

Measuring the Impact of Project-Based Learning with Indigenous Games on Social Cohesion Skills among Primary School Students in Indonesia

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Abstract

In the context of Indonesia's shifting cultural landscape, where traditional values like gotong royong (mutual cooperation) risk erosion due to digital individualism, this study examines the impact of integrating traditional Malay Riau games into Project-Based Learning (PjBL) on primary school students' social cohesion skills. Grounded in social constructivism and culturally responsive pedagogy, the research aimed to empirically assess whether culturally adapted PjBL enhances teamwork, empathy, and collective responsibility. Using a quasi-experimental mixed-methods design, 242 fifth-grade students across four schools participated in a 12-week intervention featuring games like terompah panjang and tarik upih embedded in PjBL modules, while control groups followed standard curricula. Quantitative results revealed significant improvements in social cohesion skills ($\eta^2 = 0.26$), particularly teamwork and mutual aid, supported by qualitative insights highlighting embodied learning and cultural reconnection. The study demonstrates the efficacy of a culturally responsive PjBL model in which traditional games serve as both the central project content and the medium for developing prosocial skills. The findings align with theories emphasizing social interaction and cultural relevance in skill development while revealing the need for additional scaffolding in conflict resolution. The study contributes a replicable model for balancing global pedagogies with local cultural imperatives, offering implications for curriculum design and teacher training in multicultural education systems.

Keywords:

Culturally Responsive Pedagogy, Indonesia, Primary Education, Project-Based Learning, Social Cohesion, Traditional Games



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Introduction

Core social competencies such as collaboration, empathy, and social responsibility, often categorized under the umbrella of "social cohesion" or "collective competence," are foundational to navigating complex societal challenges (Charosky et al., 2022; Santhosh et al., 2023). In Indonesia, the traditional value of gotong royong—mutual cooperation—has long served as a cultural blueprint for communal harmony and shared responsibility. However,

with the rise of individualistic tendencies, driven in part by pervasive exposure to digital technology and screen-based entertainment, these values are increasingly at risk of erosion (Cheng & Yang, 2023; Zaki et al., 2024). Amid these tensions, educators face an urgent imperative to embed local cultural values into modern pedagogical approaches.

Project-Based Learning (PjBL), as a student-centered instructional model, holds considerable promise for fostering social and collaborative competencies in authentic contexts. By engaging learners in complex, real-world tasks that require sustained inquiry and teamwork, PjBL has demonstrated effectiveness in enhancing communication, responsibility, and group problem-solving (Indriati et al., 2024; Jia et al., 2023; Leow & Neo, 2023). However, in practice, PjBL implementations often prioritize cognitive outcomes and lack deep cultural integration, thereby underutilizing the potential of local wisdom, such as *gotong royong*, to foster community-oriented values. This highlights the importance of developing and empirically validating structured models that systematically combine the procedural strengths of PjBL with local wisdom-based content that promotes community-oriented character formation.

One culturally grounded entry point is through the revitalization of traditional games. Traditional Malay Riau games—such as *terompah panjang*, *galah panjang*, and *tarik upih*—require not only physical coordination but also deep social interdependence. These games, rooted in communal practices, naturally reinforce values such as teamwork, empathy, cooperation, and shared accountability (Putra et al., 2024; Hermendra et al., 2020). However, empirical studies that rigorously assess how these games, when embedded in a PjBL framework, influence students' social development remain scarce. Moreover, existing research in the Southeast Asian context tends to focus on the preservation of cultural heritage or general character education, without directly measuring the impact of these pedagogical designs on students' social cohesion skills (Elumalai et al., 2022; Setiani et al., 2022).

Anchored in social constructivism and culturally responsive pedagogy, this study aims to fill this critical gap by empirically measuring the impact of a culturally adapted PjBL model—infused with traditional Malay Riau games—on primary school students' social cohesion skills. It not only extends the design of PjBL beyond academic content toward affective and social domains, but also offers a viable model for educational systems aiming to balance global pedagogical trends with local cultural imperatives (Baghirova, 2024; Kwon et al., 2024; Saimon et al., 2023).

This study is guided by the following research questions. First, to what extent does the integration of traditional Malay Riau games in a PjBL framework enhance elementary students' social cohesion skills? Second, which specific components of social cohesion such as teamwork, empathy, and mutual support show the most significant improvement as a result of the intervention? Finally, how do students and teachers perceive the cultural and pedagogical relevance of using traditional games in school-based project learning?

By addressing these questions, the study aims to provide a replicable, evidence-based model for cultivating culturally grounded social competencies through interdisciplinary pedagogy. The outcomes have the potential to inform educational policy, teacher training, and curriculum development in Indonesia and other multicultural societies navigating similar challenges.

Theoretical Framework

This study's interdisciplinary framework combines social constructivism, culturally responsive pedagogy, and the 21st-century skills framework to examine how PjBL with traditional games fosters social cohesion.

Social Constructivism

Social constructivism, as articulated by Vygotsky (1978), posits that learning is inherently a social process, constructed through interaction, dialogue, and participation within a cultural context. According to this perspective, knowledge is not transmitted directly from teacher to student but co-constructed through shared activities and collaboration with peers and more knowledgeable others. In this view, traditional games function as more than recreational activities—they are situated cultural practices that mediate learning by embedding values, rules, and social expectations within concrete, interactive experiences (Elumalai et al., 2022; Tameon, 2018). Project-based learning, when embedded in culturally rich tasks like indigenous games, aligns with the Vygotskian idea of the Zone of Proximal Development (ZPD), where learners stretch their social and cognitive abilities in the presence of peer support and cultural tools.

Culturally Responsive Pedagogy

Culturally Relevant Teaching (CRT) aims not only to connect learning to students' cultural backgrounds and lived experiences but also to develop their critical consciousness and empower them to challenge social inequities (Ladson-Billings, 1995). Integrating traditional Malay games into the PjBL model positions indigenous culture as a legitimate source of knowledge, thus resisting the marginalization of local identity in favor

of dominant global narratives (Kilolu et al., 2024; Zaki et al., 2024). This approach also empowers students to see their culture reflected in the curriculum, enhancing both engagement and identity formation. When traditional games are mobilized as a pedagogical tool, they do not merely teach academic content but transmit social norms such as cooperation, empathy, and mutual responsibility—key pillars of gotong royong (Baghirov, 2024; Hermandra et al., 2020;).

21st-Century Skills and Social Cohesion

Within the global discourse on education, 21st-century skills emphasize the importance of collaboration, communication, creativity, and critical thinking—commonly known as the 4Cs (Saimon et al., 2023; Yong & Saad, 2023). Social cohesion, though less frequently emphasized in Westernized skills taxonomies, intersects with these domains, particularly in terms of collaboration, empathy, and shared problem-solving (Charosky et al., 2022; Leow & Neo, 2023). Aligned with the focus of this study, social cohesion is conceptualized not only as an outcome of interpersonal engagement but as a skillset comprising teamwork, empathy, mutual support, and conflict resolution. These are often fostered more effectively through lived, cooperative experiences—such as traditional games—than through didactic instruction. The combination of PjBL and culturally meaningful activities creates a powerful context for practicing these skills in real-world settings.

Integrating the Frameworks and Identifying the Research Gap

Empirical studies support the individual components of this framework, demonstrating PjBL's efficacy for fostering collaboration (Jia et al., 2023; Leow & Neo, 2023) and the role of traditional games in preserving culture and encouraging cooperation (Hermandra et al., 2020; Putra et al., 2024). However, a review of the literature reveals a critical gap. While studies like those by Setiani et al. (2022) and Elumalai et al. (2022) focus on traditional games for cultural preservation or general character education, there is a scarcity of research that empirically measures the impact of systematically integrating these games into a PjBL framework on specific, measurable social cohesion skills. This study aims to fill this gap by investigating whether a structured, culturally-grounded PjBL model can quantitatively and qualitatively enhance competencies like teamwork, empathy, and mutual support among primary school students.

Methods

Research Design

A quasi-experimental pretest-posttest control group design was employed to evaluate the effectiveness of

the intervention (Creswell & Creswell, 2018). This design was selected due to its ability to measure change over time while comparing treatment and control conditions in educational settings where random assignment at the individual level is not feasible (Maros et al., 2023). The study incorporated both quantitative and qualitative methods to provide a comprehensive understanding of the intervention's impact, aligning with recommendations for educational research that seeks to evaluate complex social phenomena (Cheng & Yang, 2023; Jia et al., 2023).

Setting and Participants

Research Setting

The study was conducted in four public primary schools in urban and semi-urban areas of Pekanbaru, the capital city of Riau Province, Indonesia. The schools were chosen based on several criteria, including: (1) similarity in academic performance based on national standardized test scores; (2) comparable socioeconomic profiles of the student population; (3) commitment to implementing the intervention with fidelity; and (4) absence of other major educational interventions during the study period (Munir et al., 2025; Zaki et al., 2024). All selected schools followed the Indonesian national curriculum, with similar time allocations for physical education, social studies, and Indonesian language—the three subject areas integrated in the intervention.

Participant Selection

Participants were 5th-grade students (aged 10-11) across the four schools, comprising a total sample of 242 students. This age group was selected based on developmental considerations; students at this stage possess sufficient cognitive maturity to engage in self-reflection and complex project work while still being receptive to social skills development through play-based activities (Porat et al., 2023; Singer et al., 2024). Purposive sampling was used to select intact classrooms, with all students in the selected classrooms invited to participate. The study targeted 5th-grade students specifically because they have developed basic academic skills required for project work but are still formative in their social development (Slattery et al., 2024; Söderqvist Forkby, 2024).

In each school, two classes were selected, resulting in a total of four experimental classes (n = 123) and four control classes (n = 119). Class sizes ranged from 28 to 32 students, representative of typical class sizes in urban Indonesian primary schools. The demographic characteristics of the participants are presented in Table 1.

Table 1
Demographic Characteristics of Participants (N = 242)

Characteristic	Experimental Group (n = 123)	Control Group (n = 119)	Total (N = 242)	p-value
Gender				
Male	62 (50.4%)	58 (48.7%)	120 (49.6%)	.763
Female	61 (49.6%)	61 (51.3%)	122 (50.4%)	
Age				
10 years	73 (59.3%)	69 (58.0%)	142 (58.7%)	.879
11 years	50 (40.7%)	50 (42.0%)	100 (41.3%)	
Ethnicity				
Malay	76 (61.8%)	72 (60.5%)	148 (61.2%)	.905
Minangkabau	23 (18.7%)	21 (17.6%)	44 (18.2%)	
Javanese	16 (13.0%)	18 (15.1%)	34 (14.0%)	
Other	8 (6.5%)	8 (6.7%)	16 (6.6%)	
Parental Education				
Primary education or lower	7 (5.7%)	6 (5.0%)	13 (5.4%)	.852
Secondary education	78 (63.4%)	74 (62.2%)	152 (62.8%)	
Higher education	38 (30.9%)	39 (32.8%)	77 (31.8%)	
Prior Experience with Traditional Games				
Extensive	12 (9.8%)	13 (10.9%)	25 (10.3%)	.774
Moderate	37 (30.1%)	39 (32.8%)	76 (31.4%)	
Limited	58 (47.2%)	51 (42.9%)	109 (45.0%)	
None	16 (13.0%)	16 (13.4%)	32 (13.2%)	

Note. p-values were calculated using chi-square tests for independence between experimental and control groups; no significant differences were found between groups at $p < .05$.

In addition to students, 16 teachers (four from each school) participated in the study. These included the primary classroom teachers for each participating class and specialist teachers in physical education and culture who collaborated in implementing the intervention. Teachers in the experimental group had a mean of 9.8 years of teaching experience ($SD = 4.3$), while those in the control group had a mean of 10.2 years ($SD = 5.1$). All teachers held at least a bachelor's degree in education, and none had prior experience with formal PjBL implementation incorporating traditional games.

Ethical Considerations

Prior to data collection, ethical approval was obtained from the University Ethics Committee (Reference No. UEC/2024/03/15). Following institutional approval, permission was sought from the provincial education department and participating schools. Informed consent was obtained from parents/guardians of all student participants, and assent was sought from the students themselves. Teachers provided separate informed consent for their participation. All participants were informed of their right to withdraw at any time without consequences. Confidentiality was maintained by using codes instead of names in data collection and reporting. The research protocol adhered to ethical standards for conducting research with children, as outlined by UNICEF and local educational authorities (Kwon et al., 2024; Zaki et al., 2024).

Intervention Design

Theoretical Foundation

The intervention design was anchored in three complementary theoretical frameworks: social constructivism (Vygotsky, 1978), culturally responsive pedagogy (Gay, 2018), and the 21st-century skills framework with a specific emphasis on social cohesion competencies (Yong & Saad, 2023). These frameworks guided the development of a 12-week program that integrated three traditional Malay Riau games—terompah panjang (long wooden sandals), galah panjang (long pole), and tarik upih (areca palm sheath tug-of-war)—into project-based learning modules aligned with the national curriculum for 5th-grade students.

Intervention Structure

The intervention consisted of three sequential PjBL modules, each centering on one traditional game while integrating content from physical education, social studies, and Indonesian language subjects. Each module followed the Gold Standard PjBL model developed by the Buck Institute for Education (Indriati et al., 2024), modified to incorporate cultural elements (Zaki et al., 2024). The modules progressed through the following phases over a four-week period:

1. Cultural Exploration (Week 1): Students researched the historical origins, cultural significance, and traditional rules of the featured game through interviews with community elders, library research, and

video analysis. This phase emphasized both the cognitive understanding of cultural heritage and the affective connection to traditional values (Kilolu et al., 2024).

2. Game Experience and Analysis (Week 2): Students experienced the traditional game in its authentic form, followed by structured reflection on the social skills required for success. Teachers facilitated discussions about how these games naturally reinforced values such as teamwork and mutual support (Elumalai et al., 2022).
3. Game Modification and Innovation (Week 3): Working in heterogeneous teams of 4-5 members, students redesigned aspects of the traditional game to enhance specific social cohesion skills while preserving its cultural essence. This phase encouraged creative problem-solving while reinforcing the connection between cultural practices and contemporary social needs (Cheng & Yang, 2023).
4. Implementation and Community Sharing (Week 4): Student teams implemented their modified games with younger students (3rd grade), documented the outcomes, and presented their projects to the school community, including parents and local cultural stakeholders. This phase emphasized authentic assessment and community engagement (Leow & Neo, 2023; Jia et al., 2023).

The three modules focused on the following traditional games, selected based on their prevalence in Riau Malay culture and their inherent requirements for social coordination:

Module 1: Terompah Panjang (Long Wooden Sandals)
This game involves teams of 4-6 players who must coordinate their movements while standing on two long wooden sandals (3-4 meters in length). The team must synchronize their steps to move forward without falling, requiring precise communication, leadership, and collective rhythm. This game was selected to develop teamwork, communication, and leadership skills (Hermandra et al., 2020).

Module 2: Galah Panjang (Long Pole)
A strategic team game played on a grid-like court where one team attempts to cross lines defended by the opposing team. Players must analyze opponents' movements, develop team strategies, and make quick decisions. This game was selected to enhance strategic thinking, empathy (through anticipating others' movements), and conflict resolution (Putra et al., 2024).

Module 3: Tarik Upih (Areca Palm Sheath Tug-of-War)
A variation of tug-of-war using areca palm sheaths, this game requires teams to pull collectively against opposing forces. Unlike conventional tug-of-war, the unique properties of the palm sheath require more subtle coordination and sensitivity to teammates' efforts. This game was selected to develop mutual

support, shared responsibility, and resilience (Setiani et al., 2022).

Implementation Procedures

Prior to implementation, a three-day professional development workshop (21 hours total) was conducted for teachers in the experimental group. The workshop covered PjBL methodology, cultural integration strategies, facilitation techniques for social cohesion skill development, and assessment approaches. Workshop activities included experiential learning of the traditional games, collaborative planning of lessons, and simulation of facilitation strategies. This preparation was essential for ensuring implementation fidelity and teacher confidence (Indriati et al., 2024; Zaki et al., 2024).

Teachers received a comprehensive curriculum guide detailing the modules, including learning objectives, activity sequences, assessment rubrics, and reflection prompts. The guide emphasized the integration of subject content with social skill development through the traditional games. Regular implementation support was provided through weekly reflection sessions with the research team, where teachers discussed challenges, shared successes, and refined their approaches.

In the control group, teachers continued with the standard curriculum using conventional teaching methods. While control group students engaged in the same curricular content (covering similar themes in physical education, social studies, and Indonesian language), they did not experience the integration of traditional games or the project-based learning approach. Instead, they participated in standard physical education activities, teacher-centered social studies lessons, and language activities without the cultural project integration.

Implementation fidelity was monitored through classroom observations using a structured observation protocol developed for this study. Each experimental classroom was observed six times (twice per module) by trained observers using the protocol, which assessed adherence to PjBL principles, cultural integration, and facilitation of social skill development. Inter-rater reliability for observations was established at 87% agreement ($\kappa = 0.82$), indicating strong reliability (Finnestrand et al., 2023).

Data Collection Instruments

A mixed-methods approach to data collection was employed to capture both quantitative changes in social cohesion skills and qualitative insights into the process and experience of the intervention. All instruments were adapted for cultural and developmental appropriateness and validated

through pilot testing with similar populations prior to the main study.

Quantitative Measures

Social Cohesion Skills Inventory for Children (SCSIC) The primary quantitative measure was a 30-item Likert-scale instrument developed specifically for this study based on existing social skills measures (Charosky et al., 2022; Leow & Neo, 2023) and adapted for cultural relevance and developmental appropriateness. The instrument assessed five dimensions of social cohesion: teamwork and collaboration (6 items), empathy and perspective-taking (6 items), mutual aid and support (6 items), conflict resolution (6 items), and collective responsibility (6 items). Sample items included: "I help my classmates when they have difficulties" and "When working in a group, I listen to others' ideas even if I disagree." Students responded on a 5-point scale (1 = never to 5 = always), with possible scores ranging from 30 to 150. Higher scores indicated stronger social cohesion skills.

The instrument was initially developed in English based on the literature, then translated into Bahasa Indonesia using forward and backward translation procedures to ensure conceptual equivalence. Content validity was established through expert review by six specialists in child development, cultural studies, and educational assessment. The instrument was pilot-tested with 68 fifth-grade students not participating in the main study, resulting in revisions to item wording and examples. Internal consistency was high in the pilot (Cronbach's $\alpha = 0.89$) and remained strong in the main study (pretest $\alpha = 0.87$, posttest $\alpha = 0.91$). Confirmatory factor analysis supported the five-factor structure, with all items loading significantly on their intended factors ($\chi^2/df = 2.34$, CFI = 0.92, RMSEA = 0.058).

Behavioral Observation Checklist (BOC) To complement self-reported data, structured observations of student behaviors during collaborative activities were conducted using a behavioral observation checklist. The checklist, adapted from previous research on collaborative learning (Indriati et al., 2024; Saimon et al., 2023), included 15 observable behaviors across the five dimensions of social cohesion (three behaviors per dimension). Behaviors were rated on a 4-point scale (0 = not observed, 1 = rarely observed, 2 = sometimes observed, 3 = frequently observed). Observations were conducted during standardized collaborative tasks administered to both experimental and control groups at pretest and posttest. Two trained observers independently rated each student, with inter-rater reliability established at 84% agreement (kappa = 0.78).

Social Problem-Solving Scenarios (SPSS) To assess students' application of social cohesion skills in hypothetical situations, six scenario-based tasks

were developed. Each scenario presented an age-appropriate social problem requiring collaboration or conflict resolution. Students provided written responses describing how they would approach the situation. Responses were coded using a standardized rubric assessing evidence of the five social cohesion dimensions, with scores ranging from 0 (no evidence) to 3 (strong evidence) for each dimension. This measure provided insight into students' cognitive understanding and potential application of social skills beyond self-reported behaviors. Inter-rater reliability for coding was established at 82% agreement (kappa = 0.76) based on independent coding by two trained raters.

Qualitative Measures

Student Focus Groups Semi-structured focus group discussions were conducted with six groups of students from the experimental condition (6-8 students per group) and four groups from the control condition. Focus groups explored students' perceptions of collaborative activities, their understanding of social cohesion concepts, their experiences with traditional games, and perceived changes in their social interactions. Focus groups were conducted in Bahasa Indonesia, audio-recorded, transcribed verbatim, and translated into English for analysis. The focus group protocol was piloted with a similar population to ensure question clarity and developmental appropriateness.

Teacher Interviews Individual semi-structured interviews were conducted with all 16 participating teachers (8 experimental, 8 control) at the end of the intervention. Interviews explored teachers' observations of student social behaviors, perceptions of the intervention's effectiveness, challenges in implementation, and insights into cultural integration. Teacher interviews provided valuable contextual information and professional perspectives on changes in student behavior not captured by quantitative measures.

Student Reflective Journals Students in the experimental group maintained reflective journals throughout the intervention, responding to structured prompts after each significant project activity. Prompts encouraged reflection on teamwork experiences, challenges faced, strategies for resolving conflicts, and connections between traditional games and contemporary social skills. A random subset of journals (n = 40) was selected for in-depth qualitative analysis to provide insight into students' experiential learning and metacognitive processes.

Project Artifacts Documentation of student projects, including planning documents, design modifications of traditional games, implementation reports, and final presentations, were collected as qualitative data sources. These artifacts provided evidence

of student engagement, creative adaptation of cultural elements, and explicit connections between traditional games and social cohesion skills.

Data Collection Procedures

The study was conducted with four primary schools in Pekanbaru, Riau Province. Two schools were randomly assigned to the experimental condition (PjBL with traditional games) and two to the control condition (standard curriculum). The intervention lasted 12 weeks (one semester), a timeframe determined based on previous studies suggesting a minimum of 10 weeks is necessary for observable changes in social competencies to develop (Leow & Neo, 2023; Saimon et al., 2023). Data collection occurred in three phases: pretest (1 week before intervention), process assessment (during intervention), and posttest (1 week after intervention). The timeline ensured sufficient data to assess both outcomes and implementation processes.

Pretest Phase Prior to the intervention, all quantitative measures (SCSIC, BOC, and SPSS) were administered to both experimental and control groups to establish baseline scores. Students completed the SCSIC during regular class time under teacher supervision. The BOC was administered during a standardized 40-minute collaborative task where students worked in small groups to solve a community-based problem unrelated to traditional games. The SPSS was administered as a written assessment in a classroom setting, with students working individually to respond to scenarios. Administration procedures were identical across experimental and control schools to ensure comparability.

Process Assessment Phase During the 12-week intervention, qualitative data were collected to document implementation processes and evolving student experiences. Student reflective journals were maintained throughout the intervention, with entries completed after each major project activity (approximately twice weekly). Classroom observations using the implementation fidelity protocol were conducted six times per experimental classroom. Field notes on significant events, adaptations, and contextual factors were maintained by the research team.

Posttest Phase Following the intervention, all quantitative measures were readministered following identical procedures to the pretest. Additionally, focus groups with students and individual interviews with teachers were conducted during the two weeks following the intervention. All focus groups and interviews were conducted by trained researchers who were not involved in the intervention implementation to reduce potential bias. Sessions were held in private spaces within the schools to ensure comfort and confidentiality.

Data Analysis

Quantitative Analysis

Quantitative data analysis employed both descriptive and inferential statistical methods using SPSS version 28.0. Initial analyses included descriptive statistics (means, standard deviations, frequencies) and tests of assumptions for parametric analyses. Preliminary analyses confirmed that there were no significant differences between experimental and control groups on pretest measures or demographic variables, indicating successful group matching.

The primary analysis employed a series of mixed between-within subjects analyses of variance (ANOVAs) to assess the impact of the intervention (between-subjects factor: experimental vs. control group) across time (within-subjects factor: pretest vs. posttest) on social cohesion skills as measured by the SCSIC total score and subscale scores. Effect sizes were calculated using partial eta squared (η^2), with values of 0.01, 0.06, and 0.14 considered small, medium, and large effects, respectively (Maros et al., 2023). Similar analyses were conducted for the BOC and SPSS measures.

To explore potential moderating effects, additional analyses incorporated demographic variables (gender, ethnicity, prior experience with traditional games) as factors in the models. These analyses helped identify whether the intervention had differential effects on specific subgroups of students, providing insights for tailoring future implementations.

Qualitative Analysis

Qualitative data analysis followed a systematic thematic analysis approach using NVivo 14 software. Analysis proceeded through six phases: familiarization with the data, initial coding, theme development, theme review, theme definition, and report production (Sierra-Martínez, 2025). To enhance trustworthiness, multiple coding strategies were employed:

First, a preliminary codebook was developed based on the research questions and theoretical framework. Two researchers independently coded a subset of the data (20%) using this framework, then met to discuss discrepancies and refine the codebook. The refined codebook was then applied to the remaining data, with regular peer debriefing sessions to address emergent codes and ensure consistency.

For student focus groups and teacher interviews, transcripts were coded line by line, with attention to both semantic content (explicit statements) and latent content (underlying assumptions and conceptualizations). Student reflective journals were analyzed using both structural coding (organizing

content according to reflection prompts) and process coding (identifying action-oriented experiences related to social skill development). Project artifacts were analyzed using content analysis techniques to identify evidence of social cohesion concepts, cultural integration, and creative adaptations.

Throughout the analysis, particular attention was paid to: (1) evidence of changes in students' understanding and application of social cohesion skills; (2) connections made between traditional games and contemporary social competencies; (3) challenges and enablers in the implementation process; and (4) cultural and pedagogical relevance as perceived by students and teachers.

Trustworthiness and Validity

To ensure the trustworthiness and validity of the findings, several methodological strategies were implemented. The credibility of qualitative data was strengthened through triangulation of multiple data sources (self-reports, observations, interviews, and journals), member checking with teacher participants, and prolonged engagement throughout the 12-week intervention. Furthermore, peer debriefing and the maintenance of a reflexive journal and audit trail enhanced the confirmability and dependability of the analysis. For the quantitative data, validity and reliability were established via expert review, pilot testing, and psychometric analysis, while implementation fidelity checks ensured that observed effects could be confidently attributed to the intervention.

Results

Impact of Traditional Games Integration on Social Cohesion Skills

To address the first research question regarding the extent to which integrating traditional Malay Riau games in a PjBL framework enhanced students' social cohesion skills, both quantitative and qualitative analyses were conducted.

Quantitative Findings

The primary quantitative analysis compared changes in social cohesion skills between the experimental and control groups from pretest to posttest using the Social Cohesion Skills Inventory for Children (SCSIC). Table 2 presents descriptive statistics and results from the -model ANOVA with one between-subjects factor (group) and one within-subjects factor (time).

The results indicate statistically significant interaction effects between time (pretest/posttest) and group (experimental/control) for all three measures of social cohesion skills. The significant interaction effect for the SCSIC total scores [$F(1, 240) = 83.46, p < .001, \text{partial } \eta^2 = 0.26$] demonstrates that students in the experimental group showed substantially greater improvement in self-reported social cohesion skills compared to the control group. The large effect size (partial $\eta^2 = 0.26$) suggests that the intervention had a substantial impact, explaining approximately 26% of the variance in score changes.

Similarly, observational data from the Behavioral Observation Checklist showed a significant interaction effect [$F(1, 240) = 76.92, p < .001, \text{partial } \eta^2 = 0.24$], with experimental group students demonstrating much larger gains in observable social behaviors compared to control group students. Performance on the Social Problem-Solving Scenarios also showed a significant interaction effect [$F(1, 240) = 62.18, p < .001, \text{partial } \eta^2 = 0.21$], indicating that students who participated in the PjBL with traditional games developed greater competence in applying social cohesion skills to hypothetical situations.

Qualitative Insights

Qualitative data from student focus groups, teacher interviews, and reflective journals provided rich insights into how and why the traditional games integration enhanced social cohesion skills. Analysis revealed four key themes explaining the intervention's impact: (1) embodied learning through physical coordination, (2) authentic cultural relevance, (3) intergenerational knowledge exchange, and (4) emotional engagement.

Table 2

Pre-Post Comparison of Social Cohesion Skills Between Experimental and Control Groups

Measure	Group	Pretest M (SD)	Posttest M (SD)	Mean Difference	F(interaction)	p-value	Partial η^2
SCSIC Total	Experimental (n=123)	94.63 (12.57)	118.92 (13.85)	+24.29	83.46	<.001	0.26
	Control (n=119)	93.85 (11.94)	98.67 (12.23)	+4.82			
Behavioral Observation	Experimental (n=123)	18.27 (4.53)	29.64 (5.17)	+11.37	76.92	<.001	0.24
	Control (n=119)	18.53 (4.28)	20.16 (4.34)	+1.63			
Social Problem-Solving	Experimental (n=123)	8.92 (2.14)	13.87 (2.36)	+4.95	62.18	<.001	0.21
	Control (n=119)	8.84 (2.06)	9.37 (2.19)	+0.53			

Note. SCSIC = Social Cohesion Skills Inventory for Children. Possible range: 30-150 for SCSIC Total, 0-45 for Behavioral Observation, 0-18 for Social Problem-Solving. F(interaction) = F-value for Group \times Time interaction effect.

Students frequently described how the physical coordination required in traditional games naturally facilitated social skill development. As one student remarked:

"In terompah panjang, we cannot move if we don't communicate and listen to each other. At first, we kept falling because everyone wanted to move at their own pace. Then we learned to say '1-2-1-2' together and move as one body. Now I understand better how to work with others—it's like we became one person with many legs." (Student FG3-S4)

The embodied nature of learning appeared particularly effective for students who typically struggled with abstract social concepts. A teacher noted:

"For my students who have difficulty expressing themselves verbally or understanding social rules, the games provided a concrete experience. They could physically feel what cooperation means when standing on the wooden sandals. It wasn't just talk about teamwork; they had to actually do it or they would fall. This experiential learning was much more powerful than any lecture I could give." (Teacher E2-T3)

The cultural authenticity of the games emerged as another significant factor. Many students expressed pride in connecting with their heritage and discovering the relevance of traditional practices to contemporary challenges:

"Before this project, I thought these old games were just for fun or for ceremonies. Now I see that our ancestors were very smart—they created these games to teach us important values. In galah panjang, we need strategy and trust in teammates. These skills are useful even when we're doing group projects in science or making presentations." (Student FG1-S7)

Another student reflected on the connection between traditional values and modern social needs:

"My grandmother told me stories about how village people played these games during harvest season. They needed to work together to survive, so the games taught them cooperation. It's the same for us today. When we worked on our final project to modify tarik upih, we had to respect each team member's ideas and find compromises when we disagreed. This is what gotong royong really means." (Student FG4-S2)

The intergenerational knowledge exchange component of the intervention appeared to deepen students' appreciation for social cohesion skills. By interviewing elders and researching historical contexts, students gained a richer understanding of the cultural foundations of collaboration:

"When we interviewed my friend's grandmother about tarik upih, she explained that in her village, people couldn't survive alone. Everyone needed help with farming, building houses, and raising children. The games reminded people how to work together. This made me think about how dependent we still are on others, even if we don't realize it." (Student FG2-S5)

A teacher similarly observed:

"The interview component was transformative. Students who normally show little interest in social studies were suddenly engaged because they were connecting with real people from their community. They began to see social cohesion not as an abstract concept but as a living tradition with real purpose. Many students came back saying, 'My grandfather's eyes lit up when I asked about these games—he was so happy to share.'" (Teacher E1-T4)

Finally, the emotional engagement fostered by the games appeared to enhance learning. Students reported experiencing joy, frustration, pride, and accomplishment—emotions that seemed to make the learning more memorable:

"When our team finally succeeded in crossing the playground with terompah panjang without falling, everyone cheered. I felt so proud that we solved the problem together. This feeling is different from just getting a good grade. I won't forget what I learned because it's connected to this happy memory." (Student FG5-S3)

This emotional dimension was also noted by teachers:

"The authentic emotions these activities generated—from frustration when teams couldn't coordinate to elation when they succeeded—created powerful learning moments. I observed students processing these emotions together, learning to encourage teammates when they failed and celebrate collective achievements. These emotional experiences seemed to help solidify the social skills in ways that our regular classroom activities rarely achieve." (Teacher E3-T2)

The qualitative findings strongly complement and expand upon the quantitative results, offering explanations for why the intervention was effective. The embodied, culturally authentic, intergenerational, and emotionally engaging nature of learning through traditional games appeared to create a powerful combination that fostered meaningful development of social cohesion skills.

Components of Social Cohesion Showing Greatest Improvement

The second research question examined which specific components of social cohesion showed the most significant improvement as a result of the intervention.

Quantitative Findings

To address this question, changes in each of the five dimensions of social cohesion skills measured by the SCSIC were analyzed. Table 3 presents the results of this dimensional analysis.

Table 3
Changes in Specific Dimensions of Social Cohesion Skills by Group

SCSIC Dimension	Group	Pretest M (SD)	Posttest M (SD)	Mean Difference	F(interaction)	p-value	Partial η^2
Teamwork & Collaboration	Experimental	19.42 (3.31)	25.87 (3.18)	+6.45	95.73	<.001	0.29
	Control	19.28 (3.24)	20.12 (3.06)	+0.84			
Empathy & Perspective-taking	Experimental	18.97 (3.42)	23.54 (3.21)	+4.57	52.18	<.001	0.18
	Control	18.74 (3.19)	19.63 (3.14)	+0.89			
Mutual Aid & Support	Experimental	19.23 (2.96)	25.64 (2.84)	+6.41	93.45	<.001	0.28
	Control	19.14 (3.07)	20.05 (2.95)	+0.91			
Conflict Resolution	Experimental	17.53 (3.58)	21.16 (3.42)	+3.63	43.27	<.001	0.15
	Control	17.41 (3.47)	18.24 (3.31)	+0.83			
Collective Responsibility	Experimental	19.48 (3.24)	22.71 (3.19)	+3.23	49.56	<.001	0.17
	Control	19.28 (3.08)	20.63 (2.96)	+1.35			

Note. Possible range for each dimension: 6-30. F(interaction) = F-value for Group \times Time interaction effect.

The analysis revealed significant interaction effects for all five dimensions, indicating that the experimental group showed greater improvement than the control group across all aspects of social cohesion. However, the magnitude of these effects varied considerably. The largest effects were observed for Teamwork and Collaboration (partial $\eta^2 = 0.29$) and Mutual Aid and Support (partial $\eta^2 = 0.28$), with mean increases of 6.45 and 6.41 points respectively in the experimental group compared to minimal changes in the control group (0.84 and 0.91 points).

Moderate effects were found for Empathy and Perspective-taking (partial $\eta^2 = 0.18$) and Collective Responsibility (partial $\eta^2 = 0.17$), with mean increases of 4.57 and 3.23 points respectively in the experimental group. The smallest effect, though still statistically significant and meaningful, was observed for Conflict Resolution (partial $\eta^2 = 0.15$), with a mean increase of 3.63 points in the experimental group.

These findings suggest that the intervention was particularly effective in developing teamwork, collaboration, mutual aid, and support skills—components that align closely with the physical and social demands of the traditional games featured in the intervention. The more modest improvements in conflict resolution skills may indicate that these competencies require more explicit instruction or different types of experiences than those provided primarily through cooperative physical games.

Qualitative Insights

Qualitative data offered deeper insights into the differential effects on specific social cohesion dimensions. The stronger impact on teamwork and mutual aid emerged as a consistent theme in student reflections and teacher observations, with rich explanations for why these particular skills showed the greatest growth.

Students frequently discussed how the inherent structure of the traditional games necessitated teamwork and mutual support:

"In terompah panjang, you literally cannot move forward unless everyone coordinates. This taught us real teamwork, not fake teamwork like when one person does all the work in a group project. Everyone has to contribute equally, or we all fail together. This is different from other school activities where sometimes students can hide and not participate." (Student FG1-S2)

Another student highlighted the mutual aid aspect:

"During tarik upih, I learned that supporting teammates is not just about cheering. It's about sensing when they are struggling and adjusting your own effort to help them. If someone in the front line gets tired, those behind must pull harder. This taught me to pay attention to others' needs without them having to ask for help." (Student FG3-S6)

Teachers corroborated these observations, noting the natural alignment between game structures and teamwork/mutual aid development:

"The physical interdependence in these games creates an immediate and unavoidable need for cooperation. Unlike academic group work where students can divide tasks and work independently, these games require continuous coordination. I observed students developing increasingly sophisticated communication systems and support strategies over time, particularly in terompah panjang where physical synchronization is essential." (Teacher E4-T1)

Regarding the moderate improvements in empathy and collective responsibility, students' reflections suggested that these skills developed more gradually through the cumulative experiences:

"At first, I was frustrated when teammates couldn't keep balance on the terompah. But after experiencing how difficult it was myself, I became more patient with others. I started to understand that everyone has different abilities and challenges. This helped me in other group projects too—I'm less quick to judge classmates now." (Student FG2-S1)

A teacher observed the development of collective responsibility:

"The project structure, where students modified games for younger children, created authentic accountability. They weren't just responsible to me

or themselves, but to real third-graders who would play their games. I noticed students becoming increasingly concerned with safety, inclusivity, and ensuring everyone could participate successfully. This sense of responsibility toward others extended to their regular classroom behaviors as well.” (Teacher E2-T2)

The relatively smaller effects on conflict resolution skills were reflected in students’ and teachers’ comments, which acknowledged both progress and continuing challenges:

“We still had arguments during our project, especially when designing game modifications. But we learned to listen more and found ways to combine different ideas instead of fighting about whose idea was best. It’s still hard sometimes, but better than before.” (Student FG4-S7)

A teacher elaborated on the conflict resolution challenges:

“Conflict resolution seemed to require more explicit scaffolding than the other social skills. The games themselves didn’t naturally create the space for productive conflict resolution in the way they inherently demanded teamwork. We found we needed to implement specific reflection protocols and mediation strategies to help students process disagreements constructively. This suggests that while traditional games are powerful tools, they may need complementary approaches for developing the full spectrum of social cohesion skills.” (Teacher E1-T2)

The qualitative findings thus provide context for understanding the quantitative differential effects across social cohesion dimensions. The physical and social structure of the traditional games created natural affordances for developing teamwork and mutual aid, moderate opportunities for building empathy and collective responsibility, and fewer inherent supports for conflict resolution skills without additional instructional scaffolding.

Perceptions of Cultural and Pedagogical Relevance

The third research question explored how students and teachers perceived the cultural and pedagogical relevance of using traditional games in school-based project learning.

Quantitative Findings

While primarily addressed through qualitative methods, some quantitative data were collected on

Table 4

Student and Teacher Perceptions of Cultural and Pedagogical Relevance

Perception Item	Students (n=123) M (SD)	Teachers (n=8) M (SD)
Cultural relevance to student identity	4.35 (0.63)	4.63 (0.52)
Connection to community values	4.52 (0.58)	4.75 (0.46)
Applicability to contemporary challenges	4.17 (0.72)	4.50 (0.53)
Effectiveness compared to conventional teaching	4.46 (0.65)	4.38 (0.74)
Sustainability of implementation	3.87 (0.84)	3.25 (0.89)
Overall satisfaction with the approach	4.73 (0.48)	4.50 (0.53)

Note. Items scored on a 5-point scale (1 = strongly disagree to 5 = strongly agree)

perceptions of relevance using Likert-scale items in post-intervention surveys. Table 4 summarizes these findings.

The survey results indicate consistently positive perceptions of cultural and pedagogical relevance among both students and teachers. Particularly strong ratings were given for connection to community values (students: M = 4.52, teachers: M = 4.75) and overall satisfaction with the approach (students: M = 4.73, teachers: M = 4.50). The lowest ratings, though still positive, concerned sustainability of implementation (students: M = 3.87, teachers: M = 3.25), suggesting some concerns about the practical challenges of continuing the approach long-term.

Qualitative Insights

The qualitative data revealed three predominant themes regarding perceptions of relevance: (1) cultural reconnection and identity affirmation, (2) bridging traditional wisdom and contemporary competencies, and (3) pragmatic implementation challenges.

The cultural reconnection theme emerged strongly across student and teacher responses, with many expressing how the intervention helped strengthen cultural identity and intergenerational connections:

“When we started learning about these games, I was surprised that my grandfather knew so much. He told me stories about playing galah panjang when he was young and how the whole village would gather to watch. This made me feel proud of being Malay. Before, I sometimes felt our traditions were boring compared to video games, but now I see they have deep meaning and are actually fun.” (Student FG5-S1)

Another student reflected on identity affirmation:

“In our final presentation, my mother came and saw us play the modified terompah panjang game we created. She had tears in her eyes and told me later that she worried the new generation would forget our culture. She was happy to see we could respect traditions while also making them our own. This made me feel connected to something bigger than myself.” (Student FG2-S3)

Teachers similarly emphasized the cultural affirmation dimension:

"This project addressed a critical gap in our educational approach. Previously, cultural heritage was treated as a separate subject, something to be studied rather than lived. By integrating traditional games into academic learning, we demonstrated that cultural practices are not relics but living resources with contemporary value. Students developed pride in their cultural identity while simultaneously building crucial social skills." (Teacher E3-T1),

The theme of bridging traditional wisdom and contemporary competencies emerged as students and teachers recognized connections between ancestral values and modern educational needs:

"What surprised me most was how these old games actually teach the skills we need for modern group projects and future jobs. In tarik upih, you have to feel the tension in the palm sheath and adjust your pulling strength. This is like how my father says good teams at his office need to sense when colleagues need help without being told. These ancient games were preparing people for cooperation all along." (Student FG1-S5)

A teacher elaborated on this bridging function:

"The genius of this approach is that it resolves what seemed like competing priorities—preserving cultural heritage versus developing 21st-century skills. By analyzing the social dynamics embedded in traditional games, students discovered that their ancestors had sophisticated methods for cultivating exactly the collaborative skills valued in today's world. This realization transformed how students viewed both traditional practices and contemporary skill requirements." (Teacher E4-T4)

The third theme concerned pragmatic implementation challenges, reflecting the lower quantitative ratings for sustainability:

"I loved the traditional games project, but it took a lot of space and time to organize. Sometimes it rained, and we couldn't use the field. I worry that teachers might not continue this approach because it's harder than just sitting in the classroom." (Student FG3-S2)

Teachers were particularly forthcoming about implementation challenges:

"While I'm convinced of the educational value, I must acknowledge the logistical demands. Organizing suitable outdoor spaces, coordinating across subject areas, managing noise levels, and ensuring safety all require significant planning. Without institutional support for scheduling flexibility, resource allocation, and professional development, even enthusiastic teachers may find it difficult to sustain this approach." (Teacher E1-T3)

Another teacher highlighted adaptation challenges:

"The approach requires pedagogical flexibility that many of us weren't trained for. Moving between facilitator, cultural guide, and academic instructor roles demands a different skillset than conventional teaching. I found myself learning alongside students at times, which was rewarding but sometimes uncomfortable. For widespread adoption, we would need systematic professional development that addresses both the cultural content and the facilitation skills required." (Teacher E2-T1)

Despite these challenges, the overwhelming sentiment from both students and teachers was that the cultural and pedagogical benefits justified the additional effort:

"Even though it was sometimes difficult to organize everything, seeing the students develop both social skills and cultural appreciation made it worthwhile. What particularly struck me was how this approach reached students who typically struggle in conventional academic settings. Several of my students who rarely participate in regular lessons emerged as leaders in the traditional games context." (Teacher E3-T4)

The qualitative findings thus provide a nuanced understanding of the quantitative perceptions data, highlighting the meaningful cultural connections fostered by the intervention, the perceived relevance to contemporary educational needs, and the practical considerations that would need to be addressed for sustainable implementation.

Discussion

Integrating traditional Malay Riau games into a Project-Based Learning (PjBL) framework significantly enhanced primary school students' social cohesion skills, particularly in teamwork, collaboration, mutual aid, and support. These results align with the theoretical foundations of social constructivism, which posits that learning is co-constructed through social interaction and culturally embedded activities (Arwin et al., 2024; Vygotsky, 1978). The physical and social interdependence required by games like *terompah panjang* and *tarik upih* provided concrete, embodied experiences that naturally fostered cooperation and collective problem-solving, validating the Vygotskian concept of the Zone of Proximal Development (ZPD). The qualitative data further illuminated how these games served as cultural tools, mediating social learning by embedding values such as *gotong royong* (mutual cooperation) within interactive, emotionally engaging contexts. This supports the argument by Hermandra et al. (2020) and Putra et al. (2024) that traditional games are not merely recreational but pedagogical instruments for transmitting communal values.

The study's outcomes also resonate with the principles of Culturally Responsive Pedagogy (CRP), as articulated by Gay (2018). By anchoring the PjBL modules in local cultural practices, the intervention affirmed students' identities and bridged ancestral wisdom with contemporary educational goals. Students' reflections revealed a heightened sense of pride and connection to their heritage, underscoring CRP's emphasis on leveraging cultural knowledge to foster inclusive and affirming learning environments. This finding challenges the critique by Setiani et al. (2022) and Elumalai et al. (2022) that traditional games are often studied merely for cultural preservation

rather than their pedagogical potential. Instead, this study illustrates how such games can dynamically address modern educational imperatives, such as developing 21st-century skills like collaboration and empathy (Saimon et al., 2023; Yong & Saad, 2023).

However, the study also revealed nuances in the effectiveness of the intervention across different social cohesion dimensions. While teamwork and mutual aid showed the most significant improvements, conflict resolution skills exhibited more modest gains (Jusoh et al., 2023; Waty et al., 2024). This suggests that the inherent structure of cooperative games may not sufficiently address the complexities of conflict resolution without additional explicit instruction, a point echoed by teacher observations. This finding diverges somewhat from the broader literature on PjBL, which often assumes uniform development of social skills through collaborative projects (Jia et al., 2023; Leow & Neo, 2023). It thus highlights the need for complementary pedagogical strategies to target specific social competencies, particularly those requiring higher levels of cognitive and emotional scaffolding.

The study's unique contribution lies in its empirical demonstration of how culturally grounded PjBL can serve as a transformative pedagogical model in multicultural societies. Unlike previous research that focused either on PjBL's cognitive outcomes or traditional games' cultural significance, this study bridges these domains, offering a replicable framework for integrating local wisdom into global educational trends (Putri et al., 2024; Sunarti et al., 2024). The intervention's success in enhancing social cohesion skills while reinforcing cultural identity addresses the gap identified by Zaki et al. (2024) and Baghirov (2024), who called for educational innovations that balance global pedagogical trends with local imperatives. Furthermore, the mixed-methods design provided robust evidence not only of the intervention's effectiveness but also of the mechanisms underlying its success, such as embodied learning and emotional engagement, which are often overlooked in quantitative-dominated studies (Charosky et al., 2022; Santhosh et al., 2023).

Despite these strengths, the study also uncovered practical challenges, particularly regarding the sustainability of the intervention. Teachers noted logistical and pedagogical demands, such as resource allocation and the need for professional development, which align with broader concerns about implementing PjBL in resource-constrained settings (Indriati et al., 2024; Maros et al., 2023). These findings suggest that while the model is theoretically sound and empirically effective, its scalability requires systemic support, including teacher training and curricular flexibility.

Conclusion

This study demonstrates that integrating traditional Malay Riau games into PjBL significantly enhances primary students' social cohesion skills, particularly teamwork and mutual aid, by leveraging embodied learning and cultural authenticity. The findings validate social constructivist and culturally responsive frameworks, illustrating how collaborative, culturally rooted activities foster skills like empathy and collective responsibility—key to addressing modern educational and societal challenges. However, the intervention's limited impact on conflict resolution suggests that cooperative games alone may not suffice for complex social competencies, necessitating complementary strategies. Practical challenges, such as resource demands and teacher adaptability, highlight barriers to scalability, echoing broader concerns about implementing PjBL in resource-constrained settings. Despite these limitations, the study offers a transformative model for global educators seeking to preserve cultural heritage while nurturing 21st-century skills. Future research should explore longitudinal effects, adaptations for diverse cultural contexts, and strategies to mitigate implementation barriers, ensuring sustainable integration of traditional knowledge into contemporary pedagogy. By bridging cultural preservation and modern education, this approach not only enriches social learning but also empowers students to navigate an interconnected world with rooted yet adaptive competencies.

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