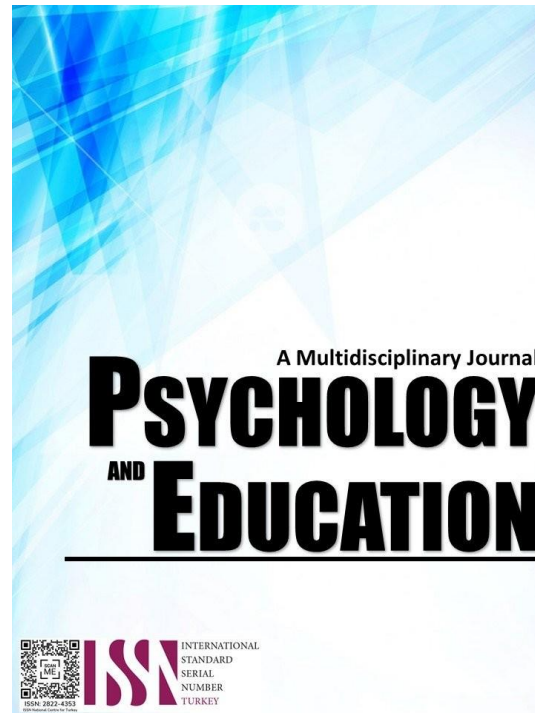


EXPLORING MARINE RESOURCES: A PHOTO-ELICITATION APPROACH BY SCIENCE 10 STUDENTS



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Exploring Marine Resources: A Photo-Elicitation Approach by Science 10 Students

Friezenith C. Calamay,* Christine P. Abo

For affiliations and correspondence, see the last page.

Abstract

The rapid degradation of marine ecosystems is a global environmental crisis. Climate change, overfishing, pollution, and habitat destruction have led to declining fish populations, coral bleaching, and the loss of biodiversity. According to the United Nations, over 3 billion people rely on marine and coastal biodiversity for their livelihoods, yet many of these ecosystems are under threat due to unsustainable human activities. In the Philippines—an archipelagic country rich in marine biodiversity—coastal communities like Kalamansig face significant challenges in protecting their marine resources. This situation reflects a global issue: the disconnect between environmental awareness and meaningful action. I was motivated to conduct this study to understand how young people, particularly students, perceive their role in marine conservation within their local setting. Using photo-elicitation as a participatory tool, this research aimed to empower Grade 10 students from Kalamansig National High School to document marine resources and reflect on their significance. By capturing and discussing their own images, students developed insights into both the ecological and economic value of marine life. This approach aligns with the global call for environmental education and community-based action, especially among youth, to address the growing threats facing our oceans and coastal ecosystems.

Keywords: *science education, hands-on learning, photo-elicitation, qualitative research, exploring marine resources*

Introduction

The ocean, covering more than 70% of the Earth's surface, holds an abundance of resources that are vital to human life and the planet's health. From fisheries and minerals to renewable energy and medicinal compounds, marine resources offer vast potential for economic development, scientific discovery, and environmental sustainability. As global demand for natural resources grows, the exploration of marine environments has become increasingly important – not only to harness their benefits but also to ensure their protection and responsible use. Exploring marine resources is therefore a critical endeavor that balances innovation, conservation and global cooperation.

Incorporating a photo-elicitation approach into the study of marine resources allows Science 10 students to engage visually and critically with real-world environmental issues. This method involves using photographs as prompts to stimulate discussion, reflection, and inquiry, encouraging students to connect scientific concepts with observable phenomena in marine environments. By analyzing images of marine biodiversity, resource extraction, and conservation efforts, students are guided to ask questions, share insights, and develop a deeper understanding of the significance and sustainability of marine resources. This approach not only enhances visual literacy and observational skills but also fosters empathy and a stronger sense of environmental responsibility among young learners.

People living in the coastal area are likely attuned to fishing as their primary source of income. They resort to different materials and equipment in catching marine resources. Some of the fishermen are familiar of the species and they can easily segregate and label the kinds of marine resources when these are brought to the market. However, some of them and sea food providers could hardly identify a specie of a fish reasonably they lack knowledge and failed to read information from the books and other sources, which sometimes ends in a chaos and crisis in the business.

The world's marine ecosystems provide critical resources, including food, livelihood opportunities, and ecological services. Coastal and marine biodiversity support millions of people worldwide, particularly those in fishing communities who depend on marine resources for sustenance and economic stability (FAO, 2020). However, these ecosystems face increasing threats due to overfishing, habitat destruction, and climate change, leading to concerns about sustainability and conservation (Pauly & Zeller, 2016). Understanding how individuals perceive and engage with marine resources is essential for fostering environmental stewardship, especially among younger generations.

Our country, overfishing and destructive practices such as dynamite and cyanide fishing had continued to pose significant threats to marine biodiversity and the sustainability of local fisheries. According to the Department of Environment and Natural Resources (DENR, 2020), these practices had severely damaged marine ecosystems and had impeded the recovery of fish populations, thereby compromising food security and the livelihoods of coastal communities.

Recent studies highlighted the impact of illegal, unreported, and unregulated (IUU) fishing on coastal economies. For example, Anticamara et al. (2021) emphasized that IUU fishing significantly reduced fish stocks and undermined the long-term sustainability of the Philippine fishing industry. Pollution from plastics, industrial discharge, and oil spills continued to degrade marine ecosystems, diminish fish populations, and disincentivize community involvement in marine conservation (David et al., 2022).

In Kalamansig, most of the young people who experienced to go on fishing have disclosed that they are not acquainted of the

classification of the marine resources. Being aware of the diverse species of the marine resources plays a vital role to the young ones who want to opt out fishing as livelihood and as marketers so that they can assure the safety of the consumers and at the same time every fish will be given a corresponding price. Getting accustomed to the marine resources while they are young offers a promising fishing business and it opened a way to make program that attracts more involvement of these students in a worthwhile endeavor.

In addition, photo-elicitation was an innovative research method that incorporated visual stimuli to evoke cognitive and emotional responses, providing deeper insights into students' perceptions and understanding of marine resources (Harper, 2002). This method gained renewed relevance in environmental education, with recent studies showcasing its ability to enhance learner engagement and promote reflective thinking (Wee et al., 2021; Garcia & Lorenzo, 2023). Through photo-elicitation, this study explored how Grade 10 students interpreted and connected with images of marine environments, examining their awareness, attitudes, and potential roles as future environmental stewards.

Students in coastal communities interacted with marine resources through diverse socio-economic roles such as consumers, traders, and fishermen. Their perspectives were shaped by cultural, economic, and environmental experiences, which influenced their appreciation and sense of responsibility toward marine conservation (Cinner et al., 2018). Recent research also supported that experiential and visual-based learning improved students' understanding of complex environmental topics (Taylor & Fraser, 2019; Mendoza & Cruz, 2021), reinforcing the use of photo-elicitation as a meaningful strategy in science education.

Given the pressing challenges in marine resource management, integrating visual methodologies into science education can bridge gaps in knowledge and inspire proactive conservation behaviors. This study seeks to contribute to existing literature by exploring the cognitive and emotional responses of Grade 10 students to images of marine environments, providing insights into how young learners conceptualize and relate to these vital ecosystems.

Research Questions

This research specifically addressed the following questions:

1. What are the different marine resources captured?
2. How do participants reveal their awareness and world view of the marine resources?
3. How do participants dream to take part in the sustainability of marine resources?

Literature Review

This section presents the reviewed literature on exploring marine resources on photo elicitation approach by science 10 students.

Photo-Elicitation in Scientific Research

Photo-elicitation is a qualitative research method that employs visual stimuli to engage participants in discussions and reflections on specific topics (Harper, 2015). This approach as discussed by Clark-Ibáñez (2016) has been widely used in educational and environmental studies to elicit deeper cognitive and emotional responses compared to traditional interview techniques. Additionally, Gallo & Gluck (2019) emphasized that within science education, photo-elicitation allows students to critically analyze real-world issues, fostering scientific literacy and environmental awareness.

Meanwhile, Schuldt (2017) conveyed that the exploration and sustainable use of marine resources have become critical topics in environmental science. Studies indicate that integrating students into marine conservation activities can enhance their awareness and responsibility toward marine ecosystems. Engaging students in projects related to marine biodiversity and resource sustainability has been shown to promote active learning and scientific inquiry (Hicks et al., 2018).

Marine Resources and Their Importance

Marine resources, including marine biodiversity, fish stocks, and ecosystems, are essential for maintaining ecological balance and providing sustenance to millions of people worldwide. The decline of these resources due to overfishing, pollution, and climate change poses significant challenges to global sustainability, making their conservation a critical concern (UN, 2017).

Science Education and Marine Awareness

Effective science education is crucial in developing environmental awareness and promoting sustainable behaviors. Engaging students in environmental topics, particularly marine conservation, has been shown to increase their understanding of the importance of preserving marine ecosystems. Educational interventions that foster awareness of marine issues can inspire responsible actions in future generations (Liu et al., 2014)

The Role of Seafood Consumers in Marine Sustainability

Seafood consumers play a crucial role in the sustainability of marine resources. Research suggests that consumer preferences and behaviors significantly impact marine conservation efforts, particularly regarding overfishing and responsible seafood consumption (D'Souza et al., 2016). Photo-elicitation can be an effective tool to capture consumer perceptions of seafood quality, sourcing, and

sustainability, thereby linking science education with real-world market dynamics (Freitas et al., 2020).

Quality of Seafood and Market Preferences

Carlucci et al. (2015) highlighted that the quality of seafood is a primary concern for both traders and consumers. Several studies highlight that freshness, texture, and origin are key determinants of seafood purchase decisions. Additionally, consumer awareness of sustainable fishing practices influences seafood selection, with a growing preference for eco-labeled and sustainably harvested products (Teletchea, 2019). Understanding these perspectives through a photo-elicitation approach can provide insights into consumer education and policy development.

Engaging Grade 10 Students in Marine Resource Studies

Incorporating Grade 10 students into marine resource exploration through photo-elicitation aligns with contemporary science education frameworks that emphasize inquiry-based learning (Berg & Sutheimer, 2018). Studies suggest that visual methods enhance student engagement, motivation, and conceptual understanding of ecological issues (Brown & Campbell, 2021). By using photographs to document seafood markets, fishing practices, and marine environments, students can develop critical thinking skills and connect classroom learning with real-world environmental concerns.

Previous Studies Related to the Research Proposal

Previous research on photo-elicitation has been widely applied in environmental studies, particularly to explore students' attitudes toward nature and conservation. However, studies specifically focusing on the perceptions of marine resources, especially among high school students, are limited. This research aims to bridge this gap by using photo-elicitation to understand Science 10 students' emotional and cognitive responses to marine conservation, thereby contributing to both educational and environmental fields.

Carlucci et al. (2015) underscored the importance of the seafood quality as the traders and consumers are very particular on it. Science education and marine awareness are significant in sustaining marine resources. On one hand, marine resources really give life to every person in this world and it should be taken care. Engaging students into marine resource exploration through photo-elicitation is an ideal step in increasing awareness which is helpful in setting marine resources in a right direction.

Methodology

Research Design

This study employed a qualitative research design utilizing a photo-elicitation approach as the primary method of data collection. Qualitative research allows for an in-depth exploration of students' perceptions, knowledge, and engagement with marine resources through visual stimuli (Creswell & Poth, 2018). This design of study will elicit clear and factual data as the respondents' responses are based on their personal experiences. In this, the respondents will do the actual way using the photo-elicitation method. Additionally, using this research design will allow the respondents to explain and to reason about what they have encountered during the exploration of marine resources.

Participants

The research study focused on Grade 10 students with a total number of 22 consisting of 2 males and 20 females. The study involved students who belonged to different categories like consumers, traders, and fishermen, representing a diverse range of perspectives on marine resources.

This study employed a purposive sampling technique, a widely used method in qualitative research that allows for the intentional selection of participants who can provide rich and relevant data (Creswell & Poth, 2018)

The purpose of using this technique is to ensure that the participants take direct experience and contextual knowledge of the phenomenon being studied—in this case, the exploration of marine resources and the use of photo-elicitation among Grade 10 Science students in Kalamansig National High School.

Participants responsibility met the following criteria to be included in the study: First, they must be currently enrolled as Grade 10 students of Kalamansig National High School. Second, they must demonstrate the ability to communicate and reflect on their experiences through visual and verbal expression. Lastly, students must voluntarily agreed to participate.

Instrument

This study used photo-elicitation interviews (PEIs) and student reflection journals as the primary data-gathering instruments. These tools facilitate an in-depth exploration of science 10 students' perceptions, knowledge, and engagement with marine resources through visual prompts (Harper, 2002). The Photo-Elicitation Interviews (PEIs) method involves using images of marine resources such as coral reefs, mangrove forests, and marine organisms to stimulate discussion and reflection among students. Participants were also encouraged to capture or select images related to their local marine environment, fostering a personal connection to the topic (Clark-Ibáñez, 2004). Rose (2016) further affirmed that semi-structured interview guides were used to facilitate discussions, with open-ended

questions prompting students to describe, interpret, and analyze the significance of the images in relation to biodiversity and conservation.

Student Reflection Journals Students maintain reflection journals where they documented their thoughts, observations, and learning experiences based on the photo-elicitation activities. These journals served as qualitative data sources, capturing students' evolving understanding of marine biodiversity and conservation. Reflection prompts guide students in articulating their insights, emotions, and connections between the images and real-world ecological issues (Kolb, 2014). To further explore common themes and shared experiences, focus group discussions (FGDs) were conducted. These discussions allowed students to collectively analyze and interpret marine-related images, encouraging collaborative learning and critical thinking (Creswell & Poth, 2018). The data collected through these instruments were analyzed using thematic analysis to identify recurring patterns and themes in students' reflections, discussions, and photo interpretations (Braun & Clarke, 2006).

Procedure

The data collection for this study followed a qualitative approach using photo-elicitation as the primary method. The procedure involved several stages to ensure comprehensive data collection from science 10 students at Kalamansig National High School.

The study began with the selection of participants through purposive sampling (Patton, 2015), ensuring that students enrolled in science 10 and actively participating in biodiversity-related lessons are included. Prior to data collection, an orientation session was conducted to explain the study's objectives, the concept of photo-elicitation, ethical considerations, and the expectations for student participation (Creswell & Poth, 2018). Informed consent was obtained from both students and their guardians before participation (Bryman, 2016).

Photo-Elicitation Activity Participants were provided with specific themes related to marine resources, such as marine biodiversity, conservation practices, and human impacts on marine ecosystems. They were then tasked with capturing or selecting photographs that reflect their understanding and perceptions of these themes (Harper, 2002). Students may take their own photos or choose from pre-curated images, ensuring accessibility for all participants.

Meanwhile, each student submitted a written reflection accompanying their selected photographs, detailing their thoughts, interpretations, and emotional responses. These reflections provided insights into their conceptual understanding and personal connections to marine resources (Clark-Ibáñez, 2004).

After the submission of photo reflections, the students participated in focus group discussions (FGDs) and semi-structured interviews to further explore their perspectives. The FGDs encouraged peer interaction, promoting dialogue about shared experiences and insights (Krueger & Casey, 2015). Interviews allowed for deeper probing into individual responses, clarifying themes that emerge from the reflections (Seidman, 2019).

Finally, all qualitative data, including reflections, FGDs, and interviews, were transcribed and analyzed using thematic analysis (Braun & Clarke, 2006). This method identified the recurring patterns and significant themes related to students' perceptions, awareness, and learning experiences regarding marine resources. Coding was then conducted iteratively, ensuring reliability and depth in data interpretation.

Data Analysis

The data collected in this study was analyzed using thematic analysis, a widely used method in qualitative research that allows for the identification, interpretation, and reporting of patterns within the data (Braun & Clarke, 2006). Thematic analysis is appropriate for this study as it enables the exploration of science 10 students' perceptions and understanding of marine resources through photo-elicitation activities.

The first step involved organizing and transcribing the collected qualitative data, including students' photo reflections, focus group discussions (FGDs), and interview transcripts (Creswell & Poth, 2018). Each dataset was reviewed to ensure accuracy and completeness, with anonymized codes assigned to each participant for confidentiality (Bryman, 2016).

Familiarization with data was also acknowledged as part of the process. The researchers immersed themselves in the data by reading and re-reading transcripts and reflection notes while reviewing the associated photographs. This step ensured a deep understanding of students' perspectives and emotional responses toward marine resources (Nowell et al., 2017).

Thematic analysis was then conducted using inductive and deductive approaches (Saldaña, 2021). Initially, open coding was applied to identify recurring words, phrases, and patterns in students' responses. These initial codes were grouped into broader categories based on their relevance to marine biodiversity, conservation awareness, and learning engagement (Gibbs, 2018).

After coding, significant themes are identified through a systematic comparison of coded data (Braun & Clarke, 2006). Themes represent key insights from students' experiences with photo-elicitation, such as: Awareness and Appreciation of Marine Resources Human Impacts and Conservation Perspectives Emotional and Personal Connections to Marine Biodiversity Learning Engagement and Knowledge Construction Each theme is carefully reviewed to ensure coherence, with supporting quotes and photographs used to illustrate findings (Nowell et al., 2017).

It was then followed by data interpretation and thematic synthesis. When themes were established, they were analyzed in relation to the study's research objectives and existing literature on photo-elicitation in science education. The interpretation focused on how students construct meaning from marine biodiversity images and how this affects their learning engagement (Creswell & Poth, 2018).

To enhance the credibility of findings, triangulation was employed by comparing data from multiple sources (photos, reflections, FGDs, and interviews) (Lincoln & Guba, 1985). Member checking was also conducted, where participants review preliminary themes to confirm the accuracy of interpretations (Merriam & Tisdell, 2016).

Lastly, inter-coder reliability was ensured by involving multiple researchers in the coding process to validate theme consistency (Miles et al., 2014). By applying thematic analysis, this study provided a structured and rigorous examination of how Science 10 students perceive and engage with marine resources through photo-elicitation.

Ethical Considerations

Informed consent was obtained from all participants and their guardians, ensuring they are fully aware of the study's purpose and procedures. Participants' privacy was protected by anonymizing their responses and securely storing data. Additionally, ethical guidelines were followed in the use of students' photographs, ensuring that images are used only for research purposes and with participants' explicit permission.

Justice the students as participants are given for snacks and refund with the tricycle fare to compensate their expenses while gathering images on the seashore.

Results and Discussion

This section presents the data gathered, the results of the statistical analysis done, and the interpretation of the findings. These are presented in tables following the sequence of the specific research problem related to the Exploring Marine Resources: A Photo-Elicitation Approach by Science 10 Students.

Different Marine Resources Captured

The different marine resources captured by the participants are the Tuna Species (Scombridae), Mackerel Species (Scombridae), Grouper Species (Serranidae), Scad Species (Carangidae), Sardine Species (Clupeidae), and Anchovy Species (Engraulidae). Each marine resources has various types. There are five tuna species captured such as Bigeye Tuna (*Thunnus obesus*) as the prevalent captured, Yellowfin Tuna (*Thunnus albacares*), Skipjack Tuna (*Katsuwonus pelamis*), Albacore Tuna (*Thunnus alalunga*) as intermittently captured, and the Pacific Bluefin Tuna (*Thunnus orientalis*) as the least captured species.

Types of Tuna Species



Figure 1: a. Yellowfin Tuna b. Bigeye Tuna c. Skipjack Tuna d. Albacore Tuna e. Pacific Blue Fin Tun

There are three types of Mackerel Species (Scombridae) captured namely Indian Mackerel (*Rastrelliger kanagurta*) as the strongly recurring captured, Short Mackerel (*Rastrelliger brachysoma*) as frequent captured, and Spanish Mackerel (*Scomberomorus commerson*) as the least captured.

Types of Mackerel Species



Figure 2. a. Indian Mackerel b. Short Mackerel c. Spanish Mackerel

Meanwhile, there are six types of Grouper Species (Serranidae) which are almost equally recurring among the participants such as Malabar Grouper (*Epinephelus malabaricus*), Humpback Grouper (*Cromileptes altivelis*), Orange-Spotted Grouper (*Epinephelus coioides*), Coral Hind (*Cephalopholis miniata*), Brown-Marbled Grouper (*Epinephelus fuscoguttatus*), and Tiger Grouper (*Mycteroperca tigris*)

Types of Grouper



Figure 3: a. Malabar Grouper b. Coral Hind c. Bluespotted Hind d. Orange-Spotted Grouper e. Brown-Marbled Grouper f. Tiger Grouper

Among all the species, Scad Species (Carangidae) has the most various types. There are eight species such as Bigeye Scad (*Selar crumenophthalmus*) and Yellowtail Scad (*Atule mate*) as the prevalent captured; Oxeye Scad (*Selar boops*), Round Scad (*Decapterus punctatus*) and Mackerel Scad (*Decapterus macarellus*) as moderately captured; and Indian Scad (*Decapterus russelli*), Shortfin Scad

(*Decapterus macrosoma*) and Muroaji (*Decapterus muroadsi*) as the least captured.

Types of Scad Species



Figure 3: a. Malabar Grouper b. Coral Hind c. Bluespotted Hind d. Orange-Spotted Grouper e. Brown-Marbled Grouper f. Tiger Grouper

Further, Sardine Species (Clupeidae) has five types of species namely Fimbriated Sardinella (*Sardinella fimbriata*) as prevalently captured, followed by the Goldstripe Sardinella (*Sardinella gibbosa*); and the Indian Oil Sardine (*Sardinella longiceps*), Rainbow Sardine (*Dussumieria acuta*) and White Sardine (*Escualosa thoracata*) as scarcely mentioned.

Types of Sardines Species



Lastly, Anchovy Species (Engraulidae) has three types such as Philippine Anchovy (*Encrasicholina oligobranchus*) as consistently mentioned across participants, Commerson's Anchovy (*Stolephorus commersonnii*) as moderately mentioned, and Indian Anchovy (*Stolephorus indicus*) rarely mentioned.

Types of Anchovy



Figure 4: a. Commerson's of Anchovy b. Indian of Anchovy c. Philippine of Anchovy

SOP 2: Participants' Awareness and World View of the Marine Resources

In this particular problem, five themes were formulated based on the responses of the respondents.

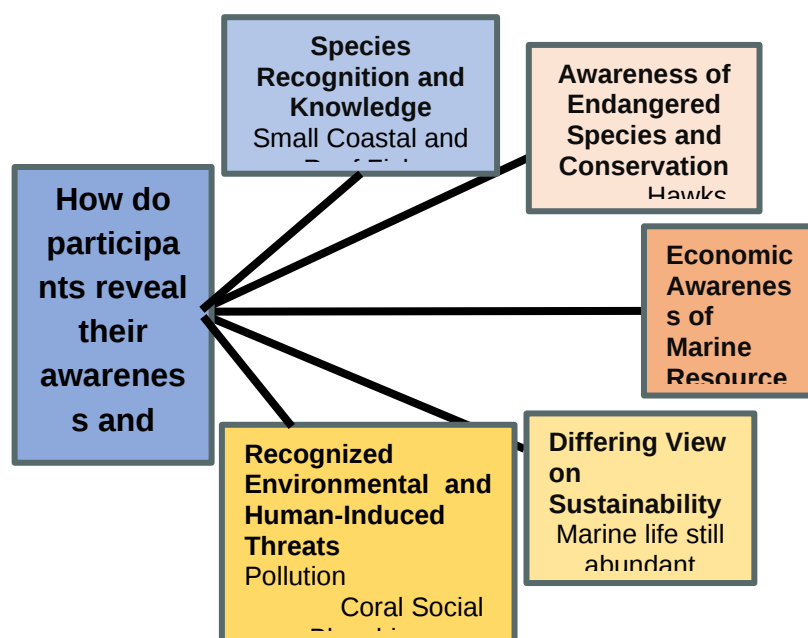


Figure 5: Show the Participants Awareness and World View of the Marine Resources.

Theme 1. Species Recognition and Knowledge

One of the most fundamental ways participants revealed their awareness of marine resources is through species recognition and classification. Most students relied on visual characteristics such as color, shape, and size to identify different fish species. Additionally,

many participants used local or market names rather than scientific terminology, highlighting the cultural and economic significance of these species in their communities.

For example, Student 8 stated, "I recognize species based on market names and scientific classifications," demonstrating an understanding that extends beyond local knowledge to scientific identification. In contrast, Student 3 emphasized, "Different species have unique body shapes and sizes," reflecting a more observational approach to species recognition. This variation in responses indicates that while some students have a basic, experience-based understanding of marine species, others possess a more structured, academic knowledge of marine biodiversity. The reliance on market names also suggests a practical engagement with marine resources, where identification is linked to trade and consumption rather than ecological class and Reef Fish (Commonly Caught)

Theme 2. Awareness of Endangered Species and Conservation

Participants exhibited varying degrees of awareness regarding endangered species and conservation. Some students have had direct experiences with rare marine animals, while others depend on media, education, or secondary sources for information.

For example, Student 2 described, "Encountering a whale shark was a life-changing experience," suggesting that firsthand exposure to marine wildlife can significantly influence one's perception and awareness of conservation needs. This type of personal interaction fosters a stronger emotional connection to marine life and may encourage advocacy for conservation efforts.

Conversely, some students demonstrated a more academic or secondhand awareness of endangered species. Student 7 stated, "Hawksbill sea turtles are critically endangered due to habitat loss," indicating knowledge derived from external sources such as school, books, or documentaries. While both firsthand experiences and secondary knowledge contribute to conservation awareness, the data suggests that students with direct encounters are more likely to express concern and emotional investment in marine preservation.

Overall, this theme reveals a spectrum of conservation awareness, with some students expressing deep concern over species loss, while others demonstrate a general understanding but lack personal engagement.

Theme 3. Economic Awareness of Marine Resources

Marine resources play a vital role in the economic well-being of coastal communities, and students display a strong understanding of their significance. Many participants recognize that fisheries and tourism are essential for sustaining livelihoods and driving local economies.

For example, Student 1 and Student 16 stated, "Fishing provides jobs for thousands of families," emphasizing the direct link between marine biodiversity and community survival. This highlights an awareness of economic dependence on marine resources, particularly in areas where fishing is a primary livelihood. Similarly, Student 5 observed, "Tourism supports businesses such as hotels and restaurants," demonstrating an understanding that marine biodiversity is not only valuable for fishing but also for the hospitality and service industries.

These responses suggest that participants are conscious of the economic importance of marine ecosystems and recognize the need for sustainable resource management. However, there is limited discussion on how overexploitation or environmental changes might impact these economic benefits. While students understand that marine resources contribute to financial stability, fewer responses address the long-term sustainability of these industries.

Theme 4. Differing Views on Sustainability

The students' perceptions of marine resource sustainability are divided, with some believing that marine life is still abundant, while others express concern over depletion and environmental threats.

For example, Student 8 asserted, "Daily fish catches prove marine life is still abundant," indicating a perception of stability and continuity in marine resources. This viewpoint suggests an optimistic perspective, possibly influenced by the current availability of fish in markets and the ongoing productivity of fisheries.

In contrast, Student 14 warned, "Pollution and illegal fishing are causing marine resource depletion," expressing concern over unsustainable practices. This contrasting perspective reflects a growing awareness of environmental degradation and its potential impact on future fish stocks.

The differing opinions on sustainability suggest that some students are more attuned to environmental issues than others. Those who see marine resources as abundant may base their views on short-term observations, whereas students who highlight depletion likely have a broader awareness of ecological and long-term sustainability issues. This division underscores the importance of enhancing education on marine conservation to ensure that awareness extends beyond immediate availability to long-term ecological health.

Theme 5. Recognized Environmental and Human-Induced Threats

The most prevalent concerns among participants relate to human-induced environmental threats, including pollution, climate change, and overfishing. Many students recognized that human activities are negatively impacting marine ecosystems, revealing a significant level of awareness regarding environmental degradation.

For instance, Student 1 and Student 7 stated, "Plastic pollution and oil spills harm marine life," acknowledging the direct impact of pollution on biodiversity. This suggests that students are aware of anthropogenic threats, possibly due to visible environmental changes, media exposure, or community discussions.

Climate change is another recognized threat. Student 3 conveyed, "Rising ocean temperatures cause coral bleaching," indicating an understanding of how global warming affects marine ecosystems. The mention of coral bleaching suggests that some students recognize climate change as a pressing issue, though this awareness is not uniformly expressed among all participants.

Additionally, Student 12 and Student 13 mentioned, "Dynamite fishing is destroying fish habitats," highlighting harmful fishing practices as a major concern. The recognition of destructive fishing methods reveals that some students are informed about unsustainable fishing techniques and their consequences.

These statements collectively indicate a broad awareness of human-induced environmental threats. However, while students acknowledge these issues, there is little discussion on possible solutions or personal responsibility in mitigating these threats. This suggests that while awareness is present, active engagement and advocacy for conservation may still be limited.

Research Question 3: How do participants dream to take part in the sustainability of marine resources?

Sustainability of Marine Resources

Participants demonstrate a diverse range of aspirations and actions for ensuring the sustainability of marine resources. Their perspectives reflect a strong awareness of environmental responsibility, community collaboration, and the need for policy enforcement. The following themes illustrate how participants envision their roles in promoting marine conservation and sustainable practices.

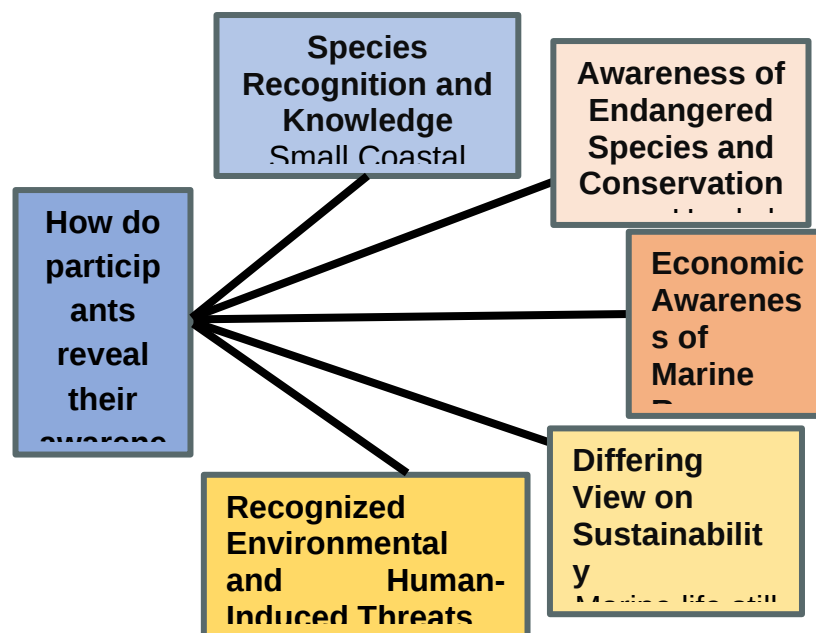


Figure 6: Participants Reveal their Awareness and World View of the Marine Resources

Theme 1. Commitment to Responsible Fishing and Trade Practices

One of the most fundamental ways participants engaged in marine sustainability is through their commitment to responsible fishing and trade practices. Fishermen and traders acknowledge that marine resources are finite, and therefore, they express a willingness to adopt sustainable methods that prevent depletion.

For example, participants emphasized their efforts to use appropriate net sizes to avoid catching juvenile fish, respect seasonal fishing bans, and avoid illegal techniques such as dynamite fishing. These actions indicate an understanding of how unsustainable fishing negatively impacts fish populations, marine biodiversity, and the long-term viability of their livelihoods.

The responses suggest that awareness of sustainable fishing is growing among those directly involved in the industry. However, some participants acknowledge that not all fishermen follow sustainable practices due to economic pressures. Thus, while individuals are committed to responsible fishing and trade, stronger enforcement and incentives may be necessary to ensure compliance on a larger scale.

Theme 2. Education and Community Awareness for Sustainability

Education emerges as a crucial driver of marine sustainability. Many participants, particularly educators and community leaders, highlight the importance of integrating marine conservation into school curricula and public awareness campaigns.

Teachers see education as a means of shaping the attitudes and behaviors of future generations, instilling a sense of environmental responsibility in students. By teaching topics such as marine biodiversity, sustainable fishing practices, and the consequences of illegal fishing, they aim to create a knowledgeable community that values and protects marine resources.

Beyond formal education, participants emphasized the role of community awareness programs, such as training for fishermen, public seminars, and outreach activities. These initiatives help people understand the long-term impact of their actions on the marine ecosystem.

However, participants also note that marine conservation education is still insufficient in many areas. They suggest that schools and organizations should expand their efforts, incorporate hands-on learning experiences, and strengthen collaboration with fishermen and policymakers to create a more effective approach to conservation education.

Theme 3. Active Participation in Conservation Programs

Many participants are already involved in marine conservation efforts and see these activities as a direct way to contribute to sustainability.

Coastal cleanups, mangrove planting, and marine monitoring programs are some of the most mentioned activities. Participants recognize that cleaning shorelines helps reduce pollution, while mangrove planting protects coastal areas from erosion, serves as fish breeding grounds, and enhances biodiversity.

Additionally, some fishermen participate in training programs on sustainable fishing and volunteer for community-based marine resource monitoring. Their involvement reflects a strong commitment to actively preserving the marine ecosystem rather than merely relying on government efforts.

While participation is strong, some participants call for more structured and widespread community-led conservation initiatives. They believe that conservation programs should not be occasional events but should be consistently integrated into the daily practices of fishermen, traders, and consumers.

Theme 4. Strengthening Policies and Law Enforcement

While many participants take personal actions toward marine conservation, others recognize the need for stronger government policies and enforcement to ensure sustainability on a broader scale.

Participants advocate for stricter fishing regulations, the establishment of marine protected areas (MPAs), and better enforcement of existing laws. They highlight that some illegal fishing practices still persist due to weak implementation of regulations and lack of accountability.

For instance, policies such as seasonal fishing bans and restrictions on destructive fishing methods exist, but enforcement remains inconsistent. Some fishermen continue to use fine-mesh nets, cyanide, and dynamite fishing, which degrade marine habitats.

Policymakers in the study express a desire to strengthen conservation laws while also providing alternative livelihoods for affected fishermen. They emphasize that effective policy enforcement requires collaboration between law enforcement, local governments, and community members.

A major challenge raised by participants is ensuring that conservation laws are not just written but actively enforced. Many believe that empowering local communities to report violations and increasing government support for monitoring efforts would be crucial steps in achieving better marine governance.

Theme 5. Collaboration for Collective Action

Participants recognized that marine conservation cannot be achieved by individuals alone. Instead, they emphasized the importance of collaboration between multiple stakeholders, including fishermen, traders, consumers, educators, policymakers, and environmental organizations.

Many believed that sustainability is a shared responsibility and that creating partnerships among different sectors may lead to better marine resource management.

For example, traders discussed how they prioritized purchasing seafood from fishermen who use sustainable fishing methods, while educators work to raise awareness among students and local communities. Meanwhile, government officials focus on crafting and implementing conservation policies.

This theme highlights the need for an integrated approach to marine conservation one where different sectors of society work together

rather than addressing sustainability in isolation. Participants suggested that regular dialogues, joint conservation programs, and increased cooperation between government agencies and community members can enhance marine conservation efforts.

Theme 6. Aspirations for a Sustainable Marine Ecosystem

Participants express a hopeful vision for the future and emphasize the importance of protecting marine resources for future generations. Many participants dream of a future where marine resources remain abundant and communities continue to benefit from sustainable fishing and tourism.

Some expressed concerns that if marine resources are not managed responsibly, food supplies, local economies, and marine biodiversity may be at risk. They highlighted the importance of long-term planning and sustainable practices to ensure that future generations will have access to marine resources.

For example, one participant states, "If people do not take care of marine resources, our food supplies, tourism, and economy will be in danger." This reflects an awareness of the broader implications of marine conservation beyond just environmental concerns participants understand that marine sustainability is deeply tied to economic and social well-being.

Many participants believe that achieving a sustainable marine ecosystem is possible through continued education, policy enforcement, and collaboration. Their responses indicate a strong motivation to act and encourage others to be responsible stewards of the ocean.

Conclusions

The use of photo-elicitation approach, exploring marine resources has proven to be an effective educational tool for science 10 students. This method did not only enhanced students' understanding of marine ecosystems and its importance but also encouraged emotional engagement, critical thinking and personal reflection.

Through visual analysis and guided discussion, students were able to articulate their observations, connect scientific concepts to real life issues and express a greater awareness of marine conservation.

Integrating visual strategies like photo-elicitation into science education can significantly improve student engagement promote environmental literacy, and foster a deeper sense of responsibility toward the protection of marine resources.

Based on the findings of this study, the following recommendations are proposed: Schools may implement field-based and photo-elicitation activities in science classes to help students observe and reflect on marine resources in their local environment. Educators may highlight both ecological and economic values of marine resources by engaging local experts and using interactive materials like infographics, videos, and photo exhibits. Schools and communities may support student-led initiatives such as clean-up drives and youth forums to foster active involvement in sustainable marine resource practices. Future studies may explore other coastal areas or include a wider range of participants to deepen insights into youth perceptions and actions toward marine sustainability.

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Affiliations and Corresponding Information

Friezenith C. Calamay

Kalamansig National High School

Department of Education – Philippines

Christine P. Abo, PhD

Sultan Kudarat State University – Philippines