

When Project-Based Sociology Requires Research Literacy: Barriers to Student-Led Social Inquiry in an Indonesian Secondary School

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Abstract

Project-based learning (PjBL) in school sociology assumes that students can read academic instructions, formulate researchable questions, collect social data, collaborate, and use digital tools productively. This exploratory qualitative case study examines barriers to those capacities at SMA Pertiwi 1 Padang, Indonesia. Based on a sociology-teacher interview, classroom observation, and supporting literature, the analysis identifies five interrelated challenges: weak academic reading literacy, limited understanding of social-research methodology, predominantly consumptive technology use, difficulty understanding abstract methodological concepts, and low confidence in field research. These barriers are interpreted as an inquiry-readiness problem rather than simple resistance to PjBL. The findings indicate that project work should be accompanied by explicit and staged instruction in question formulation, observation, interviewing, evidence organization, ethical interaction, digital collaboration, and academic communication. The study contributes a readiness perspective to project-based sociology teaching by showing that meaningful student inquiry depends on textual, methodological, digital, and interpersonal foundations. The study identifies research literacy as a prerequisite for open-ended project work and clarifies the scaffolds students need before conducting independent social inquiry.

Keywords: digital literacy; inquiry readiness; project-based learning; research literacy; sociology education;.

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Introduction

Project-based learning is attractive in sociology because the subject naturally invites students to investigate the social world. A project can ask learners to observe patterns of interaction, interview community members, analyze social change, map forms of inequality, or document how norms operate in school settings. Such activities can make sociological knowledge more concrete and can position students as producers rather than recipients of information.

Yet project work carries hidden prerequisites. To investigate a social phenomenon, students must understand complex instructions, identify a manageable question, distinguish evidence from opinion, collect information systematically, interact ethically with participants, organize findings, and communicate an argument. These capacities are forms of research literacy. When they are weak, a project may remain at the level of task completion without developing disciplinary understanding.

The literature on PjBL often emphasizes engagement and higher-order skills, but a sociology project also depends on research literacy. Students must be able to turn a social topic into a question, identify usable evidence,

judge source quality, and connect information to a sociological claim. Secondary PjBL research shows that authentic work can be productive while still requiring explicit support for disciplinary inquiry (Boardman et al., 2024). The problem examined here is therefore an inquiry-readiness gap: project autonomy can exceed the research practices students have previously learned.

This issue is especially visible in sociology research tasks. Even at university level, sociology educators have long argued that students require explicit support to learn research design, evidence use, and evaluation criteria. Thakore (2024), for example, shows the importance of making research-method learning objectives and assessment rubrics explicit. Secondary students are likely to need even more structured preparation because many are encountering research concepts for the first time.

The study at SMA Pertiwi 1 Padang identified low reading interest, limited knowledge of social-research methodology, weak productive use of technology, difficulty understanding abstract methodological concepts, and low fieldwork readiness. These findings frame PjBL readiness as the central problem rather than the topic of social interaction alone. The research question is therefore: What forms of literacy and readiness constrain student-led project work in secondary sociology, and what scaffolding is needed to make social inquiry feasible?

The findings of the study can be understood through the concept of inquiry readiness. Inquiry readiness is not a fixed student trait but a set of capacities that make project-based social research possible. The first layer is textual literacy: students must interpret instructions, extract relevant information, and organize written ideas. The second is methodological literacy: they must understand how a broad topic becomes a focused question, how evidence is generated, and how a conclusion is connected to data.

A third layer is productive digital literacy. Daily smartphone use may demonstrate familiarity with devices but does not guarantee the ability to search strategically, evaluate sources, organize shared files, or communicate academic findings. A fourth layer is interpersonal and ethical readiness. Social research involves approaching other people, explaining the purpose of a task, asking questions respectfully, and handling information responsibly. A fifth layer is organizational readiness: projects require time management, division of labor, monitoring, and revision.

These layers interact. A student who misunderstands the assignment may formulate an unfocused question; an unfocused question produces weak observations or interviews; poorly documented data are difficult to organize digitally; and weak evidence makes report writing more difficult. Inquiry readiness therefore offers a stronger explanation than attributing project problems only to low motivation.

Project-based learning creates a meaningful reason to use research skills, but it does not automatically teach those skills. Research on PjBL shows that student-generated questions and coherent inquiry are among the most difficult characteristics to implement (Markula & Aksela, 2022). Even in university sociology, students benefit from explicit learning objectives and assessment criteria in research-method courses (Thakore, 2024). Secondary students, many of whom are encountering research methodology for the first time, are likely to require even more visible scaffolding.

Inquiry-cycle research provides a useful analogy. Pedaste et al. (2015) describe inquiry as a sequence involving orientation, conceptualization, investigation, conclusion, and discussion. Although their framework was developed in science education, the logic applies to school sociology. Fieldwork is only one phase. Students need to understand the question before collecting data and need to organize and discuss evidence after collection. Sending students into the field without these phases can produce activity without analytical depth.

Method

The study used an exploratory qualitative case-study approach at SMA Pertiwi 1 Padang, Indonesia. Evidence consisted of an interview with a sociology teacher, direct classroom observation, and literature used to contextualize the field findings. The case-study orientation supports interpretation of a bounded educational setting in context rather than statistical generalization (Yin, 2018).

The teacher interview focused on difficulties encountered in sociology lessons and student responses to PjBL. Classroom observation examined the learning environment, the use of instructional media, and patterns of student interaction. The documentary/literature component was used to connect these observations with existing work on literacy, technology, and project-based learning.

The interview date, duration, number of observed lessons, and student participant profile were not recorded in sufficient detail. The empirical material is therefore organized around five recurrent constraints that were consistently identified in the qualitative evidence: reading literacy, methodological literacy, productive digital literacy, conceptual abstraction, and fieldwork readiness. The analysis is interpretive and diagnostic rather than evaluative; it does not test the effect of PjBL on learning outcomes. The analytic emphasis is consistent with reflexive thematic attention to patterned meaning across qualitative materials (Braun & Clarke, 2021).

Reporting on teacher selection, observation procedures, consent, and ethics is limited. This constrains methodological transparency and transferability and is treated as a limitation of the case study.

The analysis organizes interview and observation material around five recurring constraints: reading literacy, methodological literacy, productive digital use, conceptual abstraction, and fieldwork readiness. Each constraint is interpreted in terms of how it affects the project cycle. The study is diagnostic rather than evaluative; it does not measure whether PjBL improves achievement or compare one learning model with another.

Because the interview date, duration, number of observed lessons, and student participant profile were not recorded in sufficient detail, the article does not make numerical claims about exposure or saturation. This reporting limitation narrows transferability, but the case remains useful for identifying prerequisites teachers may need to assess before assigning open-ended social research.

Results and Discussion

Reading literacy as the first layer of project readiness

The teacher identified low reading interest as a major barrier. This problem extended beyond the amount students read. It affected their ability to interpret complex task instructions, identify main ideas in academic texts, connect information across sources, and organize written arguments.

These difficulties became more visible in project work because PjBL increases the amount of independent interpretation students must perform. A conventional worksheet can often be completed through short responses; a research-oriented project requires students to understand a problem, search for information, determine relevance, and synthesize evidence. Weak reading literacy therefore reduced students' capacity to begin and sustain inquiry.

Methodological literacy as a missing bridge between topic and research

Students also struggled with basic social-research concepts. They had difficulty narrowing broad topics into researchable questions and distinguishing a general issue from a specific problem that could be investigated. Terms such as variable, hypothesis, data-collection technique, and analysis were experienced as abstract.

The difficulty was not only terminological. Students often understood "research" as gathering information rather than as a systematic sequence of questioning, evidence collection, analysis, and conclusion. This distinction is central to sociology. Without methodological literacy, students can complete an attractive project product while remaining uncertain about how a sociological claim is justified.

Technology availability did not equal productive digital literacy

Most students were familiar with smartphones, but the teacher observed that devices were more frequently associated with social media, gaming, and entertainment than with academic collaboration or research. Students were less familiar with tools such as collaborative documents, digital idea boards, research-oriented searching, and visual communication platforms used for project production.

The key barrier was therefore not simple access. Students could use digital platforms in everyday life yet still struggle to search strategically, evaluate sources, annotate evidence, and synthesize information for an academic purpose. Research on collaborative digital reading demonstrates that information literacy improves when learners are prompted to interact with sources analytically rather than merely retrieve them (Chen et al., 2022). This distinction is central to project-based sociology because an abundance of online information can intensify superficial copying unless search and evaluation routines are taught explicitly.

Abstract concepts increased the teacher's scaffolding burden

Research methodology was described as difficult for both explanation and learning because many of its concepts have no immediate physical referent. Students could understand an example of an interview more readily than the idea of a data-collection strategy; they could recognize a social problem more readily than formulate a research question.

This condition required teachers to move between examples and abstractions repeatedly. Simulations, worked examples, model research questions, and short practice tasks were therefore more appropriate than assigning a full field project immediately. The finding reinforces the view that PjBL depends on scaffolding rather than minimal guidance (Markula & Aksela, 2022).

Fieldwork readiness included interpersonal and ethical confidence

A final barrier concerned students' readiness to interact with participants. They reported uncertainty about whom to approach, how to formulate interview questions, how to record observations, and how to behave during data collection. Some also lacked confidence when speaking with unfamiliar respondents.

These difficulties show that social research is not merely a cognitive task. It requires interpersonal skills, ethical awareness, and procedural routines. Students need opportunities to rehearse interviewing, practice note-

taking, discuss consent and respectful interaction, and learn how to distinguish observation from judgment before entering the field. Research with sociology students similarly indicates that repeated participation in research activity can build research confidence and experience (Medley-Rath & Morgan, 2022).

Barriers accumulated rather than operating separately

The five barriers described above formed a cumulative pattern. Weak reading could lead to misunderstanding of the task; limited methodological knowledge could produce an unfocused question; uncertain fieldwork skills could result in weak data; and limited digital organization could make evidence difficult to retrieve during report writing. By the final stage, a group might compensate through attractive presentation even when the inquiry remained analytically thin.

This cumulative effect helps explain why students may appear active while learning remains shallow. The issue is not necessarily unwillingness to work. Students may invest considerable time but lack the research infrastructure needed to transform effort into evidence-based sociological explanation.

Discussion

The findings suggest that the central implementation problem was not a lack of enthusiasm for PjBL but a mismatch between project demands and students' existing inquiry capacities. This can be conceptualized as an inquiry-readiness gap.

Four forms of infrastructure are especially important. Textual infrastructure refers to the ability to interpret instructions, read sources, and synthesize information. Methodological infrastructure refers to the capacity to formulate questions, collect evidence, and reason from data. Digital infrastructure includes not only devices and connectivity but also productive digital practices for searching, collaborating, documenting, and presenting. Interpersonal infrastructure refers to the confidence and ethical skill needed for observation, interviewing, teamwork, and communication. These classroom-level capacities also depend on institutional conditions; research in diverse secondary settings identifies time, resources, curricular fit, and teacher support as significant enablers or constraints for project-based learning (Wilson, 2021).

This framework helps explain why simply assigning more projects may not solve the problem. PjBL can develop complex skills, but it also presupposes a minimum level of those same skills. Teachers therefore need a staged design in which project complexity increases as students acquire the required literacies. A first project might involve analyzing a teacher-provided dataset or observing interaction within the school; a later project might involve students constructing their own interview protocol and collecting community data.

The findings also support the argument that research methods should be taught through visible criteria. Thakore (2024) emphasizes the value of explicit learning objectives and rubrics in sociology research-method instruction. At secondary level, rubrics can translate abstract expectations into observable indicators: clarity of research question, relevance of evidence, ethical data collection, connection to sociological concepts, and quality of interpretation.

Digital literacy requires a similar shift from assumed familiarity to explicit disciplinary practice. Reviews of ICT integration in secondary education show that successful use depends on pedagogy, teacher support, infrastructure, and task design (Msafiri et al., 2023). Teacher digital competence likewise includes professional and pedagogical judgment, not only technical operation (Tzafilkou et al., 2023). In a sociology research project, those judgments include choosing databases or search terms, modeling source evaluation, protecting participants, and helping students distinguish evidence from opinion.

The study is limited by its single-school setting and by sparse methodological reporting. It does not include direct student interviews, literacy measures, or project-performance data. Future research could develop an inquiry-readiness rubric and examine how students' capabilities change across a sequence of scaffolded sociology projects.

From readiness diagnosis to progressive autonomy

The study suggests that autonomy should be progressive. PjBL does not need to be postponed until students are fully competent researchers. Instead, early projects can use teacher-provided questions, short readings, simulated observations, and structured interview guides. Later projects can gradually transfer responsibility for question formulation, instrument design, and evidence organization. Scaffolds can be reduced when students demonstrate competence rather than according to a predetermined schedule.

This progression turns project work into a curriculum for research literacy. Students learn not only about a social topic but also how sociological knowledge is produced. Such a design is particularly valuable because school sociology can otherwise separate theory from method: students memorize concepts in one unit and encounter research procedures as a disconnected topic. Project sequences can integrate the two when methodological instruction is timed to the needs of the investigation.

Productive digital literacy must be explicitly taught

Digital readiness should be defined through academic functions rather than device ownership. Teachers can make specific routines explicit: how to construct search terms, check the authority and date of a source, name files consistently, collaborate in a shared document, record field notes, and create a simple evidence table. These routines shift technology use from consumption toward knowledge production.

Teaching digital routines also reduces unequal dependence within groups. When only one student knows how to manage shared documents or presentation tools, that student may control the project while others become passive. Rotating digital responsibilities and providing short technical demonstrations can distribute competence more evenly.

Fieldwork readiness includes confidence and ethics

The findings also show that social research is interpersonal. Students may understand what an interview is yet remain anxious about approaching a respondent, asking follow-up questions, or handling refusal. Role-play can help students rehearse introductions, question sequences, and note-taking. Such practice makes social confidence part of academic preparation rather than treating it as an individual personality problem.

Ethical guidance should be equally explicit. Students need age-appropriate explanations of consent, privacy, respectful questioning, and responsible data storage. They should not be encouraged to investigate sensitive classmates or expose identifiable personal information. These principles improve both the quality of fieldwork and students' understanding that sociological evidence is produced through relationships of trust.

Practical Implications for Sociology Teachers

A more feasible PjBL sequence would begin by teaching the capacities required for inquiry. Teachers can model how to turn a broad topic into a researchable question, conduct a short demonstration interview, jointly code a small set of observations, and use sample reports to show what counts as evidence. Digital tools should be introduced for specific purposes rather than as general "technology integration." For example, a shared document can be used to build an interview protocol, a spreadsheet to organize simple frequencies, and a design platform to communicate findings.

Project assessment should also distinguish product quality from research quality. A polished video should not compensate for weak evidence, and a visually simple report should not be undervalued when it demonstrates strong sociological reasoning. Separating criteria for inquiry, conceptual understanding, collaboration, and communication can make expectations more transparent.

A staged architecture for project-based social inquiry

A practical project architecture can be organized into five stages. The first stage develops reading and question formulation through short, teacher-selected sources. The second stage uses a simulated observation or interview so that students can practice research procedures in a low-risk setting. The third stage involves a limited amount of real-world data collection with an approved instrument. The fourth stage focuses on organizing evidence and connecting it to sociological concepts. The fifth stage culminates in a report, poster, or presentation accompanied by individual reflection.

Before fieldwork, teachers can use readiness checks. A group should be able to explain its research question, identify what evidence is needed, show a draft instrument, describe participant roles, and explain how data will be stored. If students cannot do these things, additional scaffolding is more productive than allowing a weak design to proceed and correcting it only after data have been collected.

Assessment rubrics can reinforce the same architecture. Criteria should include clarity of question, relevance and quality of evidence, ethical procedure, use of sociological concepts, organization of argument, collaborative contribution, and reflection. This prevents the final product from being judged primarily by visual appearance and makes research literacy an explicit learning outcome.

School-level implications

The literacy demands of PjBL exceed the boundaries of one subject. Indonesian language classes can reinforce academic reading and report writing, while informatics can support productive digital practices. Sociology can provide authentic contexts in which these capacities are applied. Coordination across subjects can make project skills cumulative rather than forcing each teacher to reteach them independently.

Schools can also support field-based learning through clear procedures for student research, access to digital tools, and scheduling flexibility. Without institutional support, teachers may respond to low readiness by reducing projects to simple group assignments. A supportive environment makes it more feasible to preserve the inquiry dimension of PjBL.

Limitations and future research

The study relies on one teacher perspective and broadly reported classroom observation. Student voices are not systematically represented, and no instrument was used to measure the different dimensions of inquiry readiness. The framework should therefore be treated as an interpretive proposition grounded in the case rather than a validated model.

Future research could develop indicators of textual, methodological, digital, interpersonal, and organizational readiness and examine how these dimensions relate to project quality. Comparative studies could also investigate whether staged scaffolding improves the quality of student questions, field notes, evidence use, and sociological explanations over time.

Why research literacy matters for sociology as a discipline

Research literacy is not merely a technical prerequisite for completing a project; it is part of learning what sociology is. Sociology differs from everyday commentary because claims are expected to be connected to concepts and systematically produced evidence. When students learn to formulate a question, observe carefully, interview respectfully, and distinguish a claim from an impression, they begin to experience sociology as a way of knowing rather than as a collection of definitions.

This disciplinary perspective also changes the meaning of literacy. Reading becomes a way of locating ideas and evidence, writing becomes a way of organizing an argument, and digital tools become instruments for documenting and communicating knowledge. These practices are mutually reinforcing. A student who can identify the central claim of a source is better positioned to formulate a research question; a student who can organize field notes is better positioned to write an evidence-based conclusion.

Project-based learning can therefore serve as a bridge between substantive sociology and research methods when the project is carefully sequenced. A unit on social interaction, for example, can introduce concepts and then ask students to observe a bounded interaction setting using a structured protocol. The resulting evidence can be discussed through the same concepts that motivated the observation. Method and theory become connected through the task.

This connection is important for long-term curriculum design. If research skills are taught only once as an isolated unit, students may forget them before the next project. Repeated, increasingly complex inquiry tasks can make research literacy cumulative. The goal is not to turn secondary students into professional researchers, but to help them develop disciplined habits of questioning, evidence use, and ethical interpretation.

Teacher workload must also be considered. Scaffolding research literacy requires time for reading support, instrument review, consultation, and feedback on drafts. If projects are added without reducing other demands, teachers may be pushed toward superficial monitoring. Schools that expect inquiry-oriented learning should therefore provide planning time and shared resources for common research procedures.

Student readiness should likewise be treated as variable rather than deficient. Different groups may require different levels of structure, and the same group may be strong in digital production but weak in reading or interviewing. Diagnostic flexibility allows teachers to target support instead of labeling students globally as 'unprepared.'

Seen in this way, PjBL becomes a framework for progressive participation in disciplinary practice. The educational objective is not simply to finish a project but to help students perform more of the intellectual work of sociology with decreasing dependence on teacher direction.

An inquiry-readiness perspective also encourages more precise evaluation of project failure. When a group produces weak results, the teacher can ask whether the difficulty arose from reading, question formulation, field interaction, digital organization, or analysis. This diagnostic approach is more useful than attributing the outcome to motivation alone because it identifies a teachable next step.

Over time, records of these difficulties can inform curriculum planning. If several groups repeatedly struggle with the same research practice, that practice can become an explicit mini-lesson before the next project. In this way, classroom evidence is used to strengthen the infrastructure of future inquiry.

This approach also makes differentiation more precise. Rather than simplifying the entire project for students who struggle, teachers can provide targeted support at the layer where difficulty occurs—for example, a reading scaffold, a question template, an interview rehearsal, or a digital organization guide—while preserving the same sociological learning goal.

Contribution: Inquiry Readiness as a Condition of Project-Based Sociology

The concept of inquiry readiness provides a more precise explanation of why apparently well-designed sociology projects can falter. Project-based learning is frequently discussed in terms of authenticity, collaboration, creativity, or final products, yet social inquiry also presupposes a set of less visible capabilities. Students must be able to read academic instructions, convert broad interests into researchable questions, distinguish observation from inference, record information systematically, communicate with participants, evaluate digital sources, and

transform evidence into an argument. When several of these capabilities are weak at the same time, the project can become a sequence of logistical tasks rather than sociological investigation. This interpretation is consistent with research showing that PjBL outcomes are moderated by implementation conditions (Chen & Yang, 2019) and with meta-analytic evidence that problem-driven approaches produce heterogeneous motivational effects across contexts (Wijnia, Noordzij, Arends, Rikers, & Loyens, 2024). The practical implication is not to postpone projects until students are fully “ready,” but to make readiness itself an instructional target. Teachers can diagnose prerequisite capabilities, model one inquiry practice at a time, use short rehearsal tasks, provide partially structured instruments, and gradually remove support as students demonstrate control. In sociology, this sequencing has an additional disciplinary value: it teaches that claims about social life require evidence collected and interpreted through explicit procedures. Inquiry readiness therefore links literacy, methodology, digital practice, and ethics rather than treating them as separate remedial problems. It also offers a useful criterion for differentiation. Groups may investigate a common sociological theme while receiving different levels of support for reading, question formulation, field-note construction, interviewing, or digital organization. The goal is equivalent access to sociological reasoning, not identical amounts of teacher assistance. Framed in this way, scaffolding protects the intellectual ambition of PjBL while making student-led social inquiry feasible for learners with uneven prior preparation. This focus on explicit reasoning is aligned with systematic work showing that higher-order and critical thinking in problem- and project-based environments requires carefully designed prompts, tasks, and guidance (Loyens, van Meerten, Schaap, & Wijnia, 2023).

The challenges identified in this case can be interpreted as an inquiry-readiness problem rather than simply as student reluctance to complete projects. Project-based sociology assumes a set of background capacities that may not yet be fully developed: reading instructions, locating credible information, translating a broad topic into a researchable question, gathering evidence, recording observations, interviewing ethically, and constructing an argument from data. Recent inquiry research reinforces this point. Dah, Noor, Kamarudin, and Syed Abdul Azziz (2024) show that open inquiry can support meaningful learning but that its benefits depend on students' capacity to manage greater autonomy. Eymur and Çetin (2024) likewise demonstrate the importance of inquiry experiences for scientific literacy, while Thakore (2024), in sociology research-methods teaching, emphasizes the value of explicit learning objectives and rubrics for making the research process visible to students. Although these studies come from different educational levels and disciplines, they converge on a principle directly relevant to this case: inquiry becomes productive when complex research activity is decomposed into teachable and assessable practices.

This perspective helps explain why digital access alone did not resolve the difficulties observed at SMA Pertiwi 1 Padang. Students needed an inquiry architecture: how to formulate a researchable question, document a search trail, evaluate relevance and credibility, summarize without copying, and connect evidence to concepts. Work on disciplinary writing shows that content teachers can make otherwise invisible literacy demands explicit through inquiry into students' texts (Seah et al., 2022). The implication is that research literacy should be taught inside the project workflow, not assigned as a prerequisite students are assumed to possess.

Recent project-learning research reinforces the importance of scaffolding before autonomy is expanded. Boardman et al. (2024) show that authentic secondary projects require deliberate enactment of disciplinary and participatory practices, while information-literacy research shows that collaborative digital tools are most useful when they structure how students read and evaluate evidence (Chen et al., 2022). For sociology, these findings support a phased design: model a research practice, rehearse it with feedback, document its use in the project, and only then increase independence. This sequence directly addresses the inquiry-readiness gap identified in the case.

The inquiry-readiness gap also helps explain why students can value project learning while still experiencing uncertainty about what constitutes adequate research work. Oduro et al. (2024) document both positive and challenging K–12 student experiences of PjBL, and Yusri et al. (2024) show that project frameworks vary in how inquiry and higher-order competencies are structured. These findings support an explicit research-literacy progression: before students are asked to work autonomously, they need modeled routines for questioning, searching, evaluating, documenting, interpreting, and communicating evidence.

Conclusion

Project-based sociology requires an infrastructure of inquiry. At SMA Pertiwi 1 Padang, students' difficulties with academic reading, research methodology, productive technology use, abstract concepts, and fieldwork interaction limited their ability to conduct independent social inquiry. These constraints should not be interpreted simply as low motivation or as evidence that PjBL is unsuitable. They indicate where scaffolding is required.

The analysis therefore shifts the focus from “using projects” to preparing students to investigate social life. When textual, methodological, digital, and interpersonal capacities are taught explicitly and developed

progressively, PjBL is more likely to become a vehicle for sociological reasoning rather than a demanding group assignment with limited analytical depth.

Declarations

Author contribution

Author 1: developed the main research idea and objectives, designed the research methodology, conducted data collection and investigation, performed the data analysis, and prepared the first draft of the manuscript. Author 2: contributed to the development and implementation of the research methodology, supported the data collection and investigation process, and reviewed and revised the manuscript to improve its academic quality, clarity, and structure, provided input into the research concept and direction, supervised and guided the overall research process, reviewed and improved the manuscript, and contributed to obtaining financial support or research funding

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The authors declare that there is no conflict of interest related to the publication of this article.

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