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Research Article

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Robot-Assisted Language Learning (RALL) for Communication Skills Development in Maritime-Themed EFL Education: A Study of Secondary School Students in West Sulawesi, Indonesia

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Abstract

Obstacles to communication practice in English as a Foreign Language (EFL) classrooms are often experienced due to a lack of access to authentic, life-related learning materials, fear of peer assessment, culturally unfamiliar textbook content, and exam-related pressures. These situations often inhibit students' willingness to speak and reduce ongoing engagement. In response to these issues, this study aims to explore whether Robotic Assisted Language Learning (RALL) supported by maritime-themed teaching materials can help improve students' communicative interactions in a culturally relevant context. Respondents were students randomly selected from six junior high schools in Polewali Mandar, West Sulawesi, Indonesia. The schools were purposively selected based on the following three criteria: (a) coastal or semi-coastal areas, (b) implementation of the national EFL curriculum by the Ministry of Education, and (c) school availability to conduct technology-based classroom observations. Following this purposive sampling, classes within each school were randomly selected, and students who met the inclusion criteria (aged 13–14, in 7th grade) were invited to participate. A total of 238 students participated in the study. Mixed-methods design was used, with quantitative and qualitative data collection, with analysis occurring in parallel, and integrated during interpretation. Data sources included a 20-item Likert-scale survey to measure learner readiness, perceived usefulness, and affective responses to RALL, as well as semi-structured interviews inquiring about students' lived experiences. Results indicated a strong learner preference for the use of AI-powered tools, thematically including ChatGPT, Duolingo, ELSA Speak, and Cici Bot. Quantitative findings consistently reflected positive perceptions and stable response patterns, while qualitative findings described how RALL reduced anxiety levels, encouraged repeated practice, and provided a safer and less stressful environment for communication. The results of this study have practical implications for the development of context-relevant, sustainable EFL instruction that enhances engagement, which does not rely solely on traditional, textbook-based acquisition.

Keywords: robot-assisted language learning, AI in EFL, maritime culture, communication, Indonesia

The incorporation of digital technologies into English as a Foreign Language (EFL) pedagogy has fundamentally transformed learners' interaction patterns in language acquisition (Zhang & Umeanowai, 2025), especially in regions facing resource constraints and cultural heterogeneity. Developments in Artificial Intelligence (AI) have facilitated the creation of adaptive, individualized, and immersive educational environments that address not merely learners' cognitive requirements but also their emotional and social circumstances (Ren & Lan, 2024). Various instruments, including AI-driven chatbots, pronunciation coaching systems, and multimodal feedback mechanisms, have demonstrated effectiveness in boosting learner motivation, alleviating speaking apprehension (Alenezi & Alenezi, 2025), reducing anxiety (Tajik, 2025), and enhancing overall communicative proficiency (Ding & Yusof, 2025; Liang & Hwang, 2024; Wang & Zou, 2025).

Amid these technological advancements, Robot-Assisted Language Learning (RALL) has gained increasing recognition for its ability to replicate real-time, interactive exchanges. Through physical engagement with humanoid or social robots, learners can engage in speaking, listening, and conversational activities that promote fluency enhancement and encourage experimentation within a secure environment devoid of judgment concerns (Liang & Hwang, 2025; Shafiee Rad & Roohani, 2025). Empirical research demonstrates that learners working with physical robots typically achieve superior performance compared to those utilizing virtual avatars or traditional instructional resources, especially in speaking and pronunciation activities (Yan, Li, & Lowell, 2025).

The conditions in EFL classrooms in Polewali Mandar reflect the broader pressures in Indonesian coastal secondary education. Students typically have little opportunity to hear spoken English except in short class routines and little opportunity for extended practice due to large classes, mixed-ability groups, and a preference for written work and textbook-based instruction. Many students also experience embarrassment about sharing their spoken English with others, resulting in suppressed class participation and a reluctance to attempt to demonstrate their communication skills. Furthermore, access to technology varies across schools. While most students will have basic access to a smartphone, internet connectivity, and paid educational apps, these are not universal. These contextual factors position RALL as a potentially useful support tool, particularly if it allows for low-pressure speaking practice and feedback on culturally engaging maritime content.

The intersection of culturally rooted pedagogy and advancing AI technologies constitutes a meaningful advancement in promoting inclusive and equitable educational practices, consistent with UNESCO's Sustainable Development Goals (Sun, 2025; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2023). Although commonly employed RALL tools, including Duolingo, ELSA Speak, Cici bot, and ChatGPT, have demonstrated potential for supporting EFL education, their often culture-neutral characteristics may diminish their effectiveness in localized educational settings (Ren & Lan, 2024). Therefore, incorporating regional themes into AI-driven platforms provides a viable connection between global technological advancement and local contextual relevance. While RALL demonstrates considerable potential, research gaps persist regarding how robot-assisted environments might be constructed to incorporate cultural contexts or how students perceive such technologies when they include local narratives. Comprehending learners' attitudes and preparedness toward culturally enhanced AI-based education remains crucial, particularly as students increasingly assume active roles in their educational journeys.

Despite significant interest in AI in language learning, current research remains limited to university or adult learners, laboratory settings, or general EFL topics, and has paid little attention to how maritime-related themes influence students' motivation, confidence, and willingness to speak. Furthermore, much of the literature focuses on technological affordances and pays little attention to students' classroom experiences of anxiety, lack of speaking time, and unequal access to stable connectivity. This study fills this gap by examining how seventh-grade students in Polewali Mandar

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understand maritime-themed RALL learning, combining questionnaire results with classroom observations.

Methodology

In this study, a convergent mixed-methods design was applied, with data collected in both quantitative and qualitative forms at the same fieldwork stage, analyzed separately, and then integrated to achieve a more comprehensive understanding of students' readiness and perceptions of the usefulness of RALL. The survey component (quantitative phase) focused on students' perceptions of RALL use and a structured questionnaire, and the qualitative phase (classroom observations and semi-structured interviews) aimed to complement the first by explaining how learners learn through RALL-supported speaking practice in a natural classroom environment. Integration was carried out during interpretation through triangulation, in which statistical trends were validated and contextualized with field evidence.

The maritime cultural focus proved particularly relevant given Indonesia's coastal geography and the daily realities many students face in their communities. The maritime cultural focus proved particularly relevant given Indonesia's coastal geography and the daily realities many students face in their communities. The study involved 238 junior high school students (aged 13-14 years; 100 males and 138 females) from a public school in a coastal area of West Sulawesi, Indonesia (Figure 1). All participants were in Grade 7, identified as native Bahasa Indonesia and local language speakers, and received EFL instruction in accordance with the national curriculum.

Figure 1

Participants in Coastal Area (Source: Prasetyo & Pusparini 2018)
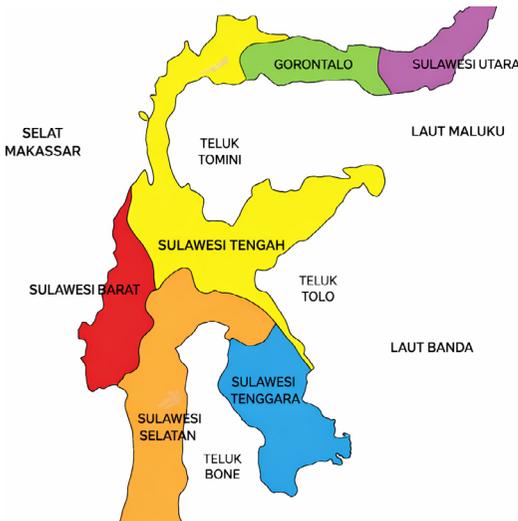
Participants were selected using purposive sampling based on three criteria: (1) basic digital literacy, (2) prior experience using at least one AI-powered language learning tool (e.g., ChatGPT, Duolingo, ELSA Speak, or Cici Bot), and (3) familiarity with maritime-themed content. Before data collection, informed consent was obtained from both students and their guardians, complying with ethical standards for research involving minors (Creswell & Poth, 2018).

Table 1

Student Demographics

Demographic	Categories	Frequency
Age	13-14 years old	Majority (100%)
Gender	Female	58%
	Male	42%
AI Tools Used	ChatGPT, Cici Bot, Duolingo, Elsa	All participants used ≥1

Figure 2

Observation (July 27, 2025)

Data were collected through a 20-item Likert-scale questionnaire (ranging from 5-Strongly Agree to 1-Strongly Disagree) measuring students' attitudes, readiness, and engagement in RALL with maritime cultural content. The questionnaire was administered online via Google Forms and was available in both English and Indonesian. To ensure clarity and relevance, expert evaluation assessed content validity, and pilot testing refined item phrasing and scale appropriateness. Reliability analysis demonstrated high internal consistency (Cronbach's alpha = 0.962). Exploratory factor analysis (EFA) confirmed a four-factor structure with item loadings exceeding 0.50 (Hair et al., 2019).

The survey consisted of 20 Likert-scale statements (1=strongly disagree, to 5=strongly agree) grouped into four key indicators: readiness and prior exposure (students' familiarity with and willingness to use RALL/AI tools), perceived value of communication practice (role-play opportunities for speaking practice, dialogue simulations, interaction practice, and pair/group work), perceived feedback and support (usefulness of feedback on pronunciation, vocabulary, and grammar), and affective-motivational outcomes (enjoyment of confidence; reduction of speaking anxiety; sustained engagement). Scores for the indicators were calculated by averaging item responses within each domain to provide interpretable subscale patterns.

Classroom observations were organized around a structured checklist developed by the research team, which included five indicator categories relevant to the study's objectives: (1) student participation behaviors (e.g., frequency and quality of speaking attempts, turn-taking), (2) markers of on-task engagement (e.g., attention to task, time on task, persistence), (3) interaction patterns during speaking activities; teacher support; peer collaboration; and (4) student engagement behaviors. student

interactions with the tool. Affective responses can also be recorded in subcategories, such as anxiety or discomfort due to a lack of confidence in one's abilities and learning environment constraints (such as device availability or connectivity disruptions). Field notes were elaborated immediately after each session to record contextual details and specific incidents that demonstrated how RALL facilitated communication practice.

Systematic classroom observations were conducted during the data collection period to document students' actual interactions with RALL technologies and their engagement with maritime-themed learning materials (Figure 2). These observations provided contextual insights into how students utilized AI-powered tools such as ChatGPT, Duolingo, ELSA Speak, and Cici Bot in authentic classroom settings. Observational data captured students' behavioural patterns, engagement levels, collaborative interactions, and spontaneous responses to culturally relevant maritime content, complementing the self-reported questionnaire responses with direct evidence of learning processes.

Semi-structured interviews complemented the survey to gain in-depth information about students' backgrounds, goals, and perspectives on the cultural relevance of RALL. Quantitative analysis utilized SPSS version 26 for descriptive statistics, reliability testing, normality assessment through P-P plots, chi-square tests, and autocorrelation analysis. Qualitative interview data underwent thematic analysis, including systematic familiarization with transcripts, initial coding, theme identification, and refinement (Braun & Clarke, 2021; Creswell & Poth, 2018).

Table 2

Research Implementation Timeline

No.	Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1	Preparation and technical coordination	X											
2	Preliminary observation at research site	X	X										
3	Expert consultation		X	X									
4	Research instrument development			X	X								
5	Instrument validation				X	X							
6	Research permit processing				X	X							
7	Preliminary study at schools				X	X	X	X	X	X			
8	Data collection through questionnaire and observation							X	X	X			
9	Interview with students								X	X			
10	Focus Group Discussions (FGDs)										X	X	X

Note: X indicates the implementation period of each activity

The research commenced with preparation and technical coordination in January 2025, followed by preliminary observations at the research site throughout January and February. Expert consultations were conducted in February and March to refine the research design. From March to May, the focus shifted to instrument development and validation, with research permits obtained in April and May.

The core data collection period extended from July through September 2025, during which the validated questionnaire was administered to 238 Grade 7 students. Systematic classroom observations were conducted concurrently to document students' actual interactions with RALL technologies and their engagement with maritime-themed content. Semi-structured interviews were conducted in August-September, and Focus Group Discussions (FGDs) were organized in November-December with English teachers and educational stakeholders.

This carefully structured timeline ensured systematic implementation while maintaining flexibility to address emerging insights and contextual factors specific to the coastal communities of West Sulawesi.

Results and Discussion

This section presents the findings from the descriptive statistics, reliability testing, normality assessment, chi-square analysis, autocorrelation, and qualitative interview responses on RALL and maritime content as EFL teaching materials. All students are enrolled in English in junior high school and exposed to maritime materials.

Table 3

Descriptive Statistics of Student Responses to RALL Questionnaire

	Statements	N	Min	Max	Mean	Std. Deviation
1	I have used AI apps like Duolingo, Cici bot, Elsa, AI Stimuler or ChatGPT or other AI apps to learn English.	238	1.00	5.00	3.9076	1.25279
2	I want to learn to speak English with the help of a robot or digital avatar.	238	1.00	5.00	3.9454	1.08750
3	I'm interested in using a robot friend like Cici bot or others to practice daily English conversation.	238	1.00	5.00	3.9412	1.09309
4	I want to learn correct pronunciation with the help of an app like Elsa Speak.	238	1.00	5.00	3.8319	1.18585
5	I feel more confident speaking if I learn with a robot/AI assistant first.	238	1.00	5.00	3.9580	1.06652
6	I want to learn English based on virtual robots	238	1.00	5.00	3.8613	1.12213
7	I need a text-to-speech feature to improve my listening skills.	238	1.00	5.00	3.8866	1.15093
8	I feel more interested in learning if there is interaction with a responsive learning robot.	238	1.00	5.00	3.8739	1.14039
9	I want to develop my writing skills with the help of AI (Grammar and vocabulary).	238	1.00	5.00	3.8403	1.19056

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Statements		N	Min	Max	Mean	Std. Deviation
10	I need a work communication simulation training with an AI-based robot.	238	1.00	5.00	3.9076	1.11372
11	I want to practice business communication using AI scenarios	237	1.00	5.00	3.7848	1.14615
12	I wish there was a robot that could rate my pronunciation and give me feedback.	238	.00	5.00	3.9370	1.17652
13	I like learning new vocabulary through chatbots like ChatGPT or Duolingo.	238	.00	5.00	3.9496	1.19668
14	I want to learn to create sentences and paragraphs with interactive AI guidance.	238	1.00	5.00	3.9412	1.08534
15	I find it helpful when robots or AI present materials in visual and audio	238	1.00	5.00	4.0000	1.07915
16	I want an AI robot to help me understand English learning material	238	1.00	5.00	4.0084	1.09849
17	I am interested in trying to learn English through a social robot in class.	238	1.00	5.00	3.8908	1.07358
18	I want to practice communication through simulations with AI.	238	1.00	5.00	3.8950	1.07596
19	I am more comfortable speaking English to a robot than to a person.	238	1.00	5.00	3.7017	1.25254
20	I believe learning with AI/robots can help me become fluent in speaking faster.	238	1.00	5.00	3.6639	1.27141
	Valid N (listwise)	**237**				

Table 3 provides a comprehensive overview of students' perceptions and support for the use of robot-assisted platforms in EFL learning. The data show that 238 respondents expressed a strong interest in Artificial Intelligence (AI) and Virtual Robotics Tutors (VTR), particularly when learning themes were culturally relevant, such as maritime topics. The questionnaire consisted of 20 items measuring attitudes, experiences, and behaviours related to RALL in the English learning ecosystem.

Item 1 ("I have used AI apps like Duolingo, Cici Bot, ELSA, AI Stimuler, or ChatGPT...") received a high mean score (M = 3.91), indicating that most students had prior experience using AI tools for independent learning. Items 2 and 3, which explored students' interest in conversing with robots or AI "friends" such as Cici Bot, also scored highly (M = 3.94), showing that learners view these systems as interactive partners rather than mere tools.

Pronunciation and feedback emerged as key areas of interest. Items 4 and 12, related to pronunciation feedback through ELSA Speak, scored 3.83 and 3.94, reflecting learners' preference for clear, corrective input. The highest score appeared in Item 5 (M = 3.96), suggesting that students feel more confident practicing with AI before engaging in human interaction.

Items 6–10 examined AI's role in listening, writing, and professional communication, with means ranging from 3.84 to 3.91, aligning with prior findings that AI supports task-based, real-life language learning (Jiao, Dewitt, & Razak, 2024). Items 15 and 16 recorded the highest means (4.00 and 4.01), confirming students' strong preference for multimodal, audio-visual materials and their trust in AI as a learning aid.

Although Items 19 and 20 scored slightly lower (3.70 and 3.66), indicating some hesitation toward robot-assisted classroom conversations, overall results demonstrate that students are open to AI-based learning. This study highlights how integrating culturally relevant themes, particularly Indonesia's maritime culture, into RALL can enhance communicative competence, confidence, and cultural engagement, providing an inclusive and innovative framework for EFL education in the Global South.

Table 4

Reliability Statistics

Cronbach's Alpha	N of Items
.962	20

In Table 4, Cronbach's Alpha of 0.962 indicates that the 20 questionnaire items are very consistent with each other. This means that the tool accurately assesses a single idea: how students feel about, like, and expect to study English through AI and robot-assisted platforms.

Figure 3

P Plot of RALL and Communication Skills through Maritime Teaching Materials
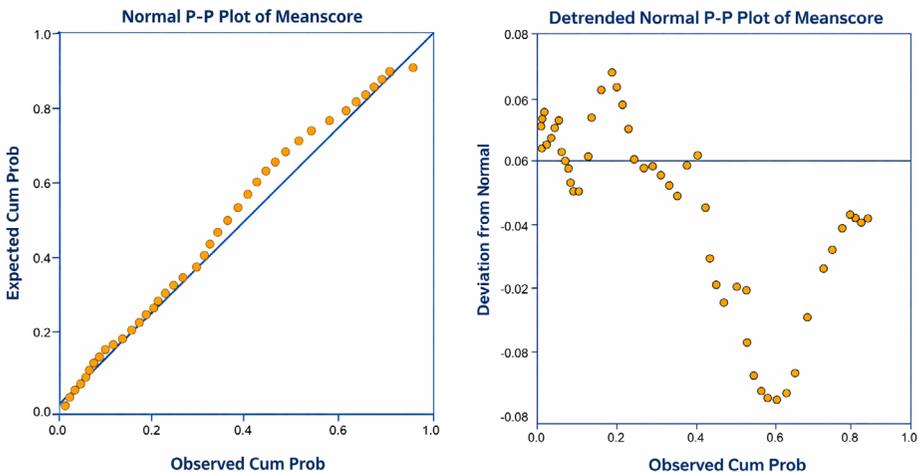
Both graphs in Figure 3 show the normal P-P plot and the detrended P-P plot for the mean score variable, which is based on students' responses to a 20-item questionnaire on the use of robot-assisted language learning (RALL) with maritime-themed teaching materials. These plots are used to check the "normality of the data distribution", which is a very important assumption for many parametric tests in quantitative research. Normal P-P Plot mean score of this graph shows the difference between the observed cumulative probability of the mean of students' responses and the expected cumulative probability of a strictly normal distribution. The data points (circles) in this visual are clustered near the diagonal line, indicating that the mean score variable is close to a normal distribution. It is normal for educational datasets to show slight differences in the middle and upper ranges because people tend to be biased in how they express their feelings or thoughts.

In this study, the normality of the estimate means that students' opinions about learning English through RALL, especially through culturally relevant content such as maritime culture (e.g., navigation, rituals, boats like Sandeq or Phinisi), are evenly distributed across different levels of agreement. This suggests that students provided a range of meaningful answers. This evidence suggests that the data set is rich and diverse. Then the data in the Normal P-P Plot was removed from the Mean Value Trend. This map shows how far each point is from the normal expectation. The "S shaped" pattern in this graph shows a slight negative slope, especially in the middle and upper-middle regions. However, there is no significant difference, and all values are within ±0.1, which is good for both psychological and educational evaluation scales.

This evidence suggests that, in general, students are positive about the use of robots and AI for English learning, especially in interactive and local contexts. This supports the previous descriptive results that showed high average responses (averages close to or above 4.0) on items such as "I would like an AI robot to help me understand English learning materials." "I feel helped when robots or AI present materials in visual and audio forms." The responses suggest that people are indeed receptive to multimodal and interactive learning, especially when it is based on "sustainable local knowledge", such as maritime traditions. Adding RALL to this kind of information not only makes people more interested but also aligns with global efforts in education for sustainable development (ESD) that aim to protect intangible cultural heritage through modern teaching methods.

The P-P Plot visualization shows that the data set meets the "normality assumption", which supports the statistical test, indicating that RALL can improve communication skills by focusing on important aspects of rich maritime culture. Students not only learn with robots, but also benefit more when the material is relevant to their lives. For example, using maritime culture to teach language skills, collaboration, digital literacy, and cultural pride.

Table 5

Test Statistics

	Mean score
Chi-Square	242.101a
df	53
Asymp. Sig.	.000

Note. (a) 54 cells (100.0%) have expected frequencies less than 5.
The minimum expected cell frequency is 4.4.

The Chi-Square Test results (χ^2 = 242.101, df = 53, p < 0.001) indicate that the way students answer the 20 questions in Table 2 differs across participants. This means that students do not answer questions at the same frequency or pattern on a scale (1 to 5), and their answers are random. In addition, the data show statistically significant results (p < 0.001), indicating that students have certain preferences, beliefs, and levels of agreement for each item. For example, in Figure 4 below.

Figure 4

Statements on RALL in EFL Setting

Student Responses to RALL Questionnaire Statements
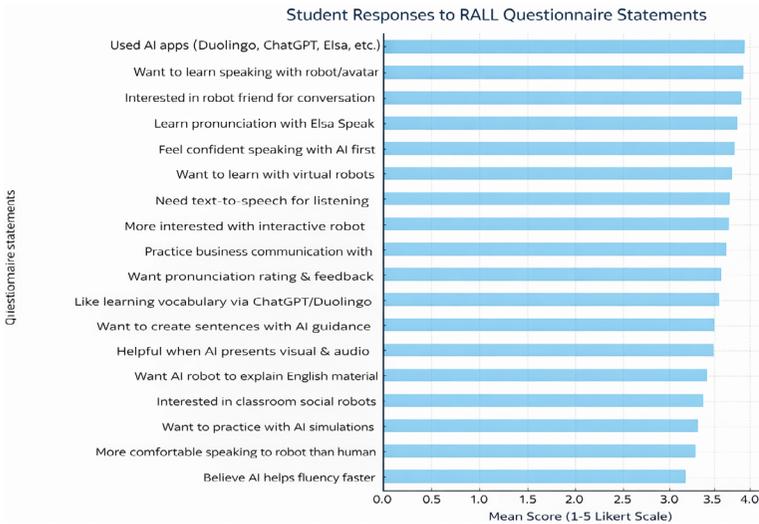
"I want an AI robot to help me understand English learning materials."
(Mean = 4.0084)

"I think it would be helpful if robots or AI showed things in sound and images."
(Mean = 4.0000)

These data show that most students agree, and they have a strong positive view in this area. Meanwhile, items such as:

"I feel better talking to a robot in English than to a person."
(Mean = 3.7017)

"I think learning with AI and robots can help me speak faster and more fluently."
*(Mean = 3.6639)*

The findings indicate that AI robots significantly aid students in their English communication.

The Chi-Square test indicates that the variance in the mean values across the items shows a significant divergence from randomness, indicating that the overall data are different. The test shows that students' responses reveal real and important preferences for various parts of robot-assisted language learning (RALL), such as pronunciation simulation, writing, listening, and speaking with AI assistance, rather than being all good or all negative.

The Chi-Square results support the findings in Table 1, which show that the 20-item questionnaire accurately captures students' structured and unique thoughts. This strengthens the research argument that students have distinct yet important demands and interests when learning English through AI and robotic platforms, especially when the subject is culturally relevant, such as maritime communication.

Figure 5

Natural Logarithmic of the Students Respond

Transforms: natural logarithm, difference(1)
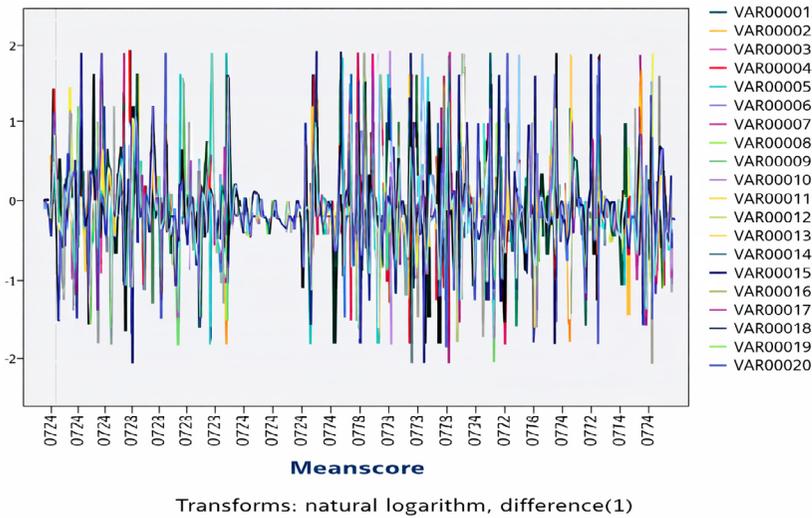
The questionnaire and the lesson setup fit well with UNESCO's framework for 21st-century skills in digital education. When combined with maritime themes, AI technologies not only support language learning but also foster cognitive flexibility and cultural empathy, which are important in communities that speak more than one language and culture. The descriptive statistics in Table 2 and Figure 5 show that learners' mean scores are quite open to using AI and RALL in English classes, especially when the content is culturally relevant and localized. These ideas provide a solid base for creating future teaching materials that combine AI technology with traditional knowledge systems to improve language schools' communication, collaboration, and technological fluency.

Table 6

Autocorrelations of RALL with Maritime Teaching Materials for Communication Skill

			Box-Ljung Statistic		
Lag	Autocorrelation	Std. Error[a]	Value	df	Sig.[b]
1	.100	.065	2.399	1	.121
2	.051	.065	3.032	2	.220
3	.141	.066	7.850	3	.049
4	.103	.067	10.448	4	.034
5	.020	.068	10.550	5	.061
6	.039	.068	10.923	6	.091
7	.209	.068	21.758	7	.003
8	.094	.070	23.956	8	.002
9	.137	.071	28.616	9	.001
10	.092	.072	30.746	10	.001

Lag	Autocorrelation	Std. Error[a]	Box-Ljung Statistic		
			Value	df	Sig.[b]
11	.065	.072	31.809	11	.001
12	.005	.073	31.814	12	.001
13	.108	.073	34.770	13	.001
14	.099	.073	37.250	14	.001
15	.046	.074	37.790	15	.001
16	.043	.074	38.271	16	.001

Note: (a) The underlying process assumed is MA with the order equal to the lag number minus one. The Bartlett approximation is used; (b) Based on the asymptotic chi-square approximation.

Based on the Box-Ljung test in Table 6, the results are not random, and the consistently significant values suggest that students' views on AI and RALL are stable, due to shared habits or experiences, such as using digital devices or being in the same class before. Taken together and understood, these three tables provide a strong statistical basis for the validity of the study. The high dependency scores indicate that the devices are consistent.

The chi-square test shows that students' responses are distributed in a reasonable manner, indicating they are paying attention to the questionnaire items. On the other hand, the autocorrelation results imply that views remain the same over time or in a certain sequence. These findings are particularly relevant to studies examining how people embrace technology, how prepared they are for school, and how they interact with AI. This paper is novel in that it applies RALL to culturally relevant marine information and rigorously tests learner perception data using multiple methods. It is one of the first studies in Indonesia and among the few in the ASEAN region to integrate robot-assisted EFL learning with ethnolinguistic content and to achieve this level of psychometric and temporal validation. As a result, this paper adds to theory (in AI in education and sociocultural linguistics) and to practice (curriculum design, education policy, and teacher training) by providing strong evidence for the use of responsive technologies in culturally appropriate language classrooms for sustainability.

Figure 6

Extracted Responses from Students (Extract 1–10)

Student Interview Responses on AI-Assisted EFL Learning

Category	Value
Use of AI for learning	4.5
Role of AI in speaking practice	4.6
Interest in learning via robots/avatars	4.7
Expected features for speaking	4.8
Comfort: robots vs friends	4.4
Learning via real-time robots	4.6
Benefits of AI for pronunciation	4.7
Motivation via AI	4.8
Practice presentations with robots	4.5
Favorite AI applications	4.6
Favorite AI applications	4.6

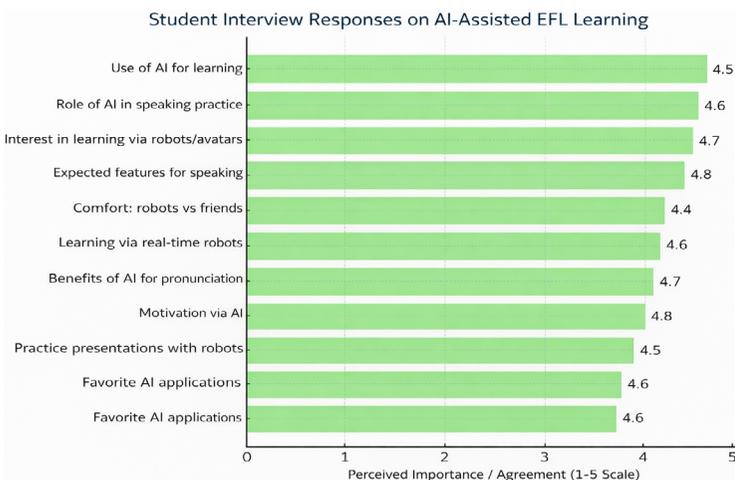Perceived Importance / Agreement (1-5 Scale)

Figure 5 presents a graphic overview of the interview findings, showing students' perceptions across 10 thematic areas and indicating consistently high levels of agreement and enthusiasm, particularly regarding their experiences and the future of learning English with AI technologies and robot-assisted instruction, especially in culturally relevant subjects such as maritime themes. The answers show that the students are very comfortable with RALL technology. A lot of them have already used apps like ChatGPT, Duolingo, Cici bot, and Elsa Speak to help them learn new words, translate, and practice their pronunciation learning via real-time RALL instruction. Students were excited when asked if they would be prepared to practice speaking English with robots or avatars. They said that robots were less scary than teachers or classmates.

In addition, students wanted virtual robot robots (VTRs) that could give them feedback on their pronunciation beyond just saying whether they were right or wrong. This shows that they desired more detailed and personalized responses. Students liked using chatbots and flashcards (like Duolingo) to learn new words. They asked for help building sentences and using visual cues to write better paragraphs. The majority of students always said that AI solutions that combined audio, video, and interactivity were "engaging" and "memorable." Students saw robots as patient teachers who could explain things over and over again without becoming angry, showing that they could be helpful learning tools. People thought that practicing presentations and talking to robots was a good method to get better at speaking and feel less scared about speaking in front of others.

Finally, when asked to compare speaking to people and speaking to machines, several students indicated they felt "less embarrassed" speaking English to robots. They also thought that using AI technologies often would help them learn the language faster. This belief shows how AI and RALL could help students practise language in ways that feel safer, easier to understand, and more relevant to their lives. For example, this study uses AI technology and indigenous content to promote linguistic and cultural fluency through local cultural themes, such as maritime materials.

Our research highlights the strong potential of Robot-Assisted Language Learning (RALL) to improve students' communicative abilities, particularly when lessons incorporate culturally meaningful elements, such as Indonesia's maritime traditions. The study involved 238 Grade 7 students (aged 13-14 years) from a coastal community in West Sulawesi, with a notably higher female participation rate (58%) than male participation (42%), as shown in Table 1. This gender distribution may reflect broader patterns in language learning engagement, where female students often demonstrate higher motivation and participation in foreign language education (Abate, Mengistie, & Ayenalem, 2025). All participants had prior experience with at least one AI-powered language learning tool, such as ChatGPT, Duolingo, ELSA Speak, or Cici Bot, indicating a foundational level of digital literacy that facilitated the implementation of RALL interventions. This pre-existing familiarity with AI technologies suggests that students in coastal Indonesian communities are not merely passive recipients of traditional instruction but are already actively engaging with digital learning resources, making them well-prepared for more structured RALL integration.

Students responded enthusiastically to AI-powered tools in EFL settings, with high mean scores (M = 3.66–4.01), reflecting strong digital literacy and readiness to adopt innovative learning technologies. AI Applications such as ChatGPT, Duolingo, ELSA Speak, and Cici Bot received particularly positive responses. Students rated AI assistance for understanding English materials highest (M = 4.01) and preferred multimodal learning through audio-visual input (M = 4.00). These findings align with multimodal learning theory and Vrins, de Wit, and Vogt (2022), who noted that social robots enhance learning through multimodal interaction, which is often missing in traditional classrooms.

RALL was also found to build learner confidence, particularly in speaking. RALL enhances

students' communication skills, which is also associated with higher perceived communication confidence and greater willingness to speak. Students agreed they "feel more confident speaking if I learn with a robot/AI assistant first" (M = 3.96), viewing robots as low-anxiety partners. This supports Belpaeme et al. (2018) and Van den Berghe et al. (2019), who showed that robots reduce fear of negative evaluation and foster psychologically safe learning spaces. While much RALL research targets early education (Iio et al., 2025; Li et al., 2025), this study extends the approach to secondary education in Indonesia, aligning with UNESCO's goals of digital inclusion and cultural preservation. Methodologically, descriptive statistics and interactive simulations confirmed students' readiness and engagement, showing that AI promotes personalization and psychological safety (Alkhwaldi, 2024; Wang et al., 2025). Activities included culturally grounded maritime scenarios, sea rituals, navigation, and seafood market simulations—connecting AI-assisted learning with local heritage.

Students valued AI feedback tools, particularly for pronunciation and grammar. ELSA Speak earned praise for its real-time feedback, which improved phonological awareness, supporting Abdelhalim and Alsehibany (2025) and Wang et al. (2025), who found that AI feedback enhances accuracy and autonomy through self-regulated learning. Qualitative data revealed that students viewed AI tools as friendly, patient, and realistic, especially in maritime communication or tourism simulations, reflecting principles of Task-Based Language Teaching (TBLT) and English for Specific Purposes (ESP). Students reported that RALL provides helpful opportunities for repeated speaking practice and pronunciation feedback.

Broader trends in mobile and metaverse-based learning reinforce these findings. Jiao, Dewitt, and Razak (2024) reported that students increasingly rely on interactive technologies for independent learning. Pronunciation improvement, particularly through Cici Bot, was a recurring theme, echoing Abdelhalim and Alsehibany (2025) and Juma (2021). Robots' "friendly" and "non-judgmental" qualities further reduced anxiety (Lee, Jeon, & Choe, 2025). Students also favored virtual and avatar-based training for listening and comprehension, appreciating robots' immediate responses—an advantage over delayed teacher feedback (Oh et al., 2025). AI writing assistance for grammar and vocabulary boosted confidence, while maritime communication simulations connected language use to real-world applications. Wu, Hapsari , and Huang (2025) similarly found that social robots increase motivation and willingness to communicate.

Overall, students showed strong interest in autonomous English learning through RALL, especially when tied to maritime culture. They preferred interactive, AI-mediated settings that simulate authentic communication (Alkhwaldi, 2024; Muthmainnah et al., 2025). Integrating maritime themes strengthened cultural identity while improving communicative competence. Interview results confirmed high familiarity with AI, and students favored ChatGPT, ELSA Speak, Cici Bot, and Duolingo for personalization and realism, supporting Kundu and Bej's (2025) findings.

Pedagogically, findings underscore robots' emotional and intellectual support, especially in culturally sensitive contexts (Alkhwaldi, 2024). Simulating port interactions or maritime narratives demonstrated how AI can merge global technology with local relevance. Although students valued robots, their preference for blended models (M = 3.70) suggests combining AI tools with teacher facilitation for optimal outcomes (Liang & Hwang, 2025).

Statistical results support these insights: Cronbach's alpha (0.962) confirmed reliability, chi-square (χ^2 = 242.101, p < 0.001) indicated significant variance, and autocorrelation showed response stability. The demographic profile presented in Table 1 reinforces the study's relevance, as the participants' age range (13-14 years) falls within a critical developmental period when students are forming their language-learning identities and technological competencies. The balanced representation across genders and universal exposure to AI tools among participants strengthen the generalizability of

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findings within similar coastal EFL contexts in Indonesia and potentially across Southeast Asian maritime communities.

Pedagogical implications include integrating culturally relevant AI tools, using RALL to reduce affective barriers (Peura, Peura, & Mutta, 2025), and improving teacher AI literacy (Zawacki-Richter et al., 2019). Theoretically, this extends Vygotsky's Zone of Proximal Development into digital learning, where AI acts as a mediating scaffold within ESP and TBLT frameworks. Practically, RALL offers potential for EFL applications simulating maritime environments to prepare learners for industry communication and national workforce goals in the Society 5.0 era.

Conclusion

Integrating social robots and AI applications into classroom instruction does more than enhance students' communicative abilities; it also builds their confidence, motivation, and learning independence. When digital tools and instructional materials reflect students' everyday experiences and cultural backgrounds, learners are more willing to participate actively and meaningfully in language-learning activities.

From an educational standpoint, these findings highlight the critical need to create responsive, inclusive, and context-sensitive learning environments, especially for students in under-resourced but culturally vibrant regions. RALL offers a practical approach to achieving such environments by combining technological innovation with authentic, community-based content that resonates with learners' lived experiences.

This study shows that RALL for communicative language skills in EFL and maritime contexts builds learners' motivation, confidence, and readiness to speak. Students identified the AI-based tool as useful for pronunciation support, interactive dialogue simulations, and repeated practice without fear of peer rejection. These findings suggest that culturally contextualized RALL may have pedagogical potential to enhance learner participation in coastal EFL contexts.

Quantitatively, 238 seventh-grade students demonstrated consistently high levels of perception toward RALL and maritime-themed EFL instruction. Mean scores for items from the 20-item questionnaire ranged from a high level of agreement (M = 3.66–4.01), indicating that participants were well-prepared to use AI-involved tools and perceived strong value from repeated speaking practice, pronunciation feedback, and practice supported by feedback. Internal consistency for the overall scale was excellent (Cronbach's α = 0.962), indicating that students' responses were stable over time and reliable across multiple measures.

Collectively, these descriptive findings suggest that RALL is positively related to students' communicative readiness, confidence, and engagement, particularly when the learning tasks are interactive and culturally connected to the students' coastal realities. Therefore, future research could compare students' speaking performance before and after training using external assessments and/ or rubric-based oral tasks to determine whether their perceived improvements are reflected in the measures. Future research should employ experimental or quasi-experimental designs and objective speaking evaluations to determine whether these perceptions lead to observable proficiency gains.

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Availability of Data and Materials

The dataset generated and analyzed in the current study is not publicly available due to privacy and confidentiality concerns, but is available from the corresponding author upon reasonable request.

Conflict of Interest Statement

The authors declare that they have no competing interests.

AI Disclosure

The authors acknowledge the use of artificial intelligence (AI) tools in supporting aspects of this research, including language refinement, editing, and formatting. All intellectual content, data analysis, and interpretations presented in this study are the original work of the authors. The authors take full responsibility for the accuracy, integrity, and originality of the manuscript.

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