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Ocean Literacy Competency : What Competencies Do Students Need Regarding Alignments with the Sea?

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Abstract: This study aims to map the ocean literacy competency needs through a competency needs assessment. The method used in this research is a survey. This research involved 116 respondents, namely junior high school teachers in the Riau Archipelago Province. The instrument used is an assessment of ocean literacy competency needs developed by researchers based on the results of a synthesis of several studies and the Blue Curriculum documentary by UNESCO. Data analysis technique used descriptive statistical analysis. Based on the research results, it was found that the average of the four ocean literacy competencies (building social-emotional; action for collective welfare; promoting sustainable development; and respecting each other), the teacher stated that they agreed if these competencies were infused in the subjects so that the achievement of ocean literacy could be achieved. This research is also an early stage in curriculum development, namely mapping competency requirements to be developed later in the next step. These competencies also can be integrated or infused into various subject competencies as curriculum and instruction innovation. Later, from the integration or infusion competencies, teachers can support students to have sympathy, awareness, caring, and responsible for the ocean and marine resources.

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Introduction

Indonesia's territorial characteristics consisting of islands and seas that stretch, and Indonesia's history as a trading area by the sea, make Indonesia worthy of being the world's maritime axis. Indonesia as The world's maritime axis was declared at the ASEAN Summit meeting in 2014 as Indonesia's goal to mobilize Indonesia's maritime power in building prosperity and glory. Education is one of the strategies needed to support a maritime country's ideals (Sulistiyono, 2016). The socialization and acculturation of maritime values and marine empowerment are contained in learning to form individuals with maritime insights.

The integration between maritime and marine in education has been driven globally through ocean literacy. This ocean literacy started in the early 2000s in the United States with a background of increasingly distant marine and maritime insights from the curriculum and school learning. This results in minimal knowledge and attitudes regarding empowering and using the sea for life. Integration of ocean literacy in education has been carried out in several island countries, such as Taiwan, Japan, Canada, and countries bordering the Mediterranean Sea, such as France and Croatia (Guest et al., 2015; Koulouri et al., 2022; Mokos et al. al., 2021; Tsao et al., 2018). Based on some research, the forms of ocean literacy integrated into curricula and learning in these countries include knowledge, skills, behaviors, attitudes, and

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values related to empowering the sea, managing marine potential, and protecting the ocean and its resources. in it, social and cultural acculturation and being critical of sea management and conditions. Several countries have regulated specific policies requiring that ocean literacy be instilled in curriculum development at every level of education (Lee et al., 2018; Lin et al., 2020).

So far, the integration of maritime affairs into curriculum and education has been driven since 2006 through the publication of the book *Pesisir dan Laut Kita* for K-12 as a reference for the 2006 curriculum and continued in 2013 by publishing the book *Pesisir dan Laut Kita* for K-6 by LIPI. The Ministry of Education and Culture, LIPI, KKP, and the Coordinating Ministry for Maritime Affairs are also working together to develop a National Maritime Curriculum which has begun to be targeted and socialized to selected schools from each province, especially coastal schools (LIPI, 2016). Then in 2020, the Ministry of Education and Culture issued a guidance document on developing maritime curriculum and implementation modules for the PAUD level (Kemendikbudristek, 2020).

However, the 2020-2024 Ministry of Maritime Affairs and Fisheries RPJMN document still states that ocean literacy in Indonesia needs to be improved (Ministry of Maritime Affairs and Fisheries, 2020). Teachers' understanding and mastery of maritime issues are still relatively low (Amelia & Erlina, 2017; Farchan & Muhtadi, 2019; PSKP-Kemendikbud, 2018). The concept of marine insight still needs to be commonly understood by educators and students in Indonesia. Also, the research results of Guest et al. (2015) showed that students' understanding of marine science concepts is still low. Even so, the study results also showed that students were optimistic and interested in studying the maritime field contained in their subjects.

A development study conducted by Prastianto et al. (2022) states that the main problem in not developing a marine-based curriculum is the lack of marine content or issues in the school curriculum. It was then coupled with the teacher's lack of maximum *linking and bridging* between maritime contexts on the subjects being taught (Ahmad, 2017). The conception is that ocean literacy is still focused on topics related to science and geography. At the same time, ocean literacy can flexibly be integrated or infused into multidisciplinary sciences and educational programs in schools. It remains only for the teacher to map maritime competencies and content according to the subjects taught.

Ocean literacy competency is an achievement dimension of mastered skills related to insight into the connection between humans and the sea. Ocean literacy competence is developed from seven principles of ocean literacy: (1) *The Earth has one big ocean with many features;* (2) *The ocean and life in the ocean shape the features of the Earth*; (3) *The ocean is a major influence on weather and climate*; (4) *The ocean made the Earth habitable;* (5) *The ocean supports a great diversity of life and ecosystems*; (6) *The ocean and humans are inextricably interconnected*; and (7) *The ocean is largely unexplored* (Fauville, 2018; Santoro et al., 2017). Ocean literacy competence continues to develop because the connection between humans and the ocean is growing, such as the blue economy, changes in people's socio-cultural values, human concerns and anxieties about marine sustainability, etc. Therefore, more than ocean literacy competence is required with the scope of knowledge. McKinley et al. (2023) conducted research related to the development of ocean literacy competencies, covering ten dimensions, namely knowledge, communication, attitude, awareness, behavior, activity, emotional connection, experience, trust and transparency, and the ability to provide advice in a variety of knowledge, values, and beliefs.

With the same scope, UNESCO in 2022 issued a manual for curriculum developers and policymakers regarding the competency dimensions of ocean literacy (Santoro et al.,

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2022). These dimensions are knowledge, skills, attitudes, values that aim to build responsible, critical, and caring behavior toward the marine environment. The competency dimensions are also grouped into four achievement approaches: knowledge-based, nature activity-based, social-emotional-based, and competency-performance-based. Each approach category can be developed and adapted according to environmental conditions and needs. And then, curriculum developers and teachers compile each indicator of ocean literacy competence in the form of new subjects, infuse or integrate them with existing subjects, or create other educational programs.

Based on the research survey results, this preliminary research conducted unstructured and limited interviews with 10 Indonesian teachers at the junior high school level. Based on the interview results, teachers said they rarely associated maritime content in their subjects because this was not stated in the textbooks. There was no reinforcement regarding the necessity to bring maritime content into learning. Then, this research continued to collect the need of ocean competency. However, based on the results of a survey of 116 Indonesian language teachers at junior high schools in the Riau Archipelago Province, they stated that they agreed and needed to integrate ocean literacy into Indonesian language learning.

This research aims to map the need for ocean literacy competencies infused into the Indonesian language micro curriculum at the junior high school level. Furthermore, these competencies can be integrated or infused into the organization of materials and learning activities to develop and improve ocean literacy. Assessment of ocean literacy competency needs is still rarely carried out in Indonesia. However, a needs assessment for curriculum design that focuses on mapping local maritime content has been carried out by Farchan & Muhtadi (2019). For this reason, the authors are interested in measuring the assessment of ocean literacy competency needs. This ocean literacy competency consists of four aspects on research synthesis and blue curriculum framework UNESCO (McKinley et al., 2023; McKinley & Burdon, 2020; Santoro et al., 2022): developing socio-emotional, acting for collective welfare, promoting sustainable development, and respecting each other. The four competencies are then created for each indicator and statement item as sub-indicators to achieve competence.

Research Method

The method used in this research is a survey. The instrument used is an assessment of ocean literacy competency needs developed by researchers based on the results of a synthesis of several studies and the *Blue Curriculum document* by UNESCO (Ashley et al., 2019; Mogias et al., 2019; Santoro et al., 2017; Stoll-Kleemann, 2019; Tsai & Chang, 2018). Furthermore, the instrument has passed the validation, reliability, and readability test to measure the instrument's feasibility. The total needs assessment statements amount to 26 statements divided into four scopes of ocean literacy competence. The four scopes of ocean literacy competence consisted of developing students' social-emotional competence towards the sea, acting for the collective welfare of the maritime environment, promoting sustainable development from the maritime side, and respecting each other from an ocean literacy perspective. Statements are designed as a Likert scale of 1 – 4 to measure the level of approval of competencies that students must achieve. Then the research data were analyzed with descriptive statistics.

The respondents of this study were Indonesian language teachers in the Riau Archipelago Province. The sample for this study used the Slovin sampling technique with consideration of the total number of teachers who joined the Indonesian language teacher community in each region. So that, the total number of research respondents were 116

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becoming research respondents, covering the areas of Batam City, Tanjungpinang City, Bintan Regency, and Karimun Regency. The data collection technique was carried out by survey using Google Forms and then processed with descriptive statistics to explain the percentage of ocean literacy competency assessment requirements infused into the Indonesian micro curriculum.

Table 1. Likert Scale

Score	Categories
1	Strongly Disagree
2	Disagree
3	Agree
4	Strongly agree

Results and Discussion

Ocean literacy is an understanding of the sea's influence on humans and humans' influence on the sea (Fauville, 2018; Santoro et al., 2017). Ocean literacy has developed in scope, mastering knowledge and the ability to change behavior, and attitudes, improve skills, and care for the oceans (McKinley et al., 2023; McKinley & Burdon, 2020). These scopes of capabilities are referred to as ocean literacy competencies, which are based on the seven principles of ocean literacy. Teachers must encourage students to be sensitive and critical of maritime topics. This competency covers students' social-emotional competence, acting for collective welfare, promotion of sustainable development, and respect.

Table 2. Origin of Teachers

County town	Percentage
Tanjung Pinang City	34%
Batam city	33%
Bintan Regency	25%
Karimun Regency	9%

1) The Need for Achievement of Ocean literacy Competency

In 2021, UNESCO declared *the Decade of Ocean Science for Sustainable Development* (2021 – 2030) as an effort to support and gather stakeholders worldwide to improve and maintain ocean conditions for life in the present and the future as a sustainable development goal. Of course, schools can take action as *stakeholders* to create and build learning systems that favor the environment, oceans, and sustainable development. Integrating maritime topics in learning can be an alternative to developing pro-environmental and student-friendly learning.

Ocean literacy is defined as an understanding of the influence of human actions on the oceans and the influence of the oceans on humans. Ocean literacy is not only a movement to increase public awareness of the oceans but as an approach to encourage accountability and behavior in favor of protecting, empowering, and critical of the oceans and their resources (Fielding et al., 2019). For this reason, in addition to the mastery assessment of the oceans and maritime potential, an ocean literacy achievement *framework was developed based on changing behavior and knowledge simultaneously* (McKinley et al., 2023; McKinley & Burdon, 2020; Santoro et al., 2022). The competency achievement *framework* is also aligned with global human competencies for sustainable development initiated by the OECD. The four competencies are examining local, global, and intercultural problems or issues; understanding and appreciating various perspectives and views; engaging openly and building connectedness across cultures; and acting for the collective practice of global well-

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being and sustainable development (Piacentini et al., 2018). These competencies are interrelated in knowledge, values, attitudes, behavior, and skills.

The framework is then used by the author in developing an assessment of ocean literacy needs. The processing results of assessing student competency needs for ocean literacy are described in Table 3. Table 3 describes the average need for the four competencies and the standard deviation, representing the data distribution from sample respondents for each statement of competency needs. The average results show that the teacher agrees that these four ocean literacy competencies are integrated into the subject matter so that ocean literacy is close to student learning.

Table 3. Elements of Ocean Literacy Competence

Competence	N	Mean	std. Dev
Development of social-emotional competence of students towards the sea.	116	3.21	0.56
Act for collective well-being	116	3.16	0.50
Promote sustainable development.	116	3.23	0.51
Be respectful of each other	116	3.16	0.54

2) Social-Emotional Competence of Students Against the Sea

Social-emotional competence is an individual's ability to understand and manage emotions, develop positive relationships with others, and make appropriate and responsible decisions in various social situations. This emotional-social ability is also related to communicating well, empathizing, and cooperating with others (Arifin, 2023). This social-emotional competence includes self-awareness, self-management, and responsibility for the actions taken. This social-emotional ability is also related to a child's ability to interact positively with others, communicate feelings positively, and behave responsibly (Innis, 2014).

Social-emotional abilities in ocean literacy concluded that social-emotional skills include building communication, acting, self-confidence, making decisions, and self-evaluating actions and behavior towards the sea and coastal environment. Competence to support social-emotional is also aligned with the ability to interact positively and behave responsibly to socialize through ocean literacy. Table 4 describes the average need for competency indicators for achieving social-emotional competence of students towards the sea and the distribution for each indicator in the 0.53 – 0.58. The following is the percentage of the need for indicators of achieving students' social-emotional competence towards the sea.

Table 4. The Need for Socio-Emotional Competence for the Sea

Competence	Indicator	N	Mean	std. Dev
Development of social-emotional competence of students toward the sea	Understand your role in marine sustainability, as yourself, community, or professional	116	3.28	0.53
	Act as a responsible agent of change in schools, homes, and communities	116	3.19	0.56
	Reflecting the socio-cultural values of local communities in coastal areas related to marine life.	116	3.16	0.58

3) Competency Acting for the Collective Welfare of the Maritime Environment

Acting for collective welfare in sustainable development is one of the global competencies put forward by the OECD (2017, 2018). This action for collective welfare relates to the actions and reflections of human activities directly related to the environment.

The environment also directly relates to the sustainability and well-being of the global community (Yale-University, 2022) because environmental changes will directly affect individuals' perspectives, mental and social health, economic life, and emotions. Collaboration is needed to achieve competence to act for collective welfare. Ardoins et al. (2022) explained that environmental literacy based on collective welfare is a dynamic and synergistic process between groups of individuals to produce ideas, values, behaviors, and social and environmental activities.

Concerning action for collective welfare in the marine environment, this competency includes indicators of understanding the concept of marine sustainability in discussions, collecting information, and respecting the perspectives of local coastal communities regarding actions to protect and use the sea. The purpose of this competency is that students can consider and manage information to think critically, responsibly, and reflectively about actions or behaviors that are carried out related to the marine environment. This competence is described in Table 5, with the average range of needs being 3.14 – 3.19. The teacher agrees that the three indicators are essential for achieving competence to act for collective welfare through learning. This competency also aligns with the OECD's idea that competent humans can manage information, act reflectively, and collaborate to create a peaceful, inclusive, and pro-environmental (OECD, 2017).

Table 5 Competency Needs for Acting for Collective Welfare Maritime Environment

Competence	Indicator	N	Mean	std. Dev
Act for collective well-being	Understand the importance of the concept of ocean sustainability in democratic and collaborative discussions	116	3.19	0.47
	Gathering information achieves good habits and actions for sustainable life at sea	116	3.14	0.49
	Respect the viewpoints and actions of local communities as a form of marine protection and utilization	116	3.16	0.54

4) Competency Promoting Sustainable Development

Education has a crucial and important role in building and transferring new knowledge and values regarding developing competencies relevant to life's dynamic needs and challenges (Mora et al., 2020). One of the goals of the strategy of integrating sustainable development and environmental literacy into curriculum and learning is to shape and develop students' abilities to be able to manage knowledge, values, attitudes, and skills in the promotion of life and sustainable development (Ali, 2017; Ferreira et al . , 2021; Mochtar et al., 2014).

Kelly et al. (2022) state that education is one of the keys to growing and developing ocean literacy in line with the goals of education for sustainable development. Ocean literacy is not only a mastery of the seas and oceans but a way to promote other interrelated and integrated indicators of sustainable development goals (Ferreira et al., 2021; Santoro et al., 2022). In order to achieve and improve this promotional ability, students must understand concepts related to sustainable development related to the marine and coastal environment and the crucial role of the sea in the stability of life.

Compared to other ocean literacy competencies in Table 3, the need for competencies to promote sustainable development through ocean literacy is higher. From the survey results in Table 6, the average teacher agrees in the range 3.26 – 3.21 that through indicators of

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understanding concepts and vocabulary related to the sustainability of marine ecosystems as well as an understanding of the sea, which is crucial for the community must be fulfilled to achieve competence in promoting sustainable development.

Table 6. Competency Needs Promoting Sustainable Development

Competence	Indicator	N	Mean	std. Dev
Promote sustainable development	Understand the vocabulary concepts of fish stocks, biotechnology, renewable energy, coastal empowerment, or other ideas related to the sustainability of marine ecosystems	116	3.21	0.49
	Understanding how the sea is very crucial to human life, especially local communities and indigenous peoples who depend on marine resources	116	3.26	0.53

5) Competency of Mutual Respect

Management of resources from the environment must be community-based (Saiful & Ruban, 2021). The target of meeting needs and pursuing profits without consideration is to turn the environment, including the sea and its resources, into exploitation land (LPSPL-Sorong, 2021). Management based on the community, seen as wise and in favor of humans and the environment in a balanced manner, is local wisdom. Local wisdom is defined as the attitudes, views, and abilities of the community and is related to certain specific cultures. Local wisdom reflects the community's ability to manage the spiritual and physical environment of the area where the community is located. Then this local wisdom becomes an instrument in shaping harmonization and balance in managing nature and humans, including marine and coastal resources (Ketti, 2020; Puspita, 2017; Saiful & Ruban, 2021).

Local wisdom will undoubtedly differ between community groups. The difference due to natural conditions, living areas, history, beliefs, customs, values, and so on. This is where the role of the school is to foster attitudes and behavior that respects students towards the local wisdom approach of the community towards the environment. This dimension describes an individual's ability to see a variety of perspectives and values from each point of view without judging and feeling exclusive (Piacentini et al., 2018). Respectful attitudes and behaviors are then contained in *the Blue Curriculum framework* published by UNESCO (Santoro et al., 2022) with the aim that through ocean literacy, students can think critically about the various perspectives of local communities regarding the sea, appreciate the diversity of local perspectives, and cultivate attitudes.

Based on the results of a survey of 116 respondents regarding the need for competence to respect each other through ocean literacy in Table 3, the average need for the three achievement indicators is 3.16. To achieve competency in respecting others through ocean literacy, the average teacher agrees in the range of 3.15 – 3.16 in Table 7, where students must master indicators of critical thinking from various perspectives, respect diversity of perspectives, and foster local and global characteristics related to sea-based justice and maritime.

Table 7. Respect for each other

Competence	Indicator	N	Mean	std. Dev
Be respectful of each other	Think critically about the perspective of ocean history, culture, and coastal/maritime/island communities	116	3.15	0.55
	Appreciate and understand the diversity	116	3.16	0.52

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of opinions about the sea from the perspective of people's cultural and religious practices			
Fostering local and global attitudes toward the sea or maritime-based justice	116	3.16	0.56

Ocean literacy is part of environmental literacy. However, ocean and maritime topics are not limited to science or geography subjects but can be taught from a multidisciplinary scientific perspective (Dupont, 2017; Hamilton & Skelley, 2022). For this reason, the competencies developed by experts and mapped by the author in the needs assessment can be used across subjects. Incorporating ocean literacy into subjects can be carried out using competency integration or infusion methods on the subject competencies that have been formulated. Thus, to support successful learning, teachers are needed who can re-orient learning and innovate in bringing the contextual environment closer to the subjects being taught (Amelia & Erlina, 2017; Hindrasti, 2018; Irawan, 2018; Lestari et al., 2022).

Several studies have shown that ocean literacy is carried out in multidisciplinary and project-based learning. In addition to the ability of teachers who are required to re-orient and innovate, this learning can be done by building communication and collaboration between schools, coastal communities, and practitioners in the maritime and maritime fields. This collaboration will support learning activities to achieve competence in respecting others, action for collective, social-emotional well-being, and promotion of sustainable development.

This research can be used as a reference for developing environmental-based educational literacy competencies in existing subjects or forming special learning programs related to environmental geography. Environment-based education is urgently needed as a strategy to bring closer contextual environmental situations, including marine and coastal, to learning. Thus, learning outcomes can be more impactful and interrelated between knowledge gained in class, skills, values, and behaviors related to environmental sustainability (O'Halloran & Silver, 2022). Competency achievements that are integrated with behavior towards the environment are also educational competency achievements and global development goals.

Conclusion

In this study, it was found that based on the results of the competency needs assessment regarding ocean literacy, the average teacher agreed with each competency indicator. Ocean literacy competencies include social-emotional development, acting for collective welfare, promoting sustainable development, and respecting each other. This competence is achieved through ocean literacy. These competencies can be conveyed in learning, integrated, or infused into various subjects. Therefore, teachers must be able to re-orient learning so that they do not view ocean literacy as only part of scientific or regional knowledge.

Furthermore, this research can be used as a reference for teachers to map behavioral and attitude competencies related to ocean literacy which will be integrated with subject competencies, for example, Indonesian. Learning Indonesian can be a learning tool that integrates language skills based on ocean literacy and other subjects.

Recommendation

This research is the basis for curriculum development, namely needs assessment. This ocean literacy competency mapping can be recommended to be studied and elaborated on subject competencies. Especially in the Indonesian language subject because the respondents

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from the research and the basis for this research were to integrate ocean literacy competencies into the Indonesian language micro curriculum. However, this competence can also be considered for infusion in other subjects. For this reason, this research can also be used as a basis for competency mapping for teachers who teach in coastal and island areas.

This research can be a recommendation to curriculum developers to arrange to learn close to the implemented curriculum's contextual and regional situation. This maritime literacy competence can be achieved if learning activities are also related to the environment, not only in organizing material and knowledge concepts in subjects. In addition, there is also a need for cooperation between curriculum developers in schools, local governments, and the community. The collaboration aims to build connectivity and relevance between the maritime competencies learned in class and the environment's contextual conditions and societal values.

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