

ISSN 2964-3902 (Online)
SUJANA: Journal of Education and Learning Review
https://journal.jfpublisher.com/index.php/sujana
Vol. 5, Issue. 1, (2026)
doi.org/10.56943/sujana.v5i1.1105

Mathematics Anxiety and Game-Based Learning in Indonesian Elementary Schools: Promise Versus Evidence

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ABSTRACT

Mathematics anxiety is associated with weaker mathematics achievement, and game-based learning is often proposed as a way to reduce it, yet international evidence is cautious and Indonesian elementary-school evidence has not been consolidated. This narrative review examined how Indonesian studies published between 2023 and 2025 describe mathematics anxiety and game-based approaches in elementary schools, and how strong the supporting evidence is. Five Indonesian-language studies met the inclusion criteria and were analysed through data reduction, display, and conclusion drawing, with design features such as sample size, comparison group, and measurement recorded for each study. Anxiety appeared in cognitive, affective, behavioural, and physiological forms; in one school, about 70% of 34 students were at a moderate or high level. Reported causes were outcome-oriented teaching, reprimands, and limited emotional support, but these were not tested. A negative association with achievement was found in one class ($r = -.61$), and one small controlled study ($n = 20$) reported a significant reduction in anxiety after a numbers game. Other strategies, including cooperative learning and mistake-tolerant classrooms, were recommended without testing. The findings agree with the direction of international evidence, extend it to Indonesian elementary classrooms, and show that local confidence in game-based approaches exceeds the available data. Teachers can adopt low-stakes, cooperative practices while monitoring students' anxiety. Larger multi-school controlled studies using validated scales are needed.

Keywords: *Elementary School, Game-Based Learning, Indonesia, Mathematics Anxiety, Narrative Review*

INTRODUCTION

Mathematics underpins logical, analytical, and quantitative reasoning, yet many children meet it with apprehension rather than confidence (Möhring et al., 2024). Mathematics anxiety refers to feelings of tension and worry that interfere with handling numbers and solving mathematical problems in everyday and school settings (Cipora et al., 2022; Khasawneh et al., 2021). A meta-analysis of 747 effect sizes from studies conducted between 1992 and 2018 found a small-to-moderate negative correlation between mathematics anxiety and mathematics achievement ($r = -.28$), and grade level moderated this relation (Barroso et al., 2021). A longitudinal study of 337 Polish children showed that the link can already be traced during the first two years of primary school, although the effects were small (Szczygieł et al., 2024).

Difficulty with mathematics is also documented in Indonesian classrooms. Raupu et al. (2023) described mathematics as a complicated subject that some students find hard to understand and apply, and they associated these difficulties with weaker achievement. In their study of 25 eighth-grade students at a junior high school in Palopo, students in the low-score group showed concept difficulties of 61%, principle difficulties of 60%, and verbal difficulties of 59%, whereas students in the high-score group showed no concept or principle difficulties. That study concerned lower secondary students and did not measure anxiety. It does show, however, that difficulties concentrate among lower-achieving students, the group that the deficit account identifies as most exposed to anxiety (Szczygieł et al., 2024).

Evidence from Indonesian elementary schools points in a similar direction, although it rests on small, localised samples. In a survey of 34 students at one Islamic integrated elementary school, Fadila et al. (2025) reported a mean anxiety score of 31.68, which fell into the moderate category. Of these students, 47.06% showed moderate anxiety and 23.53% showed high anxiety, so nearly 70% were at a moderate or high level. The 12-item questionnaire showed high internal consistency (Cronbach's $\alpha = .966$). Aisah (2025) studied 28 fifth-grade students at one elementary school in Bima District, Nusa Tenggara Barat. Anxiety scores, measured with an adapted elementary-school version of the Math Anxiety Rating Scale, correlated negatively with mathematics test scores ($r = -.61$, $p < .01$). Because both studies were conducted in single schools, their findings describe those schools and cannot be treated as national prevalence estimates.

The direction of this association remains unsettled. Szczygieł et al. (2024) compared three accounts: that low achievement produces anxiety, that anxiety lowers achievement, and that the two reinforce each other. In their final model, anxiety at the end of the first grade predicted lower achievement at the end of the second grade ($\beta = -.11$, $p = .024$), and achievement at the end of the first grade predicted anxiety one year later ($\beta = -.14$, $p < .001$). Both paths were weak, and the authors noted that a correlational longitudinal design does not allow causal claims.

Correlational findings such as those of Aisah (2025) are therefore best read as evidence of association rather than cause.

Children's anxiety has been linked to experiences of failure, poor grades, and negative reactions from classmates, teachers, and parents (Szczygieł et al., 2024). This has drawn attention to teaching approaches that lower the cost of making mistakes, and game-based learning is one of them. International evidence on such approaches is cautious, however. A meta-analysis of 11 randomised studies (16 effect sizes, 686 participants) found only a small and statistically non-significant reduction in mathematics anxiety after game-based interventions (ES = −0.32, 95% CI [−0.64, 0.01]). Non-digital games performed better than digital games (ES = −0.13), and effects were larger when gameplay encouraged collaboration and social interaction (Dondio et al., 2023). Balt et al. (2022) systematically reviewed intervention research on math anxiety in school children, summarising the approaches, designs, and characteristics of the interventions together with their effects. Reviews of game-based learning in mathematics more broadly have examined both cognitive and affective outcomes (Hui & Mahmud, 2023).

In Indonesia, game-based material has mostly been examined through learning outcomes rather than anxiety. Munir et al. (2023) developed student worksheets built around the traditional game engklek and tested them with 12 seventh-grade students. The worksheets met the criteria of being very valid and very practical, mathematics learning outcomes improved, and the game fostered values such as cooperation, honesty, and patience. The study did not measure anxiety, however, and it involved lower secondary rather than elementary students.

Taken together, these studies leave three gaps. First, the international syntheses combine studies from different countries and age groups, so they cannot show how game-based approaches operate in Indonesian elementary classrooms. Second, the Indonesian studies that measured anxiety in elementary schools described its level or its association with achievement but did not examine interventions (Aisah, 2025; Fadila et al., 2025), whereas the Indonesian study that examined a traditional game measured learning outcomes and values, not anxiety, and involved lower secondary students (Munir et al., 2023). Third, in the sources identified for this review, no account consolidates what Indonesian elementary-school studies report about the forms and causes of mathematics anxiety, about game-based and related strategies, and about the quality of the evidence behind them. The novelty of this review lies in treating these three questions together: it synthesises Indonesian elementary-school studies, appraises their design features critically, and positions the findings against the international syntheses to show where they support, extend, or qualify them.

This article therefore aims to review how Indonesian elementary-school studies published between 2023 and 2025 describe mathematics anxiety and game-based approaches to reducing it, and to evaluate the strength of that evidence against international research. Three research questions guide the review: (1) What forms

and causes of mathematics anxiety among elementary school students are reported in Indonesian studies? (2) What do these studies report about game-based and related strategies for reducing mathematics anxiety, and how strong is the supporting evidence? (3) Do the findings support, extend, or contradict international research? The review contributes a critical, context-specific synthesis for researchers who design interventions and for teachers who must decide which strategies are worth trying, and it offers a basis for the larger, better-controlled studies that the field still lacks. As a narrative review, it is descriptive and does not aim to establish effectiveness.

LITERATURE REVIEW

Mechanisms of Mathematics Anxiety in Early Schooling

Control-value theory treats anxiety as an achievement emotion that arises from a student's appraisals of control over learning activities and of the value attached to their outcomes (Pekrun, 2006). Putwain and Wood (2023) tested this account with 1,242 Year 5 students (mean age 9.3 years) from 24 English primary schools, measuring classroom anxiety, control, and value at two points seven months apart. Higher control predicted lower later anxiety ($\beta = -.18$), and higher anxiety predicted lower later control ($\beta = -.14$), so the two reinforced each other. Anxiety also predicted lower later value, but value did not predict later anxiety. Control at the first wave was related to higher achievement at the third wave, indirectly and partly through lower anxiety. The authors read these results as a case for reducing anxiety directly or for strengthening students' sense of control.

A second account concerns cognitive resources. According to attentional control theory, anxiety shifts attention toward threat and loads working memory, which impairs the processing that mathematical tasks require (Finell et al., 2022). Their meta-analysis of 57 studies and 150 effect sizes found a mean correlation of $r = -.168$ between mathematics anxiety and mathematics performance. A descriptive estimate based on 15 effect sizes gave a mean indirect effect through working memory of −.092. A larger synthesis of 177 studies with 906,311 participants separated mathematics anxiety from test anxiety. Both were significantly related to mathematics performance, sociodemographic moderators had modest effects, and working memory mediated the relationship only weakly (Caviola et al., 2022). These syntheses support a genuine but modest association, and they suggest that working memory explains only part of it, which leaves room for motivational and social explanations.

Indonesian reviews describe the same processes in elementary classrooms. Gampu and Lumbantobing (2025) reviewed national and international articles published between 2015 and 2025. They characterised mathematics anxiety by fear, tension, and avoidance, and linked it to weaker conceptual understanding, working memory, and motivation. This agreement with the international evidence is useful,

but a review can only be as sound as the primary studies it collects, which is why the methodological quality of the Indonesian studies is examined later in this article.

Theoretical Foundations of Game-Based Learning

Gamification, the use of game design elements within learning activities, has been synthesised meta-analytically. Sailer and Homner (2020) reported small positive effects on cognitive (g = 0.49), motivational (g = 0.36), and behavioural outcomes (g = 0.25). Cognitive effects remained stable in the most rigorous studies, whereas motivational and behavioural effects were less stable. For behavioural outcomes, game fiction and competition combined with collaboration were associated with larger effects. These findings suggest that results depend on design features rather than on the mere presence of a game.

Three classical theories explain why such features might matter. Piaget (1952) described children as constructing understanding through action on their environment, which is the usual starting point for activity-based mathematics teaching. Vygotsky (2018) located learning in social interaction within the zone of proximal development, where a child can achieve with support what cannot yet be done alone. Self-determination theory adds a motivational layer: intrinsic motivation and well-being are sustained when activities satisfy needs for autonomy, competence, and relatedness (Ryan & Deci, 2000). Game structures that allow repeated attempts, calibrated challenge, and cooperation could in principle supply each of these conditions, although whether they do so in a given classroom is an empirical question.

Control-value theory links these ideas to anxiety. If anxiety follows from low perceived control, instruction that matches task difficulty to the learner and treats failure as a normal part of learning should reduce it. Putwain and Wood (2023) proposed interventions of this kind, including individualised learning, tablet-based activities matched to a student's progress, and growth-mindset principles. Game designs with adjustable difficulty and low-stakes repetition correspond to these suggestions. That correspondence is a theoretical argument and not evidence that games lower anxiety, which the empirical sections of this review assess.

Teachers, Parents, and Classroom Climate

Teachers shape the emotional climate in which these processes operate. McLean et al. (2023) studied 33 fourth-grade teachers and 463 students in 14 schools in the south-western United States. Teachers' own mathematics anxiety was positively associated with the mathematics anxiety of their low-socioeconomic-status students, and the authors interpreted this as evidence of emotional transmission in the classroom. The design was observational, so the finding indicates association and not cause. Indonesian literature on teacher strategies has also pointed to classrooms that tolerate mistakes as part of a supportive approach (Gampu & Lumbantobing, 2025).

Parents contribute in a less straightforward way than is often assumed. Guzmán et al. (2023) studied 311 Chilean second graders and their parents. Among parents with low anxiety, children's mathematics performance was negatively associated with their anxiety regardless of how often home numeracy activities took place. Among mathematically anxious parents who engaged frequently with their children, no association between child anxiety and achievement appeared. The authors concluded that family dynamics and parents' emotions are central to the performance-anxiety relationship in early development. A single sample cannot be generalised, but the result shows that the parental role depends on parents' own emotions and the quality of interaction, not only on whether they help.

RESEARCH METHODOLOGY

This study is a narrative literature review. Its purpose was to describe and interpret what research conducted in Indonesian elementary schools reports about mathematics anxiety and about game-based approaches to reducing it, not to estimate a pooled effect. A narrative design suits this purpose because the available studies are few and differ in design, ranging from surveys and correlational studies to classroom case studies and literature reviews. Narrative reviews are flexible, and they openly acknowledge that they may not include all relevant literature (Sukhera, 2022). For that reason, no PRISMA flow diagram is reported, and the findings are presented as an interpretive synthesis and not as an exhaustive account.

The corpus consists of Indonesian-language studies published between 2023 and 2025. This window was chosen to describe recent classroom practice rather than to trace the history of the topic, and the restriction is acknowledged as a limitation. Studies were included if they (1) involved elementary school students (SD or MI), (2) reported the forms or causes of mathematics anxiety or described strategies, media, or games related to its reduction, and (3) appeared in a peer-reviewed journal with a verifiable publication year and bibliographic record. Surveys, correlational studies, classroom case studies, experimental studies, and literature reviews were all eligible. Studies of secondary or tertiary students, opinion pieces without data, duplicate reports of the same study, and sources whose bibliographic details could not be verified were excluded.

International studies were treated differently from the Indonesian corpus. They were located through targeted searches for meta-analyses, systematic reviews, and longitudinal studies published between 2020 and 2025, together with foundational theory. They supply the conceptual framework and the benchmark against which the strength of the Indonesian evidence is judged. They were not coded as data, because the research question concerns Indonesian elementary classrooms and because combining studies from different educational systems would blur the contextual conditions the review aims to describe.

Analysis followed the cycle of data reduction, data display, and conclusion drawing and verification described by (Miles et al., 2020). For each study, the year, location, sample, design, anxiety measure, main findings, and stated limitations were entered into a matrix, which forms the basis of Table 1. Codes were derived deductively from the four conditions identified in the literature review (students' sense of control, working-memory load, the emotional climate set by teachers and parents, and game design features) and inductively from patterns that did not fit those conditions. No numerical quality score was assigned. Instead, the design features that bear on the strength of the evidence were reported for every study and are discussed in the Results: sample size, setting, presence of a comparison group, and whether anxiety was measured with an instrument or inferred from observation. Because the data are published reports, member checking was not applicable. The main limitations of the approach are the small number of included studies, the restriction to Indonesian-language articles, the absence of a pre-registered systematic search protocol, and the possibility that relevant studies were missed.

RESULT AND DISCUSSION

Overview of the Reviewed Studies

Five Indonesian-language studies published between 2023 and 2025 met the inclusion criteria. Three were empirical: a survey of 34 students (Fadila et al., 2025), a correlational study of 28 students (Aisah, 2025), and a pretest-posttest control-group experiment with 20 students (Rahayu et al., 2023). The other two were literature reviews, one supplemented by observation of a single classroom (Gampu & Lumbantobing, 2025) and one based entirely on eight earlier articles (Hutasoit et al., 2025). Table 1 summarises their settings, designs, measures, findings, and limitations.

Table 1 Characteristics of the reviewed studies

Study	Setting and design	Anxiety measure	Main findings	Limitations
Fadila et al. (2025)	Elementary school in Sorong; survey of 34 students	12-item questionnaire with four aspects (somatic, cognitive, affective, understanding/self-confidence), 4-point Likert, α = .966	Mean 31.68 (moderate); 47.06% moderate, 23.53% high, 29.41% low	Single school; sampling procedure unclear; descriptive only
Aisah (2025)	Elementary school in Bima, Nusa Tenggara Barat; correlational	20-item questionnaire adapted from MARS-E, 4-point Likert, expert content validation	Mean 53.7 (SD = 11.2); r = −.61, p < .01 with mathematics scores	One class; reliability not reported; correlational

Study	Setting and design	Anxiety measure	Main findings	Limitations
	study of 28 fifth graders			
Rahayu et al. (2023)	Elementary school in Makassar; pretest-posttest control group, 20 fifth graders	Mathematics learning anxiety scale	Numbers game group differed significantly from control ($p = .014$)	Very small sample; single school
Gampu and Lumbantobing (2025)	Literature review (2015–2025) plus observation of one fifth-grade class over three lessons	Observation sheet and field notes	Emotional, behavioural, and physiological signs; teacher stressed correct answers; three groups of strategies	One class; observation instrument not validated; strategy effectiveness not tested
Hutasoit et al. (2025)	Literature review of eight articles	None	Anxiety linked to grade pressure, reprimands, and negative self-talk; social-emotional strategies recommended	Databases not reported; one article served as main reference; no primary data

Source: Collected by the researchers (2025)

The methodological quality of these studies was modest. Every empirical study was conducted in one school or one class, and only Rahayu et al. (2023) included a comparison group. Three studies measured anxiety with a questionnaire, whereas Gampu and Lumbantobing (2025) relied on an observation sheet whose validation was not reported. Fadila et al. (2025) stated in their aims that they would relate anxiety to gender, achievement, and parental support, but their results are purely descriptive, and Aisah (2025) reported no reliability coefficient for the adapted scale. Hutasoit et al. (2025) described their work as a systematic review without reporting the databases searched, and they treated one of the eight articles as the main reference. The results below should therefore be read as descriptions of particular classrooms and as a summary of recommendations, not as established effects.

Forms and Reported Causes of Mathematics Anxiety

The studies described mathematics anxiety in several forms. In the survey of Fadila et al. (2025), the mean score of 31.68 fell in the moderate category, and 24 of 34 students (70.59%) were classified as moderately or highly anxious. Cognitive symptoms (mean 2.47) and affective symptoms (2.42) scored above somatic symptoms (2.19) and lack of understanding or confidence (2.17), although the whole range spanned only 0.30 points. Gampu and Lumbantobing (2025) observed one fifth-grade class during three lessons and recorded tension and fear of error, repeated checking of answers, avoidance of eye contact, delayed starting, requests to leave the room, nail biting, foot tapping, and one report of dizziness. Because these data come from a single class, they show what anxiety can look like in practice but not how often each form occurs. As for causes, the two reviews pointed to learning environments that stress grades, speed, and correct answers, to reprimands after mistakes, and to limited emotional support, which in turn fostered negative self-talk and low confidence (Gampu & Lumbantobing, 2025; Hutasoit et al., 2025). The observed teacher did emphasise correct answers over students' reasoning, and no mistake-tolerant practice was recorded. Fadila et al. (2025) offered a comparable interpretation of their prevalence figures but did not test it. The causes reported in this corpus therefore derive from earlier literature and interpretation, not from tests carried out within the studies.

Aisah (2025) reported a mean anxiety score of 53.7 (SD = 11.2; range 31–74) and a negative correlation between anxiety and mathematics scores ($r = -.61$, $p < .01$). The correlational design and the single class leave open whether anxiety lowered scores, low scores raised anxiety, or both. Working memory was named as the underlying mechanism, yet none of these studies measured it, so the explanation was imported from the international literature (Aisah, 2025; Finell et al., 2022; Gampu & Lumbantobing, 2025; Hutasoit et al., 2025).

Games and Related Strategies Reported in the Studies

Only one study tested a game against measured anxiety. Rahayu et al. (2023) assigned 20 fifth graders in Makassar to an experimental and a control group, taught the experimental group through a numbers game, and found a significant difference in anxiety scores ($p = .014$). The authors concluded that the method could reduce mathematics learning anxiety, although the sample was very small and drawn from one school.

The remaining studies treated games as one element of wider sets of strategies. Gampu and Lumbantobing (2025) grouped strategies into pedagogical ones (contextual learning, manipulatives, and game-based instruction), psychological ones (positive reinforcement, supportive communication, and a growth mindset), and classroom management ones (cooperative learning, Think-Pair-Share, and mistake-tolerant environments). Hutasoit et al. (2025) recommended social-emotional learning through active pedagogy that includes

manipulatives and numerical games, collaborative models, teacher support, and the normalisation of mistakes. Fadila et al. (2025) recommended interactive methods, educational games, group activities, teacher training, parent workshops, and counselling. None of these recommendations was tested within the reviewed studies, and their support came from other literature, which means that the only direct evidence on games and anxiety in the corpus is the experiment of Rahayu et al. (2023).

Conditions and Challenges for Implementation

The studies identified teacher practice as the main condition for implementation. The class observed by Gampu and Lumbantobing (2025) illustrates how outcome-oriented responses persist, and Fadila et al. (2025) suggested that grade pressure and results-oriented teaching may sustain anxiety, which makes assessment culture a plausible barrier. Fadila et al. (2025) proposed training teachers to recognise anxiety and give constructive feedback, while Hutasoit et al. (2025) presented social-emotional learning as consistent with the Merdeka Curriculum. Parents appeared only in the recommendation of Fadila et al. (2025) that they support children without pressing for grades. None of the studies examined class size, curriculum coverage, teacher workload, or the availability of materials, although every strategy described above depends on teacher time and training.

The negative association between anxiety and achievement reported by Aisah (2025) agrees in direction with the pooled estimate of Barroso et al. (2021), but the coefficient of $r = -.61$ is more than twice as large as their $r = -.28$. With 28 students from one class, sampling variability and local conditions probably account for much of the difference, so the finding supports the direction of the relationship and says little about its typical strength. Szczygieł et al. (2024) found only weak reciprocal paths between anxiety and achievement in young children ($\beta = -.11$ and $-.14$), which is a further reason to avoid reading Aisah's coefficient causally. The prevalence reported by Fadila et al. (2025), about 70% at a moderate or high level, describes one school at one point in time and cannot speak to how anxiety develops. The reviewed studies also contain no analysis of anxiety by achievement group, so they cannot test whether anxiety concentrates among low achievers, a pattern that Raupu et al. (2023) suggested for learning difficulties among junior high school students.

The experiment of Rahayu et al. (2023) points in the same direction as the positive cognitive and affective outcomes of game-based mathematics learning summarised by Hui and Mahmud (2023), but it stands against the small and statistically non-significant pooled reduction that (Dondio et al., 2023) found across 11 randomised studies (ES = −0.32, 95% CI [−0.64, 0.01]). A single study of 20 students can neither confirm nor overturn that estimate, and the difference most plausibly reflects the scale of the evidence. The recommendations for cooperative

formats in Gampu and Lumbantobing (2025) and Hutasoit et al. (2025) are consistent with the finding of Dondio et al. (2023) that collaborative and social gameplay worked better, although in this corpus they rest on recommendation and not on measurement. The engklek study of Munir et al. (2023) produced valid and practical worksheets, better learning outcomes, and values such as cooperation, honesty, and patience, yet it involved junior high students and measured no anxiety. Rahayu et al. (2023) is the only reviewed study that connects a game to measured anxiety at the elementary level.

The international studies cited in the Introduction rest on large or pooled data: 747 effect sizes in Barroso et al. (2021), 337 children followed over two years in Szczygieł et al. (2024), and 686 participants across 11 randomised studies in Dondio et al. (2023). The reviewed Indonesian studies rest on 20 to 34 students each. Despite this difference, the two reviews express their conclusions with considerable confidence. Hutasoit et al. (2025) described anxiety as proven to arise from results-oriented environments, and Gampu and Lumbantobing (2025) concluded that engaging pedagogy, emotional support, and a positive climate significantly reduce it, yet neither paper presents primary data to that effect. The Indonesian literature therefore states the case for game-based and emotionally supportive approaches more firmly than its own evidence warrants.

The findings of this review support earlier research in two respects. They agree with the negative direction of the association between anxiety and achievement (Barroso et al., 2021), and they agree with the view that collaborative, low-stakes learning formats are promising (Dondio et al., 2023; Hui & Mahmud, 2023), although in this corpus the second rests more on recommendation than on measurement. The review extends earlier research in three respects. It maps the forms in which anxiety appears in Indonesian elementary classrooms, it identifies a single measured game intervention that links the game evidence of Munir et al. (2023), which included no anxiety measure, to anxiety outcomes at the elementary level, and it shows which design features limit the transfer of findings: sample size, comparison group, and measurement. No reviewed finding contradicts the international evidence directly. Two results qualify it: the correlation reported by Aisah (2025) is larger than the pooled estimate, and the significant effect reported by Rahayu et al. (2023) contrasts with the non-significant pooled estimate of Dondio et al. (2023). With samples of 28 and 20 students, both are better read as local observations than as challenges to the larger syntheses.

CONCLUSION

This review examined what five Indonesian-language studies published between 2023 and 2025 report about mathematics anxiety and game-based approaches in elementary schools. Anxiety appeared in cognitive, affective, behavioural, and physiological forms, and in the one school surveyed, about 70%

of students were at a moderate or high level (Fadila et al., 2025). The reported causes were learning environments that stress grades, speed, and correct answers, together with reprimands, limited emotional support, and low confidence. These causes came from earlier literature and interpretation and were not tested within the studies. A negative association between anxiety and mathematics scores was found in a single class (Aisah, 2025), but its direction cannot be determined. A numbers game reduced anxiety in one small controlled experiment (Rahayu et al., 2023), and the other strategies, among them cooperative learning, manipulatives, positive reinforcement, and mistake-tolerant classrooms, were recommended without being tested. The evidence is therefore too limited to establish that game-based approaches reduce anxiety in Indonesian elementary classrooms, although the direction of the findings is encouraging.

For teachers and schools, the studies suggest that practice can be adjusted without waiting for stronger evidence. Teachers can attend to how they respond to errors and whether they credit reasoning as well as correct answers. They can give students low-stakes opportunities to try, fail, and try again. They can use cooperative game formats, which fit the international evidence that collaborative and social play works better (Dondio et al., 2023). These steps should be treated as reasonable practice and not as proven interventions. Schools that introduce them should monitor students' anxiety before and after, since none of the reviewed studies tested whether such steps work, and none examined class size, curriculum coverage, or teacher workload.

The conclusions are limited by the small number of studies, their single-school samples, and a literature in which only one study had a comparison group. The review was also narrative, restricted to Indonesian-language articles and to three recent years, and it may have missed relevant work. Future research should use quasi-experimental or randomised designs with larger, multi-school samples. It should use anxiety scales with reported reliability, report effect sizes, and follow students after the intervention ends. It should also compare game features, such as collaborative against individual play, and measure the mechanisms that the reviewed studies only assumed, namely students' sense of control and working memory. Studies of teachers and parents are needed to show whether a supportive classroom and home climate strengthens or weakens the effect of games.

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