# Instilling Children's Ocean Literacy Through Comic Media: STEAM to R-SLAMET Learning Design for ECE educators

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ABSTRACT: Ocean literacy is currently at the forefront of the development of the notion of marine environmental sustainability. It is critical to compare ocean literacy ideas in curriculum standards. Comics Convey various messages of maritime insight content on integrated, contextual, and meaningful learning. This study aims to design STEAM (to R-SLAMET; Religion, Science, Literacy, Art, Math, Engineer, and Technology) learning that contains ocean literacy messages in a comic media. Through the qualitative research method with study case type, researchers seek to aid early childhood education (ECE) educators in designing R-SLAMET learning through the media to overcome maritime cultural literacy problems. The participants of this study consisted of three educators and 43 children. The findings show that the natural play experience of early childhood can be a source of inspiration to find ocean literacy through R-SLAMET learning activities. Contextual play by children becomes a reference for designing comic-based R-SLAMET learning. Comic media can integrate R-SLAMET learning in improving children's ocean literacy.

Keywords: children ocean literacy, comic media, STEAM to R-SLAMET learning design

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## 1  INTRODUCTION

The ocean covers two-thirds of the earth's surface and is crucial in defining our world. As a result, many people perceive the earth to be an ocean planet. The ocean is a valuable resource because it has a substantial impact on climate change, weather, and oxygen levels. Furthermore, the ocean is home to a variety of aquatic creatures and serves as an effective route of transportation (Tuddenham et al., 2005). Learning about the global sea's interaction with all world systems, as well as society's influence on that sea, is part of marine education. Oceanography, ocean scientific models, coastal zone management, and aquatic studies are all included in the phrase "marine education" (Fortner & Mayer, 1989). Ocean literacy has been recognized as a critical component among trans disciplinary characteristics, given its importance in the period of global climate change.

Ocean literacy (OL) refers to the dissemination of information about the ocean and its significance, as well as responsible behaviour toward the seas, oceans, and resources. Prerequisites and logical steps include increasing ocean literacy, improving marine citizenship, and expanding ocean education (Hawthorne & Alabaster, 1999). One of the most important determinants of environmental behaviour and education has been discovered as OL (Chang et al., 2021). A person's perspective of the ocean and its value is heavily influenced by their knowledge. With sufficient information gained through formal education, effective environmental and ocean-related policy can be achieved (Steel et al., 2005). Ocean sustainability remains an issue as the world's climate and ecosystem change (Mokos et al., 2020). Textbooks or other media are frequently used to help students understand the notion of marine environmental sustainability. As a result, it is critical to comprehend the scope of the curriculum standards to comprehend ocean sustainability.

Comic media can be one of the tools to develop children's knowledge. The need to explore knowledge by both teachers and students has been successfully met in the development of comic's media and has proven to be a very practical and successful tool to assist students (Hermawanti & Susilaningsih, 2020). Rahmatullah's et al., (2020) research shows that students generally understand the ideas given in comics, even though the comics are only given as complementary material for school-based theme learning. Another finding also revealed that with electronic comics, elementary school children (aged 6-8) can recognize and appreciate marine conservation in science learning. The introduction of marine conservation can then be done with the latest technology to arouse children's interest in learning (Syarah, Yetti, Fridani, Lara, et al., 2019).

STEAM to R-SLAMET learning design can be a tool to convey ocean literacy through comic media. For young children, STEAM is included in the category of inquiry-based learning. Active (sometimes hands-on) experiences that enhance comprehension and vocabulary development, critical thinking, problem solving, communication, and reflection are all encouraged through inquiry training. Teachers need to provide opportunities for children to learn about the world through STEAM lens and ask high-quality open-ended questions to encourage an inquiry experience. Young children benefit

from inquiry activities because they can approach problems in new and authentic ways. In America, The Black Girls Dive Foundation (BGDF) was created to empower and inspire children to explore their STEM (Science, Technology, Engineering, and Mathematics) identity through marine conservation and water-based STEM activities. The BGDF STREAMS program emerged to combine SCUBA diving with scientific diving, ocean research, and stewardship in an aquatic setting within STEAM. STREAMS look at how to extend the reach and influence of STEM identities and STEM interests to those who have historically been underprivileged and underrepresented in science and offers research-based solutions to reduce inequality and achieve equity.

Based on previous findings, this study aims to provide guidelines for implementing the use of comic's media in STEAM and R-SLAMETS learning to teachers before treatment is given to both groups of children. The implementation of this activity is intended to provide PAUD teachers with an understanding that learning STEAM content can be carried out easily in educational activities in the ECE unit.

## 2 THEORITICAL STUDY

### 2.1 *Children Ocean Literacy*

One important understanding of marine concepts is ocean literacy with maritime culture. Ocean literacy is one of the strategic pillars to build the character of the Indonesian culture towards Indonesia as the world's maritime axis (Hidayat & Ridwan, 2017; Yunandar, 2018). Ocean literacy provides an overview of a person's ability to understand, interpret and process information about knowledge, values, attitudes, and behaviours related to maritime life (Arthur, 1990). These literacy skills will be the basis for someone to master maritime culture as a major part of the nation's character.

It's critical to note that ocean literacy can take on diverse meanings depending on the country and culture. For example, Europe contains numerous basins and regional seas, each with its own cultural context and relationships(Santoro et al., 2017). Citizens of all ages must recognize and comprehend the relationship between man and the sea to protect, conserve, and utilize marine resources responsibly. "A comprehension of the ocean's influence on you and your influence on the ocean" is how ocean literacy is defined (Tuddenham et al., 2005).

Beyond comprehension, an ocean literate citizen applies their knowledge of the ocean and awareness of ocean issues to meaningfully speak about the ocean and make educated and responsible decisions (Mogias et al., 2019). Educational institutions can support plans to promote marine literacy and a culture of conservation, restoration, and sustainable use of the ocean, for example, by using part of the school curriculum, thereby underlining the importance of ocean literacy.

Since a result, promoting ocean literacy in elementary and secondary schools is critical (Visbeck, 2018), as children represent future citizens and customers who will form attitudes and make actions that will surely have an impact on the environment. Children

are also essential agents of social change in society because, in addition to directly engaging in responsible environmental behaviours. They can influence their peers, families, and community's environmental knowledge, attitudes, and actions (Hartley et al., 2015). If elementary school kids have their innate interest about the world around them, it is critical to capture their attention early by include ocean literacy-related topics in national curriculum and to continue developing that curiosity in higher-education levels. Only future inhabitants who are ocean literate will be able to appreciate ocean-related concerns and make appropriate judgments; after all, they will be the only ones who fully comprehend that the ocean's vitality is intrinsically linked to their own survival.

In 2015, a group of Mediterranean academics and educators (the EMSEA Med working group) began an effort to adapt them to the unique characteristics of the Mediterranean Sea. As a result of this process, the Mediterranean Sea Literacy (MSL) handbook was created, which includes seven principles and 46 ideas that define various aspects of the Mediterranean Sea and its relationship to people and society (Santoro et al., 2017). The seven principles that form the basis of ocean literacy include: Earth has one large ocean with many features; The oceans and life in the oceans make up Earth's features; The sea is a huge influence on weather and climate; The oceans make the earth habitable; The oceans support incredible biodiversity and ecosystems; The oceans and humans are closely related; The ocean is largely unexplored.

### 2.2 *Comic as Learning Media for Children*

The results of a research demonstrated that the digital comic features that boost young pupils' tendency toward higher-order thinking are linked to structuring manipulation and meta cognition. Children may use a variety of tools to select characters, construct a related speech, and rearrange panels to serve best their aims. Furthermore, the order in which the panels were displayed on the initial page of Comic Lab directed youngsters to establish specific tactics for producing their story and effectively divide work among themselves (Melliou et al., 2014).

In terms of language, all groups used comic dialogue balloons to give the characters more depth and allow for a more thorough study from multiple points of view. This feature in comics media also helps to use discussion systematically and improves emergent literacy. The results of this study point to the digital comic's efficacy in the formation of thinking dispositions in young students. The study design, on the other hand, is exploratory and limited to a specific set of youngsters, therefore the findings may not be generalizable to a larger population. Further research into the impacts of digital comics on children's thinking dispositions could help educators utilize technology more effectively into their teaching (Melliou et al., 2014).

The objective of using a comic media in the classroom is to educate youngsters with characters that are appropriate for their age (Yulianti et al., 2016). Comics educate youngsters by visualizing content and characters to make them easier to understand. The comic is a useful tool for children who are learning. The comic should correspond to the

demand for instruction and contain messages that can pique people's interest in learning. As a teaching medium, it is a tool for delivering an instructional message that can also be used as a visual communication medium, as the context refers to the process of communication between children and learning materials (Ntobuo et al., 2018).

The comic book is an engaging medium for delivering knowledge since it offers a story told via graphics that can elicit a desire to learn. Character qualities based on economic activities undertaken by children in their daily activities can be integrated into interesting and creative learning media such as comics. Characters are the ways of thinking and acting like that determines how people live and collaborate in their families, societies, and countries. The developed competence has a function in building the character of the young generation so that they have a mindset, attitude, and behaviour that are consistent with the nation's identity. The comic's unique feature is that its continuous drawing art. The consistency brings the comic to life when read, making it easier to convey the idea. The comic can be used to impart knowledge, expand pupils' vocabulary and reading skills, and pique their enthusiasm in reading.

### 2.3 *STEAM to R-SLAMET Learning Design*

Integrative STEM education is a learning strategy that focuses on technology / engineering design and purposefully mixes science and/or mathematics concepts and activities with technology and engineering concepts and practices. Integrative STEM education can be strengthened by combining it with other disciplines such as language arts, social sciences, architecture, and so on. Educators are expected to take a purposefully designed pedagogical approach by incorporating STEM principles and practices into a pedagogy based on religion, social studies, literacy, art design, math, engineering design, and technology (R-SLAMET).

The process of integrating maritime culture through comics media can be carried out through STEAM (Science, Technology, Engineering, Art, and Math) learning content. In the learning content in the PAUD (Early-Childhood Education) unit, the content can be expanded to R-SLAMETS content (Religion, Science, Art, Math, Engineering, Technology and Social Study). This expansion of content integration characterizes PAUD content in Indonesia, which emphasizes Religion, Science, Arts, Mathematics, Engineering, Technology, and social studies (Hapidin, Gunarti, Pujianti, & Syarah, 2020). Through the STEAM and R-SLAMETS-based comic media, it is hoped that it will help develop maritime cultural literacy in children from an early age.

### 3  METHOD

This study uses qualitative method with a case study (Creswell, 2015) that involves observing two groups of early childhood at two different ECE units. Each group was given STEAM and R-SLAMETS learning treatment using comic media. Researchers have provided guidelines for implementing the use of comic's media in STEAM and R-SLAMETS learning to teachers before treatment was given to both groups. The two

teachers were teachers selected from virtual STEAM training and workshops. The implementation of this activity is intended to provide an understanding to PAUD teachers who learning STEAM content can be carried out easily in educational activities in PAUD units. The implementation process was recorded in the form of video and photo documents, which were used as research study material.

3.1  *Participant*

The participants of this study were ECE educators in training activities and workshops on the use of comic's media as learning media with STEAM content. Overall participants reached 278 participants from various parts of Indonesia. Based on these participants, it was found that two participants from two ECE institutions were willing to be used as pilot locations for the implementation of the research by observing the stimulation of oceanic literacy through comic's media, and the practice of learning STEAM and R-SLAMETS content in the ECE unit.

The study involved two groups of early childhood in different ECE units, namely Laa Tahzan Kindergarten (four people participating in children) and Al-Hikmah Kindergarten (four children participating). Al-Hikmah Kindergarten is in East Latokdok Hamlet, Kalaotoa Village, Pasilambena District, Selayar Islands Regency, South Sulawesi. TK Laa Tahzan Islamic School is in Jadimulya Village, Gunung Jati District, Cirebon Regency, West Java. Both groups are ECE units that have the characteristics of rural ECE units with access to the beach and the sea (see table 1).

Table 1 Distribution of Participants

| Characteristics of Respondents | Group 1 (TK Laa Tahzan) | Group 2 (TK Al-Hikmah) |
|---|---|---|
| Total number of teachers | 1 | 1 |
| Age | 24 years old | 26 years |
| Teaching experience | 4 years | 3 years |
| Educational qualification | Bachelor of ECE | Bachelor of ECE |
| The number of students | 4 | 4 |
| Student age range | 4-6 Years | 4-6 years |

3.2  *Data Collection*

The data collection of this research was carried out using interviews, non-participatory observations and video and photo documents. Interviews were conducted on teachers and children, focusing on teachers to express opinions about thematic lesson plans, procedures for using comic's media in STEAM to R-SLAMETS learning, as well as assessment instruments on ocean literacy. The instrument consists of several open-ended questions related to the teacher's understanding of the three documents in question. The video analysis procedure is aimed at assessing the entire process of giving treatment or intervention for the comic-based R-SLAMET learning model.

### 3.3 *Data Analysis*

Analysis of research data used a case study analysis procedure of Campbell's matchmaking technique, which was carried out through three main stages, namely general statement analysis, analysis of specific statements and constructing a concept map (Campbell & Stanley, 2015). In addition, data analysis was also carried out using narrative analysis techniques (Oliver, 1998) to describe all important and meaningful events during the process of using comic's media in applying the R-SLAMET learning model based on comics and ocean literacy in early childhood.

## 4 RESULT AND DISCUSSION

### 4.1 *Result*

This study reports on the process and results of a study on the use of comic's media containing STEAM and R-SLAMETS content to introduce ocean literacy to children. The findings show that comic's media are one of the alternative media choices in conveying various learning messages related to ocean literacy in early childhood. Comic media has proven to have the strength in integrating learning messages containing R-SLAMET content. In addition, Comics also presents learning content messages in an interesting, easy, meaningful, and fun way.

### 4.1.1 *Natural Play is a Source of Inspiration*

Participants were invited to recall playing times at an early age such as playing natural and traditional games by examining two video shows. Based on the results of the reflection of the two videos, participants were invited to provide responses to the analysis of R-SLAMET content in playing activities or for reading comic media activities about the ocean in early childhood learning. The instrument for obtaining this information was done through dialogue questions of R-SLAMET content analysis (see table 2).

Table 2. R-SLAMET (STEAM) Content Analysis Dialogic Questions

| Question | Teacher's Answer |
| --- | --- |
| Is there science content in the game? | Yes, when the child throws there is material about force and motion |
| Is there math content? | Yes, get to know geometry and the concept of numbers |
| Is there Literacy content? | Yes, the child conveys an idea, writes a number symbol |
| Is there Art content? | There, making something out of various geometric planes |
| Is there engineering content (engineering) | Yes, the child made an *Tapak Gunung* game drawing design |
| Is there technology content? | Yes, children use simple tools to make game shapes. |

The video excerpt that was shown to the participants was a game of *Tapak Gunung* (see figure 1).



Figure 1. Video Traditional Playing Tapak Gunung

### 4.1.2 *Building an R-SLAMET Learning Plan (STEAM Learning Design)*

Based on the reflective notes on the study, participants were invited to build an understanding of thematic learning that integrates STEAM and R-SLAMETS content in PAUD units. Participants were helped to elaborate on the use of a theme and a network of concepts and play activities in STEAM and R-SLAMETS content, respectively. The illustration of mentoring in the preparation of STEAM and R-SLAMETS content learning in a thematic approach to participants can be illustrated such as, see picture 2.
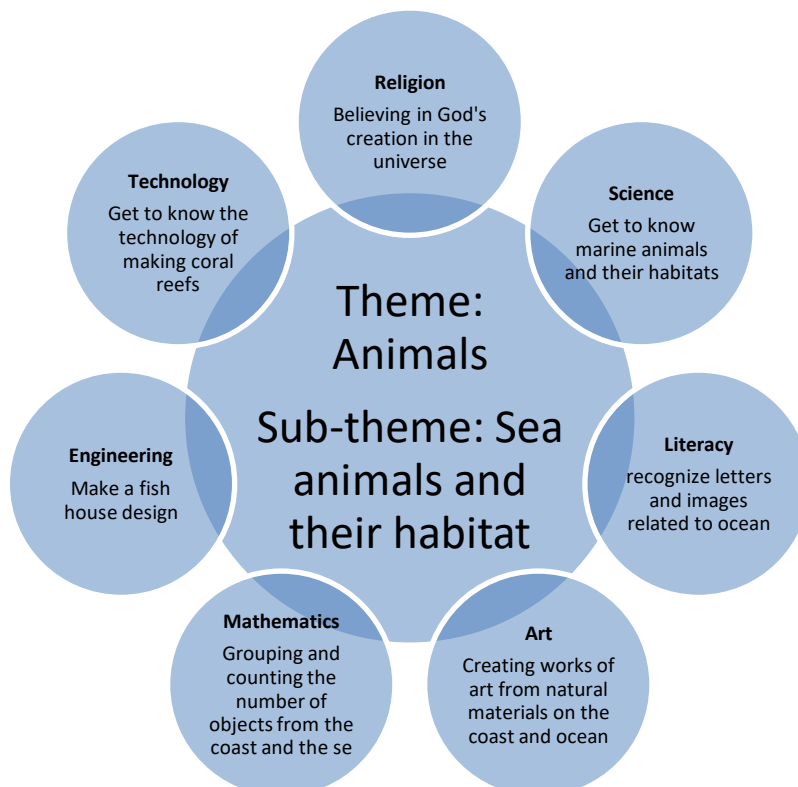


Figure 2.  R-SLAMET Content Analysis in Themes

Participants were invited to analyse the use of the theme by studying and finding various R-SLAMET contents such as those in natural play activities. The theme forms an integration network in conducting R-SLAMET learning. In each content, the teacher must find at least one game name (the title of the play about the ocean). The results of this analysis are then developed into the form of a lesson plan.

In the lesson plan section, the teacher must display the identity of the learning plan that includes the theme, age of the child and the estimated developmental aspects that will appear during the learning process. Aspects and indicators are in nature as something that might appear. The learning process involves the opening steps, core and closing activities that include the name of the game and the scenario of play that is arranged on a continuum. The display of the continuum playing scenario containing the R-SLAMET learning content and ocean literacy can be seen in table 4.

Table 4. Opening Activity

| Play Activities | Learning Materials | Child Development Achievement Level Standard | Media and tools | Assessment |
|---|---|---|---|---|
| Core activities:<br>Play with Nemo's friends | R-SLAMET (STEAM) and ocean literacy teaching materials | | | |
| Educators prepare materials, equipment, and playing media<br>Educators organize the play environment | | | Shells of various sizes<br>Glues and other adhesives<br>Cardboard of various sizes<br>Images that represent the theme | |
| Apperception activities:<br>The teacher introduces the themes and activities to be carried out<br>Educators ask children to greet and pray before playing<br>Educator introduces **GEMARI** (Indonesian Maritime Movement) comic series<br>The teacher gives instructions on the rules during the game (Read a load of comics about the ocean) | Religion (prayer before playing)<br><br>Science (Ocean literacy in comics)<br><br>Social studies (rules of play and behavioral responses after hearing/reading comics) | Moral and religious values (the habit of praying before doing something)<br>Language knows books and stories<br>Socio-emotional (able to follow the rules of the game) | GEMARI comic series<br>Game rules table | Observation |

The initial design of the R-SLAMET content learning activity and ocean literacy begins with the main play activity, "playing with nemo," the name of this activity implies the introduction of a type of marine fish known as nemo. This playing identity is also an icon in the comic title which will be the focus of learning R-SLAMET content and ocean literacy using comic media. In the early stages of learning (opening), the teacher prepares the environment and play tools that will be used throughout the continuum play scenario.

The next stage is described through the core activities in table 5 showing a learning scenario designed through a series of playing R-SLAMET content and ocean literacy. Play scenarios are arranged in a flowing and continuum as early childhood plays naturally. Play activities are focused on children's activities (child centre) by using various game media sourced from environmental materials around the beach that are easily found by children. These play activities have been pursued in accordance with the stories in the comics. In the closing activity, the teacher invites children to recall the type of play, the process of playing and the results of the game that the child has produced. At the same time, this section can examine children's understanding of ocean literacy obtained, both from comic stories and direct activities carried out by children.

Table 5. Core and Closing Activities

| Play Activities | Learning Materials | Child Development Achievement Level Standard | Media and tools | Assessment |
|---|---|---|---|---|
| Core activities:Listening to comic stories delivered by educators | Literacy: Ocean Literacy from the comic story of my best friend Nemo | Cognitive: getting to know ocean literacy/ scientific knowledge about the ocean and its conservation | Digital Comics | Observation and portfolio |
| Children convey experiences that are like stories in comics | Social studies, children's experiences, and ocean-related events | Language (able to communicate an event) | Digital Comics | observation |
| Children make fish habitat designs | Engineering (designing fish habitat) | Physical motor (making something that stimulates hand-eye coordination) | Coconut shell Ceramic pieces | observation |
| Children make ways to develop coral reefs | Technology (knowing about simple coral reef development technology) | Cognitive (understanding to make or compose something) | | observation |
| Children group and count the number of shells | Math (knowing the concepts of grouping and the sum of numbers) | Cognitive (understanding the concept of numbers and grouping) | Shells of various sizes | Observation and portfolio |
| Children create works of art using natural materials from the coast and the sea | Art (making art through ocean literacy/making photo frames | Physical motoric (develop fine motor) | Things from the seacoast | |
| Children communicate their work | | Language skills in listening and listening to stories | | |
| Closing activities: The teacher asks the child's playing experience and what is felt from the playing experience | | | | |
| Children convey their wishes and plans for the next game | | | | |

### 4.1.3  *Use of Comic Media in R-SLAMET Learning for Ocean Literacy*

Experimental activities in the two groups of cases began with the initial appearance of comic media, which became the basis for teachers to ask questions to children. The beginning of this activity found some understanding of children's ocean literacy such as

initial knowledge about types of fish, coral reefs, marine plants and life around the sea. The activity was continued with the presentation of the comic story of the Indonesian maritime generation which discussed the theme "Nemo my friend" and this comic storyline stream's scenarios related to religious content and activities, such as praying for children and carrying out other worship activities. Stories also flow into content and activities in science (knowing the types of fish and their habitats), literacy (knowing the types of tools and methods of catching fish), art (making art from shellfish), mathematics (counting the types and numbers of shellfish) and social studies (marketing their products) Creation).

At the end of the comic story, there is a dialogue with the children to review the understanding of the content, plot, characters, and concepts found by the children. The activity was continued with play activities containing projects such as children making coral reefs from recycled materials. The project produced by the child can be seen in Figure 3 and 4.



Figure 3. Children make types of fish



Figure 4. Results of Collaborative Projects to Create Fish Habitat

4.2 *Discussion*

The initial findings in this study were the result of reflection with participants on traditional games in their childhood, which raised awareness of the importance of involving multiple games and how to recognize R-SLAMET in children's natural play. This elaborate dialogue has built awareness among research participants whom R-SLAMET (STEAM Awareness) content is found in many natural play activities and traditional early-childhood games (Chujan et al., 2019; Hapidin, Gunarti, Pujianti, & Siti Syarah, 2020). Playing activities like that is also a learn experience that teachers have done when they were childhood. This awareness of R-SLAMET content is the basic capital to bring teachers in designing R-SLAMET content in thematic learning to build ocean literacy for early childhood.

The theme-based R-SLAMET content learning design is the basis for making R-SLAMET content-laden play activities (Castek et al., 2019). The use of the theme is a description of contextual play activities in early-childhood learning. Contextual play by children becomes a reference for designing comic media models that contain STEAM content learning content (Koutníková, 2018; Puspitorini et al., 2017) and R-SLAMETS content. Contextual play activities refer to the habits of early childhood in natural play, which always use contexts in the form of themes. In various contexts (themes), children usually agree on the name of the game, learn materials, a person's role in playing activities, game rules and scenarios. These components are the main source for teachers to determine and increase play activities that are in accordance with the needs, stages of development and the nature of early childhood.

Comic media has the tremendous power in integrating STEAM content as well as broader content, namely R-SLAMETS (Religion, Science, Literacy, Art, Math, Engineering, Technology and Social Study). This content is a pre-academic learning material that is usually discussed in the curriculum for early-childhood education. Comics can also accommodate integrated maritime cultural literacy learning content, both in STEAM and R-SLAMETS content.

Comic media designed to accommodate the real life of children in the surrounding environment have helped build awareness, knowledge, value recognition, attitudes and behavior of children towards the entire ocean literacy with maritime cultural context that surrounds them  (Rina et al., 2020; Tatalovic, 2009). The comic media and the play activities that support it have helped children recognize and strengthen natural play experiences into a variety of knowledge, values, attitudes, and behaviors in maritime cultural settings. Some aspects of ocean literacy that appear in children include: (1) Knowledge of types of marine animals, marine plants, coral reefs, events that occur and the lives of people related to the sea and (2) Values in the context of maritime culture such as courage, responsibility, love for the marine environment, and resilience in dealing with circumstances. (3) Respect for the environment (e.g., marine debris), polite attitude and want to help foreigners and cooperation and tolerance for others. (4) Maritime culture behaviors that appear in early childhood include creative behavior in utilizing the

surrounding environmental resources as play materials, skillful use of fishing gear, and skillful making of various coastal natural play equipment.

The implication of this research is that it hopes to bring up many new policies in early childhood education regarding marine education from an early age. The policy of curriculum diversification and implementation of education in the Indonesian national education system should be a momentum to develop the concept of marine education at every type, level, and unit of education. The study on marine education curriculum development has been initiated by Hapidin, et al since 2015 with a focus on studies in the Thousand Islands. The results of the study found that there was no conceptual structure and implementation of education of marine who was integrated into the curriculum, even though the school was in an archipelago.

This effort was continued specifically through the development of a project-based integrative thematic learning model by producing a maritime education model in PAUD and elementary school units  (Hapidin, Nurjannah, 2018). More specific studies are carried out further through the development of storybook media (such as comics and sliding books) in increasing understanding of concepts and ocean literacy. Media stories in various forms are considered effective for providing understanding of concepts about maritime and ocean literacy in children from an early age (Pramitasari et al., 2018; Syarah, Yetti, Fridani, et al., 2019).

## 5  CONCLUSION

Comic media shows the tremendous power in bringing and building understanding of STEAM content in PAUD teachers and mastery of ocean literacy in early childhood. Comics designed with a thematic approach can integrate STEAM content and R-SLAMETS content as well as ocean literacy. The teacher considers that comic's media are very easy to use media in learning so that they have a strong impact on a focused, interactive, meaningful, and sustainable learning atmosphere. With stories in comic media, it has accelerated the acquisition of ocean literacy in early childhood.

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