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RESEARCH ARTICLE

Environment-based immersions as catalysts for molding science-oriented advocacy: Lenses from higher education students

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ABSTRACT

Environment-based immersions provide students with firsthand exposure to the real-world challenges that communities face due to environmental degradation, allowing them to understand the social, economic, and ecological dimensions of conservation. Engaging in community-based initiatives helps students connect theoretical knowledge with practical application, reinforcing the relevance of their academic studies in addressing local environmental concerns. This paper explored how immersive experiences shape students' science-oriented advocacy, particularly in the context of environmental preservation. A purposive sample of 16 college students participated in the study, providing responses to open-ended online questions. The narratives from one-on-one interviews were analyzed, with a focus on identifying recurring themes related to students' attitudes and actions towards environmental advocacy. The findings indicated that with hands-on experiences with real-world environmental issues, students felt empowered, realizing that their scientific knowledge could directly contribute to solving environmental challenges. Students expressed a heightened sense of capability and motivation, especially after seeing the tangible impacts of scientific research on local ecosystems and understanding the importance of their involvement in advocacy efforts. Engagement with communities affected by environmental degradation brought awareness of the social dimensions of these issues, encouraging a commitment to environmental justice and the recognition of the disproportionate impact on marginalized communities. The learning experiences and community engagement were crucial in bridging theoretical knowledge with practical applications, encouraging learners to advocate for sustainable practices, conservation efforts, and the protection of biodiversity.

Keywords: environmental empowerment; environmental preservation; immersions; learning experience

1. Introduction

Environment-based immersions act as catalysts for shifting students' perceptions of science and their role in society. By engaging students in real-world environmental issues, these experiences encourage critical reflection on their existing views and foster a deeper emotional connection to the environment. This process helps cultivate a sense of responsibility for environmental stewardship and inspires students to advocate for sustainable practices in science.

Transformative learning, a theory of adult learning, provides a framework for understanding how

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individuals construct and revise their interpretations of experiences[1]. In this context, first-year students, as learners, are actively examining their perspectives, values, and practices. Transformative learning exposes them to situations where they can challenge their beliefs and develop a deeper understanding of themselves as effective learners[2]. This process involves cognitive restructuring, where students question their existing beliefs and assumptions about science, and emotional engagement, where they develop a stronger sense of connection to the environment and a sense of responsibility for its well-being.

By positioning students as active participants in environmental science education, they can begin to reimagine the meaning of science for themselves and society[3]. This reimagining is crucial, as environmental education has become an integral part of the school curriculum[4-5]. The goal of this integration is to provide students with a foundational understanding of ecological principles, connect individual actions to environmental degradation, and empower them to take meaningful steps towards environmental sustainability. The inclusion of environmental literacy as a cornerstone of citizenship aligns with constitutional mandates and has the potential to drive more responsible and sustainable actions, fostering a stronger sense of collective responsibility towards the environment[6]. This process of developing environmental literacy can be seen as a form of attitude change, where students develop a greater awareness of environmental issues and a stronger commitment to pro-environmental behaviors.

This study explores the psychological mechanisms behind these transformative experiences, examining how environment-based immersions lead to cognitive restructuring in students' views towards science, examining how these shifts in u development of pro-environmental attitudes. By understanding these psychological processes, we can better nderstanding contribute to their advocacy for good science practices. The study will investigate the role of emotional engagement in motivating students to advocate for environmental protection, and how immersion experiences contribute to the design educational programs that foster a deeper engagement with science and inspire individuals to become active agents of change.

2. Literature review

Education has long been seen as a transformative tool for fostering social equality, adapting to meet evolving societal needs[7]. As Bird and Bhardwaj[8] highlight, educational objectives have evolved to prioritize cognitive skills, emphasizing "how to think" rather than "what to think"[9]. This cognitive approach is crucial in environment-based immersions, where students are encouraged to engage critically with scientific concepts, thereby meeting the study's objective of reshaping learners' attitudes toward science through psychological growth and cognitive skill development[10].

Incorporating environmental education into curricula serves to deepen students' understanding of ecological and socio-political issues, which can have a lasting psychological impact on learners. Gryaznova et al.[11] observe that by experiencing environmental challenges firsthand, students are more likely to recognize the economic and political implications of these issues. This experiential approach contributes to a shift in mindset, inspiring students to seek proactive solutions, a need underscored by Kinzig et al.[12]. Such psychological engagement fosters a personal responsibility toward science, aligning with the study's second objective to identify how environment-based experiences can inspire science advocacy.

Psychological motivation is a powerful driver in science engagement. Trott and Andrea[13] discuss how framing science as a tool for addressing global issues can motivate learners to see themselves as future advocates for scientific solutions. The National Science and Technology Council[14] adds that by sparking students' interest in science, immersive experiences can inspire a proactive approach toward learning and

advocacy. This theme of motivation connects directly with the study's focus on identifying psychological factors that lead learners to advocate for science after environment-based immersions.

Metacognition, or the awareness and control of one's thought processes, is another significant aspect of psychological development in environment-based education. Julie et al.[15] argue that strong metacognitive skills enable students to assess their understanding, identify learning gaps, and apply suitable strategies, which enhances their engagement and performance in scientific studies. Stanton et al.[16] further suggest that students with well-developed metacognitive abilities are better equipped to approach complex scientific issues, thereby aligning with the study's objective to investigate how immersions support self-reflective and science-oriented advocacy.

Environment-based immersions foster a sense of personal responsibility and ethical engagement with science. By experiencing real-world environmental issues, students internalize the importance of scientific practices, which can lead to lifelong advocacy[17]. This psychological engagement is essential, as it transforms learners from ents to active participants in science, helping fulfill the study's goal of assessing how environment-based experiences shape students' personal and collective responsibility toward science.

3. Methods

3.1. Research design

This paper explored how do environment-based immersions could mold the mindset of college students towards science advocacies. Exploratory studies are employed to investigate phenomena that remain insufficiently understood, often serving as a precursor to more definitive and structured investigations[18-19]. This approach permits the investigation of emergent research contexts without the constraints of predefined hypotheses, which encourages an inquiry process that is both inductive and adaptable[20-22]. For Stebbins[23], exploratory research is characterized by its adherence to systematic methodologies aimed at discerning fundamental patterns, thus enabling the meticulous documentation of social, psychological, and contextual dynamics. This approach has particular significance in the social sciences, where the primary objective is to discern and examine the fundamental components and interconnections that underpin a phenomenon[24]. Although exploratory studies are occasionally criticized for their perceived lack of scientific rigor, their importance lies in their capacity to uncover research opportunities and delineate pathways for future investigations[25]. Chavez[18] also emphasized the participatory nature of qualitative exploratory designs, which actively involve participants in the collaborative construction of knowledge within the research domain. This paper answered one critical question: *how the experiences in environment-based immersions could shape the mind of college students towards science-oriented advocacies.* This understanding was expected to shed light on developing positive mindset among young individuals for environmental sustainability.

3.2. Population and sampling

Sampling methods in exploratory studies are intrinsically linked to the nature and objectives of the research, prioritizing depth and detail over broad representativeness. Unlike quantitative research, exploratory studies do not necessitate large sample sizes, as the primary aim is to achieve a clear understanding of the phenomenon under investigation[26-27]. The flexibility of sampling in this context allows researchers to focus on particular subgroups or individuals who possess the characteristics, expertise, or experiences most relevant to the study[28]. Purposive sampling is a widely employed strategy in exploratory studies due to its adaptability and emphasis on the richness of data[29]. This non-random sampling technique enables researchers to identify and select participants who meet specific criteria pertinent to the research

objectives. According to Rai and Thapa[30], purposive sampling ensures that the participants provide insights aligned with the central focus of the study, thus enhancing the contextual relevance of the findings. An online purposive sampling[31] was carried out using open-ended questions disseminated through Google Forms. There were three major criteria in selecting the participants: (1) exposed to environment-based immersions (tree planting, community cleaning, tour, among others), (2) currently enrolled in Academic Year 2024-2025, and (3) active participation in environmental advocacy initiatives. There were 121 college students who responded to the form, but only 16 were chosen to be interviewed. **Table 1** presents the summary of their characteristics.

Table 1. Background information of 16 sampled participants.

Participant Name	Sex	Age	Active Participation in Advocacy Initiatives
James	Male	21	Regular participant in community tree planting programs and environmental seminars.
Maria	Female	19	Active member of the university's environmental club, participating in sustainability workshops.
Peter	Male	23	Frequently involved in beach clean-up drives and environmental awareness campaigns.
Clara	Female	20	Leads a group in organizing local waste segregation initiatives.
John	Male	22	Volunteers in forest conservation projects and environmental education programs.
Sophia	Female	18	Active in online advocacy for climate change and participates in eco-friendly product campaigns.
Alex	Male	21	Coordinates community clean-ups and helps promote renewable energy solutions.
Ella	Female	23	Works with a local NGO on sustainable agriculture practices and environmental restoration.
Ryan	Male	19	Volunteers in youth-led environmental initiatives focusing on water conservation.
Natalie	Female	20	Participates in local eco-tourism programs and promotes organic farming.
Lucas	Male	22	Engaged in organizing local recycling programs and environmental advocacy in schools.
Zoe	Female	18	Member of a youth-led environmental organization focused on reducing plastic waste.
Daniel	Male	23	Advocates for sustainable urban development and has been involved in green city planning projects.
Ingrid	Female	21	Works on climate change awareness campaigns, specifically on reducing carbon footprints.
Benjamin	Male	22	Actively participates in forest preservation efforts and environmental policy discussions.
Jasmine	Female	20	Organizes environmental education workshops and community-driven sustainability projects.

3.3. Instrumentation

Semi-structured interviews served as the primary data collection tool, allowing flexibility to probe participants' experiences and perceptions deeply. This instrument was designed to encourage open-ended responses, which are essential in capturing the psychological nuances of participants' transformative learning processes. Through these interviews, participants could freely express how their immersion experiences affected their cognitive restructuring, emotional engagement, and development of advocacy for environmental issues. **Table 2** presents the final quire questions used in the interview process.

Table 2. Instrument of the study.

Objectives	Interview questions
Determine how environment-based immersion changed the views of learners towards science-oriented advocacy.	1. Are environment-based immersions important to change the views of learners about science? Elaborate more. 2. What is your take-aways from your science-based immersions as part of your academic exposure? Explain your views. 3. What has change in terms of viewing science on the time when you were not yet immersed to environment-based activities versus the time when you were

	immersed to them? Elaborate further.
Determine the factors that led to learners to advocate good science-oriented advocacies.	1. Did your environment-based immersion form some further belief or advocacy about science? Explain the concept further. 2. What is there in environment-based immersion that formed this/these advocacies? Explain the process. 3. Why do you think learners form certain belief or advocacy after they are having environment-based immersions? Elaborate further.

Table 2. *(Continued)*

3.4. Data gathering procedure

Narratives have long been a way for individuals to derive meaning from their experiences, serving as a framework for understanding their behaviors and actions since the advent of written documentation[32]. As a widely used method in phenomenological research, interviews facilitated the exploration of the lived experiences of individual participants[33]. The interviews were conducted through the establishment of a clear yet adaptable framework, enabling the collection of in-depth data while attentively listening to the participants' narratives. The process in this study started with the identification of explicit research objectives and the selection of participants who met predefined criteria, which ensured that the sample accurately represented the phenomena under investigation[34-35]. Prior to each interview, the researchers engaged in discussions with the participants regarding the study's purpose, confidentiality, and data usage[36], which could help making participants feel more at ease[37-38]. The interview was deliberately conversational, as this informal approach facilitated a natural flow of information and encouraged participants to provide comprehensive, narrative responses[39-40]. Notwithstanding the informal tone, a structured interview guide was adhered to, which included thematic questions directly aligned with the study's objectives[41]. These questions (outlined in **Table 2**) directed the conversation toward critical topics, while follow-up probes facilitated exploration of the participants' responses, enabling clarification of meanings and enriching the data gathered[42-43]. The participants were also asked to speak using their native language or mother tongue to help them express their thoughts effectively[44]. The entire interview process was recorded, and preliminary notes were taken using Microsoft Excel, with the participants' permission.

3.5. Data analysis

Narrative data collected through interviews served as the primary source of information for this study. Thematic analysis provides a structured approach for documenting, organizing, and analyzing recurring patterns of meaning, known as themes, within a dataset[45]. Langridge[46] suggested that researchers should began with a basic descriptive coding process and systematically advanced to a more analytical level of analysis, in line with the approach proposed. Reflexive thematic analysis, an approach particularly conducive to the exploration of participants' subjective experiences, places significant emphasis on the active role of the researcher in the interpretation of the data. In contrast to methods that strive for a strict objectivity, reflexive thematic analysis explicitly acknowledges the influence of the researcher's inherent values, personal experiences, and preconceived notions, all of which inevitably shape the interpretive process[47-48]. Employing an inductive approach, the analysis sought to minimize the imposition of pre-existing assumptions, which also facilitated the emergence of themes that authentically and meaningfully reflect the participants' lived experiences[45]. Inductive method allowed themes to organically emerge from the data rather than being preordained, proved particularly well-suited to the exploratory nature of the present study, offering a flexible framework for in-depth analysis of context-dependent phenomena[49-50]. The coding process, as described by Braun and Clarke[51], followed six iterative phases (**Figure 1**): familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and

producing the final report. This process facilitated engagement with the data, ensuring that the themes evolved through repeated interaction and revision. Reflexivity is an essential principle in the analysis, as it enabled the researchers to reflect on how their perspectives might influence both data collection and analysis[47,49].

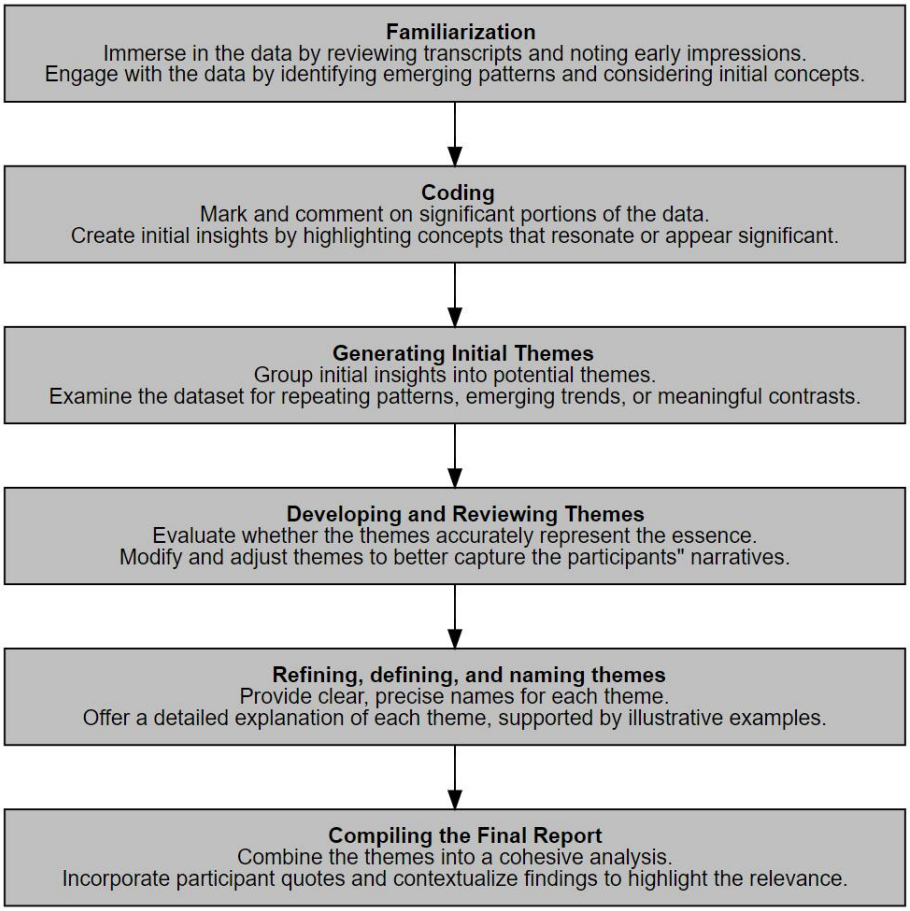

Figure 1. Workflow of data analysis process.

4. Results

Objective 1: Determine how environment-based immersion changed the views of learners towards science-oriented advocacy.

The environment-based immersions profoundly reshaped learners' perspectives on science-oriented advocacies. With engagement in environmental issues, participants experienced a sense of empowerment and realization about the practical applications of their scientific knowledge. The immersion not only sparked a passion for environmental advocacy but also highlighted the tangible impacts of scientific research on local ecosystems, reinforcing the idea that science could drive meaningful change.

Learners expressed newfound motivation to contribute to solutions, with many recognizing their ability to make a difference in addressing environmental challenges. The experience also led to a broader realization about the relevance of science in solving global issues, such as climate change and pollution.

Theme 1: Empowerment

Several participants expressed that the immersion experience ignited a *passion* for environmental protection, illustrating how the connection between *science* and *social change* motivated them to become

involved in the advocacy movement. One participant noted that witnessing the tangible impacts of scientific research on local ecosystems served as an inspiration, linking their academic pursuits with real-world advocacy and reflecting on the significance of scientific work in addressing environmental challenges.

> "The immersion experience sparked my passion for environmental advocacy. It showed me how science can drive change, making me want to be part of that movement. It felt empowering."

> "Seeing the tangible impacts of scientific research on local ecosystems inspired me. It showed me that my studies in science could translate into real advocacy work, which I find incredibly motivating."

The students highlighted the feeling of capability that arose from understanding the scientific principles underlying environmental issues, particularly with respect to climate change. This understanding encouraged a sense of empowerment, making them feel equipped to contribute to solutions. The participants also emphasized how experiences can spark motivation as it reinforced their commitment to continuing their education and pursuing active roles in environmental advocacy.

> "Understanding the science behind environmental challenges made me feel capable of contributing to solutions and inspired me to continue learning."

> "Learning about the science behind climate change during our immersion made me feel like I could actually make a difference."

The immersion experiences enhanced participants' knowledge and encouraged a strong sense of self-efficacy, inspiring them to believe that their individual actions could meaningfully contribute to larger environmental solutions.

> "It was empowering to realize that my actions could contribute to larger solutions."

Theme 2: Realization

Participants expressed how their involvement in sustainability projects broadened their awareness of the far-reaching implications of chemistry, such as the impact of pollutants and the development of green technologies. These experiences prompted a significant shift in their perceptions, encouraging them to recognize how chemistry could help in addressing environmental challenges.

> "After participating in sustainability projects opened my eyes to the broader implications of chemistry, like the impact of pollutants and the development of green technologies."

> "It made me realize that chemistry has a role in solving environmental problems, and I want to contribute to that."

Several participants described how their immersion in the practical aspects of science led them to view it not merely as an academic subject, but as a living, breathing practice with immediate relevance to global and community-level environmental issues. The real-world context in which they applied ecological processes made the subject matter appear more urgent and directly tied to addressing pressing environmental concerns.

> "I started to see science as a living, breathing practice that directly impacts our planet and communities."

> "Understanding ecological processes in real life made the subject so much more relevant and urgent."

Finally, the experience led to understanding of collective action, with participants emphasizing the power of unity in creating a lasting impact on environmental issues.

> "I've learned that when people unite for a cause, they can create a lasting impact."

Objective 2: Determine the factors that led to learners to advocate good science-oriented advocacies.

Through direct engagement with real-world environmental issues, learners moved beyond theoretical knowledge to understand the effects of scientific concepts in addressing local environmental challenges. This hands-on involvement in field studies, community engagement, and practical problem-solving not only bridged the gap between classroom learning and its real-world applications but also instilled a sense of responsibility toward sustainable practices.

Learners' immersion in community engagement shed light on the social dimensions of environmental issues, making them realize that environmental challenges are deeply intertwined with public health and social equity. Interacting with communities affected by environmental degradation prompted learners to advocate for environmental justice, emphasizing the disproportionate impact of these issues on marginalized groups.

Theme 1: Learning Experiences

Learners reported that observing ecosystems up close provided them with an understanding of the real-world applications of scientific concepts learned in class. They emphasized the significance of moving beyond theoretical knowledge to witness how science is applied in practical settings, which made the learning experience more relevant and meaningful.

> "Instead of just theory, I got to observe ecosystems up close. It made me realize the real-world applications of what we learn in class."

> "Working on real environmental problems forced me to apply what I learned in class."

> "It wasn't enough to just know the theory; I had to analyze data and come up with practical solutions, which deepened my understanding."

Prior to the field study, some learners viewed science primarily as an exercise in memorization, but the opportunity to engage with local environmental issues and observe ecosystems firsthand helped them to connect theory to practice, making science feel more tangible and applicable to solving real problems.

> "Before the field study, I thought science was all about memorizing facts. Being out in the field, seeing ecosystems firsthand, helped me connect the dots between theory and practice. It made everything feel so much more relevant."

The immersion experience pushed learners to think critically about scientific data and apply it to solve real-world environmental problems. The need to analyze data and come up with practical solutions fostered a deeper understanding of the concepts they had previously studied, emphasizing the importance of critical thinking in scientific inquiry.

> "Engaging with local environmental issues pushed me to think critically about scientific data. It wasn't just about memorizing information; I had to analyze and come up with solutions based on real problems."

> "My immersion in fieldwork and hands-on research has solidified my belief in the importance of sustainable practices. Seeing firsthand the effects of pollution on local ecosystems made me an advocate for environmental protection."

These experiences were also essential in demonstrating how theoretical concepts were directly used to address environmental challenges, reinforcing the idea that science is not abstract but a field that produces tangible effects in the world.

Learners noted that their immersion in projects such as river cleanup or their internships in tech companies had practical outcomes, such as revitalizing ecosystems or promoting science, technology, engineering and mathematics (STEM) education, which further solidified their advocacy for sustainable practices and community-led conservation efforts. As a result, the immersive learning experiences were key in deepening the understanding of scientific concepts and encouraging a commitment to applying science for social and environmental good.

> "During my immersion, I witnessed firsthand how theoretical concepts were used to address environmental challenges. It made me realize that science is not just abstract; it has tangible effects on our world."

> "My experience working with a local river cleanup project highlighted how collective action can revitalize ecosystems. It inspired me to promote awareness about local waterways and advocate for community-led conservation efforts."

> "My internships in tech companies have shown me the power of applied science. I've always believed in the value of innovation, but working alongside scientists and engineers has made me an advocate for STEM education."

Theme 2: Community Engagement

Community engagement also developed the mindsets of college students towards positive science-oriented advocacies. One participant noted that engaging with communities affected by environmental degradation allowed them to appreciate the social dimensions of environmental challenges. This realization emphasized that environmental concerns extend beyond scientific theory and touch on people's lives and livelihoods, motivating them to advocate for environmental justice with the belief that every individual deserves a healthy environment.

> "Engaging with communities affected by environmental degradation made me realize the social dimensions of environmental issues."

> "It's not just about the science; it's about people's lives and livelihoods. This understanding pushed me to advocate for environmental justice, as I believe everyone deserves a healthy environment."

The immersion experience also highlighted the direct connection between science and the real-world application of solutions. For example, conducting field research on local wildlife allowed participants to understand the delicate balance of ecosystems, leading them to advocate for biodiversity conservation and the protection of endangered species.

> "Conducting field research on local wildlife helped me understand ecosystems. It inspired me to advocate for biodiversity conservation and the protection of endangered species."

Volunteering with a local environmental group further demonstrated the impact of community engagement on conservation efforts, with participants witnessing firsthand how grassroots movements can encourage significant change. This experience inspired them to advocate for local initiatives, reinforcing the belief that small, collective actions can create substantial impacts.

> "During my time volunteering with a local environmental group, I witnessed the direct impact of community engagement on conservation efforts."

> "The immersion made me realize how powerful grassroots movements can be. I now advocate for local initiatives, believing that small actions can lead to significant change."

Participating in a hands-on restoration project for a local wetland helped participants recognize the critical role that such ecosystems play in maintaining biodiversity. Observing the immediate effects of their efforts prompted a renewed commitment to advocating for similar restoration initiatives. Lastly, working with a community organization addressing air pollution in low-income neighborhoods exposed participants to the health disparities caused by environmental degradation, particularly how marginalized communities are disproportionately affected by environmental issues.

> "Participating in a hands-on restoration project for a local wetland showed me the critical role these ecosystems play in biodiversity. Seeing the difference, we made in just a few days inspired me to advocate for similar restoration efforts."

> "Working with a community organization that addresses air pollution in low-income neighborhoods opened my eyes to the health disparities caused by environmental degradation. I learned that environmental issues disproportionately affect marginalized communities."

5. Discussion

The participants' experience in field studies transformed their understanding of science, moving from a theoretical to a practical perspective. Observing ecosystems firsthand helped them connect abstract concepts to real-world applications, making science feel more relevant and less distant. This shift reflects the psychological principle of experiential learning, where direct experience fosters deeper understanding and knowledge acquisition[52].

The immersive experiences fostered a sense of empowerment and agency among the participants, leading to a newfound passion for environmental advocacy. Witnessing the tangible impacts of scientific research on local ecosystems inspired them to translate their studies into real advocacy work. This connection between immersive experiences and the development of a passion for environmental advocacy reflects the psychological concept of empowerment, where individuals feel a sense of control over their actions, leading to increased motivation and engagement[53].

Engaging with local environmental issues pushed participants to think critically about scientific data. They moved beyond simply memorizing information to analyzing data and developing solutions for real-world problems. This process of applying knowledge and developing practical solutions reflects the

psychological perspective of problem-solving, where individuals engage in cognitive processes to identify and address challenges[54].

The participants described how seeing scientific theories translated into real-world applications during their immersions deepened their understanding and retention of concepts. This bridge between theoretical knowledge and practical application highlights the importance of providing students with opportunities to apply their knowledge in real-world settings, enhancing their learning experience and confidence in the subject matter. This process aligns with the psychology theory of transfer of learning, where knowledge and skills acquired in one context are applied to new situations[55].

Understanding the science behind environmental challenges made participants feel capable of contributing to solutions and inspired them to continue learning. They felt like they could actually make a difference, believing that their actions could contribute to larger solutions. Another important consideration, which plays a greater role in impacting the student performance is self-efficacy. The students tend to ask whether they will be able to complete the task assigned to them; whether that task would be useful; will they be able to retain their concentration in session and others[56].

After immersion, getting involved in habitat restoration projects completely changed participants' perspectives. They started to see science as a living, breathing practice that directly impacts our planet and communities. This transformation from viewing science as a distant collection of facts to recognizing its immediate relevance and impact through hands-on environmental activities reflects the psychology principle of cognitive restructuring, where individuals change their existing beliefs and assumptions based on new experiences and information[57].

Working on environmental policy initiatives made participants realize how crucial scientific research is for shaping effective legislation. They saw science as essential for informed decision-making in politics, especially when it comes to environmental issues that affect everyone. This shift in understanding from a technical field to a vital component of social issues, policy-making, and global challenges reflects the psychological foundation of interdisciplinary thinking, where individuals integrate knowledge and perspectives from different fields to solve complex problems[58].

Participating in sustainability projects opened participants' eyes to the broader implications of chemistry, like the impact of pollutants and the development of green technologies. This shift from a narrow focus on the technical aspects of chemistry to an understanding of its broader environmental implications reflects the psychology construct of cognitive expansion, where individuals broaden their understanding of a subject by exploring its connections to other areas of knowledge and experience[59].

Engagement in practical fieldwork and research has reinforced the conviction that sustainable practices are vital. Witnessing the impact of pollution on local ecosystems firsthand has transformed them into advocates for environmental preservation. The Philippines, facing significant environmental challenges like flooding due to excessive rainfall and inadequate waste management, exemplifies such degradation[60].

Experiences from internships in technology firms have highlighted the transformative power of applied science. Collaborating with scientists and engineers has fostered a strong belief in the importance of STEM education. According to Idris et al.[61], STEM learning cultivates essential skills such as critical thinking, curiosity, resilience, decision-making, leadership, entrepreneurship, and the ability to learn from failure. Regardless of their future career paths, students equipped with STEM skills emerge as well-rounded, innovative, and adaptable individuals.

There is a strong belief in advocating for local initiatives, driven by the notion that small-scale actions can lead to considerable change. Grassroots innovations emphasize sustainability solutions that prioritize local community values over profit, which contrasts with traditional innovation models. These community-oriented approaches not only address specific local needs but also have the potential to inspire broader societal transformations[62].

Conducting research on local wildlife has deepened their appreciation for the intricate balance of ecosystems. When asked why they pursue careers in ecology, many incoming students express a desire to "make a difference." Young people are increasingly motivated to address pressing issues like climate change, species loss, and the equitable distribution of ecosystem services. However, they must also navigate a landscape where scientific discourse is often mired in political polarization concerning environmental issues[63].

Participation in environment-focused activities offers a tangible connection to the issues being studied. This aligns with the aim of achieving Sustainable Development Goal 15, which seeks to "protect, restore, and promote sustainable use of terrestrial ecosystems; sustainably manage forests; combat desertification; halt and reverse land degradation; and halt biodiversity loss"[64].

Engagement with communities impacted by environmental degradation has illuminated the social aspects of these issues. It's clear that environmental matters extend beyond scientific inquiry; they directly affect people's lives and livelihoods. This realization has inspired a commitment to advocate for environmental justice, grounded in the belief that everyone deserves a healthy environment. Addressing climate change from a justice perspective necessitates protecting society's most vulnerable members from disproportionate impacts. Initiatives such as ensuring access to clean water and sanitation, enhancing housing conditions, and aiding small-scale farmers in adapting to environmental shifts are essential to satisfy the needs of these communities[65-66].

6. Conclusion

The findings of this study demonstrated the transformative power of environment-based immersions in shaping students' psychological perspectives on science and environmental advocacy. The study revealed that these experiences led to cognitive restructuring, enhancing students' understanding of science's practical applications and its relevance to real-world issues. The immersive nature of these experiences also promoted emotional engagement, building a sense of responsibility for environmental stewardship and inspiring students to advocate for sustainable practices. The study highlighted the importance of experiential learning in deepening students' understanding of scientific concepts and their real-world implications. By providing opportunities for students to apply their knowledge in practical settings, these immersions enhanced their learning experience, increased their confidence in the subject matter, and promoted a sense of agency and empowerment. Further, the study emphasized the critical role of emotional engagement in driving environmental advocacy. It revealed that by creating a stronger connection to the environment and a sense of responsibility for its well-being, environment-based immersions inspired students to become active agents of change. The findings of this study had significant implications for educators and policymakers seeking to promote environmental literacy and inspire a new generation of science-oriented advocates. Having environment-based immersions into educational programs, educators could effectively engage students with science, support their psychological development, and empower them to become active participants in shaping a more sustainable future.

Conflict of interest

The authors declare no conflict of interest.

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