The Design of an Inquiry-Based Learning Model Integrating Mangrove Local Wisdom in Primary School Social Studies to Foster Social Attitudes

Laelia Nurpratiwiningsih[1], Rusdarti[2], Joko Widodo[3], Tjaturahono Budi Sanjoto[4]
Social Education Study Program, Faculty of Social and Political Sciences, Universitas Negeri Semarang, Indonesia[1]
Economics Education Study Program, Faculty of Economics and Business, Universitas Negeri Semarang, Indonesia[2]
Economics Education Study Program, Faculty of Economics and Business, Universitas Negeri Semarang, Indonesia[3]
Geography Education Study Program, Faculty of Social and Political Sciences, Universitas Negeri Semarang, Indonesia[4]
E-mail: laelia89@students.unnes.ac.id[1], rusdarti@mail.unnes.ac.id[2], jokowidodo@mail.unnes.ac.id[3], tjatur@mail.unnes.ac.id[4]
Correspondent Author: Laelia Nurpratiwiningsih, laelia89@students.unnes.ac.id
Doi: 10.31316/g-couns.v10i03.9118

Abstract

This study aims to design an inquiry-based learning model that integrates local wisdom about mangroves into primary school Social Studies to foster students' social attitudes. Employing a Research and Development approach with the 4D model (define, design, develop, disseminate), this research involved 6 primary school teachers and 60 fifth-grade students from coastal schools in Brebes Regency, Indonesia. Data were collected through needs analysis, expert validation, observations, interviews, and questionnaires. The resulting model systematically integrates seven-stage inquiry syntax with mangrove socio-ecological contexts, explicitly oriented toward developing cooperation, empathy, and responsibility. Expert validation by three specialists yielded an average feasibility score of 4.35 out of 5, indicating a very high level of validity. Limited trials revealed measurable improvements in students' social attitudes: cooperation increased by 18%, responsibility by 17%, and empathy by 15%. Qualitative data confirmed enhanced student engagement, collaboration, and environmental awareness. Teachers reported that the model effectively connected learning with students' real-life contexts, although they acknowledged the need for further training and assistance. This study contributes theoretically to contextual Social Studies pedagogy and, in practice, offers a sustainable instructional model for character education in coastal primary schools. The novelty lies in the systematic integration of inquiry-based learning, local mangrove wisdom, and explicit assessment of social attitudes within a single instructional design.

Keywords: character education, inquiry-based learning, mangrove local wisdom, primary school social studies, social attitudes

Article info
Received December 2025, Revised January 2026, Accepted January 2026, Published March 2026
How to Cite:
Nurpratiwiningsih, L., Rusdarti., Widodo, J., & Sanjoto, T. B. (2026). The Design of an Inquiry-Based Learning Model Integrating Mangrove Local Wisdom in Primary School Social Studies to Foster Social Attitudes. G-Couns: Jurnal Bimbingan Dan Konseling, 10 (03), July, 2173-2184. https://doi.org/10.31316/g-couns.v10i03.9118

Available online at https://journal.upy.ac.id/index.php/bk/index

INTRODUCTION

Education plays a strategic role in developing human resources who are not only intellectually competent but also socially responsible and sensitive to their surrounding environment (Usmi, 2023). In the context of primary education, learning should not merely focus on cognitive achievement but also emphasize the formation of social attitudes in other contexts, which they call independent and cooperative attitudes (Nur et al., 2025). Values ostare the main important for students to live harmoniously within society (Kurniawati et al., 2023). At the primary school level, Social Studies learning is expected to foster essential social attitudes (Eka Putri Desyani et al., 2025) such as cooperation, empathy, responsibility, tolerance, and environmental awareness from an early age. These attitudes form the foundation for students character development and social participation in later stages of life (Ayu Erisha Putri et al., 2025). However, the effectiveness of Social Studies in nurturing these attitudes largely depends on the learning approaches and instructional designs implemented in classrooms.

However, recent studies (2022–2025) indicate that Social Studies learning remains predominantly teacher-centered and only weakly connected to students' local socio-ecological contexts, resulting in limited development of social attitudes. Social Studies is a fundamental subject in achieving these goals, as it introduces students to social life, citizenship values, and democratic principles essential to sustainable societies (Sutrisno, 2023). In practice, Social Studies learning in many primary schools remains dominated by teacher-centered approaches (Shah, 2023) and textbook-based instruction (Ratmaningsih et al., 2025). Learning activities often prioritize memorizing facts and concepts over engaging students in meaningful exploration of social realities (Oktaviani et al., 2022). As a result, students tend to be passive recipients of information, with limited opportunities to reflect on social values or practice social skills through authentic learning experiences. This condition has contributed to the suboptimal development of students' social attitudes.

Another significant challenge is the limited integration of local context and culture into classroom learning. Learning materials are frequently detached from students' daily lives and immediate environments, making Social Studies content abstract and less relevant (Nurfaizah et al., 2025). When learning is disconnected from real social and environmental contexts, students often struggle to understand the practical relevance of social concepts, leading to low motivation to learn and superficial understanding (Sugiarto et al., 2024). At the same time, contextual character education highlights the importance of embedding moral and social values within learners' real-life environments (Niskaromah et al., 2025). Despite these advances, no existing inquiry-based learning model has systematically integrated local mangrove wisdom (Fariz et al., 2024) as a socio-ecological learning context and explicitly evaluated its impact on students' social attitudes (Sulaiman et al., 2023).

To address these challenges, inquiry-based learning (Watanabe et al., 2025) has been widely recognized as a relevant pedagogical approach. The novelty of this study lies in its structured integration of inquiry learning (Awinda et al., 2024), local environmental wisdom (Wardhani et al., 2024), and social attitude assessment (Yuniarto et al., 2022), contributing to both Social Studies and environmental education. Inquiry-based learning, grounded in social constructivist theory, emphasizes active knowledge construction through investigation and social interaction. Local wisdom offers valuable potential to

provide meaningful context for inquiry-based learning. Local wisdom encompasses values, knowledge, beliefs, and practices developed by communities in sustaining their social and environmental lives. In coastal regions, mangrove ecosystems embody a form of local wisdom that integrates ecological functions with social and cultural values, including mutual cooperation, environmental stewardship, and sustainable resource management.

Integrating local wisdom about mangroves into Social Studies learning allows students to explore real social and environmental issues in their immediate surroundings. Contextual learning grounded in local wisdom has been shown to enhance students' social awareness, environmental responsibility, and character development. Nevertheless, instructional designs that systematically integrate inquiry-based learning with mangrove local wisdom, particularly with a clear focus on fostering social attitudes, remain limited (Usmi, 2023).

Inquiry-based learning emphasizes students' active involvement in observing phenomena, formulating questions, conducting investigations, analyzing information, and drawing conclusions. This approach positions students as active learners who construct knowledge through interaction with their environment, while teachers act as facilitators who guide the learning (Rufia et al., 2025). Previous research has demonstrated that inquiry-based learning can effectively enhance students' critical thinking skills, problem-solving abilities, and social interaction (Yusuf et al., 2025). Through collaborative inquiry activities, students learn to communicate ideas, respect different perspectives, and work cooperatively (Usmi, 2023). Despite its pedagogical strengths, many implementations of inquiry-based learning in primary schools still lack a strong contextual grounding, particularly in Social Studies.

Most existing studies tend to examine inquiry-based learning without explicitly incorporating local environmental contexts or focus on integrating local wisdom without a structured inquiry framework. This condition reveals a research gap regarding the development of a comprehensive inquiry-based learning model that integrates local environmental wisdom to foster social attitudes in primary school students.

Therefore, this study aims to design an inquiry-based learning model that integrates local wisdom about mangroves into primary school Social Studies. The objectives of this research are to develop a contextual and inquiry-oriented learning model, to integrate local mangrove wisdom into Social Studies instructional activities, and to examine its potential contribution to fostering students' social attitudes. The novelty of this research lies in the systematic integration of inquiry-based learning principles with local mangrove wisdom as a pedagogical design explicitly oriented toward developing social attitudes in primary school students. By combining pedagogical innovation with local environmental and cultural contexts, this study is expected to contribute theoretically to Social Studies education and practically to the development of meaningful, sustainable, and context-based learning models in primary education.

METHOD

This study employed a Research and Development (R&D) approach to design an inquiry-based learning model integrating local wisdom about mangroves into Primary School Social Studies. The R&D approach was selected because it is appropriate for developing, validating, and refining educational products in the form of learning models

that are theoretically grounded and practically applicable in classroom settings. Operational procedure of the 4D model proposed by Thiagarajan, which consists of four stages: define, design, develop, and disseminate. Instruments used for needs analysis during the define stage: a needs analysis was conducted to identify instructional problems in Primary School Social Studies, students' social attitude profiles, and opportunities for integrating local mangrove wisdom. Data were collected through document analysis, classroom observations, teacher interviews, and Likert-scale questionnaires.

This study employed purposive sampling, selecting primary schools located in coastal areas adjacent to mangrove ecosystems in Brebes Regency. The sampling criteria were designed to ensure the socio-ecological context was relevant to the inquiry-based learning model integrating local mangrove wisdom. Participant selection criteria: teachers and students from two coastal primary schools, consisting of two Grade V classes, selected through purposive sampling based on their proximity to mangrove ecosystems and curriculum relevance.

The design stage focused on developing the inquiry-based learning syntax, lesson plans, instructional materials, and social attitude assessment instruments. During the development stage, the model was validated by three experts in Social Studies education and instructional design, and the validation data were analyzed using descriptive statistics. A limited field trial was conducted using a one-group pretest–posttest design involving 60 students from two coastal primary schools. Qualitative data were analyzed using thematic analysis, while quantitative data were analyzed descriptively.

Ethical considerations included informed consent, confidentiality, and voluntary participation. Ethical aspects of the research included obtaining informed consent from school principals, teachers, students, and parents. Participation was voluntary, and participants were informed of their right to withdraw at any time. The sample profile in this research is Klampok 05 State Primary School, a public primary school located in Klampok Village, Wanasari Subdistrict, Brebes Regency, Central Java, Indonesia. In 2025, the school served 165 students across six grade levels. It operates under the supervision of the Brebes Regency Office of Education and Culture and is known for its emphasis on character education and literacy development.

The design stage focused on structuring the inquiry-based learning model. This included determining learning objectives, inquiry steps, learning activities, learning materials, and assessment instruments oriented toward social attitudes. Mangrove local wisdom was integrated into learning scenarios, student activities, and inquiry tasks related to social and environmental issues in coastal communities.

The development stage involved expert validation and limited field trials. The draft learning model was reviewed by experts in Social Studies education, learning models, and primary education to assess its content and construct validity, as well as practicality. Revisions were made based on expert feedback. Subsequently, a limited trial was conducted in primary school classrooms to examine the feasibility and initial effectiveness of the model in fostering students' social attitudes.

The dissemination stage aimed to introduce the final version of the learning model to a broader audience through academic publications, seminars, and collaboration with primary school teachers. Data collection techniques used in this study included observation, interviews, questionnaires, and documentation. Qualitative data were analyzed descriptively to interpret learning processes and social attitude development,

while quantitative data from questionnaires were analyzed using descriptive statistics to support the findings.

The evaluation employed a one-group pretest–posttest design to assess changes in students' social attitudes before and after the implementation of the inquiry-based learning model. Social attitudes were measured using a Likert-scale questionnaire, and the data were analyzed descriptively.

RESULTS AND DISCUSSION

Results

Design of an Inquiry-Based Learning Model Integrating Mangrove Local Wisdom

This research successfully developed an inquiry-based learning model that integrates local wisdom about mangroves into elementary school Social Studies. The model was developed through the define and design stages of the 4D model, based on needs analysis, theoretical review, and contextual analysis of the coastal areas in Brebes Regency. The needs analysis revealed that Social Studies learning in coastal elementary schools remains predominantly teacher-centered and textbook-oriented, resulting in students' social attitudes, such as cooperation, empathy, and responsibility, not being optimally developed. Based on these findings, a hypothetical model was designed with three core components: (1) inquiry-based learning syntax, (2) mangrove local wisdom as a socio-ecological learning context, and (3) social attitude development as an explicit learning objective. The inquiry syntax in this model comprises seven stages, each integrating socio-ecological issues related to mangroves.

Table 1.
Syntax of the Inquiry-Based Learning Model Integrating Mangrove Local Wisdom

No.	Inquiry Stage	Mangrove-Integrated Learning Activities
1.	Contextual Problem Identification	Students observe the condition of mangrove forests around the school through videos or direct visits.
2.	Questioning	Students formulate questions about the functions of mangroves and the activities of coastal communities.
3.	Investigation Planning	Students plan data collection, such as interviews with community figures or salt farmers.
4.	Data Collection & Investigation	Students conduct field investigations on local wisdom practices in preserving the mangrove ecosystem.
5.	Analysis & Conclusion	Students analyze data and conclude the relationship between mangrove conservation and community social life.
6.	Reflection & Evaluation	Students reflect on the social values (cooperation, responsibility) they learned during the inquiry process.
7.	Follow-up Action	Students plan real actions, such as mangrove conservation campaigns or creating posters.

Expert Validation Results of the Learning Model

The developed learning model was then validated by three experts: a Social Studies education expert, a learning model expert, and an elementary education expert. The validation covered four main aspects: content feasibility, instructional mechanism,

language, and visual design. The validation results showed that this learning model achieved an average score of 4.35 out of 5, which falls into the "Very Feasible" category. In detail, the content and visual design aspects received the highest scores (4.40), followed by the instructional mechanism (4.33) and the language (4.27) aspects. These achievements indicate that the teaching materials are well integrated with Social Studies competencies, presented in a communicative manner suitable for students' developmental levels, and that the learning syntax is well structured to foster social attitudes.

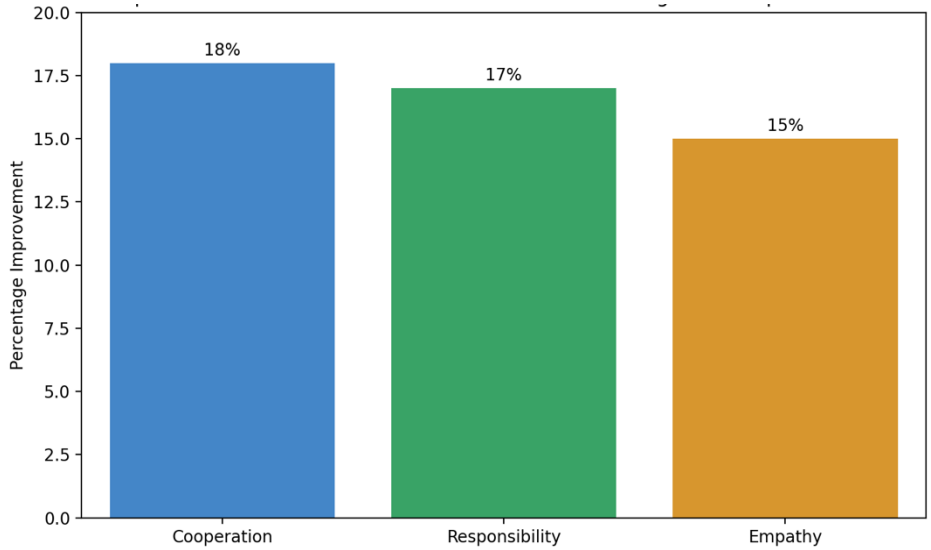
Table 2.
Expert Validation Results of the Learning Model (Scale 1-5)

Aspect Assessed	Mean Score	Category
Content Feasibility	4.40	Very Feasible
Instructional Mechanism	4.33	Very Feasible
Language	4.27	Very Feasible
Visual Design	4.40	Very Feasible
Overall Mean	4.35	Very Feasible

Improvement in Students' Social Attitudes

A limited trial using a one-group pretest-posttest design involved 60 fifth-grade students from two coastal elementary schools. The results of quantitative analysis showed a positive improvement in students' social attitudes after the implementation of the learning model. The most significant increase occurred in cooperation, at 18%. This was reflected in students' more active participation in group investigations and collaborative discussions. The sense of responsibility increased by 17%, as demonstrated by students' commitment to completing inquiry tasks and adhering to group agreements. Meanwhile, empathy increased by 15%, as evidenced by heightened student concern for peers' perspectives and environmental issues related to mangrove conservation.

Graph 1.
Improvement in Students' Social Attitudes



Implementation of Learning and Teacher Responses

Qualitative data from observations and interviews with teachers supported the quantitative findings. All teachers (100%) reported that this model ensured students were actively involved and collaborated intensively during the learning process. The teachers also observed an increase in students' enthusiasm and sensitivity towards mangrove conservation issues. However, regarding comfort with using local resources, a gap remained: 2 teachers (40%) felt comfortable, while the other 3 (60%) felt uncomfortable. Concerning the model's impact, 4 teachers (80%) believed that this inquiry learning improved students' communication skills, and the same proportion (80%) agreed that this learning also enhanced students' environmental awareness. Nevertheless, all teachers (100%) reported that implementation challenges remained high and required further assistance and training.

Table 3.
Teacher Responses to the Implementation of the Learning Model

Observed Aspect	Yes	No
Students are actively involved and collaborate	100%	0%
Teachers feel comfortable utilizing local resources	40%	60%
The model improves students' communication skills	80%	20%
The model enhances students' environmental awareness	80%	20%
Implementation challenges remain high	100%	0%

Qualitative Findings: Internalization of Values through Direct Experience

Observations during field activities showed that the process of value internalization occurred naturally. When students conducted investigations in the mangrove ecosystem and interacted with local communities, they not only gained knowledge but also directly experienced the values of mutual cooperation and environmental care practiced by the coastal community. For instance, while interviewing salt farmers about the role of mangroves, students demonstrated empathy by listening to stories about the economic challenges residents faced. Students' written reflections also revealed an increased understanding of the importance of protecting the environment as part of social responsibility. This confirms that the model is effective in making learning a meaningful experience that shapes character.

Theoretical and Practical Validity of the Model

Overall, the research results indicate that the developed inquiry-based learning model integrating mangrove local wisdom possesses strong theoretical validity, high contextual relevance, and feasibility for use in coastal elementary schools. The excellent expert validation scores confirm that this model is pedagogically sound. Meanwhile, data on improvements in students' social attitudes and positive responses from teachers demonstrate the model's practicality and initial effectiveness in achieving its objectives. This model offers a new synthesis by systematically aligning inquiry syntax, local wisdom content, and social attitude assessment within a single instructional design, a combination rarely found in previous studies.

Discussion

The findings of this study confirm that an inquiry learning model integrating local mangrove wisdom can address the challenges of social studies learning in elementary schools, which has tended to be teacher-centered and lacking contextual context. The success of this model in improving students' social attitudes is inseparable from its design, which combines inquiry syntax with real-life socio-ecological issues. This aligns with research by Uge et al. (2019), which demonstrated that a local wisdom-based social studies learning model significantly improves students' social knowledge and attitudes. By using the mangrove ecosystem as a learning resource, students not only learn abstract concepts but also engage in meaningful investigations, thereby internalizing social values through direct experience.

This strengthening of social attitudes can be explained through social constructivism and social cognitive theories. The collaborative inquiry process encourages students to interact and build shared understanding. Bandura's social cognitive theory clarifies this mechanism, where students learn through observational learning of cooperative behavior and environmental stewardship modeled by teachers, peers, or community leaders. Success in group assignments also increases students' self-efficacy, encouraging the adoption of prosocial behaviors. Darling-Hammond et al. (2020) confirmed that experiential approaches, such as inquiry, effectively develop social-emotional and cognitive skills in an integrated manner.

The success of this model is also supported by the use of an authentic local context, namely the mangrove ecosystem. The increase in students' environmental awareness, reported by 80% of teachers, indicates that integrating local wisdom fosters ecological literacy and a sense of responsibility. This finding is supported by Suryani et al. (2020), who demonstrated that pedagogy integrated with local wisdom effectively increases students' environmental awareness. This approach also supports achieving the Sustainable Development Goals (SDGs). Pratama et al. (2026) confirmed that the development of e-modules grounded in local wisdom and innovative models, such as RADEC, can significantly improve students' environmental literacy, a crucial foundation for sustainable action.

From a pedagogical perspective, this model complements the inquiry approach with a structured project framework in which students not only investigate but also plan and implement follow-up actions. This is relevant to the findings of Nurhidayati et al. (2024) that project-based learning models igrounded on local potential and constructive social investigations positively impact students' green behavior. In the context of mangroves, concrete actions such as conservation campaigns or mangrove planting strengthen students' character and attitudes of social responsibility.

The high expert validation score (mean = 4.35) indicates that the inquiry-based learning model integrating local mangrove wisdom is pedagogically sound and feasible to implement in Primary School Social Studies. This finding aligns with recent studies emphasizing that learning models grounded in inquiry and contextual relevance tend to demonstrate higher instructional validity and practicality. Well-structured inquiry syntax, clear instructional language, and meaningful learning materials contribute to effective knowledge construction and student engagement. The integration of local wisdom further strengthens the model by contextualizing learning content within students' real socio-

ecological environments, thereby enhancing instructional relevance and sustainability-oriented learning (Wang et al., 2021).

The improvement in students' social attitudes, particularly cooperation (18%), empathy (15%), and responsibility (17%), can be explained through social constructivist theory, which views learning as a socially mediated process occurring through interaction and collaboration. Recent empirical studies confirm that inquiry-based learning promotes cooperative skills and social awareness by engaging students in problem-solving, group discussions, and shared reflection (Darling-Hammond et al., 2020). In this study, students' increased cooperation and empathy emerged as they actively negotiated ideas and responded to social and environmental issues related to mangrove ecosystems, indicating that inquiry activities served as a catalyst for the development of social attitudes.

Moreover, the integration of local mangrove wisdom supports the principles of contextual character education and place-based learning, which emphasize the formation of moral and social values through direct engagement with local contexts (Bartl, 2022). Students' increased sense of responsibility and environmental awareness reflects the internalization of conservation values fostered through authentic inquiry tasks. This finding is consistent with recent international research showing that place-based and environmental inquiry learning enhances students' empathy, responsibility, and pro-environmental behavior. Therefore, this study confirms that contextual inquiry learning supported by local wisdom not only enhances cognitive engagement but also plays a critical role in shaping students' social attitudes in primary education.

Despite positive pilot results, this study acknowledged implementation challenges, particularly teacher discomfort (60%) in utilizing local resources and the need for mentoring. This indicates the need for ongoing teacher professional development programs, not only in model understanding but also in skills for designing locally context-based inquiries. Ilma et al. (2023) emphasized the importance of developing valid and practical guided inquiry learning tools to guide teachers and students, while reducing the burden of adapting the national curriculum to specific local contexts.

Overall, this inquiry-learning model based on local mangrove wisdom offers a holistic and innovative synthesis, with novelty in integrating inquiry syntax, local wisdom, and social attitude measurement as an explicit objective. With a very high expert validation score (average 4.35), this model is theoretically and practically feasible. This research contributes to contextualized and sustainable social studies pedagogy. For future development, this model can be replicated in different cultural contexts and further tested through experimental research with a control group, as well as the development of more standardized social attitude assessment instruments.

CONCLUSION

This study answers the research question by demonstrating that an inquiry-based Social Studies learning model integrating mangrove local wisdom can be systematically designed to foster primary school students' social attitudes, particularly cooperation, empathy, responsibility, and environmental awareness. The findings confirm that the model is pedagogically feasible and contextually relevant, as evidenced by high expert validation scores and positive trends in students' social attitude development during limited field trials. The originality of this study lies in its structured integration of inquiry-

based learning, local socio-ecological wisdom, and explicit assessment of social attitudes within a single instructional model. Nevertheless, this study is limited to an early development stage, has a geographically restricted sample in the coastal areas of Brebes Regency, and uses a one-group pretest–posttest design. Future research is recommended to conduct full experimental studies with control groups, replicate the model across diverse local and cultural contexts, and develop more standardized, psychometrically robust instruments for measuring social attitudes. From a policy and practice perspective, this model has strong potential to be adopted within national Social Studies curricula and teacher training programs as a context-based approach to strengthening character education and environmental awareness in primary schools.

ACKNOWLEDGMENTS

The authors would like to express their deepest gratitude to the principals, teachers, and students of the coastal primary schools in Brebes Regency for their invaluable participation and cooperation throughout this research. Sincere appreciation is also extended to the expert validators for their constructive feedback and scholarly input during the model development process. This study would not have been possible without the support of the Universitas Negeri Semarang and the local education authorities. All forms of assistance and contributions are gratefully acknowledged.

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