

Science Teacher's Knowledge, Attitudes, and Practices on SDGs in Science Instructions

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Abstract

This study explored the knowledge, attitudes, and practices (KAP) of secondary science teachers in integrating Sustainable Development Goals (SDGs) into science instruction, grounded in the framework of Education for Sustainable Development (ESD) and sustainability competencies. Using a descriptive survey design with supplementary qualitative data, 28 junior high school teachers were purposively selected from public schools in Iligan City. Data were gathered through a validated KAP instrument and analyzed using descriptive statistics and thematic analysis. Findings revealed that teachers possess high knowledge, particularly in environmental dimensions of sustainability, but demonstrate limited understanding of the SDGs as an interconnected framework. Attitudes were very positive, indicating strong alignment with ESD values such as responsibility, inclusivity, and global citizenship. While practices were generally high, implementation remained largely context-based rather than systems-oriented. Thematic analysis highlighted gaps in competencies related to systems thinking, interdisciplinary integration, and action-oriented pedagogy, alongside structural barriers such as limited resources and institutional support. The study emphasizes that effective SDG integration requires strengthening teachers' sustainability competencies through targeted professional development and systemic support structures.

Keywords: SDGs, science instruction, Education for Sustainable Development

1. Introduction

Education has become the most important avenue to address the growing environmental, social, and economic dimensions of Sustainable Development Goals (SDGs) that encourage learners to engage with sustainability issues in a holistic manner (UNESCO, 2017; UNESCO, 2020). These SDGs are a collection of 17 global goals designed to be a blueprint to a more sustainable future, which was set in 2015 by the United Nations General Assembly and was intended to be achieved by the year 2030 (UNESCO, 2020). In this context, education has a key role in equipping learners with knowledge but also with values, skills, and dispositions needed to respond to sustainable issues responsibly and critically (UNESCO, 2017; UNESCO, 2020). With this, Education for Sustainable Development (ESD) emerges as a powerful solution to the gap between what

learners know and what they do by empowering learners toward a more just, sustainable, and resilient future (UNESCO, 2017; Leicht et al., 2018). Instead of treating sustainability as an add-on or an isolated topic, ESD is wide-ranging, promoting sustainability principles across disciplines so that learners can understand the interconnection of systems in the real world and actively participate in solving them (UNESCO, 2020). In this framework, the SDGs provide a comprehensive agenda that guides educational institutions in embedding sustainability into teaching and learning processes (UNESCO, 2020). In addition, according to Wiek et al. (2011) and further expanded by Brundiers et al. (2021), sustainability education requires key competencies such as systems thinking, anticipatory, normative, strategic, collaborative, critical thinking, self-awareness, and integrated problem-solving competencies, which are essential in addressing sustainability challenges. These competencies are important, particularly in science education, as learners are expected to analyze scientific phenomena, examine evidence, and apply knowledge to their community (UNESCO, 2017; Brundiers et al., 2021).

Sustainability is inherently interdisciplinary, and among the highly regarded disciplines is science education, as it provides learners with conceptual and analytical tools in understanding global issues. Science education is closely aligned with SDGs because themes and topics in science such as biodiversity, climate change, and water management directly correspond with sustainability targets (Guo et al., 2024). The interdisciplinary feature of science allows learners to combine knowledge, values, and skills with real-world sustainability issues, particularly those rooted in observable scientific phenomena that occur in daily life. Research has shown that contextualizing science lessons with socio-scientific and environmental issues has significantly improved learners' critical thinking, scientific literacy, and problem-solving skills (Kumar et al., 2024). Additionally, experiential and sustainability-oriented learning approaches have positively influenced learners' environmental awareness, attitudes, and behaviors (Ardoin et al., 2020; Adib, 2024; Liu & Green, 2024). These findings suggest that integrating SDGs in science education has the potential to transform traditional learning into more sustainable and action-oriented learning.

The present study is anchored on the Knowledge, Attitude, and Practice (KAP) framework, which assumes that individuals' knowledge influences their attitudes, and these attitudes subsequently shape their practices (Launiala, 2009). In sustainability education, the KAP framework has been widely employed to assess stakeholders' readiness to engage in sustainable behaviors and educational initiatives (Afroz & Ilham, 2020; Sunthonkanokpong & Murphy, 2019). Within the context of science education, teachers' knowledge reflects their understanding of sustainability concepts and SDGs, attitudes represent their beliefs and willingness to integrate these concepts, while practices indicate the extent to which sustainability principles are translated into classroom instruction.

However, the successful integration of SDGs relies deeply on teachers, who serve as primary agents of change as implementers of sustainability in the curriculum. The teachers' personal knowledge, attitudes, and practices are critical indicators of how sustainability is understood, delivered, and experienced in their science classes. Knowledge enables teachers to grasp the relevance and content of SDGs, attitudes shape their willingness and motivation to integrate sustainability topics, and practices reflect the extent to which these are translated into actual instructional strategies. These align with recent studies that reveal that teachers' competencies and perceptions affect the effective integration of sustainability, emphasizing the importance of examining these dimensions in educational research (Funa et al., 2022; Jumawan & Fabiani, 2025).

At the same time, science teachers face several challenges in integrating SDGs in their classrooms. The challenges include limited training, insufficient pedagogical resources, lack of institutional support, and difficulties in aligning sustainability concepts

with the existing curriculum (UNESCO & Education International, 2021; Casanova et al., 2023; Rahmi & Rasanjani, 2025). Tadena and Salic-Hairulla (2025) emphasized the need for eco-pedagogical strategies and targeted professional development to support teachers in the effective implementation of SDG-related instruction in biology. Similarly, Zguir et al. (2022) found that teachers often feel that they are unprepared to integrate SDGs even if they recognize their importance. Moreover, teacher motivation and engagement in sustainability are directly influenced by their access to training, professional development, and supportive school environments (UNESCO & Education International, 2021; Casanova et al., 2023; Rahmi & Rasanjani, 2025). These findings highlight that beyond knowledge and attitudes, teachers' lived experiences, motivations, and perceived challenges may affect the extent to which SDGs are effectively integrated in the classroom.

Importantly, because SDG and ESD frameworks are largely shaped by Western research, literature from Asian countries such as the Philippines remains limited. There is still an incomplete understanding of how teachers contribute to ESD practices and how these practices develop and operate within local contexts. In this regard, understanding of teachers' knowledge, attitudes, and practices is essential in strengthening the integration of SDGs in science education. Therefore, this study is focused on assessing the level of science teachers' knowledge, attitudes, and practices (KAP) related to the integration of the Sustainable Development Goals (SDGs) in science education.

2. Methodology

2.1 Research Design

The study employed a descriptive research design to explore and assess the level of science teachers' knowledge, attitudes, and practices (KAP) related to the integration of Sustainable Development Goals (SDGs) into their science instruction. The collection was done through a structured KAP questionnaire utilizing a Likert scale to measure teachers' levels of knowledge, attitudes, and practices to identify patterns, trends, and levels of readiness in SDG integration. In addition, six open-ended questions were included as supplementary qualitative data to support and substantiate the quantitative findings by providing deeper contextual insights of teachers.

2.2 Participants and Setting

The researcher used twenty-eight high school science teachers handling Grades 7 to 10 from three public high schools in the Division of Iligan City. Two of the schools are among the two largest high schools in Iligan, while the other was selected due to its focus on fisheries, which provides an interesting context for the study. The participants were purposively selected based on their teaching assignments in science subjects and their experience teaching Grades 7 to 12, with at least two years of teaching experience.

2.3 Research Instruments

The primary instrument used in this study was a researcher-developed Knowledge, Attitude, and Practice (KAP) Questionnaire on the integration of Sustainable Development Goals (SDGs) in science instruction. The instrument was developed through an extensive review of relevant literature and existing instruments on sustainability education (UNESCO, 2017; Sunthonkanokpong & Murphy, 2019; Afroz & Ilham, 2020). The questionnaire underwent expert validation to establish content validity and contextual relevance.

The instrument consisted of four sections. The first section gathered the respondents' demographic information. The second section assessed teachers' knowledge regarding SDG integration in science instruction through 16 items (K1-K16) covering understanding of the 17 SDGs, the 2030 Agenda, sustainability dimensions, curriculum alignment,

sustainability-related science issues, and instructional strategies for integrating SDGs. Sample items included: *"I understand the 17 Sustainable Development Goals (SDGs) and their relevance to science teaching"* and *"I understand how science concepts relate to issues such as poverty, health, and clean water."*

The third section examined teachers' attitudes toward SDG integration using 12 items (A1-A12) that focused on beliefs, values, motivation, inclusivity, environmental responsibility, and willingness to adopt sustainability-oriented teaching practices. Sample statements included: *"I believe it is important for science teachers to integrate sustainability concepts into their lessons"* and *"I feel motivated to include SDG-related topics in my lessons."*

The fourth section measured teachers' practices using 14 items (P1-P14) that explored the extent to which respondents incorporated sustainability concepts into classroom instruction through contextualization, inquiry-based learning, community participation, collaborative work, and professional engagement. Sample items included: *"I connect science lessons to real-world sustainability challenges"* and *"I attend seminars, training, or webinars related to SDGs or environmental issues."*

All KAP items were rated using a four-point Likert scale to avoid neutral responses and encourage participants to express a clear position regarding each statement. The response options for the knowledge scale ranged from 1 = *Very Low Knowledge* to 4 = *High Knowledge*; for the attitude scale, 1 = *Very Negative* to 4 = *Very Positive*; and for the practice scale, 1 = *Very Unlikely* to 4 = *Very Likely*. Higher scores indicated greater knowledge, more favorable attitudes, and stronger implementation of SDG-related practices in science instruction. The instrument also included six open-ended questions designed to substantiate the quantitative data by capturing teachers' perception in SDG-related science lessons.

2.3.1 Validation results of the needs assessment questionnaire.

The Knowledge, Attitude, and Practice (KAP) questionnaire was validated by five expert reviewers using the Survey Instrument Validation Rating Scale adopted from Oducado (2020), assessing criteria such as clarity, relevance, logical flow, response scale appropriateness, structure, completeness, instructions, and cultural suitability. Also, it used a five-point scale, arriving at the grand high mean of 4.54, which shows the validators have strong agreement on the quality and appropriateness of how SDGs are integrated in the context of science instructions. The highest rating was given on the criterion of the study's purpose and local contextual acceptability, revealing that it is indeed relevant and applicable in the study, while slightly lower on the scope criterion, which suggested minimal revisions.

2.4 Data Gathering Procedure

The KAP questionnaire was given to 28 high school science teachers who currently handle science classes from Grade 7 to Grade 12 in three big high schools in Iligan City, in which the respondents were purposely selected; however, the final number of respondents was taken based on their response on the consent form prior to data collection. The KAP questionnaire included the Likert scale section for knowledge, attitude, and practice, in which all three have two open-ended questions each, with a total of six questions. The administration of the instruments was conducted following the ethical procedures, such as securing permission from the superintendent, school principal, and the respondents and going down to ensuring the confidentiality of all data collected. The collected data was analyzed through descriptive statistics such as mean, percentage, and standard deviation, while the open-ended questions were used to further substantiate the responses on their integration of SDGs into their science lessons.

2.5 Data Analysis

Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to analyze the level of integration of science teachers regarding the integration of SDGs into their science instructions. The statistical tools were utilized to identify patterns and trends, especially the highest and lowest levels of integration based on the given indicators, to identify factors that influence it and skills that need support.

Moreover, the open-ended questions were subjected to thematic analysis using Braun and Clarke's (2006) Thematic Analysis to identify patterns and themes related to the teacher-perceived SDG integration into their classes. The responses were coded and clustered to generate themes to further explain their reported experiences on their practices and also support quantitative findings of the research.

3. Results and Discussion

3.1 KAP Survey Participants

The respondents were composed of science teachers from three public schools in Iligan City, one school with a fisheries focus, and the other two are the biggest schools in the Division of Iligan City. The majority of the respondents specialized in biology, followed by chemistry, physics, and general science. More than half of the respondents are female with teaching experience ranging from 2 to 20 years, revealing a younger and longer teaching career among them. Also, most of the respondents were handling Grade 9-10 science, with a smaller distribution among grade levels.

3.2 Science Teachers Knowledge, Attitude, and Practices on SDGs

The understanding of science teachers' knowledge, attitude, and practices (KAP) on SDGs is important in determining their readiness in the effective implementation of sustainable-oriented lessons. SDG knowledge describes their understanding of SDG concepts; attitudes refer to their beliefs and motivation when integrating it; and practices are the translation of SDGs into their actual classroom instructions. These three dimensions are key indicators that influence the effective integration of sustainability in science education (Funa et al., 2022; Jumawan & Fabiani, 2025).

Moreover, previous studies reveal that teachers most often have enough knowledge and possess positive attitudes toward sustainability, and successful integration of SDGs is strongly influenced by training, resources, and institutional support they received to translate them into practice (UNESCO, 2017; Zguir et al., 2022). In this study, the level of KAP among junior high school science teachers was measured using descriptive statistics, and presented in the following tables are the results that give a preview of the readiness and actual classroom practice.

3.2.1 Science Teachers' Knowledge of SDGs Integration

Table 1. Level of Science Teachers' Knowledge on the Integration of SDGs

Knowledge Indicators	Low f (%)	Moderate f (%)	High f (%)
K1. Understanding of the 17 SDGs and their relevance to science teaching	1 (3.6)	20 (71.4)	7 (25.0)
K2. Understanding of sustainability as an environmental, social, and economic concept	0 (0.0)	19 (67.9)	9 (32.1)
K3. Knowledge of the 2030 Agenda and its role in global and Philippine science education	2 (7.1)	23 (82.1)	3 (10.7)
K4. Understanding of how human activities contribute to environmental challenges discussed in science	0 (0.0)	17 (60.7)	11 (39.3)

Knowledge Indicators	Low f (%)	Moderate f (%)	High f (%)
K5. Understanding of the relationship between renewable and non-renewable energy and sustainability	0 (0.0)	14 (50.0)	14 (50.0)
K6. Knowledge of science-related issues such as climate change, water scarcity, and biodiversity loss	0 (0.0)	16 (57.1)	12 (42.9)
K7. Understanding of responsible consumption and waste management in science learning	0 (0.0)	13 (46.4)	15 (53.6)
K8. Knowledge of how science concepts can address local and global sustainability problems	0 (0.0)	16 (57.1)	12 (42.9)
K9. Knowledge of strategies for embedding SDGs into science lessons	0 (0.0)	21 (75.0)	6 (21.4)
K10. Understanding of inquiry-based activities connected to SDG issues	0 (0.0)	18 (64.3)	10 (35.7)
K11. Knowledge of curriculum standards supporting SDG integration in science education	0 (0.0)	21 (75.0)	7 (25.0)
K12. Understanding of how to design classroom activities promoting sustainability concepts	0 (0.0)	21 (75.0)	7 (25.0)
K13. Knowledge of gender equality and inclusive participation in science education	0 (0.0)	18 (64.3)	9 (32.1)
K14. Understanding of how science relates to issues such as poverty, health, and clean water	0 (0.0)	15 (53.6)	13 (46.4)
K15. Knowledge of environmental justice and community sustainability issues	0 (0.0)	21 (75.0)	7 (25.0)
K16. Understanding of how global cooperation contributes to solving sustainability issues	0 (0.0)	19 (67.9)	9 (32.1)

Note. Low = Rating of 1; Moderate = Ratings of 2–3; High = Rating of 4

Table 1 presents the level of science teachers' knowledge regarding the integration of Sustainable Development Goals (SDGs) in science instruction. Since the responses were categorized into *Low*, *Moderate*, and *High* knowledge levels, the majority of the respondents were classified under the *Moderate* category across most indicators, as highlighted in Table 1. This finding suggests that while science teachers possess a foundational understanding of sustainability concepts, there remain areas that require further enhancement to support effective SDG integration in science classrooms.

The highest percentages of respondents classified under the *High* knowledge level were observed in K7, understanding of responsible consumption and waste management as integrated in science learning (53.6%), K5, understanding of the relationship between renewable and non-renewable energy and sustainability (50.0%), and K14, understanding of how science concepts relate to issues such as poverty, health, and clean water (46.4%). These findings suggest that science teachers demonstrate stronger knowledge in sustainability concepts that are more commonly embedded within science curricula. In contrast, the largest proportions of respondents categorized under the *Moderate* knowledge level were found in K3, knowledge of the 2030 Agenda and its role in global and Philippine science education (82.1%), K9, knowledge of strategies for embedding SDGs into science lessons (75.0%), K11, knowledge of curriculum standards supporting SDG integration in science education (75.0%), K12, understanding of how to design classroom activities promoting sustainability concepts (75.0%), and K15, knowledge of environmental justice and community sustainability issues (75.0%). This pattern indicates that although teachers possess general awareness of sustainability-related concepts, they may require additional support in understanding the broader SDG framework, aligning sustainability goals with curriculum standards, and developing the pedagogical

competencies necessary for effective classroom implementation. Only a small proportion of respondents demonstrated *Low* knowledge levels, ranging from 0.0% to 7.1% across the indicators. Specifically, 7.1% of the respondents exhibited low knowledge regarding the 2030 Agenda and its role in science education, while 3.6% demonstrated low knowledge related to the 17 SDGs, strategies for embedding SDGs into science lessons, and gender equality and inclusive participation in science education. Although these percentages were relatively small, they identify specific areas that may benefit from targeted interventions and professional development initiatives. Overall, the findings indicate that science teachers possess satisfactory knowledge of sustainability concepts that are directly connected to existing science content; however, there remains a need to strengthen their understanding of the broader SDG agenda, curriculum alignment, and instructional approaches necessary for effective SDG integration. Similar findings were reported by Afroz and Ilham (2020), who found that respondents generally demonstrated moderate knowledge of SDGs, and by Suaco (2024), who emphasized the need to further enhance teachers' competencies in integrating sustainability concepts within science education.

3.2.2 Science Teachers' Attitudes toward SDGs Integration

Table 2: Level of Science Teachers' Attitudes toward Integrating SDGs

Attitude Indicators	Negative f (%)	Positive f (%)	Very Positive f (%)
A1. I believe it is important for science teachers to integrate sustainability concepts into their lessons.	0 (0.0)	7 (25.0)	21 (75.0)
A2. I feel that teaching SDG-related topics helps students understand real-world problems.	0 (0.0)	7 (25.0)	21 (75.0)
A3. I believe that the science curriculum should include more sustainability lessons.	0 (0.0)	5 (17.9)	23 (82.1)
A4. Environmental and sustainability issues personally concern me.	0 (0.0)	8 (28.6)	20 (71.4)
A5. I care deeply about climate change, biodiversity loss, and water scarcity.	0 (0.0)	5 (17.9)	23 (82.1)
A6. I feel responsible for helping students become environmentally aware.	0 (0.0)	4 (14.3)	24 (85.7)
A7. I believe all students should have equal opportunities to learn science.	0 (0.0)	2 (7.1)	26 (92.9)
A8. I believe gender fairness is important in the science classroom.	0 (0.0)	6 (21.4)	22 (78.6)
A9. I value cultural diversity and inclusion when teaching science content.	0 (0.0)	6 (21.4)	22 (78.6)
A10. I feel motivated to include SDG-related topics in my lessons.	0 (0.0)	8 (28.6)	20 (71.4)
A11. I believe integrating SDGs can make science lessons more meaningful.	0 (0.0)	5 (17.9)	23 (82.1)
A12. I am willing to use new strategies to teach sustainability concepts.	0 (0.0)	6 (21.4)	22 (78.6)

Note. Negative = Rating of 1; Positive = Ratings of 2–3; Very Positive = Rating of 4

Table 2 presents the level of science teachers' attitudes toward the integration of Sustainable Development Goals (SDGs) in science instruction. Since the responses were categorized into *Negative*, *Positive*, and *Very Positive* attitude levels, the majority of the respondents were classified under the *Very Positive* category across most indicators, as

highlighted in Table 2. This finding suggests that science teachers generally hold favorable perceptions regarding sustainability education and demonstrate a strong willingness to support the integration of SDG-related concepts into science instruction.

The highest percentages of respondents classified under the *Very Positive* attitude level were observed in A7, belief that all students should have equal opportunities to learn science (92.9%), A6, feeling responsible for helping students become environmentally aware (85.7%), and A3, belief that the science curriculum should include more sustainability lessons (82.1%), A5, caring deeply about climate change, biodiversity loss, and water scarcity (82.1%), and A11, belief that integrating SDGs can make science lessons more meaningful (82.1%). These findings suggest that science teachers strongly value educational equity, environmental responsibility, and the importance of incorporating sustainability concepts within science education. In contrast, the largest proportions of respondents categorized under the *Positive* attitude level were found in A4, environmental and sustainability issues personally concern me (28.6%), A10, feeling motivated to include SDG-related topics in lessons (28.6%), A1, belief in the importance of integrating sustainability concepts into science lessons (25.0%), and A2, perception that teaching SDG-related topics helps students understand real-world problems (25.0%). This pattern indicates that although teachers generally exhibit favorable attitudes toward SDG integration, there remain opportunities to further strengthen their personal commitment, motivation, and confidence in implementing sustainability-related practices in the classroom. Notably, none of the respondents demonstrated *Negative* attitudes across any of the indicators, suggesting that science teachers consistently recognize the value and relevance of sustainability education in science instruction. The absence of negative responses highlights a supportive environment for advancing Education for Sustainable Development initiatives in schools. Nevertheless, the presence of respondents within the *Positive* category rather than the *Very Positive* category suggests that targeted professional development activities may still be beneficial in fostering stronger engagement and deeper commitment toward SDG integration. Overall, the findings indicate that science teachers possess highly favorable attitudes toward the integration of SDGs in science instruction. Their strong sense of responsibility toward promoting environmental awareness, commitment to educational equity, and recognition of the value of sustainability within the science curriculum provide a positive foundation for implementing Education for Sustainable Development. Similar findings were reported by Sunthonkanokpong and Murphy (2019), who found that pre-service teachers generally demonstrated positive attitudes toward sustainability and recognized the important role of education in promoting sustainable practices. Likewise, Funa et al. (2022) revealed that teachers exhibited favorable attitudes toward Education for Sustainable Development, highlighting educators' potential to serve as agents of change in fostering sustainability values and behaviors among learners. These findings collectively suggest that positive teacher attitudes may facilitate the successful integration of sustainability concepts and SDG-related principles into science instruction.

3.2.3 Science Teachers' Practices regarding SDGs Integration

Table 3 presents the level of science teachers' practices regarding the integration of Sustainable Development Goals (SDGs) in science instruction. Since the responses were categorized into *Unlikely*, *Likely*, and *Very Likely* practice levels, the majority of the respondents were classified under the *Likely* category across most indicators, as highlighted in Table 3. This finding suggests that science teachers generally demonstrate sustainability-related practices in their science instruction; however, there remain opportunities to further strengthen and institutionalize these practices to support more effective SDG integration in classroom settings.

Table 3: Level of Science Teachers' Practices in Integrating SDGs

Practice Indicators	Unlikely f (%)	Likely f (%)	Very Likely f (%)
P1. I discuss SDG-related science issues, such as climate change or water conservation.	0 (0.0)	13 (46.4)	15 (53.6)
P2. I connect science lessons to real-world sustainability challenges.	0 (0.0)	14 (50.0)	14 (50.0)
P3. I include examples showing the impact of human activities on the environment.	0 (0.0)	11 (39.3)	17 (60.7)
P4. I encourage students to understand global and local sustainability issues.	0 (0.0)	15 (53.6)	13 (46.4)
P5. I model practices like energy conservation, waste segregation, and recycling.	0 (0.0)	15 (53.6)	13 (46.4)
P6. I encourage students to participate in sustainable practices at school.	0 (0.0)	15 (53.6)	13 (46.4)
P7. I design classroom activities promoting responsible consumption.	0 (0.0)	18 (64.3)	10 (35.7)
P8. I use or recommend eco-friendly instructional materials.	0 (0.0)	19 (67.9)	9 (32.1)
P9. I ensure all learners participate equally in science activities.	0 (0.0)	10 (35.7)	18 (64.3)
P10. I promote fairness and respect for diverse backgrounds in my science classes.	0 (0.0)	7 (25.0)	21 (75.0)
P11. I include examples of how sustainability affects gender, health, and communities.	0 (0.0)	15 (53.6)	13 (46.4)
P12. I attend seminars, training, or webinars related to SDGs or environmental issues.	1 (3.6)	20 (71.4)	7 (25.0)
P13. I participate in school or community events related to sustainability.	0 (0.0)	20 (71.4)	8 (28.6)
P14. I collaborate with peers to improve SDG integration in science teaching.	0 (0.0)	19 (67.9)	9 (32.1)

Note. Unlikely = Rating of 1; Likely = Ratings of 2–3; Very Likely = Rating of 4

The highest percentages of respondents classified under the *Very Likely* practice level were observed in P10, promoting fairness and respect for diverse backgrounds in science classes (75.0%), P9, ensuring that all learners participate equally in science activities (64.3%), and P3, including examples showing the impact of human activities on the environment (60.7%). These findings suggest that science teachers are more likely to implement practices related to inclusive education, equity, and environmental awareness within their teaching. Such practices reflect key principles of Education for Sustainable Development, which emphasize social inclusion, environmental responsibility, and active learner participation in addressing sustainability issues. In contrast, the largest proportions of respondents categorized under the *Likely* practice level were found in P12, attending seminars, training, or webinars related to SDGs or environmental issues (71.4%), P13, participating in school or community events related to sustainability (71.4%), P8, using or recommending eco-friendly instructional materials (67.9%), and P14, collaborating with peers to improve SDG integration in science teaching (67.9%). This pattern indicates that although teachers engage in sustainability-related practices, these activities may not yet be consistently implemented to the extent reflected in the *Very Likely* category. The findings suggest a need to further encourage teachers' active participation in professional development activities, collaborative initiatives, and community-based sustainability efforts that can strengthen the practical application of SDG principles in science instruction. Only a small proportion of respondents demonstrated *Unlikely* practice levels, ranging from 0.0% to 3.6% across the indicators. Specifically, 3.6% of the respondents

reported being unlikely to attend seminars, training, or webinars related to SDGs or environmental issues (P12). Although this percentage was relatively small, it highlights the importance of increasing teachers' access to and participation in capacity-building opportunities that enhance their knowledge and skills related to sustainability education. The limited occurrence of unlikely practices across the indicators suggests that science teachers generally exhibit positive tendencies toward implementing SDG-related practices within their professional responsibilities. Overall, the findings indicate that science teachers demonstrate favorable practices regarding the integration of SDGs in science instruction, particularly in promoting inclusivity, environmental awareness, and equitable participation among learners. However, there remains a need to strengthen sustained engagement in professional development, collaborative learning communities, and broader sustainability initiatives to support more consistent implementation of SDG-related practices in the classroom. Similar findings were reported by Funa et al. (2022), who found that teachers generally exhibited positive sustainability-related behaviors and practices that support the promotion of Education for Sustainable Development. Likewise, Guo et al. (2024) emphasized that integrating SDGs into science teaching practices requires intentional instructional approaches and continuous support to enable teachers to effectively translate sustainability principles into classroom experiences. These findings collectively suggest that strengthening teachers' sustainability practices through ongoing professional development and institutional support can contribute to more effective integration of SDG principles within science education.

3.3 Thematic Analysis of Science Teachers' Perspectives on SDG Integration

To further substantiate the descriptive findings, the open-ended question under KAP was analyzed using Braun and Clarke's thematic analysis to identify emerging themes that go deeper into the teacher's perspective on actual SDG integration into their science instructions. The thematic analysis generated three key themes: (1) teacher's need for further training on SDG-related science concepts, (2) teachers' motivation for integrating SDGs in science teaching, (3) teachers' experiences in SDG integration in science teaching.

As shown in Table 4, participants identified the need for further training in SDG-related science concepts, particularly in strengthening content knowledge, curriculum integration, pedagogical strategies, continuous professional development, and understanding the socio-economic and ethical dimensions of sustainability. Teachers highlight gaps in key competencies in climate change, renewable energy, and environmental sustainability and also difficulties in aligning SDGs in the existing curriculum and translating them in science classroom instructions. This reveals that even if teachers are well aware of the relevance of SDGs, they need to have deeper conceptual understanding and institutional support, which aligns with recent studies previously mentioned that the effective integration of SDGs depends on teachers' competencies, interdisciplinary approaches, and practical application in the actual teaching practice (Suaco, 2024; UNESCO, 2017; Tadena & Salic-Hairulla, 2025). Furthermore, studies further support this, revealing that teachers' knowledge on SDGs is often fragmented and they struggle to connect them across disciplines, requiring a holistic approach and comprehensive training for teachers for better implementation (Soto-Solier et al., 2023; Encabo-Fernández et al., 2023).

Table 4: Teachers' SDG-Related Science Concepts Requiring Further Training

Responses	Code	Theme
Teachers identified the need for deeper training on specific SDG content areas, particularly climate change, renewable energy, water sanitation, environmental sustainability, and responsible consumption, highlighting gaps in content knowledge and clarity of concepts (ISST2, ISST8, ISST16, ISST20, ISST22).	SDG Content Knowledge Gaps	
Several participants emphasized the need for training in integrating SDGs into the curriculum, including aligning concepts with the new curriculum, embedding interdisciplinary topics, and connecting science lessons to real-life sustainability issues (ISST2, ISST5, ISST25, ISST27).	Curriculum Integration of SDGs	
Teachers also expressed the need for improved pedagogical strategies, including simplifying complex sustainability concepts, developing engaging lessons, and enhancing scientific literacy and student empowerment (ISST4, ISST23).	Pedagogical Skills for SDG Integration	Teachers' Need for Further Training on SDG-Related Science Concepts
Some responses revealed a need for broader and continuous professional development, including training in data science, systems thinking, digital competencies, and interdisciplinary approaches, as well as ongoing updates beyond formal education (ISST7, ISST14, ISST11).	Continuous Professional Development Needs	
Participants highlighted the need to understand the social, economic, and ethical dimensions of sustainability, including environmental justice, inequality, and global partnerships, indicating limited confidence in teaching these aspects (ISST9, ISST12, ISST26).	Socio-Economic and Ethical Dimensions of SDGs	

Table 5. Teachers' Motivation in Integrating SDG Topics in Science Classes

Responses	Code	Theme
Teachers are motivated by their awareness of current environmental and societal issues, including climate change and global challenges, which drive them to integrate SDG topics to address real-world problems through science education (ISST1, ISST5, ISST7, ISST21).	Awareness of Environmental and Global Issues	
Several participants emphasized that integrating SDGs makes science learning more meaningful, relevant, and connected to real-life situations, enhancing student engagement and understanding of scientific concepts (ISST6, ISST10, ISST14, ISST23, ISST25).	Meaningful and Relevant Science Learning	Teachers' Motivation for Integrating SDGs in Science Teaching
Teachers are also driven by the goal of developing responsible, informed, and environmentally conscious students, promoting citizenship, awareness, and sustainable behavior (ISST9, ISST11, ISST15, ISST26).	Development of Responsible and Informed Citizens	
Some responses highlighted the motivation to empower students to take action and contribute to sustainability efforts, including solving problems and making positive societal impact (ISST2, ISST8, ISST20).	Student Empowerment and Action for Sustainability	

As shown in Table 5, teachers' motivation to integrate SDG topics in science classes is driven by their awareness of environmental and global issues, the desire to make science learning more meaningful and relevant, the goal of developing responsible and informed students, the intention to empower learners to take action, and the presence of support systems such as training and collaboration. The teachers reveal that real-world sustainability enhances students' engagement and knowledge while also fostering their skills such as environmental responsibility and action-oriented learning. These responses show that their motivations are both contextual and intrinsic. These findings corroborate with Ardoin et al. (2020), which emphasized that environmental education promotes positive attitudes and behaviors toward the environment through meaningful learning experiences. Also, Santos and Ramirez (2022) shows that environmental awareness significantly influences individuals' commitment towards their sustainability practices. Moreover, Torsdotir et al. (2024) emphasized that participatory learning experience enhances students' sustainability competence, while Brundiers et al. (2021) highlighted the importance of key competencies through active and experiential learning. Thus, these findings collectively suggest that teachers' motivation to integrate SDGs is enhanced when the instruction is relevant, action-oriented, engaging, and promotes global citizenship.

Table 6. Teachers' Experiences in Integrating SDG Concepts in Science Lessons

Responses	Code	Theme
Teachers implemented SDG concepts through various science lessons such as energy conservation, climate change, biodiversity, water conservation, and environmental issues, often integrating real-world applications and linking lessons to students' daily experiences (ISST2, ISST6, ISST8, ISST14, ISST25).	Integration of SDGs in Science Content	Teachers' Experiences in SDG Integration in Science Teaching
Many participants reported that hands-on, inquiry-based, and real-world activities (e.g., experiments, recycling projects, clean-up drives, and investigations) increased student engagement, participation, and understanding of sustainability concepts (ISST3, ISST4, ISST9, ISST20, ISST24).	Experiential and Inquiry-Based Learning Approaches	
Teachers observed positive outcomes such as increased student awareness, interest, and ability to connect science concepts to real-life environmental issues and sustainability practices (ISST7, ISST10, ISST15, ISST28).	Positive Student Outcomes and Engagement	
However, challenges were also noted, including limited resources, time constraints, difficulty sustaining student practices, and issues in designing effective sustainability activities (ISST2, ISST4, ISST8, ISST25).	Challenges in Implementation of SDG Lessons	
Some responses highlighted student-related challenges such as inconsistent participation, behavioral issues, and difficulty applying sustainability practices beyond the classroom (ISST5, ISST19, ISST27).	Student Participation and Behavioral Challenges	

As shown in Table 6, teachers reported varied experiences in integrating SDG concepts into science lessons, including the use of real-world topics such as climate change, energy, and environmental issues, as well as hands-on and inquiry-based activities that enhanced student engagement and understanding. These approaches, as reported by the teachers, arrived with positive outcomes, such as students' increased awareness and interest and their ability to connect real sustainability practices. However, they are also reported to have challenges when integrating SDGs, such as limited resources, time constraints, and difficulty in sustaining students' participation in the activity. This showed the dual nature of SDG integration, which is both impactful and demanding, which aligns with studies that emphasized that experiential and context-based learning are effective in promoting sustainability competencies and engagement among students (Ardoin et al., 2020; Kumar et al., 2024). Furthermore, the challenges reported also align with studies such as imitations and implementation barriers in interdisciplinary sustainability education (Arntzen et al., 2025), and the need for continuous professional development and institutional support (Casanova et al., 2023) also persists. These findings emphasize that

experiential and context-based learning are effective; their success depends on the adequate resources, well-designed structural strategies, and support system for the teachers.

4. Conclusions

This study provides insight that there is a high level of readiness to integrate Sustainable Development Goals (SDGs) among school science teachers in the Division of Iligan City, as evidenced by their strong conceptual understanding and very positive attitude towards sustainability. The teachers demonstrate solidity on the environmental dimensions of SDGs such as renewable energy and waste management, indicating that these aspects of sustainability are already embedded within science topics. However, gaps remain more in a holistic approach in recognizing that sustainable development involves the interconnection of environmental, social, and economic dimensions of sustainability among teachers. Science teachers tend to associate SDGs only with the environment dimensions because of their understanding of the 2030 Agenda and the sustainability framework for achieving a balanced and long-term development. Although teachers expressed a strong sense of responsibility in promoting sustainability, their professional engagement with SDG-related training and collaboration is still limited.

Moreover, the qualitative findings reveal that the science teachers' ability to translate knowledge and positive attitudes into actual classroom practice is often constrained by many challenges. These include limited resources, time constraints given the already overloaded curriculum, and the need for targeted pedagogical trainings. Teachers emphasized the need for professional development that focuses on contextualizing science lessons, integrating systems thinking and interdisciplinary approaches, enhancing higher-order thinking skills, and making sustainability available among learners. Thus, teachers are motivated and ready for integrating SDGs into their teaching; achieving meaningful and continued integration requires strong institutional support. With that, providing adequate resources, continues training opportunities, and collaborative system enable teachers to move from awareness to consistent, action-oriented implementation of SDGs in science education

Recommendations

1. Implement targeted professional development focused on the 2030 Agenda and practical SDG curriculum integration strategies.
2. Provide localized instructional resources, including contextualized materials, lab tools, and digital supports.
3. Formalize curriculum mapping to align SDGs with science competencies and manage time constraints.
4. Strengthen institutional support through collaboration structures like Professional Learning Communities (PLCs).

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5. References

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