awareness of STEM edupreneurship. This is further confirmed by the one-way ANOVA results, which also showed no significant difference in STEM scores across different programs (Biology, Chemistry, Physics). Combined, these findings suggest that the program of study does not

influence the level of knowledge and awareness of STEM edupreneurship among preservice teachers at all. This lack of relationship may be due to a uniformly structured curriculum across different STEM programs, ensuring that all students receive similar levels of exposure to STEM edupreneurship concepts.

In an indirect contrast though, Blotnick et al. (2018) found that students with higher mathematics self-efficacy (MSE) tend to have higher STEM knowledge than those who do not and according to Wachsmuth et al. (2017), biology and other life science major students tend to have lower emotional satisfaction towards mathematics than others. Combined, these studies suggest possible significant differences in STEM knowledge based on the field of study and attributed these differences to varied curricular emphases. The uniformity in findings in this study, however, might be indicative of a well-balanced curriculum in the study area. Although being well-balanced does not relate exclusively to quality and relevance as it is possible for a non-relevant or outdated curriculum (as pointed out earlier) to be taught uniformly across the programs. Hence, this finding also highlights the need for an effective and standardized approach in STEM education

CONCLUSIONS AND RECOMMENDATIONS

According to the findings of the survey, respondents in the area under investigation have a modest degree of expertise in the STEM fields. This demonstrates the need for enhancing knowledge in STEM fields since an increase in knowledge could have a big impact on the entrepreneurial endeavors in STEM fields. It would suggest that there is a possible correlation between knowledge of STEM fields and entrepreneurialism in STEM fields among the respondents. Enhancing the expertise of preservice teachers in the studied area could potentially increase STEM entrepreneurship.

The presence of a p-value that is more than 0.05 implies that there is no significant association between knowledge of STEM fields and awareness of STEM entrepreneurship, as indicated by the analysis. Similarly, there is no substantial correlation between the program of study and the level of knowledge and awareness of STEM entrepreneurship. This is the case. It was also shown that there was no significant difference in the scores of students who participated in STEM programs, such as Biology, Chemistry, and Physics. This finding reaffirms the absence of any relationship or influence between the variables in question.

These findings have prompted a number of suggestions. First and foremost, it is of the utmost importance to improve STEM education by overhauling and expanding the curriculum in order to raise the level of STEM understanding among preservice teachers. Increasing one's knowledge and practical abilities in STEM fields can be accomplished through the implementation of tailored training programs and seminars. Additionally, it is essential to raise awareness of the synergy that exists between STEM education and entrepreneurial endeavors. The implementation of awareness campaigns that emphasize the significance of STEM education and the role it plays in entrepreneurship can be of assistance in accomplishing this goal. Creating learning experiences that are more cohesive will be accomplished through the development of projects that combine knowledge of STEM fields with training in practical entrepreneurship.

It is vital to conduct ongoing evaluations and make adjustments to educational programs in order to guarantee that they effectively develop both understanding of STEM subjects and awareness of an entrepreneurial mindset. It would be helpful to set up feedback systems to gather input from students and teachers on the effectiveness of the tactics used. It is necessary to undertake additional study in order to investigate the

underlying elements that may have an effect on the connection between educational attainment in STEM fields and entrepreneurial endeavors. It is also recommended that advocacy for policy support be made in order to improve STEM education and entrepreneurship programs at both the institutional and governmental levels.

Through the implementation of these recommendations, the research domain has the potential to enhance the level of knowledge and entrepreneurship in the STEM fields, ultimately leading to the development of a more inventive and entrepreneurial attitude among preservice teachers.

REFERENCES

- Agoro, A. A., & Adeboye, O. O. (2023). Pre-service teachers' awareness and attitude toward STEM education as a panacea for national development. *Journal of Education and Practice*, 14(29), 21–28.
- Aina, J. K. (2022). STEM education in Nigeria: Development and challenges. *Current Research in Language, Literature and Education*, 3, 53–60.
- Ajzen, I. (1991) Organizational behaviour and human decision. *Processes*, 50(2), 179–211.
- Bayus, B. L. (2013). Crowdsourcing new product ideas over time: An analysis of the Dell Ideastorm Community. *Management Science*, 59(1), 226–244.
- Blotnicky, K. A., Franz-Odenaal, T., French, F., & Joy, P. (2018). A study of the correlation between STEM career knowledge, mathematics self-efficacy, career interests, and career activities on the likelihood of pursuing a STEM career among middle school students. *International Journal of STEM Education*, 5(1), 22.
- Bybee, R. W. (2013). *The case for STEM education: Challenges and opportunities*. NSTA Press.

- Chalmers, C., Carter, M. L., Cooper, T., & Nason, R. (2017). Implementing “big ideas” to advance the teaching and learning of science, technology, engineering, and mathematics (STEM). *International Journal of Science and Mathematics Education*, 15, 25–43.
- Chekole, Z. G. (2014). *Challenges and prospects of micro and small enterprises in Awi zone: The case of Dangila district* [Project Work]. Indira Gandhi National Open University.
- Chisom, O. N., Unachukwu, C. C., & Osawaru, B. (2024). STEM education advancements in African contexts: A comprehensive review. *World Journal of Advanced Research and Reviews*, 21(01), 145–160.
- Chulavatnatol, M. (2013). STEM Education Thailand and STEM ambassadors. *IPST*, 42(185), 14–18.
- Dawha, J. M., & Medugu, J. D. (2016). Emerging entrepreneurial and business planning competencies required by motor vehicle mechanic students in establishing enterprise in Bauchi and Gombe states, Nigeria. *International Journal of Humanities Social Sciences and Education*, 3(1), 156–161.
- Dzomonda, O., & Fatoki, O., (2017) The impact of leadership styles on the entrepreneurial orientation of small and medium enterprises in South Africa. *Journal of Economics and Behavioral Studies*, 9(2), 104–113.
- Enombo, J. P., Hassan, S. L. & Iwu, C. G. (2015). The significance of entrepreneurship education in Gabonese schools: justifications for a new curriculum design. *Socioeconomica–The Scientific Journal for Theory and Practice of Socio-Economic Development*, 4(8), 493–506.
- Ergün, S. S. (2019). Examining the STEM awareness and entrepreneurship levels of pre-service science teachers. *Journal of Education and Training Studies*, 7(3), 142–149.
- Ewim, D. (2023). Integrating business principles in STEM education: Fostering entrepreneurship in students and educators in the US and Nigeria. *International Journal of Entrepreneurship and Business Development*, 6(4), 590–605.

- Firdaus, A. R., & Rahayu, G. D. S. (2019). Effect of STEM-based learning on the cognitive skills improvement. *Elementary School Forum, Mimbar Sekolah Dasar*, 6(2), 198–207.
- Gamede, B.T., & Uleanya, C. (2020). Roles of entrepreneurship as a tool to improve economic development: Case of job creation in developing nations. *Journal of Entrepreneurship Education*, 23(6).
- Guyotte, K., Sochacka, N., Costantino, T., Walther, J., & Kellam, N. (2014). STEAM as social practice: Cultivating creativity in trans-disciplinary spaces. *Art Education*, 67(6), 12–19.
- Guzey, S. S., Harwell, M., & Moore, T. (2014). Development of an instrument to assess attitudes toward science, technology, engineering, and mathematics (STEM). *School Science and Mathematics*, 114(6), 271–279.
- Hansen, M. (2014). Characteristics of schools successful in STEM: Evidence from two states' longitudinal data. *The Journal of Educational Research*, 107(5), 374–391.
- Hess, F. M. (2006). *Educational entrepreneurship: Realities, challenges, possibilities*. Harvard Education Press.
- Hess, F. M. (2008). *The future of educational entrepreneurship: Possibilities for school reform*. Harvard Education Press.
- Hoachlander, G., & Yanofsky, D. (2011). Making STEM real. *Educational Leadership*, 68, 60–65.
- Kelley, T. R., & Knowles, J. G. (2016). A conceptual framework for integrated STEM education. *International Journal of STEM Education*, 3(11).
- Kerr, S. P., Kerr, W. R., Özden, Ç., & Parsons, C. (2016). Global talent flows. *Journal of Economic Perspectives*, 30(4), 83–106.
- Kim, J. Y., Choi, D. S., Sung, C.-S., Park, J. Y. (2018). The role of problem-solving ability on innovative behavior and opportunity recognition in university students. *Journal of Open Innovation: Technology, Market, and Complexity*, 4(1), 1–13.
- Lăcătuș, M.L. & Stăiculescu, C. (2016). Entrepreneurship in education. *International Conference Knowledge-Based Organization*, 22(2), 2016, 438–443. <https://doi.org/10.1515/kbo-2016-0075>

- Marginson, S., Tytler, R., Freeman, B., & Roberts, K. (2013). *STEM: Country comparisons: International comparisons of science, technology, engineering and mathematics (STEM) education. Final report*. Australian Council of Learned Academies.
- Nadelson, L. S., Seifert, A., Moll, A. J., & Coats, B. (2013). i-STEM Summer Institute: An integrated approach to teacher professional development in STEM. *Journal of STEM Education: Innovations and Research*, 14(2), 36–44.
- National Research Council (2013). *Monitoring progress toward successful K-12 STEM education: A nation advancing?* The National Academies Press.
- Obaje, N. G., Angwal, Y. A., Mustapha, M. T., Sarangapani, P., Maniar, V., Ramchard, M., Kawu, A. A., Adelabu, A. S., Aliyu-Paiko, M., Musa, D. A. M., Majiya, H., Zakariyya, A., Ewugi, M. S., & Ibrahim, S. (2023). Piloting an innovation for teachers' capacity development in STEM subjects in Nigerian secondary schools. *GSC Advanced Research and Reviews*, 17(2), 209–220.
- Ogbondah, L., & Nwogu, G. A. I. (2017). Entrepreneurship education and sustainable youth empowerment in Nigeria. *International Journal of Education and Evaluation*, 3(2), 43–53.
- Olaniran, S. O., & Mncube, D. W. (2018). Barriers to effective youth entrepreneurship and vocational education. *Academy of Entrepreneurship Journal*, 24(4), 1–10.
- Pearson, G. (2017). National academies piece on integrated STEM. *Journal of Educational Research*, 110, 224–226.
- Rafique, N., Rehman, F. & Rahman, H. (2025). The role of poor leadership, ineffective teaching methods, and low staff expectations in school ineffectiveness: Case of government schools of Punjab, Pakistan. *Research Journal for Social Affairs*, 3(2), 71–80.
- Sahin, A., Ayar, M. C., & Adiguzel, T. (2014). STEM-related after-school program activities and associated outcomes on student learning. *Educational Sciences: Theory and Practice*, 14(1), 13–26.

- Sainz, M., Moreno-Bella, E., & Torres-Vega, L.C. (2023). Perceived unequal and unfair workplaces trigger lower job satisfaction and lower workers' dignity via organizational dehumanization and workers' self-objectification. *European Journal of Social Psychology*, 53(5), 921–938.
- Shekhar, P., & Huang-Saad, A. (2021). Examining engineering students' participation in entrepreneurship education programs: Implications for practice. *International Journal of STEM Education*, 8, 40.
- Shulman, L. S. (1986). Those who understand: Knowledge in teaching. *Educational Research*, 15(2), 4–31.
- Twaddle, J., & Smith, T. (2023). STEM pedagogical content knowledge of preservice teachers. *International Journal of Multidisciplinary Perspectives in Higher Education*, 8(1), 168–182.
- Wachsmuth, L. P., Runyon, C. R., Drake, J. M., & Dolan, E. L. (2017). Do biology students really hate math? Empirical insights into undergraduate life science majors' emotions about mathematics. *CBE—Life Sciences Education*, 16(3), ar49.
- Wu, B., Peng, X., & Hu, Y. (2021). How to foster pre-service teachers' STEM learning design expertise through virtual internship: A design-based research. *Educational Technology Research and Development*, 69(6), 3307–3329.
- Ziker, C., Johnson, J., & Paredes, P. (2022). *Opportunities and challenges in bioindustrial manufacturing: An environmental scan of workforce development in the industry*. STEMconnector.

APPENDICES

Table 1
STEM knowledge level in the study area

Level	Frequency	Percent	Mean	Standard Deviation
Low	54	35.5	1.6447	0.4818
Average	98	64.5		

Table 2
Level of knowledge and awareness on STEM Edupreneurship

Level	Frequency	Percent	Mean	Standard Deviation
Low	4	2.6	2.4474	0.5512
Medium	76	50.0		
High	72	47.4		

Table 3
Chi-Square contingency test of relationship STEM-knowledge and aggregated knowledge-awareness scores

		Knowledge and Awareness of STEM Edupreneurship			χ^2	df	p	Remark
		Low	Medium	High				
Level of STEM	Low	4	22	28	3.666	2	.056	No Sig. Association
	Mod-erate	0	30	68				

Table 4

Chi-square contingency test of relationship programs and aggregated knowledge-awareness scores

		Knowledge and Awareness of STEM Edupreneurship			χ^2	df	p	Remark
		Low	Medium	High				
Pro-grams	Biology	4	44	50	3.663	4	.454	No Sig. Association
	Chem-istry	0	10	12				
	Physics	0	22	10				

Table 5

ANOVA table of program type and STEM edupreneurship knowledge and awareness

Source of Variation	Sum Squares	df	Mean Squares	F	P
Between Groups	4.302	2	2.151	0.688	0.506
Among Groups	228.119	149	2.125		
Total	232.421	151			

