Jurnal Pembelajaran Bahasa dan Sastra
Volume 4, Nomor 5, September 2025
DOI: https://doi.org/10.55909/jpbs.v4i5.889

https://pembahas.dialeks.id/index.php/jp
p-ISSN : 2809-5367
e-ISSN : 2809-6355

Increasing Student Motivation by Using Problem-based Learning of Maritim Contextual Problems Lingga Regency

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ABSTRACT
The implementation of the Independent Curriculum demands a transformation of the mathematics learning paradigm that emphasizes contextual experience through a problem-solving approach. The low motivation to learn mathematics of SMA Negeri 1 Lingga students, especially in statistics materials with achievements below the KKM (42.86% of students complete), indicates the need for innovative learning strategies that are relevant to the local context. This study aims to examine the effectiveness of Problem-Based Learning (PBL) based on maritime contextual problems in Lingga Regency in increasing the motivation to learn mathematics of grade X.1 students. The research method used the Kemmis and McTaggart model Classroom Action Research with two learning cycles over three weeks, involving 37 students selected through purposive sampling. Data were collected using a learning motivation questionnaire based on five indicators with a four-point Likert scale, then analyzed quantitatively descriptively. The results showed a significant increase in motivation scores from 3,249 (medium category) in the first cycle to 3,784 (high category) in the second cycle with an increase of 0.355 points. The contextualization of maritime issues using real data on sea transportation, fishermen's activities, and trade in marine products has succeeded in creating an authentic learning experience that bridges the gap between theoretical knowledge and practical applications. In conclusion, PBL based on the maritime context is effective in increasing students' learning motivation by transforming active participation, presentation courage, and development of independence. It is recommended that the systematic implementation of local context PBL as an alternative learning to increase student involvement in mathematics learning.

Keywords: student motivation, problem-based learning, maritim contextial problem

Meningkatkan Motivasi Belajar Siswa Menggunakan Pembelajaran Berbasis Masalah pada Materi Kontekstual Maritim Kabupaten Lingga

ABSTRAK
Penerapan Kurikulum Mandiri menuntut transformasi paradigma pembelajaran matematika yang menekankan pengalaman kontekstual melalui pendekatan pemecahan masalah. Rendahnya motivasi belajar matematika siswa SMA Negeri 1 Lingga, terutama pada materi statistika dengan capaian di bawah KKM (42,86% siswa tuntas), mengindikasikan perlunya strategi pembelajaran inovatif yang relevan dengan konteks lokal. Penelitian ini bertujuan untuk mengkaji efektivitas Pembelajaran Berbasis Masalah (PBL) berbasis masalah kontekstual kemaritiman di Kabupaten Lingga dalam meningkatkan motivasi belajar matematika siswa kelas X.1. Metode penelitian yang digunakan adalah Penelitian Tindakan Kelas model Kemmis dan McTaggart dengan dua siklus pembelajaran selama tiga minggu, melibatkan 37 siswa yang dipilih melalui purposive sampling. Data dikumpulkan menggunakan angket motivasi belajar berdasarkan lima indikator dengan skala likert empat poin, kemudian dianalisis secara deskriptif kuantitatif. Hasil penelitian menunjukkan adanya peningkatan skor motivasi yang signifikan dari 3.249 (kategori sedang) pada siklus I menjadi 3.784 (kategori tinggi) pada siklus II dengan peningkatan sebesar 0,355 poin. Kontekstualisasi isu maritim menggunakan data nyata tentang transportasi laut, aktivitas nelayan, dan perdagangan hasil laut telah berhasil menciptakan pengalaman belajar autentik yang menjembatani kesenjangan antara pengetahuan teoretis dan aplikasi praktis. Kesimpulannya, PBL berbasis konteks maritim efektif dalam meningkatkan motivasi belajar siswa dengan mentransformasi partisipasi aktif, keberanian presentasi, dan pengembangan kemandirian. Disarankan penerapan PBL konteks lokal secara sistematis sebagai alternatif pembelajaran untuk meningkatkan keterlibatan siswa dalam pembelajaran matematika.

Kata kunci: motivasi belajar, pembelajaan berbasis masalah, kontekstual maritim

Submitted	Accepted	Published
22/09/2025	28/09/2025	29/09/2025

Citation	Rachmi, R., Nevrita, N., Abadulhajar, E., & Zaitun, Z. (2025). Increasing Student Motivation by Using Problem-based Learning of Maritim Contextual Problems Lingga Regency. *Jurnal Pembelajaran Bahasa dan Sastra, Volume 4, Nomor 5, September 2025, 1113-1122. DOI: https://doi.org/10.55909/jpbs.v4i5.889*

Publisher
Raja Zulkarnain Education Foundation

https://pembahas.dialeks.id/index.php/jp
p-ISSN : 2809-5367
e-ISSN : 2809-6355
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DOI: https://doi.org/10.55909/jpbs.v4i5.889

INTRODUCTION

The implementation of the Independent Curriculum in mathematics learning requires a transformation of the educational paradigm that emphasizes contextual learning experiences through a problem-solving approach. This learning paradigm prioritizes strengthening conceptual understanding, applications in daily life, and developing in-depth and creative analytical skills (Ministry of Education and Culture, 2022). Problem-Based Learning (PBL) is one of the relevant strategies because it facilitates students in comprehensively understanding mathematical concepts through exploration and solving contextual problems.

The fundamental goal of learning mathematics in the independent curriculum is to equip students with logical thinking competencies and analytical skills that can be implemented in real situations. The maritime context of Lingga Regency offers potential authentic problems such as the analysis of fishermen's catch data, the distribution of fish sales, and factors that affect the daily productivity of fishermen, which can increase students' motivation in applying mathematical problem-solving steps.

Conventional learning practices that are still dominant in mathematics subjects often place teachers as the center of learning through expository methods and the assignment of routine assignments. This approach tends to result in students who are passive, less engaged in the process of critical thinking, and only focus on solving problems without deep conceptual understanding. As a consequence, students have difficulty relating the material to real conditions, which has an impact on decreased motivation and learning achievement. The combination of conventional methods with a modern and interactive approach can increase students' enthusiasm in the involvement of the learning process (Utami, 2023; Yulianto et al., 2020; Razak et al., 2020).

Learning motivation is a determinant factor for learning success which acts as a driver of students' active involvement in understanding the material being taught. Motivation is a key element that affects students' academic achievement, where optimal motivation results in increased learning outcomes (Nurrawi et al., 2023; Putri & Tamadhan, 2022). In addition, motivation helps students overcome learning barriers such as laziness and excessive technological distractions (Arifah, Suciptaningsih, & Geography, 2023). High motivation to learn encourages students to show greater persistence, not give up easily, and actively seek solutions to the problems they face. In contrast, low motivation results in boredom, lack of active participation, and minimal achievement of results without adequate conceptual understanding. The summative evaluation conducted by the researcher showed that the achievement of student learning outcomes at SMAN 1 Lingga was still relatively low, especially in statistical materials with an average grade below the school's Minimum Completeness Criteria (KKM) of 75. Of the 35 students who took part in the evaluation, only 15 students (42.86%) achieved standards above the KKM, while the rest were still below the expected standards. This condition indicates that students still face obstacles in gaining an in-depth understanding of statistical concepts so that they are not able to apply these basic concepts in solving complex problems.

Observations at SMA Negeri 1 Lingga show low enthusiasm of students during the learning process. The majority of students are less active, reluctant to ask questions, and tend to wait for teachers' instructions without the initiative to seek independent solutions.

Interviews with colleagues revealed similar problems, namely low learning motivation and students' absorption of learning materials, especially on topics that require an understanding of abstract concepts such as mathematics. Teachers have not fully implemented the approach in accordance with the Independent Curriculum, still implementing teacher-centered learning with direct explanations and providing examples of questions and answers, so that students are used to receiving information without further exploration.

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p-ISSN : 2809-5367
e-ISSN : 2809-6355

Previous research has proven the effectiveness of the PBL model in learning based on local wisdom. (Arifah et al., 2023) shows that the implementation of PBL with the nuances of the Riau Islands Malay culture in junior high school students in Bintan Regency is able to improve mathematical problem-solving skills. (Fuadaturrahmah, 2023) proves that the PBL model on trigonometry material at SMA Negeri 5 Batam is effective in improving students' problem-solving skills. However, the two studies have not specifically examined the integration of PBL based on maritime local wisdom in statistical materials at the high school level.

Based on the problems that have been identified, this study aims to examine the effectiveness of the use of Problem-Based Learning (PBL) based on maritime contextual problems in Lingga Regency in increasing the motivation to learn mathematics of students in grade X.1 of SMA Negeri 1 Lingga for the 2025/ 2026 Academic Year. The research hypothesis states that the implementation of the PBL learning model based on maritime contextual problems in Lingga Regency can increase the motivation to learn mathematics of students in grade X.1 of SMA Negeri 1 Lingga.

METHOD

This research adopts *a classroom action research approach* with the Kemmis and McTaggart (in Fraenkel et al., 2012; Hatch & Farhady, 1982; Cook, 2001) model which was carried out at SMA Negeri 1 Lingga for three weeks (1-17 September 2025). The study applied two learning cycles with motivational evaluation at the end of each cycle. The population includes all students of class X of SMA Negeri 1 Lingga (6 classes). The sample was selected using *purposive sampling*, namely class X.1 (37 students: 19 females, 18 males) based on the lowest average *pretest* score, making it relevant for the application *of PBL* based on maritime contexts. Implementation follows four stages: *planning*, acting, observing, and *reflecting*. Each cycle is designed to optimize the effectiveness of PBL based on maritime local wisdom on student motivation in Statistics material.

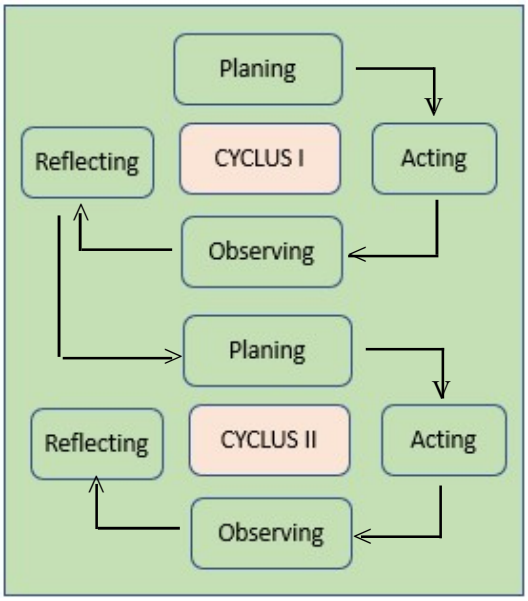

Figure-1
Classroom Action Research Cycle

The instruments include learning modules, student wokrsheet based on maritime contextual problems, and motivation questionnaires. The questionnaire was compiled based on five dimensions of learning motivation with a total of 20 statement items.

Table-1

Indicators	Items
Interest and Relevance of the Material	4
Independence and Learning Initiative	4
Activeness and Collaboration	4
Challenges and Willingness to Face Problems	4
Learning Satisfaction and Expectations	4

Thats tabel source adapted from Hmelo-Silver (2017), Savery (2015)

Data were collected using a motivational questionnaire with a four-point Likert scale (Riduwan, 2015; Azwar, 2012): strongly agree (4), agree (3), disagree (2), strongly disagree (1)

A questionnaire was distributed at the end of each cycle to measure changes in student motivation.

Data were analyzed using a descriptive quantitative approach (Creswell & Creswell, 2023). The average score is calculated by the formula: Average score = (Total Score)/(Number of Questions) (Sudjana, 2015).

Motivation categorization: high (3.5-4.0), medium (2.5-3.49), low (1.5-2.49). The validity of the instrument is confirmed through expert validation, while the reliability is tested using *Cronbach's Alpha*. Learning implementation follows PBL syntax consistently to ensure the internal validity of the research.

RESULT

1. Implementation of Learning with *a Problem-Based Learning Model*

The implementation of *the Problem-Based Learning* (PBL) model based on maritime contextual problems in Lingga Regency was carried out in two learning cycles with a total of five meetings. This research took place in the period of 1-17 September 2025 at SMA 1 Lingga, applying five phases of PBL learning consisting of problem orientation, student organization, individual and group investigations, presentation of works, and analysis and evaluation of problem solving. In the first cycle, learning was focused on data type differentiation material and diagram construction in the context of sea transportation costs in Lingga Regency. The problem orientation phase integrates learning videos that showcase the real problems of local maritime transportation, allowing learners to analyze familiar contextual situations. However, the initial implementation faces significant challenges related to the adaptation of students to the new learning methodology. Observations showed limited interaction and active participation, with the dominance of highly capable students in group discussions.

The student organization phase involves the formation of a heterogeneous group of six members, accompanied by the distribution of Student Worksheets (LKPD) that integrate maritime problems. Identified constraints include a lack of effective collaboration and reliance on the contributions of certain members. The investigation phase revealed the difficulties students had in interpreting the data and diagram construction, in particular determining the appropriate scale for the representation of marine transportation data. The second cycle showed a significant transformation in learning dynamics. The data centering material (*mean*, *median*, and *mode)* is presented through the context of analysis of sea wave height and fishermen's activities in Lingga Regency. The change in group composition based on the results of the first cycle evaluation resulted in an increase in enthusiasm and active involvement of students. The phase of presentation shows a positive evolution with spontaneous group initiative to present findings without explicit designation from educators.

2. Increasing Students' Learning Motivation

The measurement of learning motivation was carried out using questionnaire instruments administered at the beginning and end of learning implementation. The results of the analysis showed an increase in the learning motivation of students from the medium category with a score of 3,249 in the first cycle experienced a substantial increase in the second cycle. Indicators of increased motivation were identified through several behavioral aspects. First, the transformation of active participation in group discussions, which was originally dominated by high-ability students, has developed into the collective involvement of all members. Second, the evolution of courage in

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p-ISSN : 2809-5367
e-ISSN : 2809-6355

presentation, from initial conditions that require explicit appointment to voluntary initiatives to present the results of the group's work.

The third aspect includes improving the quality of academic interaction, as seen from the ability of students to give constructive responses to other group presentations. Observation shows the development of critical thinking skills through the ability to analyze and provide input for improvement to the solutions presented. Fourth, increased independence in the completion of individual tasks, which originally required intensive guidance evolved into the ability to complete independently. Contextualization of maritime issues has proven to be effective in increasing the relevance of learning to students' lives. The use of sea transportation data, fishing activities, and trade in marine products as a learning context creates meaningful connections between abstract mathematical concepts and the environmental reality of students. This contributes significantly to the increase of intrinsic motivation for learning.

3. The Effectiveness of Maritime Contextualization

The implementation of maritime contextual problems in Lingga Regency shows high effectiveness in facilitating the understanding of statistical concepts. The use of real data such as sea transportation costs, wave height, and fish catches creates *an authentic learning experience* that encourages student engagement. Qualitative analysis reveals that maritime contextualization successfully bridges the gap between theoretical knowledge and practical application. Learners demonstrate superior ability to interpret data when presented in a familiar context compared to conventional abstract problems. The ability to construct and interpret bar charts, *dot plots*, histograms, and ogives has increased significantly when associated with local maritime data.

The aspect of data centralization (*mean*, *median*, *mode)* shows a deeper level of understanding when studied through the context of analyzing fishermen's activities and trade in marine products. Learners demonstrate superior ability to identify the relevance of each concentration measure to specific contexts, such as the use of *the median* for wave height analysis and *modes* for marine products trade data. Contextualization has also succeeded in developing students' critical thinking skills in analyzing the implications of the calculation results on the real conditions of the maritime community. The ability to interpret data is not only limited to mathematical aspects, but develops into socio-economic analysis that is relevant to the local conditions of Lingga Regency.

4. Learning Process Transformation

The evolution of the learning process from the first cycle to the second cycle shows a fundamental transformation in the dynamics of the classroom. The initial obstacles in the form of resistance to new learning methodologies, limitations of group collaboration, and the dominance of certain students were successfully overcome through adaptation of learning strategies and group recomposition. The second cycle shows the achievement of optimal PBL learning characteristics, including the ability to identify problems independently, effective collaboration in problem solving, and presentation of results with high confidence. This transformation not only has an impact on cognitive aspects, but also the development of *soft skills* such as communication, leadership, and teamwork. The role of educators has transitioned from *instructor* to *facilitator*, with a focus on exploration guidance and discovery learning. This is reflected in the reduction of directive interventions and increased scaffolding support that allows students to develop learning autonomy. A comprehensive evaluation showed that the implementation of PBL based on the maritime context not only succeeded in increasing learning motivation, but also developed problem-solving skills, critical thinking, and the application of mathematical concepts in real contexts. This learning model has proven to be effective as an

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p-ISSN : 2809-5367
e-ISSN : 2809-6355
Jurnal Pembelajaran Bahasa dan Sastra
Volume 4, Nomor 5, September 2025
DOI: https://doi.org/10.55909/jpbs.v4i5.889

alternative to mathematics learning approaches that are meaningfully connected to the local environment and culture of students.

DISCUSSION

The implementation of PBL model in the context of maritime problems in Lingga Regency shows a significant positive impact on increasing student learning motivation. This study uses a Classroom Action Research design with two learning cycles involving 37 students of SMA Negeri 1 Lingga. Learning motivation data was collected through a questionnaire instrument that measured five main indicators: interest and relevance of the material, independence and learning initiative, activeness and collaboration, challenges and willingness to face problems, and satisfaction and expectation of learning.

Analysis of Motivation Questionnaire Cycle I

Based on data obtained in the first cycle which was held on September 1 and 3, 2025, it shows that from the five indicators of student learning motivation, an average score of 3.249 was obtained. According to the assessment category, the score falls into the category of moderate motivation. This condition indicates that students are not maximally motivated in carrying out PBL with the maritime context of Lingga Regency. These findings are in line with opinion (Bridges, McGrath, & Whitehill, 2012) which states that *PBL* It requires gradual adaptation to build meaning through authentic and relevant context.

Table-2

1	Indicator-1	1	0	0	23	14	3
		2	0	0	23	14	3
		3	0	0	23	14	3
		4	0	0	23	14	3
2	Indicator-2	5	0	6	23	18	3
		6	0	6	23	18	3
		7	0	6	23	18	3
		8	0	6	23	18	3

Table-2
Results of Motivation Questionnaire Cycle I

No.	Indicators	Item	Values Scale				Mode
			1	2	3	4	
3	Indicator-3	9	0	0	20	17	3
		10	0	0	20	17	3
		11	0	0	20	17	3
		12	0	0	20	17	3
4	Indicator-4	13	0	8	5	24	4
		14	0	8	5	24	4
		15	0	8	5	24	4
		16	0	8	5	24	4
5	Indicator-5	17	0	0	17	19	4
		18	0	0	17	19	4
		19	0	0	17	19	4
		20	0	0	17	19	4

In the first cycle, it was seen that the fifth indicator (satisfaction and expectation of learning) had the lowest score with an average of 2.6, while the third indicator (activeness and collaboration) showed the highest score with an average of 3.5. This shows that students still need adjustments in finding satisfaction and expectations for the learning model applied.

Analysis of Motivation Questionnaire Cycle II

The results of data analysis in the second cycle which was carried out on September 10, 15, and 17, 2025 showed a significant increase. From the five learning motivation indicators, an average score of 3.784 was obtained which was included in the high motivation category. This increase indicates that students are almost maximally motivated in carrying out problem-based learning with the maritime context of Lingga Regency.

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Table-3
Results of the Motivation Questionnaire
Cycle II

No.	Indicators	Item	Values Scale				Mode
			1	2	3	4	
1	Indicator-1	1	0	0	4	33	4
		2	0	0	4	33	4
		3	0	0	4	33	4
		4	0	0	4	33	4
2	Indicator-2	5	0	0	6	31	4
		6	0	0	6	31	4
		7	0	0	6	31	4
		8	0	0	6	31	4
3	Indicator-3	9	0	0	8	29	4
		10	0	0	8	29	4
		11	0	0	8	29	4
		12	0	0	8	29	4
4	Indicator-4	13	0	0	0	37	4
		14	0	0	0	37	4
		15	0	0	0	37	4
		16	0	0	0	37	4
5	Indicator-5	17	0	0	7	30	4
		18	0	0	7	30	4
		19	0	0	7	30	4
		20	0	0	7	30	4

The increase that occurred between cycle I and cycle II by 0.535 points shows the effectiveness of applying the PBL model with the maritime context. These results reinforce the findings (Rahayuningsih, 2020) which revealed that the implementation of PBL based on local wisdom can significantly increase class participation and student learning motivation.

The Effectiveness of Maritime Contexts in Learning

The use of maritime contextual problems in Lingga Regency has proven to be effective in increasing student involvement. The selected context includes data on fishermen's catches, distribution of sea transportation costs, and maritime trade activities that are familiar to students. This approach supports the view (Tan, 2016) that PBL must utilize real-world situations as a learning context to develop students' critical thinking competencies. Analysis per indicator shows that all aspects are improving, with the fourth indicator (challenges and willingness to face problems) showing the highest increase from 3,249 to 3,784. This is due to the compatibility between the problems presented and the students' direct experience in daily life in the archipelago. Conform to the opinion (Hamdayama, 2016), PBL learning that focuses on meaningful problems for students can encourage the improvement of critical and creative thinking skills during the solution search process.

The implementation of PBL stages consisting of problem orientation, student organization, investigation guidance, development of work results, and evaluation analysis of the problem-solving process showed consistent progressivity (Schmidt, Rotgans, & Yew, 2016). In the first cycle, students still need intensive guidance in understanding the context of maritime issues and identifying relevant information. This condition is in line with the findings (Sakinah & Fitria, 2024) that the problem-orientation phase requires strong motivation from teachers to ensure student participation in problem-solving (Learning & Tekkaya, 2016). In cycle II, there was an increase in student independence and learning initiative in collecting information and developing solutions. Students demonstrate better ability to analyze fish catch data, calculate average sea transportation costs, and present their findings systematically. This development supports the statement (Savery, 2015) that PBL inherently encourages students to direct their own learning process and develop personal responsibility for learning. The findings of this study confirm the effectiveness of integrating local contexts in mathematics learning, particularly in statistical materials, which not only increases learning motivation but also strengthens students' awareness of the potential of their area

according to their views (Irawan, 2018) about marine literacy-based education.

CONCLUSION

The implementation of PBL model based on maritime contextual problems in Lingga Regency has proven to be effective in increasing the learning motivation of SMA Negeri 1 Lingga students in learning mathematics and statistical materials. The Classroom Action research conducted in two cycles with five meetings showed a significant increase in learning motivation scores from 3,249 (medium category) in cycle I to 3,784 (high category) in cycle II, with an increase of 0.535 points. Learning transformation can be seen from the evolution of students' active participation, increased presentation boldness, the quality of constructive academic interaction, and the development of independent task completion.

The contextualization of maritime problems using real data such as sea transportation costs, wave height, and fish catches has succeeded in creating an authentic learning experience that bridges the gap between theoretical knowledge and practical applications, thereby increasing the relevance of learning to students' lives in the archipelago. The effectiveness of maritime contexts has been shown to be superior in facilitating the understanding of statistical concepts, with students demonstrating more in-depth data interpretation skills when presented in familiar contexts compared to conventional abstract problems. The five phases of PBL (problem orientation, student organization, investigation, presentation of results, analysis and evaluation) were optimally carried out in the second cycle with the characteristics of independent problem identification, effective collaboration, and high-confidence presentation. The transformation of the learning process not only has an impact on the cognitive aspect, but also the development of soft skills in communication, leadership, and teamwork.

The role of educators evolved from instructors to facilitators who support scaffolding and develop student learning autonomy, creating a learning environment that is meaningfully connected to the culture and local environment of Lingga Regency. Based on the findings of the study, it is recommended that mathematics teachers implement the PBL model with local context as an effective learning alternative to increase student motivation and engagement. The use of maritime contextual problems or other regional potentials needs to be developed systematically in learning planning, paying attention to the compatibility between mathematics material and the reality of student life. Heterogeneous group composition and adaptive scaffolding strategies need to be implemented to ensure the active participation of all students, overcome the dominance of high-ability students, and develop effective collaboration in problem solving. For follow-up research, it is recommended to explore the implementation of local context-based PBL in other mathematics materials and different levels of education to measure the consistency of its effectiveness. The development of a more comprehensive assessment instrument to measure the improvement of critical thinking skills, problem-solving, and soft skills needs to be carried out. Schools need to provide infrastructure support and training for teachers to master the PBL methodology and develop learning contexts based on local wisdom. Cooperation with local maritime stakeholders can enrich learning resources and strengthen students' authentic learning experiences in understanding the application of mathematical concepts in real life.

THANK YOU

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p-ISSN : 2809-5367
e-ISSN : 2809-6355

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