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Science Teachers' Preparedness and Attitudes Towards Environmental Sustainability on Students' Critical Thinking and Local Adaptation in Stem Curricula

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Abstract*—This study evaluated the influence of science teachers' preparedness and attitudes towards environmental sustainability on students' critical thinking and local adaptation within STEM curricula It sought to answer the following research problem: level of teachers' preparedness, level of teachers' attitudes, level of students critical thinking skills, level of students' local adaptation in the STEM curricula, significant relationship between the science teachers' preparedness and students' critical thinking skills, significant relationship between the teachers' attitude and students' critical thinking skills, significant relationship between the science teachers' preparedness in integrating environmental sustainability and the students' local adaptation, significant relationship between the science teachers' attitude in integrating environmental sustainability and the students critical thinking skills regarding local adaptation. The respondents of this study consist of four hundred (400) STEM students at Laguna Senior High School in Santa Cruz, Laguna. Data were collected through a self-made survey questionnaire that underwent reliability and validity testing. The study revealed that level of teachers' preparedness, level of teachers' attitudes, level of students critical thinking skills, level of students' local adaptation in the STEM curricula were all to a very great extent and relationship between the teachers' attitude and students' critical thinking skills, relationship between the science teachers' preparedness in integrating environmental sustainability and the students' local adaptation, relationship between the science teachers' attitude in integrating environmental sustainability and the students critical thinking skills regarding local adaptation were all significant. In conclusion, there is significant relationship that resulted to rejection of null hypothesis between the teachers' preparedness and students' critical thinking skills, between teachers' attitude and students' critical thinking skills, between the science teachers' preparedness in integrating environmental sustainability and the students' local adaptation, between the science teachers' attitude in integrating environmental sustainability and the students critical thinking skills regarding local adaptation The results confirm that science teachers' preparedness and attitudes towards environmental sustainability plays an important role on students' critical thinking and local adaptation in STEM curricula. Thus, the study recommends the implementation of continuous professional development programs for teachers focusing on environmental sustainability. Schools should encourage interdisciplinary collaboration and use hands-on learning experiences to develop students' critical thinking and local adaptation skills. Additionally, providing incentives for teachers and conducting further research across different academic disciplines would help broaden the scope of sustainability education and improve student engagement in solving real-world environmental issues*.

***Keywords*—** *Environmental Sustainability; Students' Critical Thinking; Science Teachers' Preparedness*.

I. INTRODUCTION

As environmental challenges such as climate change, biodiversity loss, and resource depletion escalate, integrating environmental sustainability into educational curricula has become a global priority. STEM education plays a crucial role in fostering environmentally literate citizens who can address these complex issues through critical thinking and problem-solving (Bybee, 2017). In this context, science teachers serve as key agents in shaping students' understanding of environmental challenges and their ability to think critically and adapt locally (UNESCO, 2017).

Teacher preparedness is a vital factor in the effective delivery of environmental education. Educators with strong knowledge and skills in sustainability are better equipped to develop students' critical thinking and problem-solving abilities—competencies essential for navigating contemporary environmental challenges (Shepardson et al., 2017). However, preparedness extends beyond content knowledge; it also encompasses pedagogical strategies that promote student engagement and real-world problem-solving Without adequate training and resources, teachers may struggle to integrate sustainability effectively into their teaching practices

Despite policy initiatives such as the Department of Education's science programs, which includes environmental education components, challenges persist in its actual implementation at the classroom level (Palma & Sta. Maria, 2020). Many science teachers face barriers related to insufficient training, a lack of instructional materials, and difficulties aligning curricula with both global sustainability standards and local environmental contexts. This gap in implementation highlights the need for a more structured approach to equipping teachers with the necessary competencies for integrating sustainability into STEM education.

In addition to preparedness, teachers' attitudes towards environmental sustainability significantly influence their instructional approaches. Educators who value sustainability are more likely to employ innovative, student-centered pedagogies such as inquiry-based learning and project-based

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activities that foster students' critical thinking and encourage local adaptation to environmental challenges (Sund, 2016). Conversely, teachers with limited training or less favorable attitudes toward sustainability may struggle to engage students in meaningful environmental discussions, restricting their ability to develop critical thinking skills.

Local adaptation to environmental challenges is particularly crucial in disaster-prone regions like Laguna, where students must be equipped with the knowledge and skills to respond to environmental risks (Alcantara, 2020). Science teachers who are well-prepared and demonstrate positive attitudes toward sustainability can help students apply scientific knowledge to local contexts, strengthening their adaptive capacity and resilience However, the extent to which teachers are equipped to address these needs within the STEM curriculum remains underexplored.

This study aims to examine the influence of science teachers' preparedness and attitudes toward environmental sustainability on students' critical thinking and local adaptation within STEM curricula. The findings provide a foundation for developing guidelines that enhance the integration of sustainability into Science education, ensuring that students not only acquire knowledge of environmental iss

1.1 Statement of the Problem

This study seeks to answer the following research questions:

1. *What is the level of teachers' preparedness on environmental sustainability in terms of:*
    - 1.1. *Knowledge*
    - 1.2. *Resources*
    - 1.3. *Skills*
    - 1.4. *Confidence*
2. *What is the level of teachers' attitudes in the environmental sustainability in terms of:*
    - 2.1. *Personal beliefs and perception*
    - 2.2. *Values*
    - 2.3. *Motivation*
    - 2.4. *Behavioral intention*
3. *What is the level of students critical thinking skills in terms of:*
    - 3.1. *Problems solving skills*
    - 3.2. *Reflective thinking skills*
    - 3.3. *Reasoning abilities*
    - 3.4. *Creative thinking*
    - 3.5. *Synthesis skills*
4. *What is the level of students' local adaptation in the STEM curricula in terms of:*
    - 4.1. *Climate adaptation*
    - 4.2. *Resources management*
    - 4.3. *Recognition of local environmental changes*
    - 4.4. *Community involvement*
5. *Is there a significant relationship between the science teachers' preparedness and students' critical thinking skills regarding the integration of environmental sustainability?*
6. *Is there a significant relationship between the teachers' preparedness and local adaptation regarding the integration of environmental sustainability?*
7. *Is there a significant relationship between the science teachers' attitude in integrating environmental sustainability and the students' critical thinking?*

II. Methodology

This study employed a quantitative correlational research design. This approach allowed for the examination of relationships between science teachers' preparedness and attitudes, and the resulting relationship on students' critical thinking skills and local adaptation in STEM curricula. Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2019)

The research is expected to identify significant correlations between science teachers' preparedness and attitudes toward students' critical thinking skills and local adaptation. Based on the findings, guidelines for curriculum integration were developed, providing actionable recommendations for improving teaching practices and enhancing students' learning experiences in sustainability.

This research design provides a structured approach to investigating the influence of science teachers' preparedness and attitudes on students' critical thinking and local adaptation within STEM curricula, laying the groundwork for effective curriculum integration.

III. Results and Discussion

This chapter presented the different results and discussed the results from treating the data gathered in this study. All specific questions in Chapter 1 under the statement of the problem were answered in this chapter supported by tables. It presents the data gathered about the significant relationship between Teachers' Preparedness, Attitudes on Environmental Sustainability and Students Critical Thinking Skills and Local Adaptation in the STEM curricula. In particular, the study sought to address the following:

Level of Teachers' Preparedness on Environmental Sustainability

In this study, the level of Teachers' Preparedness on Environmental Sustainability refers to Knowledge, Resources, Skills**,** and Confidence.

The following tables show the statement, mean, standard deviation. remarks and verbal interpretation from the perspectives of respondents.

Table 1 presents the level of teachers' preparedness on environmental sustainability in terms of knowledge, including the statements, mean, standard deviation, and remarks. Teachers demonstrate a very high level of knowledge in environmental sustainability, as indicated by their familiarity with key concepts, climate change impacts, biodiversity, and sustainability integration into STEM curricula. The highest mean (M = 4.47, SD = 0.68) shows that teachers have a strong understanding of how climate change affects local ecosystems and communities, highlighting their awareness of

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environmental issues. Meanwhile, the lowest mean (M = 4.23, SD = 0.78) suggests that while teachers are knowledgeable, there is still room for improvement in staying updated with the latest research and developments in environmental education.

Table 1. Level of Teachers' Preparedness on Environmental Sustainability in terms of Knowledge

Statements	*Mean*	*SD*	*Remarks*
The teacher is knowledgeable about key concepts related to environmental sustainability.	4.44	0.69	Strongly Agree
The teacher understands how climate change impacts local ecosystems and communities.	4.47	0.68	Strongly Agree
The teacher can effectively explain the importance of biodiversity in maintaining ecological balance.	4.34	0.76	Strongly Agree
The teacher is familiar with the latest research and developments in environmental education.	4.23	0.78	Strongly Agree
The teacher is integrating sustainability topics into STEM curricula.	4.42	0.73	Strongly Agree
Weighted Mean	**4.38**		
SD	**0.73**		
Verbal Interpretation	**Very Great Extent**		

The overall level of teachers' knowledge in environmental sustainability attained a weighted mean of 4.38 and a standard deviation of 0.73, which is verbally interpreted as very great extent.

In summary, teachers exhibit strong knowledge of environmental sustainability, allowing them to effectively integrate sustainability topics into their teaching. These findings emphasize the need for continuous professional development and access to the latest research to enhance their expertise further.

Table 2. Level of Teachers' Preparedness on Environmental Sustainability in terms of Resources

Statements	*Mean*	*SD*	*Remarks*
The teacher has access to adequate teaching materials on environmental sustainability.	4.24	0.78	Strongly Agree
The teacher utilize digital resources (e.g., online courses, videos) to enhance his/her lessons on sustainability.	4.45	0.67	Strongly Agree
The school provides sufficient resources (e.g., textbooks, lab equipment) to teach sustainability effectively.	4.15	0.89	Strongly Agree
The teacher can easily obtain community resources (e.g., local experts, organizations) to support his/her lessons on sustainability.	4.15	0.84	Strongly Agree
The teacher often collaborate with colleagues to share resources and ideas	4.28	0.78	Strongly Agree
Weighted Mean	**4.25**		
SD	**0.80**		
Verbal Interpretation	**Very Great Extent**		

Table 2 presents the level of teachers' preparedness on environmental sustainability in terms of resources, including the statements, mean, standard deviation, and remarks. Teachers demonstrate a very high level of preparedness in utilizing resources for environmental sustainability education, as evidenced by their access to teaching materials, digital resources, school-provided materials, community resources, and collaboration with colleagues. The highest mean (M = 4.45, SD = 0.67) indicates that teachers effectively utilize digital resources such as online courses and videos to enhance their lessons on sustainability, showcasing their adaptability to modern teaching tools. Meanwhile, the lowest mean (M = 4.15, SD = 0.89) suggests that while schools provide sufficient resources, there may be a need for further investment in sustainability-related materials and equipment.

The overall level of teachers' preparedness in terms of resources attained a weighted mean of 4.25 and a standard deviation of 0.80, which is verbally interpreted as very great extent.

In summary, teachers are well-equipped with the necessary resources to integrate environmental sustainability into their teaching. These findings highlight the importance of continuous investment in educational materials and fostering collaboration among educators to enhance sustainability education.

Table 3. Level of Teachers' Preparedness on Environmental Sustainability in terms of Skills

Statements	*Mean*	*SD*	*Remarks*
The teacher is skilled at using inquiry-based learning strategies to teach sustainability concepts.	4.36	0.73	Strongly Agree
The teacher can effectively facilitate group discussions on environmental issues in the classroom	4.36	0.74	Strongly Agree
The teacher is able to design engaging, hands-on activities related to environmental sustainability	4.24	0.78	Strongly Agree
The teacher incorporates real-world examples into his/her lessons to illustrate sustainability concepts.	4.38	0.73	Strongly Agree
The teacher regularly assesses students' understanding of sustainability topics through diverse evaluation methods	4.28	0.79	Strongly Agree
Weighted Mean	**4.32**		
SD	**0.75**		
Verbal Interpretation	**Very Great Extent**		

Table 3 presents the level of teachers' preparedness on environmental sustainability in terms of skills, including the statements, mean, standard deviation, and remarks. Teachers exhibit a very high level of preparedness in terms of skills related to environmental sustainability education. The highest mean (M = 4.38, SD = 0.73) indicates that teachers effectively incorporate real-world examples into their lessons, helping students better understand sustainability concepts. Similarly, the use of inquiry-based learning strategies (M = 4.36, SD = 0.73) and facilitation of group discussions on environmental issues (M = 4.36, SD = 0.74) demonstrate their strong ability to engage students in critical thinking and active learning.

The lowest mean (M = 4.24, SD = 0.78) suggests that while teachers are skilled in designing hands-on activities, further professional development in creating innovative and interactive sustainability activities could enhance student engagement.

The overall level of teachers' preparedness in terms of skills attained a weighted mean of 4.32 and a standard deviation of 0.75, which is verbally interpreted as very great extent.

In summary, teachers possess strong pedagogical skills that enable them to effectively teach environmental

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sustainability. These findings highlight the importance of continuous training and exposure to new teaching methodologies to further enhance educators' capabilities in sustainability education.

Table 4. Level of Teachers' Preparedness on Environmental Sustainability in terms of Confidence

Statements	*Mean*	*SD*	*Remarks*
The teacher feels confident in his/her ability to teach environmental sustainability topics.	4.51	0.65	Strongly Agree
The teacher believes he/she can engage students in discussions about their role in promoting sustainability.	4.40	0.70	Strongly Agree
The teacher is comfortable addressing student questions related to environmental issues.	4.46	0.69	Strongly Agree
The teacher feels prepared to integrate sustainability concepts into existing STEM curricula.	4.40	0.73	Strongly Agree
The teacher is confident in his/her ability to encourage critical thinking about environmental challenges among his/her students	4.43	0.70	Strongly Agree
Weighted Mean	**4.44**		
SD	**0.70**		
Verbal Interpretation	**Very Great Extent**		

Table 4 presents the level of teachers' preparedness on environmental sustainability in terms of confidence, including the statements, mean, standard deviation, and remarks. Teachers exhibit a very high level of confidence in teaching environmental sustainability topics. The highest mean (M = 4.51, SD = 0.65) indicates that teachers feel highly confident in their ability to teach sustainability concepts effectively. Similarly, teachers are comfortable addressing student questions (M = 4.46, SD = 0.69) and encouraging critical thinking about environmental challenges (M = 4.43, SD = 0.70), suggesting their strong capability in fostering environmental awareness and analytical skills among students.

The lowest mean (M = 4.40, SD = 0.73) suggests that while teachers feel prepared to integrate sustainability concepts into STEM curricula, additional training or resources could further strengthen their integration strategies.

The overall level of teachers' preparedness in terms of confidence attained a weighted mean of 4.44 and a standard deviation of 0.70, which is verbally interpreted as very great extent.

In summary, teachers demonstrate strong confidence in teaching environmental sustainability, engaging students in discussions, and integrating sustainability into their lessons. These findings emphasize the importance of continuous support and professional development opportunities to maintain and enhance teachers' confidence in delivering sustainability education.

Table 5 presents the composite level of teachers' preparedness on environmental sustainability, summarizing their self-assessments in four key indicators: knowledge, resources, skills, and confidence.

Among these, teachers demonstrated the highest level of preparedness in confidence (M = 4.44, SD = 0.70), indicating a strong belief in their ability to integrate environmental sustainability into their teaching. This suggests that they feel self-assured in delivering sustainability-related lessons and engaging students in meaningful discussions.

Table 5. Composite of Teachers' Preparedness on Environmental Sustainability

Indicators	*Weighted Mean*	*SD*	*Verbal Interpretation*
Knowledge	4.38	0.73	Very Great Extent
Resources	4.25	0.80	Very Great Extent
Skills	4.32	0.75	Very Great Extent
Confidence	4.44	0.70	Very Great Extent
Grand Mean	**4.35**		
SD	**0.74**		
Verbal Interpretation	**Very Great Extent**		

On the other hand, the lowest mean was observed in resources (M = 4.25, SD = 0.80), implying that while teachers effectively use available materials, there may be a need for additional resources or institutional support to further enhance their preparedness.

The overall level of teachers' preparedness on environmental sustainability attained a grand mean of 4.35 and a standard deviation of 0.74, which is verbally interpreted as very great extent.

In conclusion, educators have a solid basis in understanding, abilities, and assurance in sustainability education. However, increasing access to teaching resources could further support their efforts in effectively integrating environmental sustainability concepts into the classroom.

Level of Teachers' Attitudes in the Environmental Sustainability

In this study, the level of Teachers' Attitudes in the Environmental Sustainability refers to Personal beliefs, Perceptions, Values, Motivation, and Behavioral intention

The following tables show the statement, mean, standard deviation. remarks and verbal interpretation from the perspectives of respondents.

Table 6. Level of Teachers' Attitudes in the Environmental Sustainability in terms of Personal beliefs and Perceptions

Statements	*Mean*	*SD*	*Remarks*
The teacher emphasizes that environmental sustainability should be a core component of education.	4.36	0.71	Strongly Agree
The teacher emphasizes the importance of teaching sustainability to help students prepare for future challenges.	4.39	0.67	Strongly Agree
The teacher emphasizes that environmental issues should be integrated into all subjects, including STEM.	4.33	0.80	Strongly Agree
The teacher believes that his/her role as a teacher includes promoting environmental stewardship among students.	4.29	0.75	Strongly Agree
The teacher believes that sustainability education empowers students to make informed decisions about their environment	4.39	0.71	Strongly Agree
Weighted Mean	**4.35**		
SD	**0.73**		
Verbal Interpretation	**Very Great Extent**		

Table 6 presents the level of teachers' attitudes toward environmental sustainability in terms of personal beliefs and perceptions, including the statements, mean, standard deviation, and remarks. Teachers exhibit a very high level of

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positive attitudes toward environmental sustainability. The highest mean (M = 4.39, SD = 0.67) indicates that teachers strongly emphasize the importance of teaching sustainability to help students prepare for future challenges, demonstrating their commitment to equipping students with essential environmental knowledge.

Meanwhile, the lowest mean (M = 4.29, SD = 0.75) was observed in the belief that a teacher's role includes promoting environmental stewardship among students, suggesting a need for additional reinforcement in professional development programs to strengthen this perspective.

The overall level of teachers' attitudes attained a weighted mean of 4.35 and a standard deviation of 0.73, which is verbally interpreted as very great extent.

In summary, teachers display a strong commitment to integrating environmental sustainability into education, recognizing its importance for students' future challenges. However, while their beliefs and perceptions are highly positive, there is still room to further enhance their role in actively promoting environmental stewardship. These findings highlight the importance of continuous professional development and institutional support in reinforcing sustainability education among teachers.

Table 7. Level of Teachers' Attitudes in the Environmental Sustainability in terms of Values

Statements	***Mean***	***SD***	***Remarks***
The teacher values sustainability as an important principle in his/her teaching practice.	4.40	0.71	Strongly Agree
The teacher prioritize teaching students about the ethical implications of environmental decisions.	4.32	0.70	Strongly Agree
The teacher considers it essential to instill a sense of responsibility toward the environment in his/her students.	4.37	0.71	Strongly Agree
The teacher believes that teaching sustainability can help foster a culture of care for the planet.	4.35	0.75	Strongly Agree
The teacher holds the view that his/her teaching practices should reflect his/her commitment to environmental sustainability	4.43	0.71	Strongly Agree
Weighted Mean	**4.37**		
SD	**0.72**		
Verbal Interpretation	**Very Great Extent**		

Table 7 presents the level of teachers' attitudes toward environmental sustainability in terms of values, including the statements, mean, standard deviation, and remarks. Teachers exhibit a very high level of commitment to sustainability values in their teaching practices. The highest mean (M = 4.43, SD = 0.71) indicates that teachers strongly believe their teaching practices should reflect their commitment to environmental sustainability, emphasizing their dedication to incorporating sustainability principles into their pedagogy.

Meanwhile, the lowest mean (M = 4.32, SD = 0.70) was observed in prioritizing teaching students about the ethical implications of environmental decisions, suggesting a potential area for further emphasis in professional development programs.

The overall level of teachers' attitudes in terms of values attained a weighted mean of 4.37 and a standard deviation of 0.72, which is verbally interpreted as very great extent.

In summary, teachers strongly uphold sustainability values, integrating them into their teaching practices and fostering a culture of environmental responsibility among students. However, reinforcing discussions on the ethical dimensions of environmental decision-making may further strengthen their commitment to sustainability education.

Table 8 presents the level of teachers' attitudes toward environmental sustainability in terms of motivation, including the statements, mean, standard deviation, and remarks. Teachers demonstrate a very high level of motivation in promoting environmental sustainability in their teaching practices. The highest mean (M = 4.38, SD = 0.74) indicates that teachers are highly motivated to stay updated on current environmental issues and teaching practices, highlighting their commitment to continuous learning in sustainability education.

Table 8. Level of Teachers' Attitudes in the Environmental Sustainability in terms of Motivation

Statements	***Mean***	***SD***	***Remarks***
The teacher is motivated to stay updated on current environmental issues and teaching practices.	4.38	0.74	Strongly Agree
The teacher actively seeks opportunities for professional development in sustainability education.	4.30	0.75	Strongly Agree
The teacher is enthusiastic about incorporating sustainability projects into his/her teaching.	4.29	0.77	Strongly Agree
The teacher feels inspired to encourage his/her students to engage in environmental advocacy.	4.33	0.81	Strongly Agree
The teacher is driven to create a classroom environment that promotes sustainability awareness.	4.33	0.80	Strongly Agree
Weighted Mean	**4.32**		
SD	**0.77**		
Verbal Interpretation	**Very Great Extent**		

Table 8 presents the level of teachers' attitudes toward environmental sustainability in terms of motivation, including the statements, mean, standard deviation, and remarks. Teachers demonstrate a very high level of motivation in promoting environmental sustainability in their teaching practices. The highest mean (M = 4.38, SD = 0.74) indicates that teachers are highly motivated to stay updated on current environmental issues and teaching practices, highlighting their commitment to continuous learning in sustainability education.

Meanwhile, the lowest mean (M = 4.29, SD = 0.77) was observed in enthusiasm for incorporating sustainability projects into their teaching, suggesting that while teachers are generally eager, additional support or resources may further enhance their engagement in sustainability-related classroom initiatives.

The overall level of teachers' attitudes in terms of motivation attained a weighted mean of 4.32 and a standard deviation of 0.77, which is verbally interpreted as very great extent.

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In summary, teachers exhibit strong motivation to integrate environmental sustainability into their teaching, particularly in staying informed about current environmental issues. However, fostering greater institutional support for sustainability projects may further strengthen their enthusiasm and long-term commitment.

Table 9. Level of Teachers' Attitudes in the Environmental Sustainability in terms of Behavioral intention

Statements	*Mean*	*SD*	*Remarks*
The teacher intends to integrate more sustainability-related topics into his/her STEM lessons this year.	4.33	0.79	Strongly Agree
The teacher plans to collaborate with other teachers to enhance the sustainability curriculum.	4.24	0.79	Strongly Agree
The teacher is committed to developing his/her students' critical thinking skills related to environmental issues.	4.34	0.75	Strongly Agree
The teacher aims to involve students in community projects focused on sustainability.	4.27	0.82	Strongly Agree
The teacher seeks out additional resources to improve his/her teaching of environmental sustainability.	4.31	0.82	Strongly Agree
Weighted Mean	**4.30**		
SD	**0.80**		
Verbal Interpretation	**Very Great Extent**		

Table 9 presents the level of teachers' attitudes toward environmental sustainability in terms of behavioral intention, including the statements, mean, standard deviation, and remarks. Teachers demonstrate a very high level of behavioral intention in incorporating sustainability into their teaching practices. The highest mean (M = 4.34, SD = 0.75) indicates that teachers are strongly committed to developing their students' critical thinking skills related to environmental issues, emphasizing their dedication to fostering analytical and problem-solving abilities in sustainability education.

Meanwhile, the lowest mean (M = 4.24, SD = 0.79) was observed in collaborating with other teachers to enhance the sustainability curriculum, suggesting that while collaboration is present, additional institutional support or structured programs may encourage more interdisciplinary efforts.

The overall level of teachers' behavioral intention attained a weighted mean of 4.30 and a standard deviation of 0.80, which is verbally interpreted as very great extent.

In summary, teachers exhibit strong intentions to integrate sustainability into their lessons, particularly in enhancing students' critical thinking skills. Strengthening teacher collaboration initiatives may further enrich the sustainability curriculum and improve interdisciplinary teaching approaches.

Table 10. Composite of Teachers' Attitudes in the Environmental Sustainability

Indicators	*Weighted Mean*	*SD*	*Verbal Interpretation*
Personal beliefs and Perceptions	4.35	0.73	Very Great Extent
Values	4.37	0.72	Very Great Extent
Motivation	4.32	0.77	Very Great Extent
Behavioral intention	4.30	0.80	Very Great Extent
Grand Mean	**4.34**		
SD	**0.75**		
Verbal Interpretation	**Very Great Extent**		

Table 10 presents the composite level of teachers' attitudes toward environmental sustainability, including the indicators, weighted mean, standard deviation, and verbal interpretation. Teachers demonstrate a very high level of positive attitudes toward environmental sustainability across all dimensions. The highest mean (M = 4.37, SD = 0.72) was observed in values, indicating that teachers strongly prioritize sustainability as an essential principle in their teaching practices and believe in instilling environmental responsibility in their students.

Meanwhile, the lowest mean (M = 4.30, SD = 0.80) was observed in behavioral intention, suggesting that while teachers are committed to integrating sustainability into their curriculum, factors such as time constraints or resource limitations may affect their ability to take further action.

The overall level of teachers' attitudes attained a grand mean of 4.34 and a standard deviation of 0.75, which is verbally interpreted as very great extent.

In summary, teachers exhibit strong personal beliefs, values, motivation, and behavioral intentions toward environmental sustainability. Strengthening institutional support and collaboration opportunities may further enhance their capacity to implement sustainability-focused teaching strategies.

Level of Students Critical Thinking Skills

In this study, the level of Students Critical Thinking Skills refers to Problems solving skills, Reflective thinking skills, Reasoning abilities, Creative thinking**,** and Synthesis skills.

The following tables show the statement, mean, standard deviation. remarks and verbal interpretation from the perspectives of respondents.

Table 11. Level of Students Critical Thinking Skills in terms of Problems Solving Skills

Statements	*Mean*	*SD*	*Remarks*
I can identify problems related to environmental sustainability in my community.	4.38	0.70	Strongly Agree
I am able to develop practical solutions to environmental challenges.	4.22	0.78	Strongly Agree
I can apply scientific principles to analyze environmental issues.	4.16	0.84	Strongly Agree
I work collaboratively with peers to solve sustainability-related problems.	4.25	0.82	Strongly Agree
I feel equipped to evaluate the effectiveness of various solutions to environmental problems.	4.23	0.81	Strongly Agree
Weighted Mean	**4.25**		
SD	**0.79**		
Verbal Interpretation	**Very Great Extent**		

Table 11 presents the level of students' critical thinking skills in terms of problem-solving skills, including the statements, mean, standard deviation, and remarks. Students demonstrate a very high level of problem-solving skills related to environmental sustainability. The highest mean (M = 4.38, SD = 0.70) indicates that students are highly capable of identifying problems related to environmental sustainability in their communities, reflecting strong awareness and analytical abilities.

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Meanwhile, the lowest mean (M = 4.16, SD = 0.84) suggests that while students can apply scientific principles to analyze environmental issues, there may be room for further enhancement in bridging theoretical knowledge with practical application.

The overall level of students' problem-solving skills attained a weighted mean of 4.25 and a standard deviation of 0.79, which is verbally interpreted as very great extent.

In summary, students exhibit strong problem-solving abilities, particularly in identifying sustainability-related issues and developing solutions. Providing more opportunities for hands-on projects and interdisciplinary learning could further enhance their ability to apply scientific principles effectively.

Table 12 presents the level of students' critical thinking skills in terms of reflective thinking skills, including the statements, mean, standard deviation, and remarks. Students exhibit a very high level of reflective thinking skills in relation to environmental sustainability. The highest mean (M = 4.40, SD = 0.70) indicates that students are highly capable of analyzing how their actions impact the environment and considering different perspectives when evaluating environmental issues, showcasing strong self-awareness and critical reflection.

Table 12. Level of Students Critical Thinking Skills in terms of Reflective Thinking Skills

Statements	***Mean***	***SD***	***Remarks***
I regularly reflect on my learning experiences related to environmental sustainability.	4.32	0.77	Strongly Agree
I can analyze how my actions impact the environment.	4.40	0.70	Strongly Agree
I consider different perspectives when evaluating environmental issues.	4.40	0.71	Strongly Agree
I often think about how I can improve my understanding of sustainability.	4.29	0.75	Strongly Agree
I discuss my reflections on sustainability topics with my classmates.	4.14	0.96	Strongly Agree
Weighted Mean	**4.31**		
SD	**0.79**		
Verbal Interpretation	**Very Great Extent**		

Meanwhile, the lowest mean (M = 4.14, SD = 0.96) suggests that while students discuss their reflections on sustainability topics with classmates, there may be a need for more structured opportunities to engage in meaningful dialogue and exchange ideas.

The overall level of students' reflective thinking skills attained a weighted mean of 4.31 and a standard deviation of 0.79, which is verbally interpreted as very great extent.

In summary, students demonstrate strong reflective thinking abilities, particularly in self-assessment and considering multiple viewpoints. Encouraging more peer discussions and integrating reflection-based activities into the curriculum may further enhance their critical thinking in sustainability-related topics.

Table 13 presents the level of students' critical thinking skills in terms of reasoning abilities, including the statements, mean, standard deviation, and remarks. Students demonstrate a very high level of reasoning abilities in the context of environmental sustainability. The highest mean (M = 4.29, SD = 0.71) indicates that students are highly capable of evaluating the credibility of sources when researching sustainability topics, highlighting their ability to critically assess information.

Table 13. Level of Students Critical Thinking Skills in terms of Reasoning Abilities

Statements	***Mean***	***SD***	***Remarks***
I can construct logical arguments to support my views on environmental issues.	4.27	0.78	Strongly Agree
I evaluate the credibility of sources when researching sustainability topics.	4.29	0.71	Strongly Agree
I can draw connections between different environmental concepts and issues.	4.20	0.83	Strongly Agree
I assess the consequences of human actions on the environment.	4.25	0.79	Strongly Agree
I can effectively communicate my reasoning during class discussions on sustainability.	4.20	0.83	Strongly Agree
Weighted Mean	**4.24**		
SD	**0.79**		
Verbal Interpretation	**Very Great Extent**		

Meanwhile, the lowest mean (M = 4.20, SD = 0.83) suggests that while students can draw connections between different environmental concepts and effectively communicate their reasoning during discussions, there may be opportunities to further develop their ability to articulate complex ideas with greater clarity and depth. The overall level of students' reasoning abilities attained a weighted mean of 4.24 and a standard deviation of 0.79, which is verbally interpreted as very great extent. This means that students exhibit strong reasoning skills, particularly in source evaluation and logical argumentation. To further enhance their abilities, educators may incorporate structured debates, critical analysis activities, and evidence-based reasoning exercises into classroom discussions on environmental sustainability.

Table 14. Level of Students Critical Thinking Skills in terms of Creative thinking

Statements	***Mean***	***SD***	***Remarks***
I can generate innovative ideas for addressing environmental challenges.	4.18	0.83	Strongly Agree
I feel confident in proposing creative solutions to sustainability issues.	4.09	0.93	Strongly Agree
I enjoy brainstorming with classmates to develop unique approaches to environmental problems.	4.18	0.89	Strongly Agree
I am open to experimenting with new methods for promoting sustainability.	4.28	0.78	Strongly Agree
I use creativity in my projects related to environmental sustainability.	4.25	0.78	Strongly Agree
Weighted Mean	**4.20**		
SD	**0.85**		
Verbal Interpretation	**Very Great Extent**		

Table 14 presents the level of students' critical thinking skills in terms of creative thinking, including the statements, mean, standard deviation, and remarks. Students exhibit a very high level of creative thinking in addressing environmental sustainability. The highest mean (M = 4.28, SD = 0.78) suggests that students are particularly open to experimenting with new methods for promoting sustainability, reflecting their willingness to explore innovative approaches.

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Conversely, the lowest mean (M = 4.09, SD = 0.93) indicates that while students feel confident in proposing creative solutions to sustainability issues, there may be room to enhance their self-assurance and practical application of innovative ideas.

The overall level of students' creative thinking attained a weighted mean of 4.20 and a standard deviation of 0.85, which is verbally interpreted as very great extent.

In summary, students demonstrate strong creative thinking abilities, particularly in experimenting with sustainability methods and generating new ideas. To further enhance these skills, educators may implement project-based learning, design-thinking exercises, and interdisciplinary collaborations that encourage creative problem-solving in environmental sustainability.

Table 15. Level of Students Critical Thinking Skills in terms of Synthesis skills

Statements	*Mean*	*SD*	*Remarks*
I can integrate information from various subjects to understand environmental issues better.	4.30	0.74	Strongly Agree
I can combine different viewpoints to develop comprehensive solutions to sustainability problems.	4.22	0.78	Strongly Agree
I am skilled at summarizing and synthesizing information from multiple sources on environmental topics.	4.18	0.82	Strongly Agree
I collaborate with peers to create presentations that reflect a synthesis of sustainability concepts.	4.27	0.83	Strongly Agree
I can draw on my knowledge from different disciplines to propose effective local adaptations for environmental challenges.	4.22	0.81	Strongly Agree
Weighted Mean	**4.24**		
SD	**0.80**		
Verbal Interpretation	**Very Great Extent**		

Table 15 presents the level of students' critical thinking skills in terms of synthesis skills, including the statements, mean, standard deviation, and remarks. Students exhibit a very high level of synthesis skills in environmental sustainability. The highest mean (M = 4.30, SD = 0.74) indicates that students effectively integrate information from various subjects to deepen their understanding of environmental issues, demonstrating their ability to connect interdisciplinary knowledge.

Conversely, the lowest mean (M = 4.18, SD = 0.82) suggests that while students are skilled at summarizing and synthesizing information from multiple sources, there is room for improvement in refining their ability to consolidate diverse insights into more cohesive perspectives.

The overall level of students' synthesis skills attained a weighted mean of 4.24 and a standard deviation of 0.80, which is verbally interpreted as very great extent.

In summary, students display strong synthesis skills, enabling them to integrate knowledge, collaborate effectively, and develop comprehensive solutions to sustainability challenges. Strengthening their interdisciplinary learning opportunities and collaborative projects can further enhance their ability to synthesize information across various fields.

Table 16. Composite of Students Critical Thinking Skills

Indicators	*Weighted Mean*	*SD*	*Verbal Interpretation*
Problems solving skills	4.25	0.79	Very Great Extent
Reflective thinking skills	4.31	0.79	Very Great Extent
Reasoning abilities	4.24	0.79	Very Great Extent
Creative thinking	4.20	0.85	Very Great Extent
Synthesis skills	4.24	0.80	Very Great Extent
Grand Mean		**4.25**	
SD		**0.80**	
Verbal Interpretation		**Very Great Extent**	

Table 16 presents the composite level of students' critical thinking skills, including the indicators, weighted mean, standard deviation, and verbal interpretation. Students exhibit a very high level of critical thinking skills in environmental sustainability. Among the five indicators, the highest mean (M = 4.31, SD = 0.79) is observed in reflective thinking skills, indicating that students frequently analyze their learning experiences, consider different perspectives, and assess the impact of their actions on the environment.

On the other hand, the lowest mean (M = 4.20, SD = 0.85) is in creative thinking, suggesting that while students are confident in generating ideas and proposing innovative solutions, there is a need to further nurture their creativity in sustainability-related problem-solving.

The overall level of students' critical thinking skills attained a grand mean of 4.25 and a standard deviation of 0.80, which is verbally interpreted as very great extent.

In summary, students demonstrate strong critical thinking abilities, particularly in reflective thinking and problem-solving. Enhancing opportunities for creative expression and interdisciplinary learning can further improve their ability to develop innovative solutions to environmental challenges.

Level of Students Local Adaptation in the STEM curricula

In this study, the level of Students Local Adaptation in the STEM curricula refers to Climate adaptation, Resources management, Recognition of local environmental changes and Community involvement

The following tables show the statement, mean, standard deviation. remarks and verbal interpretation from the perspectives of respondents.

Table 17. Level of Students Local Adaptation in the STEM Curricula in terms of Climate adaptation

Statements	*Mean*	*SD*	*Remarks*
I understand the concept of climate adaptation and its relevance to my community.	4.46	0.67	Strongly Agree
I can identify local climate-related issues affecting my area.	4.30	0.71	Strongly Agree
I participate in activities that promote climate adaptation strategies.	4.10	0.90	Strongly Agree
I can explain how climate change impacts local ecosystems and human communities.	4.26	0.76	Strongly Agree
I work with peers to design climate adaptation projects relevant to my community.	4.15	0.87	Strongly Agree
Weighted Mean	**4.25**		
SD	**0.79**		
Verbal Interpretation	**Very Great Extent**		

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Table 17 presents the level of students' local adaptation in the STEM curricula in terms of climate adaptation, including the statements, mean, standard deviation, and remarks. Students exhibit a very great extent of understanding and engagement in climate adaptation topics.

The highest mean (M = 4.46, SD = 0.67) is observed in understanding the concept of climate adaptation and its relevance to the community, indicating strong foundational knowledge in this area.

Conversely, the lowest mean (M = 4.10, SD = 0.90) is found in participation in activities that promote climate adaptation strategies, suggesting that while students are knowledgeable, there may be a need for more hands-on or community-based engagement opportunities.

The overall level of students' climate adaptation in the STEM curricula attained a weighted mean of 4.25 and a standard deviation of 0.79, which is verbally interpreted as very great extent.

In summary, students demonstrate strong awareness and understanding of climate adaptation but may benefit from increased participation in practical initiatives and real-world applications to reinforce their learning.

Table 18. Level of Students Local Adaptation in the STEM curricula in terms of Resources Management

Statements	*Mean*	*SD*	*Remarks*
I understand the importance of managing natural resources sustainably.	4.45	0.70	Strongly Agree
I can analyze local resource management practices and their effectiveness.	4.22	0.81	Strongly Agree
I participate in initiatives that promote sustainable resource use in my community.	4.12	0.89	Strongly Agree
I can suggest ways to improve resource management practices in my area.	4.13	0.84	Strongly Agree
I apply principles of resource management in my projects related to sustainability.	4.24	0.83	Strongly Agree
Weighted Mean		**4.23**	
SD		**0.83**	
Verbal Interpretation		**Very Great Extent**	

Table 18 presents the level of students' local adaptation in the STEM curricula in terms of resource management, including the statements, mean, standard deviation, and remarks. Students demonstrate a very great extent of understanding and engagement in sustainable resource management. The highest mean (M = 4.45, SD = 0.70) is observed in understanding the importance of managing natural resources sustainably, highlighting their strong theoretical knowledge of sustainability principles.

On the other hand, the lowest mean (M = 4.12, SD = 0.89) is found in participation in initiatives that promote sustainable resource use in the community, indicating that while students are aware of sustainability, there may be room to increase their involvement in hands-on conservation efforts.

The overall level of students' resource management in the STEM curricula attained a weighted mean of 4.23 and a standard deviation of 0.83, which is verbally interpreted as very great extent.

In summary, students possess a solid understanding of resource management and its importance, but further opportunities for community involvement and real-world applications could enhance their engagement and practical skills.

Table 19. Level of Students Local Adaptation in the STEM curricula in terms of Recognition of Local Environmental Challenges

Statements	*Mean*	*SD*	*Remarks*
I can identify specific environmental challenges facing my community.	4.35	0.73	Strongly Agree
I understand the impact of these challenges on local ecosystems and people.	4.35	0.74	Strongly Agree
I am able to assess the effectiveness of current efforts to address these challenges.	4.37	0.77	Strongly Agree
I discuss local environmental issues with classmates and explore potential solutions.	4.08	0.88	Strongly Agree
I engage in projects that focus on addressing local environmental challenges.	4.13	0.96	Strongly Agree
Weighted Mean		**4.25**	
SD		**0.83**	
Verbal Interpretation		**Very Great Extent**	

Table 19 presents the level of students' local adaptation in the STEM curricula in terms of recognition of local environmental challenges, including the statements, mean, standard deviation, and remarks. Students exhibit a very great extent of awareness and engagement in recognizing local environmental issues. The highest mean (M = 4.37, SD = 0.77) is observed in assessing the effectiveness of current efforts to address these challenges, demonstrating their ability to critically evaluate sustainability initiatives.

Conversely, the lowest mean (M = 4.08, SD = 0.88) is found in discussing local environmental issues with classmates and exploring potential solutions, indicating that while students recognize these issues, there may be opportunities to enhance collaborative discussions and solution-oriented dialogues.

The overall level of students' recognition of local environmental challenges attained a weighted mean of 4.25 and a standard deviation of 0.83, which is verbally interpreted as very great extent.

In summary, students have a strong awareness of environmental challenges and their impacts but could benefit from increased peer discussions and collaborative problem-solving initiatives to further deepen their engagement in local sustainability efforts.

Table 20. Level of Students Local Adaptation in the STEM curricula in terms of Community involvement

Statements	*Mean*	*SD*	*Remarks*
I participate in community activities that promote environmental sustainability.	4.08	0.96	Strongly Agree
I collaborate with local organizations to address sustainability issues.	4.01	0.98	Strongly Agree
I understand the role of community engagement in solving environmental problems.	4.30	0.77	Strongly Agree
I can describe how my actions contribute to my community's sustainability efforts.	4.27	0.81	Strongly Agree
I encourage my peers to get involved in community-based environmental initiatives.	4.18	0.90	Strongly Agree
Weighted Mean		**4.17**	
SD		**0.89**	
Verbal Interpretation		**Very Great Extent**	

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Table 20 presents the level of students' local adaptation in the STEM curricula in terms of community involvement, including the statements, mean, standard deviation, and remarks. Students demonstrate a very great extent of involvement in community-based environmental initiatives. The highest mean (M = 4.30, SD = 0.77) is observed in understanding the role of community engagement in solving environmental problems, indicating that students recognize the importance of collective action in sustainability efforts.

Meanwhile, the lowest mean (M = 4.01, SD = 0.98) is found in collaborating with local organizations to address sustainability issues, suggesting that while students are aware of environmental concerns, there is room to strengthen partnerships with local organizations and stakeholders.

The overall level of students' community involvement attained a weighted mean of 4.17 and a standard deviation of 0.89, which is verbally interpreted as very great extent.

In summary, students recognize the significance of community engagement in environmental sustainability and actively participate in related initiatives. However, enhancing collaboration with local organizations could further enrich their real-world application of sustainability efforts.

Table 21. Composite of Students Local Adaptation in the STEM curricula

Indicators	***Weighted Mean***	***SD***	***Verbal Interpretation***
Climate adaptation	4.25	0.79	Very Great Extent
Resources management	4.23	0.83	Very Great Extent
Recognition of local environmental challenges	4.25	0.83	Very Great Extent
Community involvement	4.17	0.89	Very Great Extent
Grand Mean	**4.23**		
SD	**0.83**		
Verbal Interpretation	**Very Great Extent**		

Table 21 presents the composite level of students' local adaptation in the STEM curricula, summarizing their responses across four key indicators: climate adaptation, resource management, recognition of local environmental challenges, and community involvement. Students demonstrated the highest levels of adaptation in climate adaptation (M = 4.25, SD = 0.79) and recognition of local environmental challenges (M = 4.25, SD = 0.83), indicating a strong awareness and understanding of environmental issues affecting their communities.

The lowest mean (M = 4.17, SD = 0.89) was observed in community involvement, suggesting that while students recognize sustainability issues, there is potential for increased participation in community-based initiatives and partnerships.

The overall level of students' local adaptation in the STEM curricula attained a grand mean of 4.23 and a standard deviation of 0.83, which is verbally interpreted as very great extent.

In summary, Students exhibit a very great extent of local adaptation in STEM education, particularly in understanding environmental challenges and climate adaptation. While they actively engage in sustainability efforts, fostering stronger community partnerships could further enhance their real-world application. Recently, integrated STEM initiatives have been incorporated into school programs to enhance students' comprehension and enthusiasm for engaging in STEM disciplines in senior high school and university.

Test of Relationship between the Teachers' Preparedness on Environmental Sustainability and the Students Critical Thinking Skills

To test the significant relationship between the Teachers' Preparedness on Environmental Sustainability and the Students Critical Thinking Skills in terms of Problems solving skills, Reflective thinking skills, Reasoning abilities, Creative thinking and synthesis abilities were analyzed statistically employing Real Statistics Data Analysis Tools with the Pearson product moment correlation coefficient.

Table 22. Significant Relationship between the Teachers' Preparedness on Environmental Sustainability and the Students Critical Thinking Skills

Teachers' Preparedness on Environmental Sustainability		**Students Critical Thinking Skills**				
		Problem solving skills	**Reflective thinking skills**	**Reasoning abilities**	**Creative thinking**	**Synthesis skills**
Knowledge	Pearson Correlation	0.5287	0.4835	0.4968	0.4194	0.4827
	Significance (2-Tailed)	<.001	0.0149	<.001	<.001	<.001
	N	399	399	399	399	399
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*	*Sig*
Resources	Pearson Correlation	0.5373	0.4897	0.5191	0.4625	0.5035
	Significance (2-Tailed)	0.7996	0.0865	0.6664	0.0772	0.5266
	N	399	399	399	399	399
	Analysis	*Not Sig*	*Not Sig*	*Not Sig*	*Not Sig*	*Not Sig*
Skills	Pearson Correlation	0.5754	0.5334	0.5825	0.4991	0.5550
	Significance (2-Tailed)	0.0076	0.5872	0.0039	<.001	0.0027
	N	399	399	399	399	399
	Analysis	*Sig*	*Not Sig*	*Sig*	*Sig*	*Sig*
Confidence	Pearson Correlation	0.5707	0.4930	0.5457	0.4288	0.5196
	Significance (2-Tailed)	<.001	<.001	<.001	<.001	<.001
	N	399	399	399	399	399
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*	*Sig*

The results of the Pearson correlation coefficients measure the strength and direction of the relationship between teachers' preparedness on environmental sustainability and students' critical thinking skills. A positive correlation indicates that as teachers demonstrate higher levels of preparedness in environmental sustainability, students' critical thinking skills also improve.

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The correlation coefficients range from 0.4194 to 0.5754, indicating a moderate positive relationship between teachers' preparedness and students' critical thinking skills. The highest correlations were observed in teachers' skills ($r = 0.5754$, $p = 0.0076$, significant) and confidence ($r = 0.5707$, $p < .001$, significant), suggesting that these factors significantly contribute to the development of students' problem-solving and reasoning abilities. Additionally, teachers' knowledge ($r = 0.5287$, $p < .001$, significant) also exhibited a significant correlation with problem-solving skills, highlighting the importance of subject-matter expertise in fostering critical thinking.

On the other hand, teachers' resources did not show a significant correlation with any of the critical thinking indicators ($p > .05$, not significant), indicating that the mere availability of resources is not enough to enhance students' critical thinking skills unless paired with effective instructional strategies.

Overall, that teachers' preparedness, particularly in terms of knowledge, skills, and confidence, plays a crucial role in enhancing students' ability to think critically, solve problems, and analyze environmental sustainability issues. Schools should prioritize professional development programs, mentorship, and experiential learning opportunities to further strengthen teachers' preparedness, which, in turn, can enhance students' critical thinking competencies.

Test of Relationship between the Teachers' Preparedness on Environmental Sustainability and the Students Local Adaptation in the STEM curricula

To test the significant relationship between the Teachers' Preparedness on Environmental Sustainability and the Students Local Adaptation in the STEM curricula in terms of Climate adaptation, Resources management, Recognition of local environmental changes and Community involvement they were treated statistically using Real Statistics Data Analysis Tools using the Pearson product moment correlation coefficient.

The findings from the Pearson correlation coefficients evaluate the strength and direction of the connection between teachers' readiness regarding environmental sustainability and students' local adaptation within the STEM curricula. A positive correlation indicates that as teachers demonstrate higher levels of preparedness, students' ability to adapt to local environmental issues also improves.

The correlation coefficients range from 0.4587 to 0.6044, indicating a moderate to strong positive relationship between teachers' preparedness and students' local adaptation.

Table 23. Significant Relationship between the Teachers' Preparedness on Environmental Sustainability and the Students Local Adaptation in the STEM curricula

Teachers' Preparedness on Environmental Sustainability		**Students Local Adaptation in the STEM curricula**			
		Climate adaptation	**Resources management**	**Recognition of local environmental challenges**	**Community involvement**
Knowledge	Pearson Correlation Significance (2-Tailed)	0.5113	0.4963	0.5045	0.4587
	(2-Tailed)	<.001	<.001	<.001	<.001
	N	399	399	399	399
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*
Resources	Pearson Correlation Significance (2-Tailed)	0.4903	0.5153	0.5422	0.4922
	(2-Tailed)	0.9741	0.4486	1.000	0.0084
	N	399	399	399	399
	Analysis	*Not Sig*	*Not Sig*	*Not Sig*	*Sig*
Skills	Pearson Correlation Significance (2-Tailed)	0.5254	0.5838	0.6044	0.5384
	(2-Tailed)	0.0201	0.0015	0.0126	<.001
	N	399	399	399	399
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*
Confidence	Pearson Correlation Significance (2-Tailed)	0.5490	0.5578	0.5596	0.4930
	(2-Tailed)	<.001	<.001	<.001	<.001
	N	399	399	399	399
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*

Correlation Coefficient Value (r)	**Direction and Strength of Correlation**
0.00 to 0.19	Very Weakly Positive
0.20 to 0.39	Weakly Positive
0.40 to 0.59	Moderately Positive
0.60 to 0.79	Strongly Positive
.80 to 1.00	Perfectly Positive

The highest correlations were observed in teachers' skills ($r = 0.6044$, $p = 0.0126$, significant) and confidence ($r = 0.5596$, $p < .001$, significant), suggesting that these factors significantly enhance students' ability to recognize and address local environmental challenges. Additionally, teachers' knowledge ($r = 0.5113$ to 0.5045, $p < .001$, significant) also showed a significant relationship with all local adaptation indicators, highlighting the importance of subject-matter expertise in guiding students toward environmental sustainability.

On the other hand, teachers' resources did not show a significant correlation with most local adaptation indicators ($p > .05$, not significant), except for community involvement ($r = 0.4922$, $p = 0.0084$, significant). This suggests that while resource availability may support student engagement in community-based sustainability initiatives, it alone does not

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directly enhance other aspects of local adaptation without the influence of effective teaching strategies.

These findings indicate that teachers' preparedness, particularly in terms of knowledge, skills, and confidence, plays a crucial role in strengthening students' local adaptation to environmental challenges. Schools should emphasize teacher training, professional development, and experiential learning approaches to further enhance their preparedness, ultimately fostering students' engagement in climate adaptation, resource management, and community involvement.

Test of Relationship between the Teachers' Attitudes in the Environmental Sustainability and the Students Critical Thinking Skills

To test the significant relationship between the Teachers' Attitudes in the Environmental Sustainability and the Students Critical Thinking Skills in terms of Problems solving skills, Reflective thinking skills, Reasoning abilities, Creative thinking, and Synthesis skills they were treated statistically using Real Statistics Data Analysis Tools using the Pearson product moment correlation coefficient.

Table 24. Significant Relationship between the Teachers' Attitudes in the Environmental Sustainability and the Students Critical Thinking Skills

Teachers' Attitudes in the Environmental Sustainability		Students Critical Thinking Skills				
		Problems solving skills	**Reflective thinking skills**	**Reasoning abilities**	**Creative thinking**	**Synthesis skills**
Personal beliefs and Perceptions	Pearson Correlation	0.5542	0.5225	0.5330	0.4263	0.5303
	Significance (2-Tailed)	<.001	0.1234	<.001	<.001	<.001
	N	399	399	399	399	399
	Analysis	*Sig*	*Not Sig*	*Sig*	*Sig*	*Sig*
Values	Pearson Correlation	0.5362	0.5305	0.5558	0.4548	0.5092
	Significance (2-Tailed)	<.001	0.0189	<.001	<.001	<.001
	N	399	399	399	399	399
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*	*Sig*
Motivation	Pearson Correlation	0.5946	0.5164	0.5618	0.4756	0.5827
	Significance (2-Tailed)	0.0060	0.5400	0.0047	<.001	0.0019
	N	399	399	399	399	399
	Analysis	*Sig*	*Not Sig*	*Sig*	*Sig*	*Sig*
Behavioral intention	Pearson Correlation	0.6172	0.5696	0.5985	0.5277	0.6214
	Significance (2-Tailed)	0.0798	0.7173	0.0574	0.0020	0.0293
	N	399	399	399	399	399
	Analysis	*Not Sig*	*Not Sig*	*Not Sig*	*Sig*	*Sig*

Correlation Coefficient Value (r)	Direction and Strength of Correlation
0.00 to 0.19	Very Weakly Positive
0.20 to 0.39	Weakly Positive
0.40 to 0.59	Moderately Positive
0.60 to 0.79	Strongly Positive
.80 to 1.00	Perfectly Positive

The results of the Pearson correlation coefficients measure the strength and direction of the relationship between teachers' attitudes on environmental sustainability and students' critical thinking skills. A positive correlation indicates that as teachers demonstrate stronger attitudes towards environmental sustainability, students' critical thinking skills also improve.

The correlation coefficients range from 0.4263 to 0.6214, indicating a moderate to strong positive relationship between teachers' attitudes and students' critical thinking skills. The highest correlations were observed in behavioral intention with synthesis skills ($r = 0.6214$, $p = 0.0293$, significant) and motivation with problem-solving skills ($r = 0.5946$, $p = 0.0060$, significant), suggesting that these aspects of teachers' attitudes play a crucial role in enhancing students' ability to synthesize information and solve problems.

Furthermore, the p-values for personal beliefs and perceptions, values, and motivation were mostly below the 0.05 significance level, confirming that these relationships are significant. However, behavioral intention showed non-significant correlations with problem-solving, reflective thinking, and reasoning abilities, suggesting that teachers' intentions alone may not directly influence these aspects of students' critical thinking.

Test of Relationship between the Teachers' Attitudes in the Environmental Sustainability and the Students Local Adaptation in the STEM curricula

To test the significant relationship between the Teachers' Preparedness on Environmental Sustainability and the Students Local Adaptation in the STEM curricula in terms of Climate adaptation, Resources management, Recognition of local environmental changes and Community involvement they were treated statistically using Real Statistics Data Analysis Tools using the Pearson product moment correlation coefficient.

The results of the Pearson correlation coefficients measure the strength and direction of the relationship between teachers' attitudes on environmental sustainability and students' local adaptation in the STEM curricula. A positive correlation indicates that as teachers demonstrate stronger attitudes towards environmental sustainability, students' ability to adapt locally in the STEM curricula also improves.

The correlation coefficients range from 0.5062 to 0.6640, indicating a moderate to strong positive relationship between

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teachers' attitudes and students' local adaptation. The highest correlations were observed in behavioral intention with resources management (r = 0.6613, p = 0.0158, significant) and motivation with climate adaptation (r = 0.6040, p = 0.0104, significant), suggesting that these aspects of teachers' attitudes significantly contribute to students' ability to manage resources and adapt to climate challenges.

Table 25. Significant Relationship between the Teachers' Attitudes in the Environmental Sustainability and the Students Local Adaptation in the STEM curricula

Teachers' Attitudes in the Environmental Sustainability		Students Local Adaptation in the STEM curricula			
		Climate adaptation	Resources management	Recognition of local environmental challenges	Community involvement
Personal beliefs and Perceptions	Pearson Correlation	0.5668	0.6022	0.5950	0.5420
	Significance (2-Tailed)	<.001	<.001	<.001	<.001
	N	399	399	399	399
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*
Values	Pearson Correlation	0.5817	0.6006	0.5587	0.5062
	Significance (2-Tailed)	<.001	<.001	<.001	<.001
	N	399	399	399	399
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*
Motivation	Pearson Correlation	0.6040	0.6200	0.5950	0.5534
	Significance (2-Tailed)	0.0104	<.001	0.0128	<.001
	N	399	399	399	399
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*
Behavioral intention	Pearson Correlation	0.6192	0.6613	0.6640	0.6060
	Significance (2-Tailed)	0.1257	0.0158	0.1129	<.001
	N	399	399	399	399
	Analysis	*Not Sig*	*Sig*	*Not Sig*	*Sig*

Correlation Coefficient Value (r)	Direction and Strength of Correlation
0.00 to 0.19	Very Weakly Positive
0.20 to 0.39	Weakly Positive
0.40 to 0.59	Moderately Positive
0.60 to 0.79	Strongly Positive
.80 to 1.00	Perfectly Positive

Furthermore, the p-values for personal beliefs and perceptions, values, and motivation were all below the 0.05 significance level, confirming that these relationships are significant across all indicators. However, behavioral intention showed non-significant correlations with climate adaptation (p = 0.1257) and recognition of local environmental challenges (p = 0.1129), suggesting that teachers' behavioral intentions alone may not directly influence these aspects of students' adaptation. This means that teachers' values, motivation, and personal beliefs significantly enhance students' climate adaptation, resource management, recognition of environmental challenges, and community involvement.

IV. Conclusion and Recommendations

On the basis of the foregoing findings, the following conclusion was drawn.

The results indicate a significant relationship between the science teachers' preparedness and students critical thinking skills was found, thus rejecting the first hypothesis

However, a significant relationship between science teachers' preparedness in integrating environmental sustainability and students' local adaptation was found, thus rejecting the second hypothesis

Moreover, a significant relationship between science teachers' attitudes in integrating environmental sustainability and students' critical thinking skills were found, leading to the rejection of the third hypothesis.

Lastly, teachers' attitudes, including their beliefs, values, and motivation, significantly influence students' local-adaptation of STEM curricula, rejecting the last hypothesis.

Overall, these findings underscore the importance of strengthening teachers' preparedness and attitudes toward environmental sustainability to enhance students' local adaptation and applied critical thinking skills. Schools that invest in teacher training, environmental education programs, and community-based sustainability initiatives can better equip students with the skills necessary to address real-world environmental issues and foster a more sustainable future.

Based on the drawn conclusions resulted to the following recommendations:

1. Schools should implement continuous professional development programs focused on environmental sustainability. Training should emphasize integrating sustainability concepts into the curriculum, developing critical thinking skills, and applying real-world environmental problem-solving strategies.
2. The integration of environmental sustainability should not be limited to science subjects. Teachers from different disciplines, including social sciences and humanities, should collaborate to provide a holistic perspective on sustainability and critical thinking development.
3. Teachers should use hands-on learning experiences, case studies, and problem-based learning approaches to help students develop their critical thinking skills. By allowing students to analyze real-world environmental challenges and propose solutions, they can enhance their ability to think

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critically and adapt to sustainability issues in their communities.

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