

Learning through heritage: Effect size of traditional games in learning contexts



Nurkhairo Hidayati^a   | Mellisa^a  | Ahmad Muslih Bin Ahmad^b  | Heny Nurdiana^a

^aBiology Education Study Program, Universitas Islam Riau, Pekanbaru, Indonesia.

^bBiology Education Study Program, Universiti Pendidikan Sultan Idris, Perak, Malaysia.

Abstract Traditional games are often promoted as a contextually and meaningfully grounded approach to learning; however, empirical evidence of their effectiveness remains fragmented and yields inconsistent results. On the one hand, traditional games are believed to enhance student engagement and understanding; on the other hand, their effectiveness is often questioned due to a strong dependence on implementation contexts. This study aims to synthesize empirical evidence on the impact of integrating traditional games into learning through a contrast-group meta-analysis. A total of 39 effect sizes drawn from studies published between 2017 and 2025 were analyzed using a random-effects model with the support of JASP (Jeffreys's Amazing Statistics Program). The results indicate that learning through traditional games has a strong, statistically significant positive effect on learning outcomes (Hedges' $g = 3.97$; $p < .001$). However, this effect is accompanied by substantial heterogeneity, suggesting considerable variation in impact across contexts and types of learning outcomes. This pattern indicates that the observed effectiveness is not uniformly distributed, but is shaped by differences in instructional design, cultural alignment, and the nature of the learning outcomes assessed. Robustness analyses further reveal that the meta-analytic findings are relatively stable and not easily distorted by potential publication bias. These findings suggest that the effectiveness of traditional games is strong but uneven. From a theoretical perspective, the pedagogical strength of traditional games does not reside in the form of the games themselves, but rather in how they are integrated as cultural practices and meaningful learning experiences. This study contributes to the literature by positioning traditional games as a form of context-sensitive heritage-based pedagogical practice, while reinforcing the role of ethnopedagogy and constructivist learning in explaining variations in their educational effectiveness.

Keywords: heritage-based learning, educational effectiveness, ethnopedagogy, cultural learning

1. Introduction

Contemporary educational scholarship often reduces learning effectiveness to gains in academic scores and instructional efficiency, while marginalizing dimensions of meaning, cultural legitimacy, and students' lived learning experiences (Chen & Horn, 2022; Mejía-Rodríguez & Kyriakides, 2022). The dominance of universalistic learning approaches that are detached from historical and cultural contexts has produced pedagogical practices that are technically standardized yet epistemologically fragile. When knowledge is positioned as a neutral entity that can be uniformly transmitted across contexts, learning becomes disconnected from learners' identities, lived experiences, and social practices (Cope & Kalantzis, 2023). This condition reflects not merely a methodological concern, but a more fundamental problem: the rupture between school knowledge and cultural heritage as a source of learning legitimacy (Nurhaliza et al., 2025; Tatham-Fashanu, 2023).

In response to this concern, traditional games have increasingly been employed as a pedagogical approach intended to restore meaningfulness and cultural connectedness in education (Gultom et al., 2022; Saura & Zimmermann, 2021). However, the position of traditional games within the educational literature remains inherently ambiguous and problematic. On the one hand, traditional games are conceptualized as cultural artifacts embedded with values, symbols, and social practices (García-Monge et al., 2021; Luchoro-Parrilla et al., 2021). On the other hand, they are frequently reduced to engaging instructional strategies or motivational tools (Aliriad et al., 2024; Hafeez, 2021; López-Fernández et al., 2021). This ambiguity raises an epistemological question that is rarely explicitly addressed: do traditional games function as learning media because of their cultural heritage value, because of the active learning mechanisms they embody, or because of an interaction between the two? Without clarifying the pedagogical status of traditional games, claims about their effectiveness risk remaining normative generalizations insufficiently supported by integrated empirical evidence.

The ethnopedagogical framework positions traditional games not as supplements to modern pedagogy, but as representations of knowledge systems that emerge from cultural practices and the collective experiences of a Community (Kurniati & Mwariko, 2025; Slobodová et al., 2021). Ethnopedagogy advances an epistemological claim that knowledge is neither ahistorical nor neutral, but is shaped by social contexts, values, and practices transmitted across generations.



Consequently, the integration of traditional games into educational settings carries implications that extend beyond methodological innovation alone (Fernández-Oliveras et al., 2021; Hafeez, 2021). It challenges dominant assumptions regarding what constitutes legitimate sources of knowledge in formal education. However, this claim also raises a critical question: does incorporating traditional games genuinely lead to academically meaningful learning, or does it primarily reinforce symbolic and affective dimensions without yielding consistent instructional impact?

Cultural learning theory conceptualizes learning as a process of participation in social practices mediated by cultural artifacts, language, and social interaction (Engeness & Lund, 2020). Within this framework, traditional games function as mediational tools that enable learners to engage directly with rules, roles, and meanings that are socially negotiated (Fernández-Oliveras et al., 2021; Gultom et al., 2022). Nevertheless, this approach entails inherent limitations, as learning effectiveness is highly contingent on the degree of cultural alignment among the games, learners, and the learning environment. When traditional games are adapted to standardized, formal classroom settings, there is a risk of decontextualization, in which cultural practices lose their original meanings and become simulations detached from their social roots. This condition raises critical concerns regarding whether the learning impacts reported across studies are stable across contexts or fundamentally context-dependent (Berti, 2023; Freedman, 2025).

From a constructivist perspective, traditional games are often seen as effective because they provide active, collaborative, and problem-based learning experiences. Play-based activities allow learners to construct knowledge through exploration, reflection, and interaction, which theoretically aligns with principles of meaning-making and knowledge construction (Parker et al., 2022). However, this assumption tends to homogenize all forms of play into pedagogically equivalent categories, failing to adequately account for variations in game design, instructional objectives, and the cognitive demands involved. In other words, not all traditional games inherently facilitate deep knowledge construction. Consequently, constructivist claims about the effectiveness of traditional games require empirical examination, particularly regarding variations in learning outcomes.

Empirical studies examining the use of traditional games in educational settings generally report positive learning outcomes; however, the magnitude and nature of these effects vary considerably across studies (Hafeez, 2021; López-Fernández et al., 2021). While some research highlights significant gains in academic achievement, other studies emphasize improvements in students' motivation, engagement, or social interaction. Such variations are often interpreted as methodological inconsistencies or contextual limitations. From a theoretical perspective, however, these differences may instead indicate that the effectiveness of traditional games depends on diverse pedagogical mechanisms and learning conditions. Consequently, the key issue is not merely whether traditional games are effective, but rather under what conditions, for which types of learning outcomes, and through which instructional processes their benefits become most evident.

Although the growing number of studies on traditional games, much of the existing research continues to focus on testing effects within narrowly defined contexts, with limited systematic efforts to connect empirical findings to broader theoretical frameworks (Gultom et al., 2022; Saura & Zimmermann, 2021). As a result, the current literature does not adequately explain when traditional games function as effective learning tools and when they merely serve to enhance short-term engagement. This gap between normative claims about the pedagogical value of traditional games and the fragmented empirical evidence available makes it difficult for educators and researchers to draw generalizable conclusions (Ismagilova et al., 2021; Martínez-Santos et al., 2020).

Within this context, meta-analysis functions not merely as a statistical technique for summarizing research findings but as an analytical tool for testing theoretical claims across contexts and studies. By estimating pooled effect sizes and examining heterogeneity across studies, meta-analysis enables researchers to assess the extent to which ethnopedagogical, cultural learning, and constructivist claims about traditional games are supported by consistent empirical evidence. High heterogeneity, for instance, should not necessarily be interpreted as a limitation; rather, it may indicate that the effectiveness of traditional games is context-dependent and warrants deeper examination. By positioning traditional games as the object of meta-analytic inquiry, this study seeks to make two contributions. Empirically, it provides quantitative estimates of the effects of traditional games across diverse learning contexts. Theoretically, it helps clarify the pedagogical status of traditional games, whether they are better understood as culture-based learning media, mechanisms of active learning, or a combination of both. Such clarification is essential to avoid premature conclusions that frame traditional games as a universal solution without robust empirical grounding.

Based on these considerations, this study aims to conduct a meta-analysis of empirical studies examining the use of traditional games in learning contexts. The primary focus is to estimate the effect sizes of traditional games across various learning outcomes and to assess the consistency and variability of these effects across studies. Through this approach, the study seeks not only to address the question of how effective traditional games are in learning but also to provide an empirical foundation for understanding the role of traditional games as culturally rooted pedagogical practices within education.

2. Methods

The research process consisted of four sequential stages: literature searching, study screening, data coding, and data analysis. First, the literature search identified journal articles published between 2017 and 2025 using Boolean operators across several international databases, as well as the national database Sinta. Second, the study screening process involved title and abstract screening, followed by full-text review. Third, the data coding stage involved adapting the PICO framework to systematically extract key characteristics from the studies that met the inclusion criteria. Fourth, data analysis was performed in JASP using the effect sizes calculated for each included study.

2.1. Literature search process

The literature search was restricted to journal articles published between 2017 and 2025. This time frame was selected because it represents a period of increasing scholarly attention to culture-based learning, ethnopedagogy, and traditional games, and is also characterized by more systematic reporting of quantitative data suitable for meta-analytic synthesis. The search strategy combined automated and manual search procedures. Automated searches were conducted using Boolean operators across major education databases, including Scopus, Web of Science, Google Scholar, and the national database Sinta. The search string used in the database queries was: ("traditional game" OR "indigenous game" OR "local game*" OR "cultural game*") AND ("learning" OR "education" OR "learning outcome*" OR "student engagement")**. This search strategy was applied to titles, abstracts, and keywords where possible to maximize the retrieval of relevant studies. Manual searches were conducted using backward and forward citation tracking of key articles and relevant systematic reviews. Google Scholar was also used as a supplementary source to ensure that potentially relevant studies were not overlooked in the primary database searches. All articles considered in this process were drawn from peer-reviewed sources to ensure the academic quality and credibility of the studies included in the analysis.

2.2. Keywords and research themes

During the automated search process, we identified three core themes: traditional games, learning contexts, and school settings, which were formulated to address gaps identified in prior literature. These themes represent the intersection between cultural heritage and formal educational practices, an area that remains relatively underexplored through meta-analytic approaches. For each theme, keywords were selected based on two primary criteria. First, terms directly interchangeable with the main theme were included, such as indigenous games, local games, and cultural games, as equivalents of traditional games. Second, terms representing essential components of learning processes and institutional contexts were incorporated, including learning, education, learning outcomes, student engagement, school, classroom, and formal education. The keyword selection process was conducted iteratively to maintain a balance between search specificity and breadth, while ensuring thematic coherence. During this process, terms that could excessively broaden the scope of the study, such as digital games or technology-based games, were deliberately excluded to keep the search focused on traditional, non-digital, culture-based learning practices.

2.3. Study screening

Articles retrieved from database searches and manual searches were first examined to remove duplicate publications. The remaining articles were then randomly distributed among the research team for further screening. Prior to the screening process, the authors discussed and agreed on the inclusion and exclusion criteria for this study. Studies were included in the meta-analysis if they met the following criteria: (1) the study examined the use of traditional games (e.g., traditional games, indigenous games, local games, or cultural games) as part of a learning or educational intervention; (2) the study was conducted within a formal or non-formal educational context involving students as participants; (3) the study employed a quantitative research design, such as experimental or quasi-experimental methods, allowing comparison between an intervention group and a control or comparison group; (4) the study reported sufficient statistical information to calculate an effect size, including sample size, mean scores, and standard deviations or equivalent statistics; (5) the study was published in peer-reviewed journals; (6) the article was written in English or Indonesian; and (7) the study was published within the 2017–2025 time frame. Studies were excluded if they met one or more of the following criteria: (1) the study did not involve traditional games as a primary learning intervention; (2) the study was qualitative, theoretical, conceptual, or review-based without providing quantitative data suitable for meta-analysis; (3) the study did not report sufficient statistical information required to compute an effect size; (4) the participants were not students in an educational setting; or (5) the article was not published in a peer-reviewed academic journal.

The screening process was conducted in two stages: (1) title and abstract screening, and (2) full-text review. At each stage, articles were labeled as "Yes," "No," or "Pending." Articles receiving inconsistent evaluations among reviewers were discussed further until consensus was reached. During the first stage, titles, abstracts, and keywords were examined to determine initial relevance. In the second stage, full-text screening focused on the explicit use of traditional games as a learning intervention and on the availability of quantitative data that allowed calculation of effect size. The process of identifying,

screening, and selecting studies followed the general reporting principles of the PRISMA framework, and the detailed study selection procedure is presented in Figure 1.

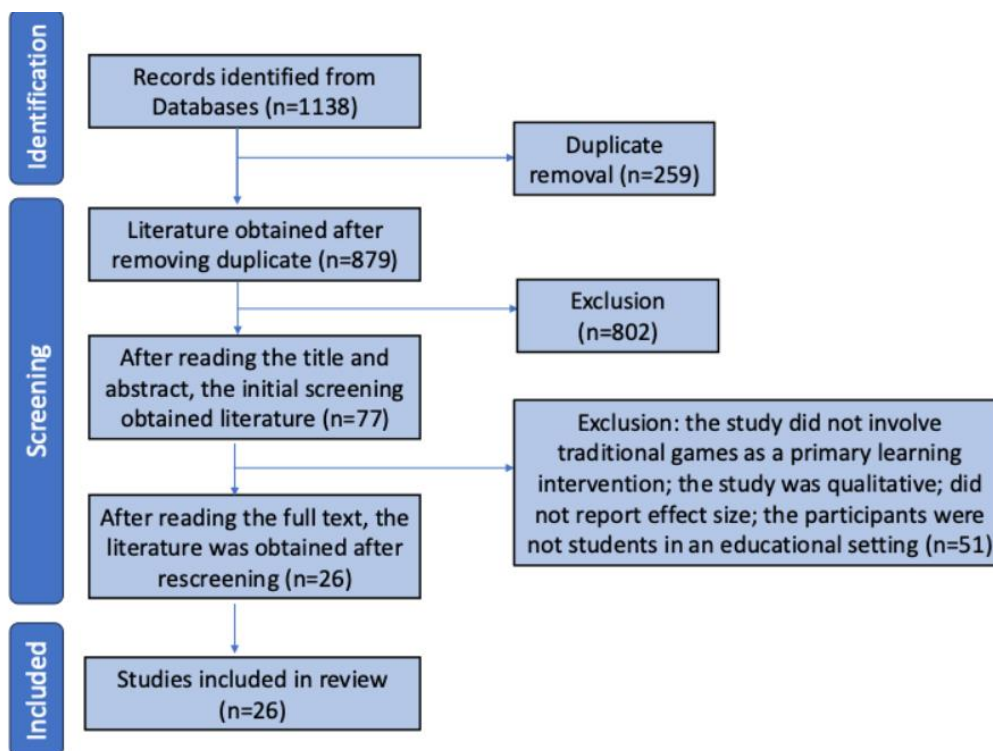


Figure 1 Screening process.

2.4. Dana coding

During the data coding stage, each article that met the inclusion criteria was assigned to one primary researcher for coding. To ensure consistency and reliability, a subset of the coded data was cross-checked by other members of the research team. Data coding was conducted by adapting the PICO framework, which includes Population (P), Intervention (I), Comparison (C), and Outcomes (O). In this study, the PICO framework was used for data extraction and organization rather than for moderator analysis. Specifically, it was used to systematically extract key information from each study, including participant characteristics, the form of the traditional game-based intervention, the type of comparison condition, and the learning outcomes assessed. In this meta-analysis, several studies reported multiple learning outcomes, leading to multiple effect sizes within a single publication. Each effect size was treated as an independent unit of analysis, based on the rationale that the outcomes measured represented distinct learning constructs and were reported separately within the same study. This approach was adopted to preserve the available empirical information and to allow for the estimation of the effects of traditional games across different types of learning outcomes. Nevertheless, to minimize potential bias arising from data dependency, the meta-analytic findings were interpreted with caution, acknowledging the possibility of interrelationships among effect sizes derived from the same study.

2.5. Data analysis

Data analysis was conducted using a contrast-group meta-analysis to compare the effectiveness of learning that integrates traditional games with learning based on conventional games. All meta-analytic procedures were performed using a random-effects model, given that the included studies originated from diverse educational contexts and employed varying instructional designs. The data extracted from each study varied in measurement scales, as reflected in differences in minimum and maximum score ranges across studies. Therefore, all data were standardized prior to further analysis. Initial effect sizes were calculated as standardized mean differences (SMDs), which represent the difference between the experimental group (learning with traditional games) and the control group (learning with conventional games), standardized by the pooled standard deviation. The estimated sample mean effect size (d) was calculated accordingly as shown in Formula (1).

$$d = \frac{x_1 - x_2}{s_{within}}, S_{within} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 - 1) + (n_2 - 1)}} \quad (1)$$

The formula used to find the standard error d (SEd) is presented in Formula (2)



$$SE_d = \sqrt{V_d}, \text{ with } V_d = \frac{n_1+n_2}{n_1n_2} + \frac{d^2}{2(n_1+n_2)} \quad (2)$$

Subsequently, the standard error of d (SE_d) was calculated to account for uncertainty in effect size estimation for each study. This standard error served as the basis for constructing confidence intervals and for weighting studies in the meta-analytic model. However, the standardized mean difference (d) is biased, particularly in studies with small sample sizes. To reduce this bias, the effect size d was corrected to Hedges' g (Formula 3) by applying a degrees-of-freedom-based correction factor (Formula 4). This correction yields a less biased and more stable estimate of effect size for meta-analytic purposes. The standard error of Hedges' g (SE_g) was subsequently calculated based on the corrected effect size as shown in Formula (5).

$$g = J \times d, \text{ with } J = 1 - \frac{3}{4df-1} \quad (3)$$

$$df = \text{degree of freedom } (n_1 + n_2 - 2) \quad (4)$$

$$SE_g = \sqrt{V_g}, \text{ with } V_g = J \times V_d \quad (5)$$

3. Results and Discussion

A summary of the characteristics of the studies included in this meta-analysis is presented in Table 1, which provides information on sample sizes, means, and standard deviations for the experimental and control groups, as well as the corresponding Hedges' g values and their standard errors (SE_g) for each effect size. The included studies encompass a wide range of educational contexts, with variations in sample sizes, measurement scales, and types of learning outcomes examined. This diversity reflects the broad application of traditional games in instructional practices and provides a robust empirical foundation for the meta-analytic synthesis.

Descriptively, the predominance of positive Hedges' g values in Table 1 indicates that learning approaches integrating traditional games are generally associated with more favorable learning outcomes than conventional instructional approaches. This finding suggests that traditional games have tangible pedagogical potential as learning tools, particularly because they emphasize activity, social interaction, and direct learner engagement (Ismagilova et al., 2021; Martínez-Santos et al., 2020). From a constructivist perspective, such learning conditions enable learners to construct knowledge through experience and reflection, thereby improving the quality of learning outcomes (Zajda, 2021). Nevertheless, the wide range of effect sizes—spanning from very small to exceptionally large—demonstrates that the effectiveness of traditional games is not uniform across contexts. This variation implies that successful implementation depends not merely on the presence of games, but on how they are designed, integrated, and aligned with instructional goals (Lew & Saville, 2021; Ribas et al., 2023).

Within the framework of ethnopedagogy, traditional games derive their pedagogical strength when they are positioned as meaningful cultural practices that resonate with learners' lived experiences. When the relationship among the game, its cultural context, and instructional objectives is insufficiently articulated, the resulting learning impact tends to diminish (Slobodová et al., 2021). Moreover, the presence of a small number of negative effect sizes indicates that, in certain contexts, integrating traditional games does not necessarily outperform comparison instructional approaches. This finding is significant in that it underscores that traditional games are not pedagogical interventions that function automatically. From a cultural learning perspective, learning is understood as participation in meaningful social practices. When traditional games are implemented in isolation from processes of meaning negotiation, collaboration, and reflection, their potential as learning vehicles may be reduced, and in some cases, may yield weaker effects than conventional approaches.

The pooled effect-size estimate across the analyzed studies indicates that learning approaches integrating traditional games have a significant positive effect. Based on a random-effects model estimated using the restricted maximum likelihood (REML) method, the analysis yielded a Hedges' g of 3.974, with a 95% confidence interval ranging from 2.665 to 5.283 (Table 2). Because the confidence interval does not cross zero, this result indicates a statistically significant difference between the experimental and control groups.

The pooled effect-size analysis presented in Table 2 shows that integrating traditional games into learning has a strong, statistically significant effect on learning outcomes. The estimated Hedges' g of 3.97, with a 95% confidence interval entirely above zero, indicates that this finding is not merely a statistical artifact but reflects a substantive difference between traditional game-based learning and conventional instructional approaches. The statistical significance of the model ($z = 5.949$; $p < .001$) further supports the inference that the observed effect reflects a consistent empirical pattern across the literature rather than random variation across studies. From a theoretical standpoint, this finding can be meaningfully interpreted through the lens of ethnopedagogy, which conceptualizes cultural heritage as a source of pedagogical legitimacy. Traditional games function not only as instructional media but also as cultural practices embedded with values, meanings, and collective identities (Luchoro-Parrilla et al., 2021; Saura & Zimmermann, 2021). When such practices are integrated into formal educational settings, learners are more likely to experience a strengthened sense of connectedness between school knowledge and their lived experiences. This sense of connectedness has the potential to enhance learning motivation and deepen the meaningfulness of instructional content, which is ultimately reflected in higher learning outcomes.

Table 1 Summary of research data, effect size, and standard error.

Study Name	Eksperimental			control			g	Seg
	N	Mean	SD	N	Mean	SD		
Arantes et al. (2025)	23	3,80	1,15	22	3,79	0,93	0,01	0,30
Arantes et al. (2025)	23	3,75	1,18	22	3,32	0,96	0,39	0,30
Aribowo et al. (2019)	24	4,67	0,37	24	3,42	0,37	3,32	0,45
Astuti. (2024)	28	68,82	18,64	27	51,20	9,95	1,16	0,29
Astuti. (2024)	28	67,62	23,11	27	64,08	18,48	0,17	0,27
Astuti. (2024)	28	4,14	0,75	27	3,7	0,68	0,61	0,27
Charles & Samuel. (2020)	142	10,21	6,48	156	11,81	7,84	-0,22	0,12
Chen et al. (2021)	56	0,43	1.84	55	9.18	2.33	0,37	0,19
Chen et al. (2021)	56	13.68	4,24	56	13.07	4,24	0,01	0,19
Chen et al. (2021)	57	11.68	1.33	55	9.18	2.33	1,34	0,21
Chen et al. (2021)	57	16,46	4,45	55	9.18	2.33	5,03	0,39
Dewi et al. (2018)	26	36,31	1,64	26	27,69	2,67	3,83	0,47
Dewi et al. (2018)	36	43,33	5,34	36	5,90	5,90	6,58	0,60
Dorji & Rigdel. (2024)	31	8,74	2,86	31	3,06	3,06	1,89	0,30
Engin et al. (2023)	21	53,95	3,72	21	50,19	5,47	0,79	0,32
Fauzi et al. (2023)	43	18,52	1,64	43	9,57	1,36	5,89	0,50
Fernández Galeote et al. (2023)	35	11,50	1,60	35	11,60	1,67	-0,06	0,24
Gokalp et al. (2025)	66	17,06	1,92	69	16,19	2,82	0,36	0,17
Gokalp et al. (2025)	66	61,27	4,40	69	38,80	2,19	6,47	0,43
Gokalp et al. (2025)	66	89,70	11,19	69	80,93	12,28	0,74	0,18
Gudadappanavar et al. (2021)	48	33,17	2,93	50	28,66	2,82	1,56	0,23
Gudadappanavar et al. (2021)	48	62,12	6.07	50	34,48	6,77	5,67	0,45
Gudadappanavar et al. (2021)	48	13,25	1,37	50	6,04	1,38	5,20	0,42
Irawan et al. (2023)	12	18,08	1,93	12	2,47	2,47	6,80	1,08
Irwansyah et al. (2022)	20	23,23	1,34	20	1,09	1,09	17,77	2,03
Iswinarti-Laily. (2024)	18	30,94	1,55	18	1,71	1,71	17,51	2,11
Iswinarti-Laily. (2024)	18	30,94	1,55	18	3,38	3,38	10,25	1,27
Kenanoglu & Duran. (2021)	36	68,81	14,80	36	40,78	11,60	2,09	0,29
Maya et al. (2017)	30	10,27	1,13	30	1,52	1,52	6,45	0,65
Maya et al. (2017)	30	1,33	0,92	30	1,49	0,74	-0,19	0,26
Mubiar et al. (2020)	16	84,98	1,211	20	79,23	1,149	4,78	0,66
Novinda. (2020)	32	18,34	3,25	32	2,58	2,58	5,31	0,53
Novinda. (2020)	32	18,34	3,25	32	3,57	3,57	4,27	0,45
Rahmat et al. (2023)	32	52,97	6,33	30	7,80	7,80	6,30	0,62
Repuya et al. (2021)	20	20,60	2,93	22	13,41	2,3	2,69	0,43
Saputra & Yun. (2021)	18	87,33	5,80	18	22,10	22,10	3,95	0,57
Sholikhah et al. (2024)	15	14,70	4,85	15	4,00	4,00	2,34	0,47
Thalib et al. (2022)	8	92,00	1,58	9	3,30	3,30	31,88	5,63
Widiana et al. (2018)	25	60,67	5,27	27	35,88	1,57	6,39	0,69

Table 2 Results of mean effect analysis of studies.

Coefficients						
	Estimate	Standard Error	z	p	95% Confidence Interval	
					Lower	Upper
Intercept	3.974	0.668	5.949	< .001	2.665	5.283

Note: Wald test.

From a theoretical perspective, the magnitude of the observed effect size can be understood through the lens of constructivism, which emphasizes that effective learning occurs when learners actively construct knowledge through direct experience, interaction, and reflection (Al Abri et al., 2024; Zajda, 2021). Traditional games, as activities characterized by physical engagement, social interaction, and rule-based problem-solving, provide learning conditions that closely align with these principles. The superiority of traditional game-based learning over conventional instructional approaches can thus be interpreted as a consequence of heightened cognitive and affective engagement during the learning process (Syafmen et al.,



2022). Empirically, the large pooled effect size is also consistent with the overall pattern observed across most individual effect sizes in the included studies, where traditional game-based learning generally outperformed conventional instruction. This consistency in the direction of effects strengthens the argument that traditional games represent more than a mere variation in teaching methods; rather, they constitute a pedagogical approach capable of fostering more effective learning conditions (Berti, 2023; Ismagilova et al., 2021). Nevertheless, the magnitude of the aggregated effect should be interpreted in light of the substantial variability across studies, indicating that the strength of the observed impact is strongly influenced by implementation contexts and the types of learning outcomes assessed.

The distribution of individual effect sizes and the pooled effect estimate are illustrated in Figure 1 (Forest Plot), which shows that the majority of studies contribute to a positive direction of effect. Nevertheless, the magnitude of the pooled effect size should be interpreted in light of the substantial variability in individual effect sizes, as reflected in both Table 1 and Figure 2.

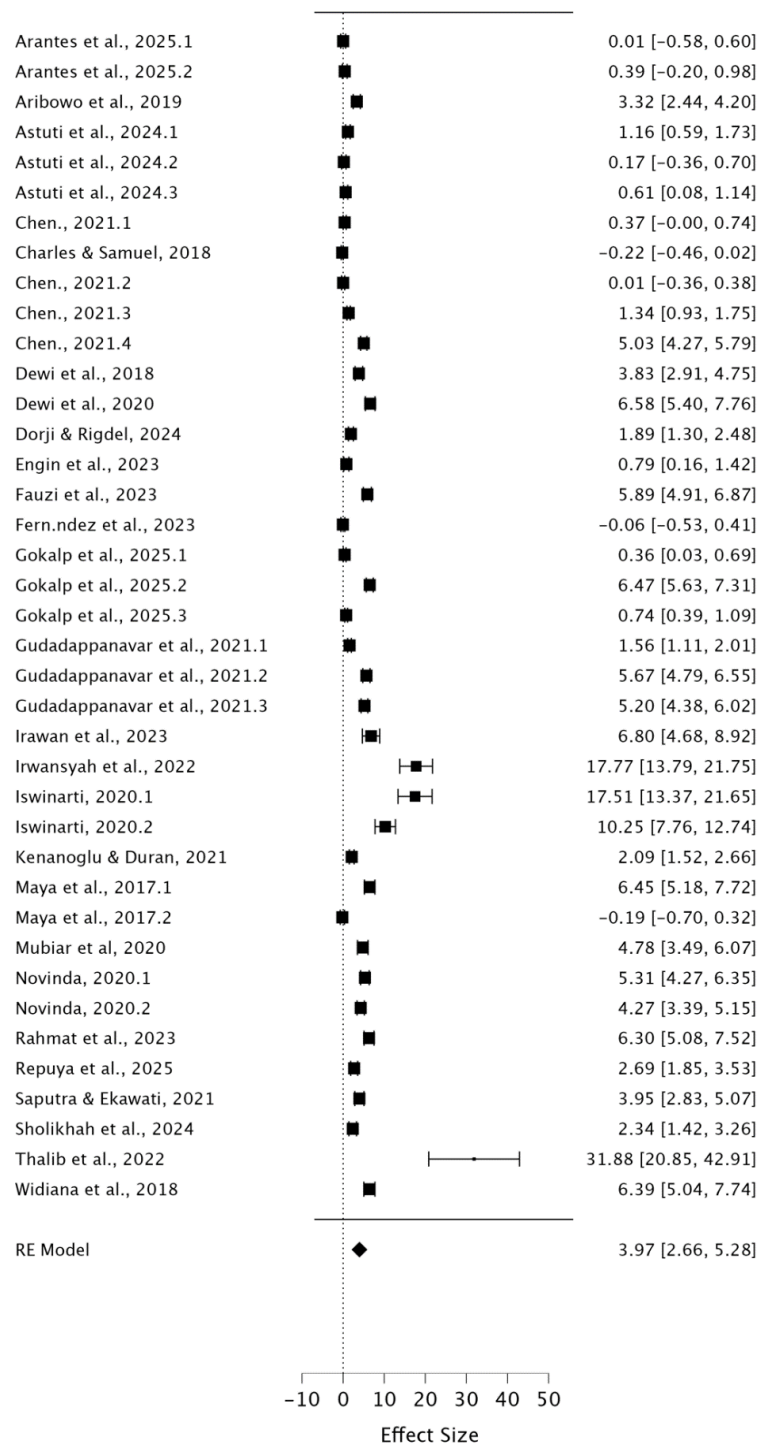


Figure 2 Forest plot.



The forest plot in Figure 2 shows that several studies reporting very large effect sizes are associated with relatively wide confidence intervals, indicating greater uncertainty, often due to smaller sample sizes or greater data variability. In contrast, studies with narrower confidence intervals contribute more stable estimates to the pooled effect size, even when their effect magnitudes are not extreme. This pattern underscores that the strong pooled effect estimate is not driven by one or two studies with exceptionally large effects, but rather emerges from the aggregation of evidence across studies with varying levels of precision. From a theoretical perspective, the dispersion of effect sizes and confidence intervals depicted in the forest plot reinforces the view that the effectiveness of traditional games is context-dependent and contingent upon the quality of the learning experiences they generate (Hartt et al., 2020). Studies reporting large effects likely represent contexts in which traditional games function as rich and meaningful learning experiences, whereas studies with smaller or non-significant effects reflect contexts where games play a more limited role or are insufficiently integrated into the conceptual structure of instruction.

Moreover, the presence of confidence intervals crossing zero in several studies indicates that traditional games do not consistently yield pedagogical advantages over comparison instructional approaches. This finding is conceptually significant, as it underscores that traditional games are not interventions that operate automatically. From an ethnopedagogical perspective, traditional games derive their pedagogical potency when they function as meaningful cultural practices that resonate with learners' social experiences. When this cultural dimension is not pedagogically activated, for instance, when games are employed merely as diversions or supplementary activities, their instructional impact tends to weaken, as reflected in low or non-significant effect size estimates (García-Monge et al., 2021; Ribas et al., 2023).

The analysis indicates that effect sizes across the included studies exhibit a very high degree of variability. As presented in Table 3, the residual heterogeneity test yielded a significant Q statistic ($Q = 1605.258$; $df = 38$; $p < .001$), indicating that the observed differences in effect sizes across studies cannot be attributed solely to sampling error. This finding confirms that the included studies are heterogeneous in the magnitude of the effects of traditional games on learning outcomes.

Table 3 Heterogeneity test result.

Fixed and Random Effects			
	Q	df	p
Omnibus test of Model Coefficients	35.386	1	< .001
Test of Residual Heterogeneity	1605.258	38	< .001

Note: p -values are approximate. The model was estimated using Restricted ML method.

Estimates of the heterogeneity index indicate that a substantial proportion of the total variance is attributable to true differences across studies. The high I^2 value suggests that most of the variability in effect sizes arises from differences in study characteristics, learning contexts, and intervention designs, rather than from random fluctuation. This condition further supports the use of a random-effects model, which assumes that individual studies estimate different yet related effect sizes within a broader distribution of effects. The high level of heterogeneity is also evident in Figure 1 (Forest Plot), where individual effect sizes are widely dispersed, ranging from very small to very large. This distribution indicates that although the overall effect of traditional games is generally positive, its magnitude is not uniform across studies. Consequently, heterogeneity is a central empirical characteristic of the analyzed data and provides a critical basis for interpreting the context-dependent effectiveness of traditional games in learning.

The combination of a large pooled effect size and high heterogeneity suggests that the effectiveness of traditional games in learning contexts is strong but uneven. This pattern indicates that traditional games should not be understood as pedagogical interventions that operate uniformly across settings, but rather as learning approaches whose effectiveness is highly contingent upon implementation conditions, instructional goals, and the types of learning outcomes assessed. Accordingly, the meta-analytic findings should be interpreted as reflecting the diversity of pedagogical practices involving traditional games, rather than as contradictory evidence. Large effect sizes observed across several studies can be understood as a consequence of alignment between instructional content and learners' cultural identities, which enhances the legitimacy of learning and cognitive engagement. Nevertheless, the wide variability in effect sizes indicates that not all implementations of traditional games automatically yield strong learning impacts. In some studies, traditional games appear to be employed in a more symbolic manner or detached from clearly articulated instructional objectives, thereby limiting their function to recreational activities (Ribas et al., 2023; Temel & Kangalgil, 2024). Under such conditions, games do not fully function as tools for knowledge construction, which may account for small or even negative effect sizes in certain contexts.

These findings are also consistent with constructivist learning principles, which emphasize that learning effectiveness depends on learners' active engagement in constructing understanding through meaningful experiences (Arik & Yılmaz, 2020; Wibowo et al., 2025). Traditional games designed to promote exploration, social interaction, and conceptual reflection tend to produce stronger learning effects than those focused primarily on procedural execution or rule-following without conceptual integration. Accordingly, the observed heterogeneity in effect sizes reflects differences in the extent to which traditional games are leveraged as constructive learning experiences, rather than merely as alternative instructional methods.

Overall, the pattern of strong yet uneven effects reinforces the conclusion that the pedagogical strength of traditional games lies not in their form but in their integration into instructional design (Syafmen et al., 2022). Moreover, the presence of multiple effect sizes derived from the same studies highlights the critical role of implementation context in shaping learning impacts. Even within a single intervention, variations in activity design, instructional focus, and outcome measurement can yield substantially different effect size estimates. This finding underscores that understanding the effectiveness of traditional games requires careful attention to pedagogical context and design features, rather than attributing outcomes solely to the inclusion of the games themselves.

To assess the robustness of the meta-analytic findings against potential publication bias, the results were evaluated using file drawer analysis and visual inspection of the distribution of effect sizes. The Rosenthal Fail-safe N, presented in Table 4, indicates that 22,205 null-result studies would be required to reduce the statistical significance of the meta-analytic findings to the conventional threshold ($\alpha = .05$). This number far exceeds the quantity of unpublished studies that could realistically exist, suggesting that the main findings of this study are highly robust and unlikely to be substantially distorted by publication bias. Publication bias was assessed using a funnel plot. The distribution of effect sizes and their standard errors is illustrated in Figure 3.

Table 4 Fail-safe N.

	Fail-safe N	Target Significance	Observed Significance
Rosenthal	22205.000	0.050	< .001

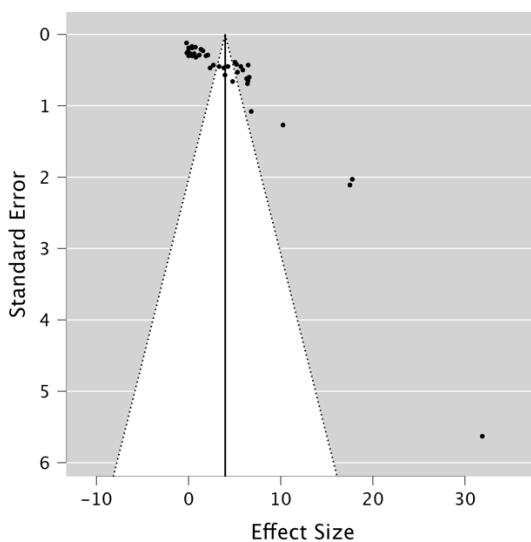


Figure 3 Funnel Plot.

Funnel Plot reveals a degree of asymmetry in the distribution of effect sizes, which may indicate publication bias. However, this asymmetry should be interpreted in light of the characteristics of the educational research literature, where studies reporting positive findings are more likely to be published, and where substantial variation in sample sizes and research designs is common. Accordingly, the observed asymmetry does not automatically invalidate the meta-analytic results. When considered jointly, the findings from the fail-safe N analysis and the pattern of effect size distribution suggest that, although publication bias may be present in the analyzed literature, the overall effect of traditional games on learning remains stable and is not easily distorted by the omission of unpublished studies. The meta-analytic estimates can therefore be regarded as a reliable assessment of the effectiveness of traditional games in learning contexts, providing a solid foundation for discussing their theoretical and pedagogical implications.

The findings of this meta-analysis carry important implications for the development of heritage-based learning. The large pooled effect size indicates that traditional games possess substantial pedagogical potential when thoughtfully integrated into instructional processes. At the same time, the high degree of variability in effect sizes underscores that this potential is not automatic, but rather highly dependent on the manner and context of implementation. A key implication of these findings is that traditional games should be understood as designed learning practices, rather than as cultural activities simply inserted into instruction. The results suggest that educators need to adopt a contextual and reflective approach when integrating traditional games into teaching. Traditional games designed to foster cognitive engagement, social interaction, and conceptual reflection are more likely to generate strong learning impacts than procedural or symbolic implementations. Accordingly, the present meta-analysis does not advocate the indiscriminate use of traditional games but instead emphasizes aligning games with instructional objectives and learner characteristics.



4. Final Considerations

This study set out to synthesize empirical evidence on the effectiveness of integrating traditional games into learning contexts through a contrast-group meta-analysis. Drawing on 39 effect sizes from studies published between 2017 and 2025, the findings provide clear empirical support for the pedagogical potential of traditional games, while simultaneously challenging overly generalized claims regarding their universal effectiveness. The meta-analytic results demonstrate that learning approaches incorporating traditional games produce a strong and statistically significant positive effect on learning outcomes. This finding supports the core research objective of determining whether traditional games can serve as effective learning practices across diverse educational contexts. However, the analysis also revealed substantial heterogeneity across the included studies, indicating that the effectiveness of traditional games is uneven and highly context-dependent. Thus, while the overall direction of the effect supports the assumed educational value of traditional games, the magnitude of impact varies considerably depending on instructional design, contextual alignment, and the types of learning outcomes assessed.

From a theoretical standpoint, these findings lend empirical support to ethnopedagogical, cultural learning, and constructivist perspectives, which emphasize that learning effectiveness emerges from meaningful engagement with cultural practices rather than from instructional techniques alone. The results suggest that traditional games exert pedagogical influence not simply because they are games, but because they can function as culturally grounded learning experiences that foster active participation, social interaction, and reflective meaning-making. Conversely, when traditional games are implemented symbolically or procedurally without clear alignment with learning objectives, their instructional impact diminishes. In this sense, the findings both support and qualify existing theoretical claims by demonstrating that the pedagogical power of traditional games is conditional rather than inherent. This study contributes to the literature in several important ways. Empirically, it provides a robust quantitative estimate of the overall effect of traditional games on learning outcomes, supported by robustness analyses indicating that the findings are stable and not easily distorted by publication bias. Conceptually, it advances the discussion beyond the question of whether traditional games are effective toward a more nuanced understanding of when, how, and under what conditions they function as meaningful pedagogical practices. By framing traditional games as context-sensitive heritage-based learning practices, this study helps bridge the gap between normative claims about cultural education and systematically synthesized empirical evidence.

Several limitations should be acknowledged. First, the high heterogeneity observed among the analyzed studies suggests substantial variation in study characteristics, including differences in research design, participant populations, educational levels, and instructional contexts. Such methodological diversity may influence the magnitude of the reported effects and therefore requires cautious interpretation of the aggregated results. Second, variations in methodological approaches across the included studies, such as differences between experimental and quasi-experimental designs, measurement instruments, and outcome variables, may also contribute to the variability of effect sizes observed in the meta-analysis. Third, limitations related to the study selection process should also be considered. Although the literature search followed systematic procedures across multiple databases and applied explicit inclusion criteria, the analysis relied primarily on published journal articles reporting sufficient quantitative data for effect size calculation. As a result, relevant studies published in other formats or lacking complete statistical information may not have been included, which may influence the overall representation of the available evidence. Future research should therefore move beyond broad effectiveness claims and focus on identifying specific pedagogical configurations that optimize the learning potential of traditional games. Longitudinal studies, mixed-methods approaches, and theoretically driven experimental designs may further illuminate the mechanisms through which cultural heritage-based practices contribute to meaningful learning. Such efforts will be essential for advancing both theory and practice in heritage-based education.

Acknowledgment

We are grateful to Universitas Islam Riau for funding this research

5. Declarations

5.1. Ethical considerations

Not applicable.

5.2. Use of artificial intelligence (AI)

The authors declare that the generative artificial intelligence (AI) tool [ChatGPT] was used exclusively for language editing and/or grammatical improvement. The use of AI did not influence the scientific content, study design, data analysis, data interpretation, results, or conclusions of the manuscript. Full responsibility for the content remains with the authors.

5.3. Conflict of interest

The authors declare no conflicts of interest.

5.4. Funding

This study was supported by the Universitas Islam Riau, Indonesia, under Grant 886/KONTRAK/P-K-PGB/DPPM-UIR/2024

References

- Al Abri, M. H., Al Aamri, A. Y., & Elhaj, A. M. A. (2024). Enhancing student learning experiences through integrated constructivist pedagogical models. *European Journal of Contemporary Education and E-Learning*, 2(1), 130–149. [https://doi.org/10.59324/ejceel.2024.2\(1\).11](https://doi.org/10.59324/ejceel.2024.2(1).11)
- Aliriadi, H., Adi, S., Manullang, J. G., Endrawan, I. B., & Satria, M. H. (2024). Improvement of motor skills and motivation to learn physical education through the use of traditional games. *Physical Education Theory and Methodology*, 24(1), 32–40. <https://doi.org/10.17309/tmfv.2024.1.04>
- Arantes, D., Gonçalves, C., Rodrigues, M., Correa, J., Milistetd, M., & Costa, G. D. C. T. (2025). Life skills and volleyball teaching: Comparison between TGfU and direct instruction model. *Education Sciences*, 15(3), 305–316. <https://doi.org/10.3390/educsci15030305>
- Aribowo, D. S., Hidayah, T., & Rumini, R. (2019). The effectiveness of Indonesian traditional games and agility on students' gross motor skills in elementary school Hj. Isriati Baiturrahman 2 Semarang. *Journal of Physical Education and Sports*, 8(3), 281–287.
- Arık, S., & Yılmaz, M. (2020). The effect of constructivist learning approach and active learning on environmental education: A meta-analysis study. *International Electronic Journal of Environmental Education*, 10(1), 44–84.
- Astuti, K. S., Langit, P. V., & Retnowati, T. H. (2024). Development of dolanan anak's song learning method for the preservation of traditional arts and the inculcation of educational values by digitalization. *Korean Journal of Research in Music Education*, 53(3), 183–203.
- Berti, F. (2023). *The shared space of play: Traditional games as a tool of intercultural education* (Vol. 3). Lit Verlag.
- Charles-Owaba, T., & Samuel, J. (2020). Effects of traditional games on students' academic achievement in mathematics. *Journal of African Contemporary Research*, 9(1), 178–192.
- Chen, G. A., & Horn, I. S. (2022). A call for critical bifocality: Research on marginalization in mathematics education. *Review of Educational Research*, 92(5), 786–828. <https://doi.org/10.3102/003465432111070050>
- Chen, Y.-C., Lu, Y.-L., & Lien, C.-J. (2021). Learning environments with different levels of technological engagement: A comparison of game-based, video-based, and traditional instruction on students' learning. *Interactive Learning Environments*, 29(8), 1363–1379. <https://doi.org/10.1080/10494820.2019.1628781>
- Cope, B., & Kalantzis, M. (2023). Towards education justice: The multiliteracies project revisited. In *Multiliteracies in international educational contexts* (pp. 1–33). Routledge. <https://doi.org/10.4324/9781003349662-1>
- Dewi, N. L., Suryati, Y., Rudhiati, F., & Mediani, H. S. (2018). The effect of traditional game of Magoak-Goakan on prosocial behavior among preschool children (5–6 years old) at Maria Fatima Kindergarten, Jembrana, Bali. *IOSR Journal of Nursing and Health Science*, 7(5), 1–7.
- Dorji, N., & Rigdel, K. S. (2024). The effect of games and simulations in learning mathematics: A quasi-experimental study. *Vietnam Journal of Educational Sciences*, 20(2), 1–15.
- Engeness, I., & Lund, A. (2020). Learning for the future: Insights arising from the contributions of Piotr Galperin to the cultural-historical theory. *Learning, Culture and Social Interaction*, 25, 1–12. <https://doi.org/10.1016/j.lcsi.2018.11.004>
- Engin, A. O., DüNDAR, F., & Engin, M. Ç. (2023). The effect of traditional child games on fifth-grade students' attitudes related to geometry. *Journal of Education and Future*, 24, 45–51. <https://doi.org/10.30786/jef.1252643>
- Fauzi, R. A., Suherman, A., Saptani, E., Dinangsit, D., & Rahman, A. A. (2023). The impact of traditional games on fundamental motor skills and participation in elementary school students. *International Journal of Human Movement and Sports Sciences*, 11(6), 1368–1375. <https://doi.org/10.13189/saj.2023.110622>
- Fernández Galeote, D., Legaki, N.-Z., & Hamari, J. (2023). From traditional to game-based learning of climate change: A media comparison experiment. *Proceedings of the ACM on Human-Computer Interaction*, 7(1), 503–525. <https://doi.org/10.1145/3611039>
- Fernández-Oliveras, A., Espigares-Gámez, M. J., & Oliveras, M. L. (2021). Implementation of a playful microproject based on traditional games for working on mathematical and scientific content. *Education Sciences*, 11(10), 624. <https://doi.org/10.3390/educsci11100624>
- Freedman, K. (2025). *Teaching visual culture: Curriculum, aesthetics, and the social life of art*. Teachers College Press. https://doi.org/10.1386/jvap.7.1.95_4
- García-Monge, A., Rodríguez-Navarro, H., & Bores-García, D. (2021). New images for old symbols: Meanings that children give to a traditional game. *Frontiers in Psychology*, 12, 676590. <https://doi.org/10.3389/fpsyg.2021.676590>
- Gokalp, M. G., Yucel, S. C., & Yılmaz, O. (2025). The effect of game-based learning on the acquisition of intramuscular injection skills. *Nurse Education in Practice*, 82, 104172. <https://doi.org/10.1016/j.nepr.2024.104172>
- Gudadappanavar, A. M., Benni, J. M., & Javali, S. B. (2021). Effectiveness of game-based learning over traditional teaching-learning strategy to instruct pharmacology for phase II medical students. *Journal of Education and Health Promotion*, 10(1), 91–102. https://doi.org/10.4103/jehp.jehp_624_20
- Gultom, S., Ampera, D., Endriani, D., Jahidin, I., & Tanjung, S. (2022). Traditional games in cultural literacy to build the character of elementary school students during the COVID-19 pandemic. *NeuroQuantology*, 20(5), 704–712. <https://doi.org/10.14704/nq.2022.20.5.nq22226>
- Hafeez, M. (2021). Effects of game-based learning in comparison to traditional learning to provide an effective learning environment: A comparative review. *International Journal of Social Sciences & Educational Studies*, 8(4), 100–115. <https://doi.org/10.23918/ijsses.v8i4p100>
- Hartt, M., Hosseini, H., & Mostafapour, M. (2020). Game on: Exploring the effectiveness of game-based learning. *Planning Practice & Research*, 35(5), 589–604. <https://doi.org/10.1080/02697459.2020.1778859>
- Irawan, D. S., Permana, R., & Hendrawan, B. (2023). The effect of traditional game-based play-teach-play learning method on physical fitness of grade VI elementary school students. *JETISH: Journal of Education Technology Information Social Sciences and Health*, 2(2), 993–998. <https://doi.org/10.57235/jetish.v2i2.797>
- Irwansyah, I., Soegiyanto, S., & Sumartiningih, S. (2022). The effectiveness of lape traditional game skills on students' physical fitness and learning outcomes during the COVID-19 pandemic. *Journal of Physical Education and Sports*, 11(3), 339–347.
- Ismagilova, L. F., Mutaeva, I. S., & Kuznetsova, Z. M. (2021a). Theoretical and practical aspects of traditional games as a pedagogical means of physical potential formation in students. *Педагогико-Психологические и Медико-Биологические Проблемы Физической Культуры и Спорта*, 16(2), 93–100.
- Iswinarti, I., & Laily, W. N. (2024). Increasing moral emotions through traditional games of Gobak Sodor and Bentengan using the experiential learning method. *Indigenous: Jurnal Ilmiah Psikologi*, 9(1), 54–68. <https://doi.org/10.23917/indigenous.v9i1.4490>



- Kenanoglu, D., & Duran, M. (2021). The effect of traditional games on the language development of pre-school children in pre-school education. *Asian Journal of Education and Training*, 7(1), 74–81. <https://doi.org/10.20448/journal.522.2021.71.74.81>
- Kurniati, E., & Mwariko, S. A. (2025). Decolonizing play: Rediscovering and revitalizing traditional play practices in post-colonial context. *Policy Futures in Education*, 23(4), 863–879. <https://doi.org/10.1177/14782103251321047>
- Lew, C., & Saville, A. (2021). Game-based learning: Teaching principles of economics and investment finance through Monopoly. *The International Journal of Management Education*, 19(3), 100567. <https://doi.org/10.1016/j.ijme.2021.100567>
- López-Fernández, D., Gordillo, A., Alarcón, P. P., & Tovar, E. (2021). Comparing traditional teaching and game-based learning using teacher-authored games on computer science education. *IEEE Transactions on Education*, 64(4), 367–373. <https://doi.org/10.1109/te.2021.3057849>
- Luchoro-Parrilla, R., Lavega-Burgués, P., Damian-Silva, S., Prat, Q., Sáez de Ocariz, U., Ormo-Ribes, E., & Pic, M. (2021). Traditional games as cultural heritage: The case of Canary Islands (Spain) from an ethnomotor perspective. *Frontiers in Psychology*, 12, 586238. <https://doi.org/10.3389/fpsyg.2021.586238>
- Martínez-Santos, R., Founaud, M. P., Aracama, A., & Oiarbide, A. (2020). Sports teaching, traditional games, and understanding in physical education: A tale of two stories. *Frontiers in Psychology*, 11, 581721. <https://doi.org/10.3389/fpsyg.2020.581721>
- Maya, B., Mehmet, K., & Halil, T. (2017). The effect of traditional children's games on orientation and rhythm ability. *Ovidius University Annals, Series Physical Education and Sport/Science, Movement and Health*, 17(2), 200–205.
- Mejía-Rodríguez, A. M., & Kyriakides, L. (2022). What matters for student learning outcomes? A systematic review of studies exploring system-level factors of educational effectiveness. *Review of Education*, 10(3), e3374. <https://doi.org/10.1002/rev3.3374>
- Mubiar, M., Mamat, N. B., & Syaodih, E. (2020). Exploring “kaulinan barudak” to develop children's character values in Islamic early childhood education. *Jurnal Pendidikan Islam*, 6(1), 13–26. <https://doi.org/10.15575/jpi.v6i1.8226>
- Novinda, K. (2020). The effectiveness of using traditional and modern games to improve students' speaking ability. In *Proceedings of the 2nd Yogyakarta International Conference on Educational Management/Administration and Pedagogy (YICEMAP 2019)* (pp. 273–276). <https://doi.org/10.2991/assehr.k.201221.059>
- Nurhaliza, W. O. S., Sarwoprasodjo, S., Fatchiya, A., & Suharjito, D. (2025). Rethinking education for sea nomads through the on-off school model: A perspective on holistic and culturally adaptive schooling for the Bajo people in Indonesia. *Frontiers in Communication*, 10, 1611083. <https://doi.org/10.3389/fcomm.2025.1611083>
- Parker, R., Thomsen, B. S., & Berry, A. (2022). Learning through play at school: A framework for policy and practice. *Frontiers in Education*, 7, 751801. <https://doi.org/10.3389/educ.2022.751801>
- Rahmat, A. D., Wilujeng, I., & Kuswanto, H. (2023). The effect of mobile learning integrated traditional games “egrang” to improve multiple representation skills. *Journal of Science Learning*, 6(4), 435–441. <https://doi.org/10.17509/jsl.v6i4.57961>
- Repuya, C., Gabia, C., Ballaran, C., Mayores, F., Bronzal, M. K. V., Noora, N., & Baloro, R. A. (2021). Integrating traditional games (TG) in mathematics to enhance students' conceptual understanding, social skills, and attitudes. *Participatory Educational Research*, 12(4), 62–81. <https://doi.org/10.17275/per.25.49.12.4>
- Ribas, J. P., Hernández-Moreno, J., Díaz-Díaz, R., Borges-Hernández, P. J., Ruiz-Omeñaca, J. V., & Jaqueira, A. R. (2023). How to understand sports and traditional games and how to apply it to physical education: On the “goal of game.” *Frontiers in Sports and Active Living*, 5, 1123340. <https://doi.org/10.3389/fspor.2023.1123340>
- Saputra, N. E., & Yun, N. E. (2021). Past and present: Improving early childhood visual spatial abilities through traditional game cengklung. *Humanitas*, 18(1), 55–64. <https://doi.org/10.26555/humanitas.v18i1.16854>
- Saura, S. C., & Zimmermann, A. C. (2021). Traditional sports and games: Intercultural dialog, sustainability, and empowerment. *Frontiers in Psychology*, 11, 590301. <https://doi.org/10.3389/fpsyg.2020.590301>
- Sholikah, A. P., Ukhtisiwi, A., Kurniawati, L., & Azizah, A. S. A. N. (2024). The influence of benthik traditional games on the level of sibling rivalry among children: A quasi-experimental study. *Indigenous: Jurnal Ilmiah Psikologi*, 9(1), 27–37. <https://doi.org/10.23917/indigenous.v9i1.3010>
- Slobodová Nováková, K., Siroťová, M., Urban, M., & Boghana, J. (2021). Using the elements of traditional culture in the teaching process from the perspective of ethnopedagogy and ethnology. *Journal of Education Culture and Society*, 12(2), 495–504. <https://doi.org/10.15503/jecs2021.2.495.504>
- Syafmen, W., Fajriah, N., Dwi Citra, Y., Rivani, P. A., & Widodo, R. I. (2022). Investigating the role of traditional games in developing students' process skills and interest in learning mathematics. *Eurasian Journal of Educational Research*, 97, 216–234.
- Tatham-Fashanu, C. (2023). A third space pedagogy: Embracing complexity in a super-diverse early childhood education setting. *Pedagogy, Culture & Society*, 31(4), 863–881. <https://doi.org/10.1080/14681366.2021.1952295>
- Temel, A., & Kangalgil, M. (2024). Teachers' views on the role of traditional children's games in education. *Journal of Education and Recreation Patterns*, 5(1), 52–65. <https://doi.org/10.53016/jerp.v5i1.220>
- Thalib, A., Sitepu, M. S., Herlina, H., Rizal, R., & Delima, A. P. (2022). The effectiveness of the Nobangan learning model based on the traditional Kaili tribe game on students' learning interest. *Jurnal Ilmiah Sekolah Dasar*, 6(2), 270–277. <https://doi.org/10.23887/jisd.v6i2.46207>
- Wibowo, S., Wangid, M. N., & Firdaus, F. M. (2025). The relevance of Vygotsky's constructivism learning theory with differentiated learning in primary schools. *Journal of Education and Learning (EduLearn)*, 19(1), 431–440. <https://doi.org/10.11591/edulearn.v19i1.21197>
- Widiana, I. W., Jampel, I. N., & Prawini, I. P. (2018). The effectiveness of traditional game-based communication learning activity for cognitive process dimension learning achievement. *Cakrawala Pendidikan*, 37(2), 260–269.
- Zajda, J. (2021). Constructivist learning theory and creating effective learning environments. In *Globalisation and education reforms: Creating effective learning environments* (pp. 35–50). Springer. https://doi.org/10.1007/978-3-030-71575-5_3