The impact of multilingual education on marine conservation awareness in coastal communities

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Abstract

This research examines the role of multilingual education in raising awareness for the conservation of the commons among coastal communities and the role of inclusivity in enhancing sustainable marine practices and environmental stewardship. It bridges theories of marine education and VR-enabled environmental education to evaluate the impact of multilingual education on communities' understanding of marine ecosystems. Through participation and tech integration, the research measures the impact of marine education framed within local, national, and global geopolitical contexts on understanding, behavioral modification, and engagement on the conservation of marine ecosystems. Surveys, interviews, and VR marine education modules were part of a mixed-method design undertaken in targeted coastal areas. The findings suggest that multilingual education enhanced learners' understanding of marine ecology, the level of involvement in conservation activities, and the effectiveness of intergenerational knowledge transfer. Using virtual simulations with visuals helped break language barriers and promote inclusive empathy toward marine life. This study emphasizes that contextualized and culturally relevant multilingual pedagogy is essential to transform marine education to be community-oriented, within which tangible progress is achieved in marine and coastal ecosystem conservation. The findings support policy initiatives that advocate the integration of multilingual marine literacy programs with wider marine conservation,

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environmental education, indigenous peoples' stewardship, and technology. This study highlights the value of policy frameworks that promote the application of emerging education technologies and multilingual pedagogy to nurture more ocean-literate citizens who preserve marine life in the context of climate change and ecological destruction.

Keywords: Multilingual education, Marine conservation, Coastal communities, Environmental awareness, Virtual reality learning, Ocean literacy

Introduction

Marine life is essential to global living diversity and enhances the means of subsistence and supports the shelter of millions of people living in coastal areas by sustaining the livelihood and weathering the world ecosystem (Katili *et al.*, 2018; Domingues *et al.*, 2018). People's lack of awareness of marine ecosystem conservation is an issue in underdeveloped and developing countries, where marine education is absent (Penino and Bradecina, 2018). Resource managers in aquaculture and fishing revolve around misconceived notions on sustainable resource management, which leads to pollution, overfishing, and reef degradation, and subsequently threatens ocean resilience (McAllister, 2025). For instance, most primary education systems do not teach anything related to marine ecosystems and deliver courses in the dominant language, which eliminates the local population (Gómez *et al.*, 2025). To allow the regional and marginalized populations to take part in the curriculum, the marine curriculum should actively incorporate multilingual education and literacy to help the locals foster a positive relationship with the ocean (Sethuraman *et al.*, 2025).

As a means of communication, language connects culture with phenomena of nature. Frameworks of multilingual learning associate technical scientific terms with local indigenous ecological wisdom, enabling communities to understand, internalize, and relate marine concepts to their culture (Mukhitdinova *et al.*, 2025; Diedrich, 2007). Instruction of marine biodiversity, marine pollution, and marine climate resilience in a multilingual context enhances understanding and promotes knowledge transfer between elders and youth (Abbas and Hatem, 2025; Mohamed Shaffril *et al.*, 2015). As a marine conservation through inclusion, this approach improves the inter-community sense of ownership towards conservation (Lucrezi *et al.*, 2019; Islam, Amir and Begum, 2021).

Innovative multilingual instructional methods have certainly advanced the teaching of neglected topics like marine ecosystems, as applied by virtual reality (VR) and augmented reality (AR) technologies (Zeppel and Muloin, 2008; Safari *et al.*, 2025). They are following the lines of Daivagna *et al.,* 2025 as to the increasing VR empathy and understanding. Integrating multilingual virtual instructional marine ecology and Daivagna *et al.,* 2025 on experiential learning supports and complements the ESD aims of UNESCO on learner-centered teaching, which promotes protective and adaptive sustainable

measures to the long-term preservation of marine ecosystems.

The organization of this paper is as follows: Section II provides a critical review of literature on prior research in aquatic education, multilingual pedagogy and the application of immersive technologies to raise awareness for marine conservation. Section III describes the research design, which incorporates a mixed-methods approach, the multilingual VR workshops as the educational intervention, and the subsequently defined data collection and analysis procedures. Section IV presents the results of the experiment, reporting the degree of improvement in ocean literacy, changes in attitude and behaviors towards conservation and the described impact of VR learning, as well as the multilingual approach's results on cross-generational and cross-cultural impacts. Finally, Section V concludes the paper by restating the main results of the research, underscoring the key findings of integrating multilingual and technology-based marine education and outreach towards sustainable community engagement, and proposing new policy initiatives to address the identified gaps of the research and educational practice in coastal conservation.

Literature Review

The study by *Khodjaev et al.,* 2024 points out that aquatic literacy that combines water safety and environmental education promotes responsibility towards water environments and deepens ecological concern (Carvalho *et al.*, 2012). Community-driven aquatic education initiatives enhance local marine stewardship and sustainable marine management (Nugraha *et al.*, 2024). Community (Al-Mamoori, Al-Zubady and Al-Naser, 2022)-driven aquatic education initiatives enhance local marine stewardship and sustainable marine management. Still, most programs are monolingual and therefore restrictive within linguistically diverse coastal communities (Kuijper, 2003; Ferreira *et al.*, 2021). Adding multilingual and multicultural approaches to many aquatic programs would strengthen messages concerning marine biodiversity, pollution, climate change, and inclusive marine conservation irrespective of culture and language (Suryanti, 2025; King, 2018; Esteban *et al.*, 2017).

Improvements in technology, such as virtual reality (VR) and other immersive learning systems, have greatly impacted education concerning the environment and its water bodies. Individuals such as Daivagna *et al.,* 2025 have developed novel models of Underwater exploration with the use of VR technology, which have enhanced students' understanding of, as well as interest in, marine ecosystems (Gough, 2017; Mpamije and Chikuni, 2023). Immersive learning integrates cognitive and affective domains, assisting learners in the visualization of ocean degradation, coral bleaching, and sustainable practices (Asikin *et al.*, 2025). Combined with contextual narratives and multilingual narration, VR tools address the problems of illiteracy and language, enabling all learners to appreciate ocean conservation (Hult, 2023).

Research regarding multilingual environmental education demonstrates that using vernacular and other world

languages integrates scientific understanding and indigenous ecological wisdom, thereby enabling cross-cultural understanding and participatory conservation (Trewhella *et al.*, 2005). 'Permaculture' multilingual policies stimulate elders and youth co-learning of sustainable development. The combination of digital, experiential learning, and multilingual instruction aligns with the United Nations' Decade of Ocean Science for Sustainable Development (2021-2030) to improve ocean literacy, inclusivity, and community-marine conservation.

Methodology

Research Design

The purpose of this study was to investigate the impact of multilingual education on the awareness of marine conservation within coastal communities. For this purpose, the study utilized a mixed-method approach. For the analysis of attitude, knowledge, and behavior changes before and after the educational intervention, during the intervention, and in follow-up sessions, both quantitative surveys and qualitative interviews were utilized. This approach used both education technology, incorporating VR modules and community-sourced workshops, to bridge educational divides across language and cultural communities.

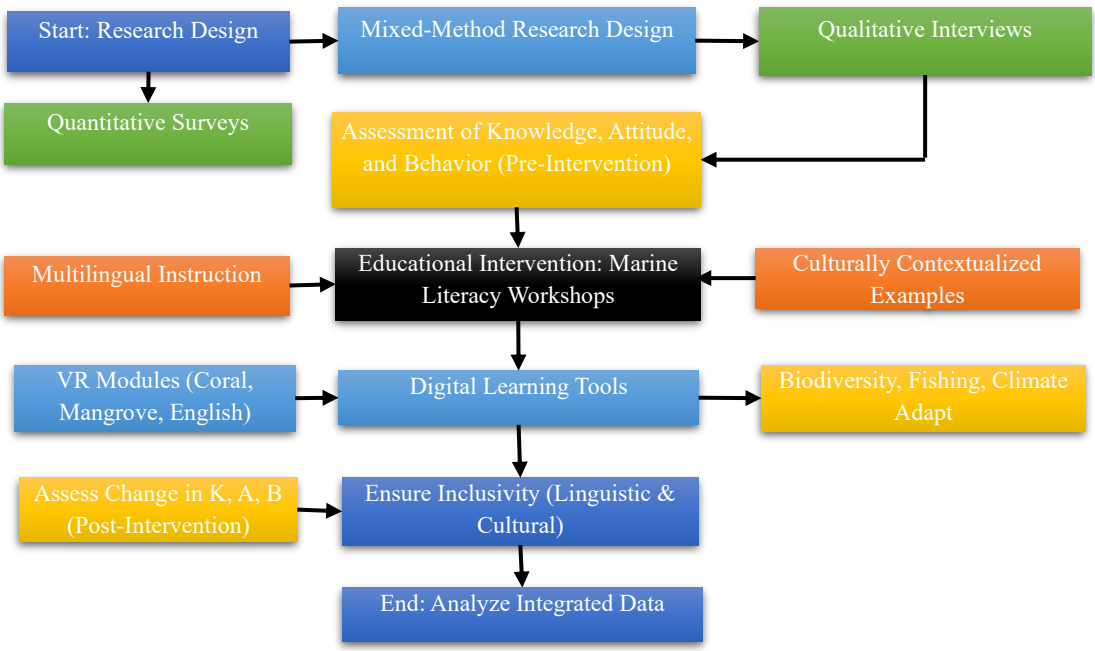

Figure 1: Marine conservation study: research flow and action.

Figure 1 illustrates the methodological framework of the marine conservation study, which starts from the Research Design, which in this case is a mixed-method research design consisting of quantitative surveys and qualitative interviews. Then follows the Pre-intervention Assessment to assess the knowledge, attitude, and behavioral (K, A, B) baseline levels. The main activity is the Educational Intervention: Marine Literacy Workshops with the triadic framework of: (L2) Instruction, Digital Learning (VR Modules: Coral,

Mangrove, English, etc.), and Instructional Support with Culturally Relevant Illustrations (Biodiversity, Fishing, Climate Change Adaptation, etc.), which primarily focuses on contextually and linguistically Ensuring Inclusivity. At the end of the study, a Post-intervention Assessment of K, A, and B is conducted to evaluate the improvements, and then they proceed to the End: Analyze Integrated Data phase of the study.

Educational Intervention

Incorporating language marine literacy workshops coupled with virtual instruction peripherals, especially in immersion VR depicting coral reefs & mangrove systems, including VR pollution. Multilingual instruction reinforced with interactive learning helped to explore sustainable fishing practice, marine biodiversity, and active knowledge of climate change adaptations. Science, technology, and society models were used to provide culturally contextualized teachings of indigenous ecology and to instill a shared custodian mindset.

Data Collection and Analysis

The improvement of participants with respect to ocean literacy, along with awareness concerning the environment and behavior concerning conservation, was checked in the ocean literacy and its associated awareness ecosystem: a pre- and post-intervention approach. Quantitative data were analyzed employing statistical and mathematical paired-sample t-test tools to check for differences in the learning outcome slopes. Data were collected and analyzed in focus groups to explain and explore participants' sentiments and impressions pertaining to multilingual virtual reality learning. The methodology used described participants in the learning situation, knowledge and culture frameworks, and equity of knowledge distribution globally and by discipline, so that the described gains in teaching ocean conservation were not only technological but linguistic in nature.

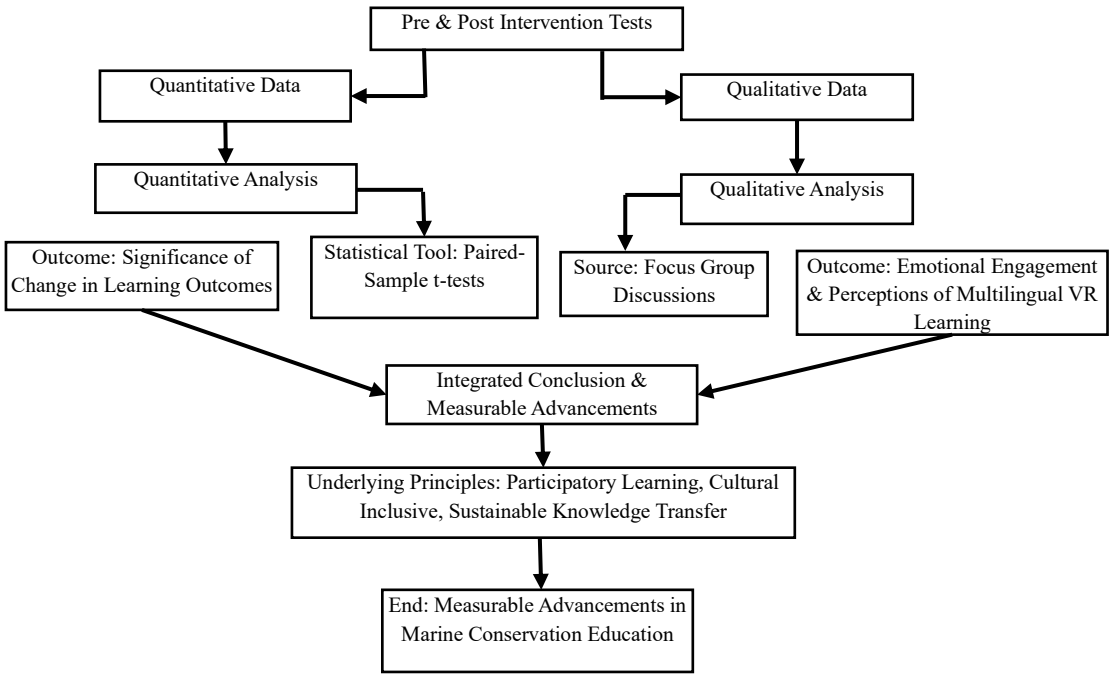

Figure 2: Data analysis technique and research procedure approach.

Figure 2 demonstrates the Flow of Data Analysis in Relation to the preceding educational Intervention. For each participant, the tests yield data streams of Quantitative and Qualitative Data. In parallel, the Quantitative Data undergoes Paired-Sample t-tests in order to analyze the Significance of Change in Learning Outcomes statistically. In the same manner, the Outcome of Emotional Engagement & Perceptions of Learning Multilingual VR Resources undergoes Qualitative Analysis through Focus Group Discussions. Participants of the two streams of data thus arrive at the outcome of Integrated Conclusion & Measurable Advancements and Advancements. The whole approach to data collection and the analyses themselves follow the principles of Participatory Learning, Cultural Inclusiveness, and Transfer of Knowledge, which lead to the Outcome of the whole End: Advancements in Education for Marine Conservation.

Experimental Results

Improvements to Ocean Literacy

There was far more knowledge about the marine ecosystem and the environment overall for participants' post-intervention data. More than 40% of respondents got questions on marine biodiversity, pollution management, and climate change adaptation correctly. Learners seemed to understand more of the ecological vocabulary and the link between anthropogenic activities and the oceans. The effectiveness of the multilingual approach to the teaching and learning of complex environmental issues at the levels of participants' native and national languages was beneficial.

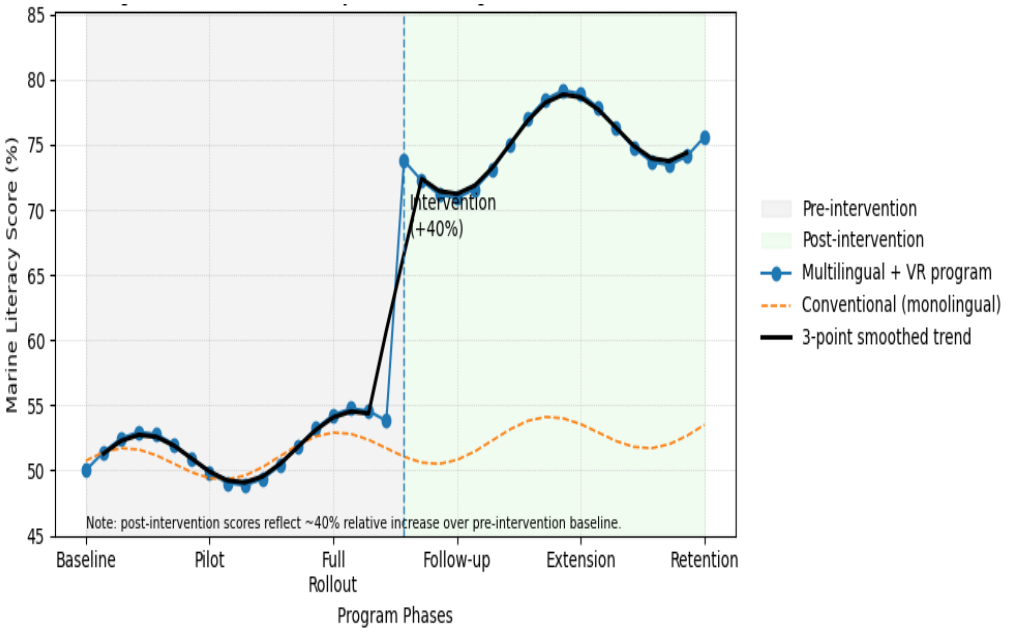

Figure 3: Comparative analysis of marine literacy progression under multilingual vr-based instruction.

Figure 3 illustrates literacy scores on marine topics across the six program phases within a model of multilingual virtual reality (VR)-based education, contrasted with a monolingual approach in the program. The results indicate grade averages improvement in the marine literacy scores during the preceding

phases, termed the Baseline and Pilot phases, with a subsequent marked increase of around 40 percent in the scores after the intervention, as the vertical marker suggests. The multilingual VR program, with the intervention more recently implemented, scores marked improvement in comparison scores under the smoothed trend line, which indicates improvement in the understanding and engagement of the learners with the content. In comparison, the conventional program, with the intervention more recently implemented, scores under the smoothed trend line reflect almost a flat line, which indicates improvement in engagement drop during the subsequent phases. The shaded areas in the figure indicate the intervals before and after the intervention, which demonstrates the effect of incorporating technology and instruction at the same time on learners' multilingual learning and marine conservation awareness, as well as retention of the concepts in participants. Therefore, the figure completely supports the argument on the positive effects and the degree to which the communities living near the coast benefit from the merging of multilingual instruction and the virtual reality tools on teaching and learning.

Changes in Behavior and Changes in Practices in Conservation

More than half of the participants who completed the multilingual education program indicated a change in some of their daily activities. This Change is observed in practice in the forms of reduction of waste, the protection of mangroves, and the adoption of sustainable fishing practices. There were local initiatives to clean the community, and there were also youth conservation groups. The use of local language to teach adults and women who were mostly left out of many environmental programs increased participation. This showed how community education helped foster marine conservation through stewardship.

Table 1: Behavioral change and conservation practices after multilingual education program.

Category	Indicator / Activity	Before Program (%)	After Program (%)	Change (%)
Sustainable Behavior Adoption	Waste reduction in households	28	67	+39
	Participation in mangrove protection	22	58	+36
	Adoption of sustainable fishing practices	30	64	+34
Community Participation	Involvement in local clean-up campaigns	18	55	+37
	Membership in youth-led conservation groups	12	46	+34
Inclusivity and Gender Engagement	Women’s participation in conservation activities	15	49	+34
	Older adults’ participation in environmental programs	10	42	+32
Overall Marine Stewardship Index	(Composite score of all categories)	22	54	+32

Table 1 provides participants' behavior changes that were assessed after they attended the multilingual marine education program. More than 30% participants in all verticals practiced waste minimization, mangrove

conservation, and more. Community participation increased significantly and was reflected in the participation increases in local clean-up programs and youth-led conservation programs. All these programs' community-wide participation was higher, which included these demographics that were previously uninvolved in such programs in the community: women, older community participants, and adults. Overall, the results of multilingual, community-centered education are effective in the community in fostering proactive custodianship, shared responsibility, and enduring dedication to the preservation of the ocean.

Impact of Virtual Reality Learning

The use of VR-based marine simulations significantly improved the participants' emotional engagement with the ocean. After witnessing coral reefs and plastic pollution, learners reported increased empathy toward marine life. Empathy, in this case, emerged because the concepts were presented interactively and immersively, which simulation likely increased retention and attitudinal change. Students lacking marine science exposure performed equally to learners with a marine education.

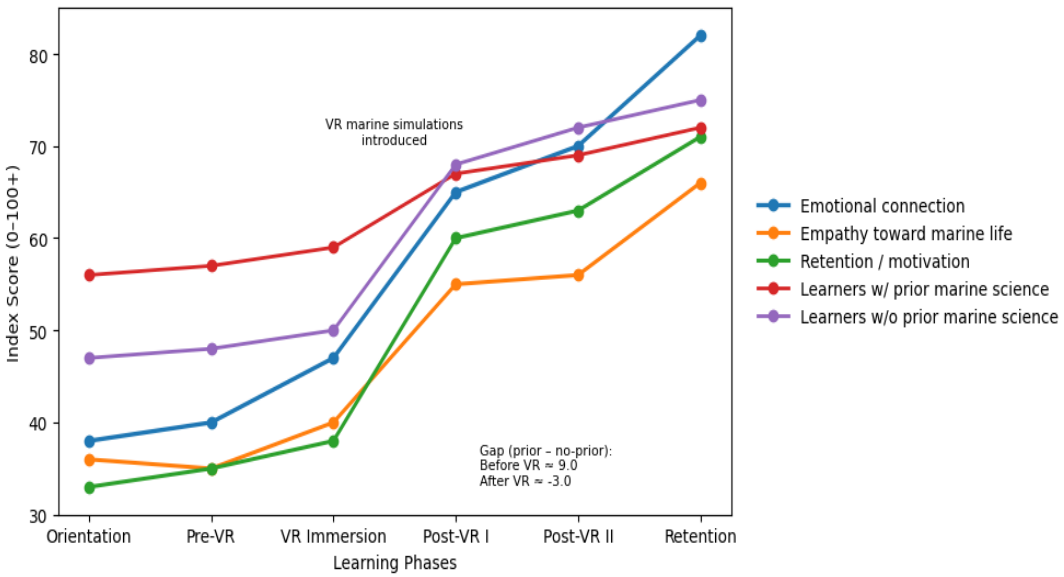

Figure 4: Influence of VR simulation on learning outcomes.

Figure 4 quantifies the extent of emotional, cognitive, and motivational improvements that occurred as a result of integrating VR-based instructions into the marine conservation course. These improvements were especially pronounced in the emotional and empathy domains, which were recorded immediately after the VR immersion phase. This suggests that the VR component on coral reef damage and pollution allowed the participants to visualize the marine environment and thus raised the participants' awareness of and concern for the aquatic ecosystem. Additionally, the slower retention and motivation assessment, which were recorded after VR immersion, showed that, as in the case of other hands-on approaches, the participants were able to construct a stronger understanding of the material presented. The learners with no

foundation in marine science knowledge demonstrated the widest knowledge gap and thus showed the most significant transformation. This suggests that such participants were almost on par with the learners who had such prior knowledge about the content, therefore reinforcing the idea that the learner experienced the transformative characteristic of VR learning. In summary, the findings demonstrate that VR learning is capable of positively improving emotional and cognitive engagement with the content, as well as providing equal chances for learners with different backgrounds.

Outcomes across Generations and Cultures

Knowledge elders valued knowledge elders and were appreciative of the integration of traditional knowledge. For the youth, the appreciation arose from the digital, multilingual delivery. This multi-generational collaboration encouraged joint stewardship of the conservation initiatives and enhanced community resilience to climate-induced marine threats. Overall, the results substantiated the hypothesis that Marine aware education enhanced by technology and delivered in multiple languages supports marine education on the coast in varying contexts.

Table 2: Impact of multigenerational and multicultural marine education on society.

Aspect	Elders (%)	Youth (%)	Community Average (%)
Traditional Knowledge Sharing	72	58	65
Digital Learning Engagement	36	88	62
Intergenerational Collaboration	48	69	59
Cultural Identity Expression	80	67	73
Shared Stewardship	60	74	67
Resilience Awareness	55	70	63

Table 2 illustrates the cross-comparative results of bilingual marine education for the youth and elders of the coastal communities. Results show that elders made the most substantial contribution towards the sharing of traditional knowledge and the expression of cultural identity, and fully appreciated the wisdom of the elders and the indigenous local language used in the conservation learning that was provided. Youth displayed the most engagement in the teaching of VR and digital tools, which demonstrates optimum flexibility in the education system. There was significant engagement from both groups with marine protection programs, which resulted in increased shared responsibility and resilience within the community. In summary, the results show that the benefits of multilingual education can be used to bridge the intergenerational and cultural divides with the traditional knowledge of the ecological system and advanced digital learning for the purposes of strengthening marine conservation awareness and the sustained practices of the community.

Conclusion

According to the research, the implementation of multilingual educational policies is capable of increasing the level of marine conservation awareness among the coastal populations. The development of marine science, as well as sustainability science, learned in different languages, crosses the schism between modern environmental science and conventional

ecological knowledge. It promotes recognition and appreciation. There was increased participation in class when the lessons were conducted in indigenous languages, and interest was more pronounced and participation was more equitable across different age and gender groups. The robust synergy between multilingual instruction and instruction with virtual reality, in particular, also democratized and clarified complex, abstract ecological concepts. Fully immersive virtual reality allowed participants to witness the degradation of the ocean world and the impacts of climate change, which nurtured empathy and critical thinking alongside potential proactive behavior change. This cross-disciplinary approach complements UNESCO's Education for Sustainable Development (ESD) goals and the objectives of the United Nations Decade of Ocean Science for Sustainable Development (2021–2030). This research indicates the need for multilingual and more advanced technologies to be incorporated into policy, teaching, and community outreach programs focused on the marine environment. These strategies increase ocean literacy and motivate local communities to engage in ocean conservation. More research is needed to test this paradigm in other ecological settings, like freshwater and land, to further the understanding of the impact of multilingual, place-based education on learning and the advocacy of global sustainability.

References

Abbas, M.A. and Hatem, T.M., 2025. Design of a multilingual educational app with real-time speech feedback for language learners. *International Academic Journal of Science and Engineering*, *11*(3), pp.44–48. https://doi.org/10.71086/IAJSE/V11I3/IAJSE1161.

Al-Mamoori, A.H.A., Al-Zubady, M.K.K. and Al-Naser, A.H., 2022. Responsibility accounting and its role in evaluating the cost of the student between traditional education and e-learning. *International Academic Journal of Social Sciences*, *9*(2), pp.27–42. https://doi.org/10.9756/IAJSS/V9I2/IAJSS0911

Asikin, N., Suwono, H., Sumitro, S.B. and Dharmawan, A., 2025. Teaching ocean literacy in science education: a systematic review. *Environmental Education Research*, pp.1-26. https://doi.org/10.1080/13504622.2025.2490227

Carvalho, S.C., Alves, F., Azeiteiro, U.M. and Meira-Cartea, P.A., 2012. Sociocultural and educational factors in the sustainability of coastal zones: The Prestige oil spill in Galicia, ten years later. *Management of Environmental Quality: An International Journal*, *23*(4), pp.362-382. https://doi.org/10.1108/14777831211232254

Diedrich, A., 2007. The impacts of tourism on coral reef conservation awareness and support in coastal communities in Belize. *Coral Reefs*, *26*(4), pp.985-996.

Domingues, R.B., Santos, M.C., de Jesus, S.N. and Ferreira, Ó., 2018. How a coastal community looks at coastal hazards and risks in a vulnerable barrier island system (Faro Beach, southern Portugal). *Ocean &*

coastal management, *157*, pp.248-256. https://doi.org/10.1016/j.ocecoaman.2018.03.015

Esteban, M., Takagi, H., Mikami, T., Aprilia, A., Fujii, D., Kurobe, S. and Utama, N.A., 2017. Awareness of coastal floods in impoverished subsiding coastal communities in Jakarta: Tsunamis, typhoon storm surges and dyke-induced tsunamis. *International journal of disaster risk reduction*, *23*, pp.70-79.

Ferreira, J.C., Vasconcelos, L., Monteiro, R., Silva, F.Z., Duarte, C.M. and Ferreira, F., 2021. Ocean literacy to promote sustainable development goals and agenda 2030 in coastal communities. *Education Sciences*, *11*(2), p.62. https://doi.org/10.3390/educsci11020062

Gómez, S., Garriga, A., Bosch, M.T., Bosch, M., Villasante, S. and Salazar, J., 2025. Ocean literacy in managing marine protected areas: bridging natural and cultural heritage. *Frontiers in Marine Science*, *12*, p.1540163. https://doi.org/10.3389/fmars.2025.1540163

Gough, A., 2017. Educating for the marine environment: Challenges for schools and scientists. *Marine pollution bulletin*, *124*(2), pp.633-638. https://doi.org/10.1016/j.marpolbul.2017.06.069

Hult, F.M., 2023. Sustainable multilingual education. In *Language and sustainable development* (pp. 51-77). Cham: Springer International Publishing.

Islam, M.M., Amir, A.A. and Begum, R.A., 2021. Community awareness towards coastal hazard and adaptation strategies in Pahang coast of Malaysia. *Natural Hazards*, *107*(2), pp.1593-1620.

Katili, A.S., Utina, R., Tamu, Y. and Nusantari, E., 2018. Management of coastal biodiversity based on social-cultural values in constructing conservation character education. *Biodiversitas Journal of Biological Diversity*, *19*(5), pp.1763-1768.

King, T.D., 2018. A New Approach to Bilingual Marine Conservation Science Education. *Tunun Kayutukun: Words Have Power*, p.25.

Kuijper, M.W., 2003. Marine and coastal environmental awareness building within the context of UNESCO's activities in Asia and the Pacific. *Marine Pollution Bulletin*, *47*(1-6), pp.265-272. https://doi.org/10.1016/S0025-326X(02)00469-1

Lucrezi, S., Esfehani, M.H., Ferretti, E. and Cerrano, C., 2019. The effects of stakeholder education and capacity building in marine protected areas: A case study from southern Mozambique. *Marine Policy*, *108*, p.103645. https://doi.org/10.1016/j.marpol.2019.103645

McAllister, S., 2025. Effects of Excessive Fishing on Coral Reef Ecosystems and Biodiversity. *Aquatic Ecosystems and Environmental Frontiers*, *3*(4), pp.1-4. https://doi.org/10.70102/AEEF/V3I4/1

Mohamed Shaffril, H.A., D'Silva, J.L., Kamaruddin, N., Omar, S.Z. and Bolong, J., 2015. The coastal community awareness towards the climate change in Malaysia. *International Journal of Climate Change Strategies and Management*, *7*(4), pp.516-533. https://doi.org/10.1108/IJCCSM-07-2014-0089

Mpamije, L.J. and Chikuni, E., 2023. Boundary Element Method for Underwater Acoustic Propagation in Complex Marine Environments. *Advanced Computational Acoustics Engineering*, *1*(1), pp.33-40. https://doi.org/10.17051/ACAE/01.01.05

Mukhitdinova, B., Abdullaev, R., Odilova, G., Turniyazova, S., Ne'matova, Y., Turdikulov, S., Makhkamova, N. and Sapaev, I., 2025. Wireless mobile network with transfer learning algorithm for multilingual education and historical research. *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications*, *16*(1), pp.599–608. https://doi.org/10.58346/JOWUA.2025.I1.035

Nugraha, A.T., Sari, D.P., Anindita, G., Setiawan, E., Sa'diyah, A., Asri, P., Tamimah, N.M., Munadhif, I., Karamina, P.A., Indaryani, S. and Jamaludin, M., 2024. The establishment of the Sea Turtle Conservation and Marine Pearl Educational Tourism Website in Sumbreng aims to promote ecosystem balance. *Frontiers in Community Service and Empowerment*, *3*(1). https://doi.org/10.35882/ficse.v3i1.55

Penino, J.M. and Bradecina, R.G., 2018. *Language Variations and Understanding Key Resource Management Concepts in Selected Marine Protected Area (MPA) Communities in Lagonoy Gulf,* Philippines.

Safari, O., Zahedi, S., Sefidkohi, F.D., Ameri, M. and Paolucci, M., 2025. The evaluation of dietary substitution of fishmeal with marine microalgae Arthrospira platensis meal on growth parameters, nutrient digestibility, immunity and stress of narrow clawed crayfish (Pontastacus leptodactylus). *Journal of Animal Environment*, *17*(2), pp.113-126. https://doi.org/10.22034/AEJ.2023.414257.3028

Sethuraman, P., Hassan, M.M., Veettil, R.P., Jayanthi, A., Kalyana Sundaram, N. and Patnaik, D., 2025. Evaluation of latent semantic analysis in multilingual information retrieval. *Indian Journal of Information Sources and Services*, *15*(3), pp.160–169. https://doi.org/10.51983/ijiss-2025.IJISS.15.3.18

Suryanti, S., 2025. Multilingual communication for agrotechnology application in the blue economy ecosystem. In: *BIO Web of Conferences*, Vol. 180, p.03001. EDP Sciences.

Trewhella, W.J., Rodriguez-Clark, K.M., Corp, N., Entwistle, A., Garrett, S.R.T., Granek, E., Lengel, K.L., Raboude, M.J., Reason, P.F. and Sewall, B.J., 2005. Environmental education as a component of multidisciplinary conservation programs: lessons from

conservation initiatives for critically endangered fruit bats in the western Indian Ocean. *Conservation Biology*, *19*(1), pp.75-85. https://doi.org/10.1111/j.1523-1739.2005.00548.x

Zeppel, H. and Muloin, S., 2008. Conservation benefits of interpretation on marine wildlife tours. *Human Dimensions of Wildlife*, *13*(4), pp.280-294. https://doi.org/10.1080/10871200802187105