Effectiveness of Experiential Learning on Conservation of Underwater Landscapes: A Study of Pigeon Island National Park, Trincomalee, Sri Lanka.

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Abstract

Sri Lanka's coastal and marine ecosystems, particularly its underwater landscapes, face significant threats due to ineffective conservation efforts despite existing legal protections. The gap between legislation and proper implementation leaves these fragile ecosystems vulnerable to degradation. As these environments are deeply concerned, there is an increasing need to explore innovative approaches that can improve conservation efforts. This research investigates how experiential learning, particularly through direct interaction with underwater ecosystems, can contribute to deeper engagement with the marine environment and more effective conservation. The study aims to assess the effectiveness of experiential learning in marine conservation in Pigeon Island National Park, Sri Lanka, and identify ways to improve awareness and attitudes towards marine conservation.

The study follows a qualitative research approach involving both online and on-site questionnaires with a semi-structured interview to collect data from general participants and experts. The analysis focused on the effectiveness of experiential learning by evaluating participants' experiences, reflections, and knowledge construction related to marine conservation. Findings suggest that experiential learning, especially when aligned with Kolb's experiential learning theory, improves participants' emotional and cognitive engagement with underwater ecosystems and promotes greater awareness and long-term commitment to conservation practices. Future research could expand on these findings by examining the comparative effectiveness of different experiential learning activities, such as virtual reality in marine environments, and their impact on different marine ecosystems, ensuring more sustainable conservation efforts over time.

Keywords: Marine Conservation, Underwater Landscape, Experiential Learning, Attitudes, Experiential Learning Theory.

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Introduction

Experiential learning offers individuals the chance to engage deeply with underwater landscapes, providing immersive experiences that may influence attitudes toward marine conservation. “The major constructs of experiential learning, such as experience, reflection, and self-planning, coincide with other learning methods, such as reflection-in-action and self-directed learning.” (Schon, 1983, Knowles, 1980, as cited in Mok, 1999). Underwater landscape ecosystems such as coral reefs and seas play a critical role in biodiversity conservation and connecting with these ecosystems through activities such as snorkeling or diving can strengthen a personal connection with the marine environment. Also, the activity is an important tool for environmental education, allowing for underwater seascape observation as well as direct interaction with marine wildlife (Dimmock, 2007; Orams, 2002, as cited in Pineiro-Corbeira et al., 2020).

Marine conservation has become increasingly critical as the health of our oceans faces many threats, including pollution, overfishing, habitat destruction, and climate change. As above mentioned, Marine ecosystems are being altered by the direct effects of climate change including ocean warming, ocean acidification, rising sea levels, changing circulation patterns, increasing severity of storms, and changing freshwater influxes (Keller et al., 2009). "Environmental conservation is becoming increasingly important due to the ongoing negative effects of climate change" (Hofman et al., 2021). Conservation efforts aim to protect and restore marine ecosystems, ensuring their resilience and sustainability for future generations.

Experiential learning, which involves active participation and reflection, has emerged as a promising approach to address this challenge. According to Lewis & Williams (1994), Experiential education first immerses adult learners in an experience and then encourages reflection about the experience to develop new skills, new attitudes, or new ways of thinking. Underwater landscapes offer a dynamic environment for such learning and vibrant ecosystems, as well as diverse marine species, create excellent opportunities to study the impact of experiential learning on conservation awareness.

Despite the growing popularity of marine-based experiential activities, limited empirical research has specifically examined the effectiveness of these activities in promoting marine conservation behaviors. This study aims to fill that gap by exploring how experiences of underwater landscapes contribute to positive attitudes toward marine conservation and encourage conservation behaviors among participants. By analyzing participants' experiential learning outcomes, this research will provide insight into the role of marine conservation efforts.

Although numerous studies have examined marine conservation and the ecological significance of underwater landscapes, much of this research has focused on biodiversity, habitat degradation, and the ecological impact of human activities (Crain et al., 2008; Barbier, 2017). However, there remains a limited understanding of behaviors in marine environments. While experiential learning has been widely applied and analyzed in terrestrial settings (Lewis & Williams, 1994; Deakin Crick, Goldspink & Foster, 2013), only a few studies have explored its role in marine conservation, leaving a notable gap in understanding its effectiveness in underwater contexts.

Furthermore, existing research on marine related activities often emphasizes tourism and ecological management (Perera & Kotagama, 2015; Ilukdeniya & Thirumarpan, 2019), but less attention has been given to the educational and attitudinal outcomes that arise from direct human interaction with marine ecosystems. In particular, little is foster reflection, motivation, and self-directed learning, which are central constructs of experiential learning theory (Kolb, 1984; Schon, 1983).

This gap is especially evident in Sri Lanka, where research has primarily focused on documenting marine biodiversity and threats to coral reefs (Rajasuriya et al., 2005; Lester et al., 2009), but rarely

examined how underwater experiences contribute to conservation education and long-term pro-environmental behaviors. Addressing this gap is crucial for strengthening conservation strategies in marine protected area and ensuring sustainable management of fragile ecosystems.

This study seeks to answer the central research question: How effective is experiential learning in underwater landscape for enhancing marine conservation awareness and promoting positive attitudes? The aim od the research is to assess the extent to which underwater experiences contribute to fostering conservation behavior, attitudes, and knowledge among participants in the selected study area. To achieve this, the study examines the role of the Modes of Adaptive Learning within experiential learning theory in raising conservation awareness, evaluates the influence of functional attributes in shaping participants; attitudes and behaviors, and investigates how experiential learning activities in underwater landscapes encourage the development of pro-conservation behaviors and long-term environmental stewardship.

Experiential Learning in Underwater Landscape

Exploring experiential learning on the effectiveness of implementing marine conservation measures in the underwater landscape. The review focuses on how experiential learning, through underwater activities, promotes practical experience and awareness of the underwater landscapes and can influence attitudes towards marine protection. (Portman & Camporesi, 2020). It delves into the significance of experiential learning as an educational tool, highlighting its potential to deepen participants' understanding of marine ecosystems and conservation challenges.

In here discusses about marine conservation and its importance in addressing the global threats facing underwater ecosystems, such as pollution, habitat destruction, and climate change. It then explores the concept of underwater landscapes, focusing on their ecological and educational value. (Hofman et al., 2021). Following this, attention shifts to experiential learning, emphasizing its relevance as a tool for promoting environmental stewardship and behavioral change. This study applies experiential learning theory to examine its influence on conservation attitudes and behaviors in underwater environments.

Marine Conservation

Marine conservation is essential for protecting the diverse ecosystems that sustain life on Earth, which are increasingly threatened by human activities such as pollution, overfishing, and habitat destruction, alongside the growing impacts of climate change. Effective conservation measures, including the establishment of marine protected areas (MPAs), sustainable fishing practices, pollution control, and habitat restoration, are critical for maintaining healthy marine ecosystems and biodiversity (Bennett & Dearden, 2014; Saraswathi S. et al., 2023). MPAs, in particular, are widely recognized as a global tool for conserving biodiversity, safeguarding critical habitats, and maintaining ecosystem services, with varying levels of protection ranging from fully no-take zones to regulated multiple-use areas (Costa et al., 2016; Khuu, Jones & Ekins, 2023).

In Sri Lanka, Marine National Parks such as Pigeon Island serve as important MPAs, preserving coral reef ecosystems and supporting sustainable recreational activities like snorkeling and diving (Ilukdeniya & Thirumarpan, 2019; Perera & Kotagama, 2015). The success of marine conservation initiatives depends on robust legal frameworks, adequate funding, effective enforcement, and active community participation, which collectively enhance the resilience and sustainability of marine ecosystems for future generations (Bennett & Dearden, 2014; Saraswathi S. et al., 2023).

Conservation Strategies and Effectiveness

Marine conservation strategies are essential for mitigating the adverse effects of human activities and environmental changes on marine ecosystems. “MPAs (Marine conservation strategies) are promoted globally as a tool for managing fisheries, conserving species and habitats, maintaining ecosystem functioning and resilience, preserving biodiversity, and protecting the myriads of human values associated with 8 the ocean”. (Bennett & Dearden, 2014).

The effectiveness of these conservation strategies depends on strong legal frameworks, adequate funding, effective enforcement, and active community involvement. By implementing and continually refining these strategies, marine conservation efforts can enhance the resilience and sustainability of marine ecosystems for future generations. “By understanding the socioeconomic implications, changes in habitat quality, challenges, and potential improvements, stakeholders can work towards more effective and sustainable approaches to protect marine life and ecosystems.” (Saraswathi S. et al., 2023).

Key marine conservation approaches include MPAs, sustainable fishing practices, pollution control, habitat restoration, and climate change mitigation. The effectiveness of these strategies relies on strong legal frameworks, proper enforcement, and active community participation to ensure long-term ecosystem resilience.

Underwater Landscapes

Characteristics of Underwater Landscapes

Underwater landscapes such as coral reefs, seagrass beds, and kelp forests are critical to maintaining marine biodiversity and ecological balance. These ecosystems support a variety of species and provide essential services such as habitat, coastal protection, and carbon sequestration. Pigeon Island off the coast of Nilaweli in Sri Lanka is a prime example with rich coral reefs, seagrass beds, and a variety of marine life. However, these underwater landscapes face significant threats from human activities and environmental changes, emphasizing the need for effective conservation measures to protect their unique biodiversity and ecological functions.

Human Interaction with Underwater Landscapes

Human interaction with underwater landscapes, such as snorkeling and diving, provides unique opportunities for experiential learning and marine conservation. These direct experiences raise awareness of marine ecosystems and create a connection that encourages conservation-oriented behavior. Kolb's Experiential Learning Theory highlights the importance of concrete experiences and reflection in shaping participants' environmental understanding. At PINP, human interaction managed through educational programs and sustainable practices can enhance both the experience and commitment to conservation while ensuring the protection of delicate marine ecosystems.

Experiential Learning

Experiential Learning in Environmental Awareness

The effectiveness of experiential learning in environmental awareness depends on the quality of the experience and the guidance provided. Poorly managed 11 activities or a lack of reflection can lead to a superficial understanding of environmental issues. “Experiential education first immerses adult learners in an experience and then encourages reflection about the experience to develop new skills, new attitudes, or new ways of thinking.” (Lewis & Williams,1994).

By engaging both cognitive and emotional dimensions, experiential learning increases awareness of the complexity and fragility of marine ecosystems, encouraging more sustainable behaviors and supporting long-term conservation of underwater landscapes.

Experiential Learning as a Tool for Marine Conservation Education Process.

Experiential learning serves as a powerful tool for marine conservation education by immersing participants in the environment they seek to protect. Unlike traditional educational methods, which often rely on theoretical lessons, experiential learning engages individuals through direct, hands-on experiences with marine ecosystems. “The major constructs of experiential learning, such as experience, reflection, and self-planning, coincide with other learning methods, such as reflection in-action and self-directed learning.” (Schon, 1983; Knowles, 1980, as cited in Mok, 1999). According to Deakin Crick, Goldspink & Foster, 2013, as cited in Bartle, (2015), Driving this shift is the recognition by universities that the purpose of 21st century education has evolved to include the generation of student competence in self-directed learning, citizenship, eco-sustainability and employability, in addition to traditional knowledge, skills and attitudes within disciplines. This approach makes abstract concepts more accessible, enabling participants to understand and appreciate the complexity and beauty of underwater landscapes.

Through reflective engagement with marine ecosystems, experiential learning fosters critical thinking and personal connection, increasing awareness of environmental threats and supporting long-term commitment to marine conservation.

Types of Experiential Learning Activities in Marine Conservation

Guided underwater tours, another significant form of experiential learning, combine education with direct engagement. Participants not only explore marine habitats but are also informed about the conservation challenges faced by these ecosystems. This form of learning encourages critical reflection on the importance of protecting marine biodiversity and its role in environmental health. “Marine Protected Areas (MPA)s are pointed out as key elements for renewing the image of a tourist destination or as useful tourist management measures to promote new recreational activities like snorkeling”. (De la Cruz Modino et al., 2012, as cited in Piñeiro Corbeira et al., 2021).

Activities such as snorkeling, diving, and guided underwater tours allow participants to recognize the fragility of marine ecosystems, strengthen emotional connections, and encourage conservation-oriented behavior and long-term environmental stewardship.

Attitudes Towards Marine Conservation

Factors Influencing Conservation Attitudes

Attitudes towards marine conservation are shaped by both psychological and sociological factors. According to this Individual’s attitudes are here defined as **“Attitudes have been a commonly used psychological measure of program effectiveness in conservation social science research.” (Nilsson, Fielding, and Dean, 2019).** Personal values, beliefs, and emotional responses, such as empathy and concern for environmental degradation, strongly influence support for conservation. Social norms, cultural traditions, and community connections to the sea also play an important role in shaping environmental responsibility. As well as **Marine conservation not only from a physical perspective but also from a social-behavioral one and to understand potential benefits and biases the public can bring to its advancement. (Portman and Camporesi, 2020).** Educational programs and public campaigns further contribute to shaping positive conservation attitudes.

Direct interaction with marine environments builds emotional connections, increases awareness of environmental threats, and encourages individuals to adopt more sustainable and conservation-oriented behaviors.

Measuring Conservation Attitudes and Behaviors

Various tools are used to assess conservation attitudes and behaviors. According to this, "Measuring conservation behaviors involves identifying the target behavior or behaviors and the optimal time to measure and then selecting the most appropriate method of measurement (i.e., direct observation, objective indicators, self-reported behavior, and behavioral intentions) that considers the strengths and weaknesses of each approach." (Nilsson, Fielding, and Dean, 2019). Common approaches include surveys, interviews, and observational studies.

Surveys and compliance measurements are commonly used to analyze conservation practices. "The authors collected data on knowledge, attitude, and practices through a questionnaire and triangulated these data with log-book data measures of compliance Conservation Biology with marine-protected area restrictions (e.g., proportion of time guarded, number of marine park authority infringements, and number of arrests) and measures of fish biomass." (Nilsson, Fielding, and Dean, 2019). These methods support better understanding and improvement of marine conservation strategies.

Long-Term Impact of The Underwear Landscape on Conservation Attitudes

Experiential learning in underwater landscapes strengthens long-term conservation attitudes by creating strong personal and emotional connections with marine ecosystems. "Investments in MPA education and outreach can generate increases in local knowledge and positive attitudes, and changing knowledge and attitudes is expected to contribute to the long-term compliance with MPA regulations." (Leisher et al., 2012).

Direct engagement with underwater environments increases awareness, appreciation, and long-term support for conservation efforts. These experiences encourage sustainable behavior and greater compliance with MPA regulations while providing a strong foundation for further empirical research.

Experiential Learning Theory (David Kolb's)

ELT is a learning model developed by David A. Kolb in the year 1984. He stressed the role of experience in the learning process and insinuated that knowledge is created because of the transformation of experience. It can be defined as a concept where learning is a process involving the continuous molding of knowledge through experience. The theory lies at the center of the learning model, which Kolb developed.

> "Experiential learning shifts the learning design from being teacher-centred, where the teaching is largely transmissive and the students may remain unmotivated and disengaged, to an approach that is semi-structured and requires students to cooperate and learn from one another through direct experiences tied to real-world problems. The role of the teacher in this process is to facilitate rather than direct the student's progress"
>
> (Kolb & Kolb, 2009, as cited in Bartle, 2015).

Kolb's theory highlights the importance of hands-on involvement and active participation in meaningful experiences, which aligns well with studies focusing on environmental education and conservation efforts.

Application of Experiential Learning

In the context of marine conservation, experiential learning serves as a powerful tool for enhancing conservation awareness and encouraging active participation in environmental protection. Applying David Kolb's ELT to underwater landscapes at PINP allows participants to engage directly with marine ecosystems, creating meaningful interactions that influence their understanding and attitudes toward conservation.

The learning cycle is more like a spiral learning process where theory and practice are conceptualized and reconceptualized, with each spiral deepening the student's understanding. (Kolb & Fry, 1975, as cited in Bartle, 2015). This approach deepens their environmental awareness, and a sense of personal responsibility, and encourages the application of conservation knowledge in future actions. The direct application of experiential learning in this context enhances the educational and emotional impact, making it a valuable method for fostering long-term conservation attitudes and behaviors in participants. "Learning begins with experiences that allow participants to observe, review and reflect on what they have practiced, and then critically reflect to consciously link their experiences to theory or previous experiences" (Cooper et al., 2010, as cited in Bartle, 2015)

Modes of Adaptive Learning

David Kolb's Experiential Learning Theory (ELT) emphasizes the importance of adaptive learning, which involves four key stages; Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. Each mode offers a distinct approach to acquiring knowledge through experience. "Through a process whereby knowledge is created through the transformation of experience" (Kolb, 1984,41, as cited in Bartle, 2015).

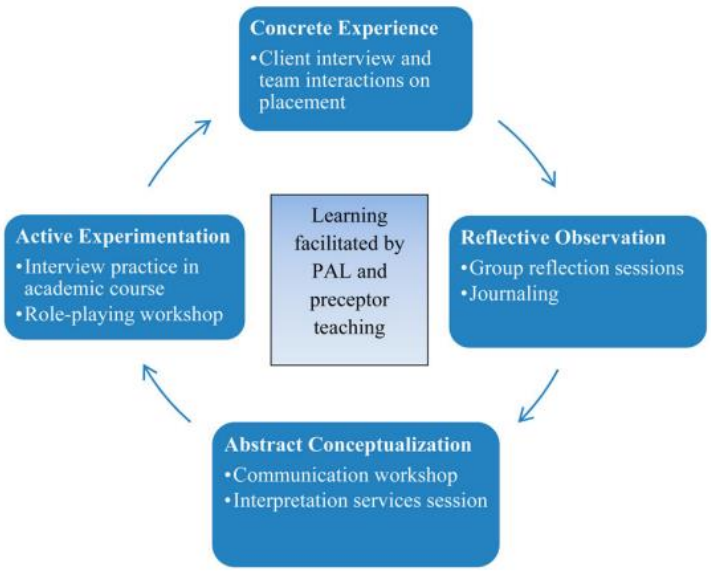


Fig. 1: *Kolb's learning cycle for communication objective*
Source: *Barker, Lencucha, and Anderson (2016)*

A more concise version of the four modes of adaptive learning,

1. Concrete Experience (CE): Engages directly in the activity, such as exploring an underwater landscape.
2. Reflective Observation (RO): Reflects on the experience, considering its impact and lessons learned.
3. Abstract Conceptualization (AC): Develops general concepts or theories from reflection, identifying patterns and principles.
4. Active Experimentation (AE): Applies these new concepts in real-world situations, testing and refining the learned principles.

Functional Attributes of Experiential Learning

The Functional Attributes of Experiential Learning are crucial in understanding how individuals learn through direct experience, reflection, and application. These attributes define the key processes that shape the effectiveness of experiential learning, particularly in contexts like marine conservation and underwater landscapes. In this research, these attributes provide a framework to analyze how participants engage with underwater environments and how such experiences influence their attitudes toward marine conservation. "Experiential learning to enhance effective learning and personal development, the accounts given of the experiential learning outcomes (functional attributes) are mostly presented as case studies, narratives, or summaries of a qualitative characterization" (Mok, Y. F. (1999)

Table 1: Functional Attributes of Experiential Learning

Functional Attribute	Definition	Role in Experiential Learning Theory (ELT)
1. Experiencing	Direct participation in an activity or experience.	Corresponds to the **Concrete Experience** mode; learning begins through hands-on interaction.
2. Reflection	Critical thinking about the experience, analyzing, and making sense of what happened.	Aligns with **Reflective Observation**; learners observe and reflect to understand experiences.
3. Perception of Values, Social & Cultural Influences	The influence of societal, cultural, and value-based contexts on the experience and reflection.	Shapes interpretation and conceptualization during **Reflective Observation** and **Abstract Conceptualization**.
4. Constructing Meaning from Experiencing	Interpreting and understanding the experience to form concepts or principles for future use.	Associated with **Reflective Observation** and **Abstract Conceptualization**; deriving lessons or insights.
5. Subject Learning	Acquisition of subject-specific knowledge through experiential learning.	Relevant to **Abstract Conceptualization**; integrating experiences into subject knowledge.
6. Personal Autonomy in Learning	Ability to take control of the learning process, making independent decisions.	Crucial in **Abstract Conceptualization** and **Active Experimentation**; constructing knowledge and testing it.
7. Learning Skills	Development and application of skills like critical thinking, problem-solving, and collaboration.	Developed and applied during **Active Experimentation** as learners test their understanding.
8. Motivation	Internal drive or incentive to engage in and persist with learning activities.	Key throughout the learning cycle, especially in **Active Experimentation**.

Source: Adapted from Mok (1999)

Theoretical Framework

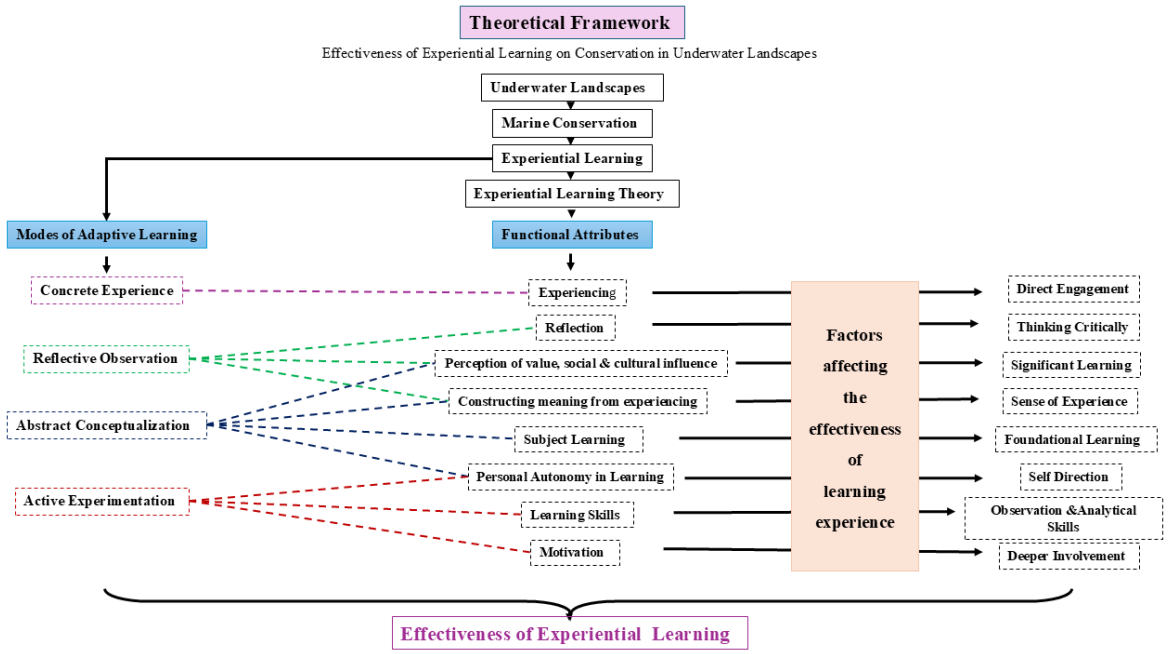


Fig. 2: Theoretical Framework
Source: author

According to the theoretical framework, identified two core dimensions of experiential learning: Modes of Adaptive Learning and Functional Attributes. These dimensions will be central to the data collection and analysis in this study. The effectiveness of experiential learning in conservation will be assessed based on these dimensions. The study will begin with an in-depth case study of Pigeon Island National Park, exploring how the park's unique underwater landscape impacts the learning experiences of its visitors.

The Experiential Learning Theory (ELT) serves as the foundational framework, explaining how knowledge is acquired through the transformation of experience. By analyzing the learning modes and functional attributes within this theoretical framework, the research aims to provide valuable insights into how experiential learning can enhance conservation efforts, while also acknowledging the limitations highlighted in prior studies.

Methodology

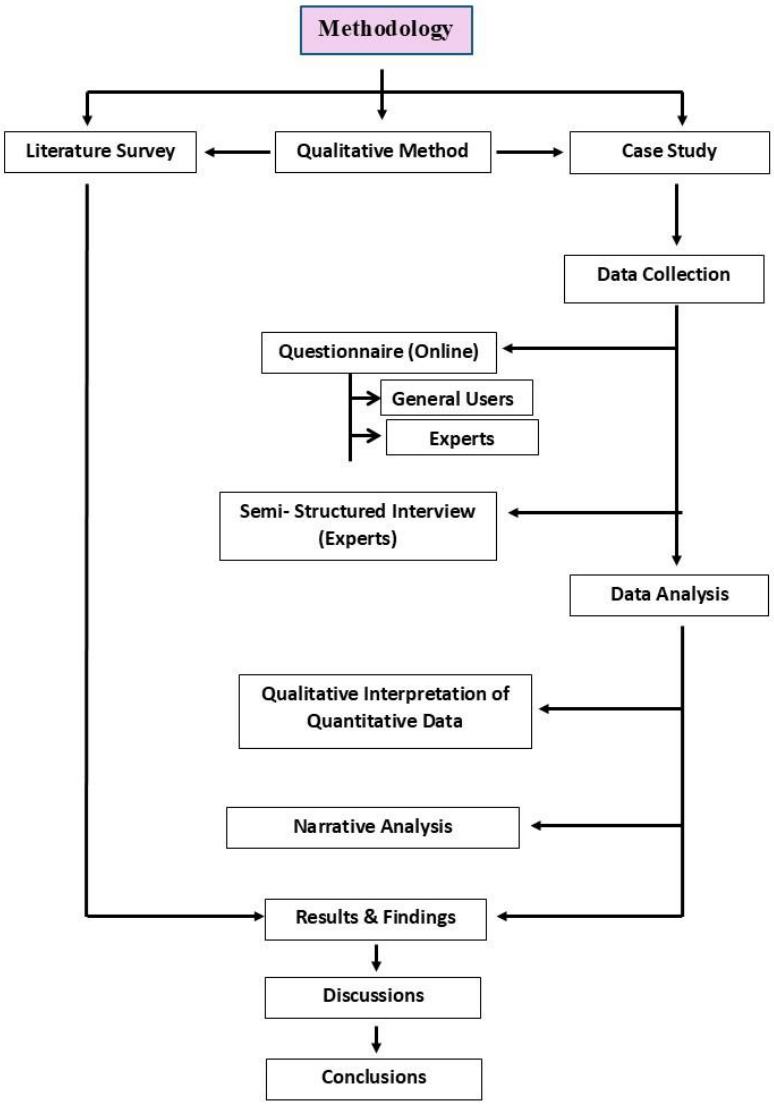


Fig. 3: Research Methodology
Source: author

The selected research methodology is a qualitative method to investigate the 'Effectiveness of Experiential Learning on Conservation of Underwater Landscapes'. In First, a literature survey was conducted to contextualize the findings within broader conservation and educational frameworks. While collecting data, questionnaire surveys and a semi-structured interview are conducted through two categories of general users and experts, the questionnaire survey analyzes the data using a novel method, namely 'Qualitative Interpretation of Quantitative Data'. Also, the information is analyzed in detail with a semi-structured interview, narrative analysis.

The discussion answers research questions and point out research aims and objectives. How the analytical data suggests answers and fulfills the research aims. The results will address the research questions on how experiential learning impacts conservation awareness and behaviors, culminating in a discussion that aligns findings with the broader objectives of marine conservation and landscape architecture. The conclusion will summarize the study's contributions and provide recommendations for enhancing experiential learning methods in similar conservation contexts.

Data Collection and Analysis Methods

The data collection process involves two key approaches. Those are questionnaire surveys from both online and on-site ways and semi-structured Interviews. The Questionnaires were distributed among people already experienced with underwater landscapes and during the field study by using on-site and online surveys. For filling out the questionnaire, respondents should have at least one firsthand experience with the underwater landscape. These methods will target two different groups of participants with underwater experiences, general users (participants) and experts.

In the general user questionnaire, 18 questions were included. In the Expert questionnaire, 09 questions were included. Among them, particular attention was paid to how long respondents had experienced underwater landscapes. The questionnaire has been prepared based on attributes for both questionnaire methods. The opinion that is the basis for each question is subjected to a separate inquiry. Simultaneously, in addition to the expert interviews, a semi-structured interview was conducted with a technical diver to gain a deeper understanding of the role of experiential learning in marine conservation. This dual approach provides a multi-dimensional deeper understanding of the effectiveness of experiential learning on conservation in underwater landscapes.

Questionnaire Survey

The questionnaire survey is the main source of data collection from online and on-site users of general users and experts with relevant knowledge about marine conservation and experiential learning activities in PINP. The researcher provided two questionnaire surveys for two categories of users (general users and experts). Questionnaire responses will provide quantitative data through closed-ended questions (e.g., Multiple-choice and Likert scale responses). This data will be analyzed using a qualitative interpretation of the quantitative data process, which involves understanding the patterns and themes that emerge from the numerical results.

The analysis will focus on comparing the effectiveness levels, attitudes, and behavioral changes of the two participant groups: general users and experts. The quantitative data from general users will be compared with that of experts to identify similarities and differences in their perceptions of marine conservation, using a Clustered Bar chart & Stacked Bar. The comparison will reveal how experiential learning influences each category of user's understanding and commitment to conservation efforts. These details will help to contextualize the effectiveness of experiential learning in promoting marine conservation and environmental awareness within the unique underwater landscapes of PINP, while also acknowledging certain limitations.

Semi-Structured Interview

In addition to expert interviews, a semi-structured interview was conducted to gain deeper insights into the role of experiential learning in marine conservation. Professor Darshana Jayawardena, a technical diver with 21 years of experience in underwater landscapes and marine biology, provided valuable input for this study. This interview followed a flexible format to explore key themes related to underwater landscapes and conservation efforts, complementing the user data collected through questionnaires.

The interview generated rich qualitative data, were generated from the interview and analyzed using narrative analysis to identify key themes. This approach focused on how the participant described his own experiences and shaped his awareness of marine conservation. The analysis compared expert perspectives, highlighting different views on conservation with an emphasis on scientific aspects.

Case Study Selection Criteria

Case Study: Pigeon Island National Park, Trincomalee, Sri Lanka.

Pigeon Island National Park (PINP), located off the coast of Trincomalee, Sri Lanka, is one of the country's two marine national parks and a prime site for marine conservation and research. Known for its rich biodiversity, the park contains one of the few coral reefs in Sri Lanka that is still in relatively good condition, making it an ideal location for studying underwater landscapes. The main reason for being selected as a case study is its significance as a protected marine area in Trincomalee, Sri Lanka, which offers a rich and unique underwater landscape. This park provides an ideal context for investigating the effectiveness of experiential learning in marine conservation, particularly through activities such as snorkeling and diving, which allow participants to directly engage with the underwater environment.

As a MPA, the park plays a crucial role in preserving the country's marine biodiversity, aligning perfectly with the study's focus on conservation. Its popularity as a tourist destination, where visitors directly engage with underwater landscapes, provides an opportunity to examine how experiential learning, through activities like snorkeling, can a deeper understanding and appreciation of marine ecosystems.

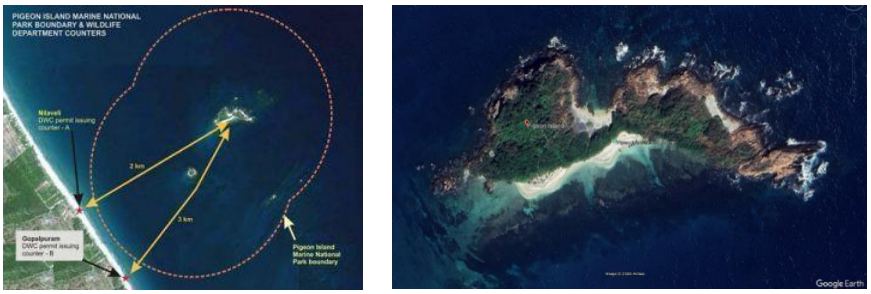


Fig. 4: Selected Case Study
Source: https://srilankaedentravels.com/pigeon-island-marine-park/ & Google Earth

Data presentation techniques

In the data presentation phase, a comprehensive and engaging approach is taken to effectively convey the research findings. In the data presentation stage, new methods were used to showcase the collected data from the questionnaire survey and semi-structured interview. Collected data from the questionnaire was transformed into Excel sheets and clear and meaningful visual representations highlighting participants' perceptions and experiences related to marine conservation.

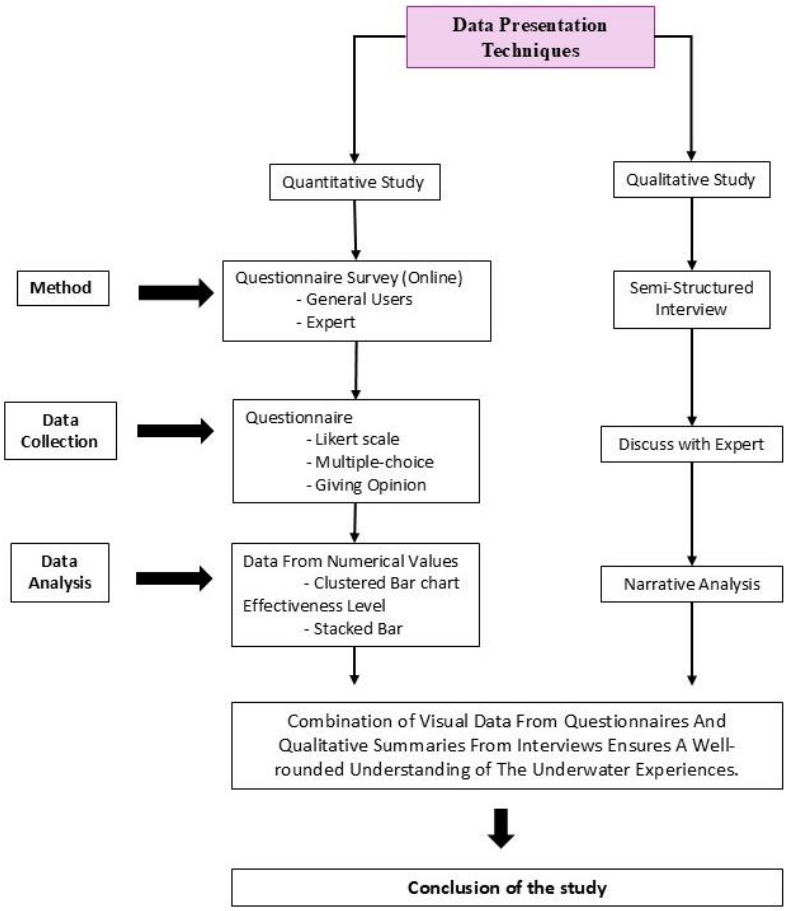
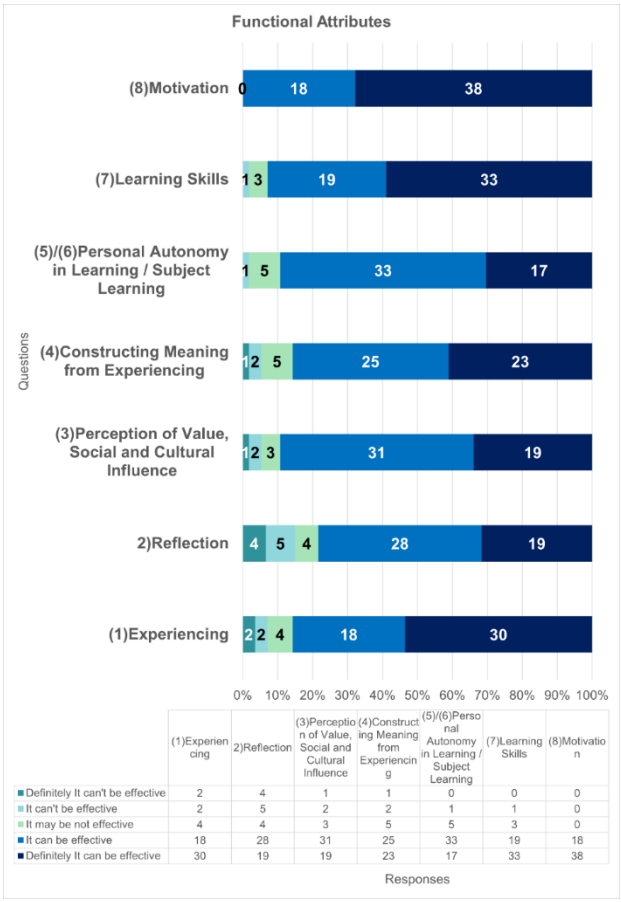


Fig. 5 Data Presentation Techniques
Source: author

Data Analysis and Findings

This research took the initiative of experiential learning and used three methods to develop the basic knowledge and emotional connection among people about this study. It can be pointed out that it is possible to carry out marine conservation in the underwater landscape. In filling the gap in First, Selected attributes from the Experiential Learning Theory (ELT) supported the theoretical framework and continued the rest. Data collected by under the two methods, two questionnaire surveys for two groups of users (general users and experts) and a semi-structured interview for an expert, and able to complete a comprehensive analysis.

Analysis of the questionnaire survey



	(1)Experiencing	2)Reflection	(3)Perception of Value, Social and Cultural Influence	(4)Constructing Meaning from Experiencing	(5)/(6)Personal Autonomy in Learning / Subject Learning	(7)Learning Skills	(8)Motivation
Definitely It can't be effective	2	4	1	1	0	0	0
It can't be effective	2	5	2	2	1	1	0
It may be not effective	4	4	3	5	5	3	0
It can be effective	18	28	31	25	33	19	18
Definitely It can be effective	30	19	19	23	17	33	38

Fig. 6: User Responses about the 'Functional Attributes'
Source: author

The chart (Figure 6*)* above presents a comparative analysis of participants' views on the effectiveness of experiential learning in marine conservation, emphasizing eight key functional attributes. The questionnaire survey conducted among 56 respondents, including both general users and experts, provided valuable insights into the effectiveness of experiential learning in underwater landscapes. Responses across the eight functional attributes.

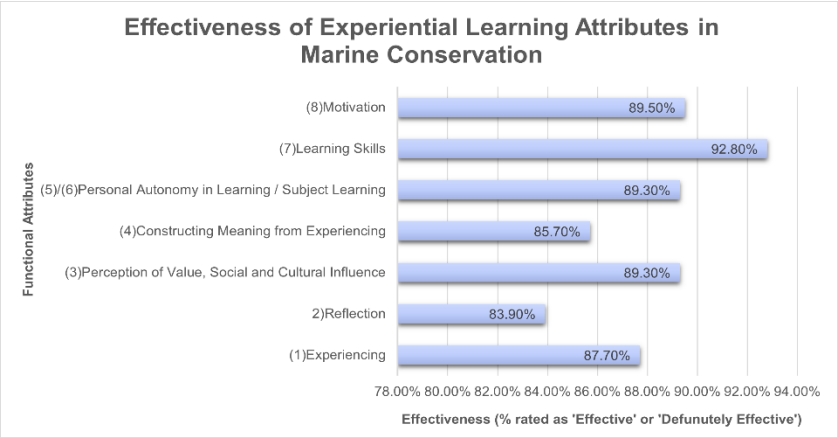


Fig. 7: Effectiveness of Experiential Learning Attributes
Source: author

Overall, the majority of participants rated each attribute as either "definitely effective" or "effective," with effectiveness levels consistently above 83%. The highest endorsement was recorded for Learning

Skills (92.8%), followed closely by Motivation (89.5%), and Personal Autonomy/Subject Learning (89.3%), showing that these aspects play a central role in shaping conservation-oriented behaviors. Attributes such as Experiencing (87.7%), Reflection (83.9%), and Constructing Meaning from Experience (85.7%) also received strong positive responses, confirming their importance in deepening conservation knowledge and commitment.

These findings demonstrate that experiential learning fosters strong emotional, cognitive, and motivational connections to marine conservation. The consistently high ratings suggest that underwater experiences when combined with reflection, autonomy, and skill development can significantly influence participants' pro-conservation attitudes and behaviors. Additionally, multiple-choice responses revealed that over 55% of respondents believe motivation gained from such experiences encourages further exploration of marine ecosystems and long-term conservation engagement.In summary, the survey highlights that all eight attributes of experiential learning are perceived as highly effective, confirming the strong potential of experiential learning as a tool for promoting marine conservation in underwater landscapes.

Analysis of the Questionnaire Survey and Semi-Structured Interview for Expert

The expert-oriented questionnaire survey and semi-structured interviews confirmed the strong effectiveness of experiential learning in promoting marine conservation within underwater landscapes. Experts emphasized that direct engagement with underwater environments fosters both emotional attachment and cognitive understanding of conservation needs, while reflection on these experiences was considered vital for building deeper awareness and long-term commitment.
They further noted that constructing meaning from personal experiences generates valuable insights that translate into conservation-oriented behavior. Self-directed learning was highlighted as empowering, as it enables individuals to take responsibility for their own conservation education and develop a deeper understanding of marine ecosystems. In addition, experts stressed that experiential learning improves critical thinking and problem-solving skills, which are essential for addressing the complex challenges faced in marine conservation. Finally, the beauty and uniqueness of underwater landscapes were described as powerful motivators that sustain long-term conservation engagement. Collectively, these insights strongly validate experiential learning as a holistic and impactful approach to enhancing awareness, engagement, and lasting pro-conservation behaviors.

Table 2: Expert Questionnaire Questions

Source: author

Question Number	Question Posed to Experts	Analysis Section
Q2	"what is the potential impact of marine conservation in underwater landscape?"	Marine Conservation Impact
Q3	"What is the current state of the marine conservation effort at Sri Lanka?"	Current Status
Q4	"What steps can we take as a solution to the current state of ocean conservation?"	Proposed Solutions
Q5	"Is it effective for marine conservation in the underwater landscape through experiential learning theory?"	EL Effectiveness
Q6	"Are there any other theories or studies that affect underwater landscape conservation?"	Qualitative Analysis
Q7	"Does the current government show more focus and direction for marine conservation in the underwater landscape?"	Government Focus
Q8	"What potential areas for cover to future researchers could steam from my study?"	Future Research
Q9	"Comment if you have a different opinion about Experiential Learning in Underwater Landscape Conservation."	Qualitative Analysis

The quantitative data underpinning the following analysis charts (Q2, Q3, Q4, Q5, Q7, and Q8) was derived from a dedicated Expert Questionnaire developed based on the study's theoretical framework. These questions addressed the potential impact of marine conservation, the current status of efforts in Sri Lanka, proposed solutions, the perceived effectiveness of experiential learning, the government's focus, and areas for future research. This quantitative data was subjected to a Qualitative Interpretation of Quantitative Data process. Furthermore, the analysis was enriched by

qualitative data from semi-structured interviews and expert commentaries (Q6 and Q9). This dual approach provided a multi-dimensional understanding of how experiential learning influences conservation awareness and behaviors within underwater landscapes.

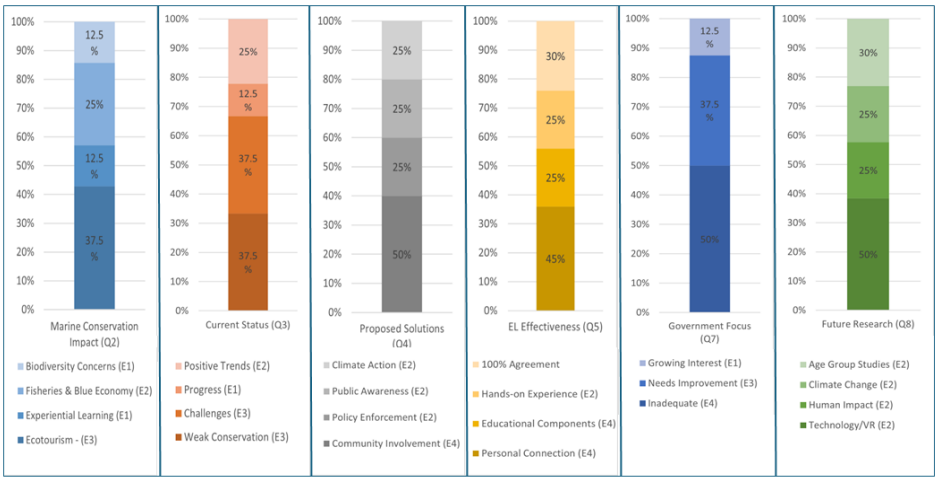


Fig. 8: Expert Analysis on Experiential Learning Effectiveness
Source: author

The expert analysis, derived from both questionnaire surveys and semi-structured interviews, strongly validated the effectiveness of experiential learning (EL) attributes in promoting marine conservation, reinforcing the high positive ratings observed in the user charts. Experts emphasized that direct engagement with underwater environments fosters both an emotional attachment and a cognitive understanding of conservation needs, with reflection deemed vital for building deeper awareness and long-term commitment. Furthermore, they noted that constructing meaning from personal experiences generates valuable insights that translate into conservation-oriented behavior, while self-directed learning empowers individuals to take responsibility for their conservation education. Finally, the experts confirmed that EL improves critical thinking and problem-solving skills essential for addressing complex marine challenges, with the beauty of the underwater landscapes serving as a powerful motivator to sustain long-term engagement.

Discussion

The findings of this study demonstrate that experiential learning plays a significant role in strengthening marine conservation attitudes within underwater landscapes. The consistently high effectiveness ratings across all measured attributes indicate that participants respond positively to immersive underwater experiences. These results align with experiential learning theory, which emphasizes the value of direct engagement and reflection in shaping environmental understanding (Kolb, 1984; Lewis & Williams, 1994). Participants' strong responses confirm that underwater experiences foster emotional and cognitive connections that support sustained conservation awareness.

The study's results are also consistent with existing literature in marine conservation, which shows that direct human interaction with marine ecosystems can promote stewardship and pro-environmental behavior (Nilsson et al., 2020). Similar to studies that highlight the role of experiential activities in building environmental responsibility, the present findings show that underwater experiences promote deeper appreciation of ecosystem fragility and motivate individuals toward protective action.

Expert responses further supported the questionnaire outcomes. Experts highlighted that experiential learning promotes long-term conservation commitment by helping individuals understand ecological processes more clearly through direct observation. This observation is consistent with existing literature in experiential education which states that personal involvement facilitates deeper learning and responsibility for environmental protection (Deakin Crick et al., 2013). Their insights reinforce the importance of incorporating experiential learning into conservation programs, especially in marine protected areas facing increasing ecological threats.

Overall, the discussion indicates that experiential learning is an effective educational approach for strengthening conservation awareness in underwater landscapes. The study expands current knowledge by demonstrating the value of this learning method within the Sri Lankan context and by contributing practical insights for environmental education and marine resource management.

Conclusion

This study set out to examine the effectiveness of experiential learning in promoting marine conservation within the underwater landscapes of Pigeon Island National Park. The findings clearly confirm that experiential learning strongly supports conservation awareness, emotional connection, and responsible environmental behavior. Participants consistently rated underwater experiential learning as highly effective, and expert opinions further reinforced this result, emphasizing that direct engagement with marine environments deepens ecological understanding and encourages long-term commitment to conservation efforts.

The outcomes of this research hold significant practical value for conservation planners, educators, and landscape architects. Integrating carefully designed experiential learning components into marine tourism programs, protected area management strategies, and community outreach initiatives can strengthen public participation in conservation. In particular, structured reflection, guided interpretation, and culturally relevant engagement can amplify the positive impact of underwater experiences and support more sustainable attitudes and behaviors toward marine ecosystems.

While the study was limited by its focus on a single case study and a relatively small sample size within a six-month research timeframe, these limitations also point toward meaningful future research directions. Further studies could expand the geographical scope to include multiple marine protected areas, compare different underwater landscapes, and involve larger and more diverse participant groups. Longitudinal research is also recommended to better understand how experiential learning influences conservation behavior over extended periods.

Despite these constraints, the research successfully fills a significant gap in existing literature by highlighting the role of experiential learning in marine conservation. It provides specific insights into how immersive underwater experiences shape environmental awareness, attitudes, and stewardship, offering a transferable framework that can be adapted to other ecological settings such as mangrove forests, seagrass meadows, and coastal wetlands. Overall, this study demonstrates that experiential learning is a powerful and meaningful approach for strengthening marine conservation efforts and advancing environmentally responsible practices within the field of landscape architecture.

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