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FROM BURDEN TO CALLING: TRANSFORMING MATHEMATICS TEACHERS' BELIEFS AND TEACHING READINESS IN GASING TRAINING

Lisbet Evy Sartika Br Simamora[1], Mubiar Agustin[1*], Asep Deni Gustiana[2], Esya Anesty Mashudi[3], Yohanes Surya[4]
[1,2]Department of Educational Psychology, Universitas Pendidikan Indonesia, West Java, Indonesia
[3]Faculty of Arts and Education, University of Auckland, New Zealand
[4]Gasing Academy, Banten, Indonesia

*Correspondence: mubiar@upi.edu

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ABSTRACT

This study examines how mathematics teachers' beliefs and self-reported teaching readiness changed during a five-day GASING (*Gampang, Asyik, dan Menyenangkan*, meaning easy, fun, and enjoyable) training held at Yayasan Hosana School, Tebas, West Kalimantan, on 15–19 December 2025. Whereas the GASING studies reviewed here have mainly examined student outcomes, this study places teachers at the centre and traces how their beliefs shifted from day to day. A descriptive qualitative design was employed. The data comprised 190 written narratives from the daily reflection sheets of 22 kindergarten, primary, junior and senior secondary teachers, analysed through reflexive thematic analysis. Four themes were generated. First, most teachers entered the training viewing mathematics as difficult and frightening, a belief possibly shaped by their own schooling. Second, this belief was unsettled through three routes of disorientation: a logical route (the concrete–abstract–mental arithmetic sequence), a kinaesthetic route (movement, songs, and games), and a moral route (the conviction that no child is incapable of mathematics). Third, change was reported as growing self-confidence and more concrete action plans, indicating perceived rather than demonstrated readiness. Fourth, a "mental arithmetic paradox" emerged: *mencongak* (mental arithmetic), the culminating stage of the method, provoked renewed anxiety when teachers had to calculate quickly and aloud in front of peers. The findings offer a context-specific account of routes of disorientation in mathematics teacher training, read through transformative learning theory. Practically, GASING training should include sessions for managing mental arithmetic anxiety and post-training mentoring so that changed beliefs can carry over into classroom practice.

Keywords: GASING Method, Mental Arithmetic Paradox, Reflection, Teacher Beliefs, Transformative Learning.

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PRELIMINARY

Mathematics is regarded as the foundation of science and technology, yet it is the subject that most often provokes fear among students. In PISA 2025, Indonesian 15-year-

olds obtained a mean mathematics score of 364, about 100 points below the OECD average and almost unchanged from PISA 2022 (*PISA 2022 Results (Volume I): The State of Learning and Equity in Education*, 2023; *PISA 2025 Results (Volume I): Future-Ready Students*, 2026). Such results cannot be explained by students' cognitive factors alone, because teachers' beliefs about mathematics also shape how the subject is presented in the classroom.

Teachers' beliefs, understood here as a relatively stable personal construct concerning the nature of mathematics and how it should be learned and taught (Sun & Zhang, 2024), influence their teaching strategies, the emotional climate of the classroom, and students' motivation (Angel-Cuervo et al., 2024; Calleja, 2022). An instrumentalist view of mathematics as a set of rigid rules and procedures tends to produce transmission-oriented teaching that can reinforce students' mathematics anxiety (Ramirez et al., 2018; Schaeffer et al., 2021), which is in turn negatively related to achievement and reasoning (Agustin et al., 2024; Barroso et al., 2021). Such beliefs, still dominant among Indonesian primary teachers (Purnomo et al., 2016; Ransus et al., 2026), generally change only through sustained professional development and opportunities for reflection (Calleja, 2022; Sun & Zhang, 2024).

This study also attends to teaching readiness, understood as a teacher's perceived preparedness to implement a new instructional approach in their own classroom (Hadiyah et al., 2025; Zee et al., 2018). Readiness is treated as having three dimensions: affective readiness (confidence and willingness to teach with the new approach), pedagogical readiness (the perceived ability to use the method's sequence, manipulatives, and activities), and planning readiness (the clarity of concrete plans that anticipate obstacles). Because these dimensions are inferred from teachers' own accounts, the study examines perceived readiness rather than demonstrated teaching competence.

One innovation addressing this problem is the GASING method (*Gampang, Asyik, dan Menyenangkan*, meaning easy, fun, and enjoyable), initiated by Yohanes Surya on the conviction that no child is incapable of mathematics; there are only children who have not yet found a suitable way of learning (Monalisa et al., 2026), an idea close to the mathematical mindset (Boaler, 2016). GASING proceeds through a concrete stage using real objects or manipulatives, an abstract stage that links concrete experience to notation, and a *mencongak* (mental arithmetic) stage that trains fluency in oral calculation as a reflection of internalised understanding rather than memorisation, all framed by songs, movement, and games. Recent studies report positive effects of GASING on students' numeracy (Kambu et al., 2026),

multiplication skills (Ulpah & Rostini, 2026; Yusuf et al., 2026), mathematical thinking (Rahmawati et al., 2026), and mathematics anxiety (Monalisa et al., 2026).

Beliefs rarely change merely because teachers receive new information; change is more likely when teachers experience dissonance between their existing beliefs and contradicting experiences (Kennedy, 2016; Sancar et al., 2021). Transformative learning theory calls such an experience a *disorienting dilemma*, which opens the way to critical reflection on old assumptions and to a change in perspective (Mezirow, 2018), and which may unfold gradually across different domains, from how people view themselves to how they behave (Hoggan, 2016; Hoggan & Hoggan-Kloubert, 2022).

However, GASING studies have primarily examined student outcomes, and one report on GASING teacher training described its activities and participants' responses without systematically examining belief change or implementation barriers (Cristina Wati et al., 2026). The teacher side of GASING, namely the beliefs teachers bring to the training, the experiences associated with change, and the barriers they anticipate, therefore remains insufficiently examined, which makes the success reported among students difficult to explain and replicate.

This study aimed to (1) describe teachers' initial beliefs about mathematics and students' learning difficulties; (2) explain the triggers, routes, and forms of belief transformation and perceived teaching readiness during the training; and (3) analyse the obstacles teachers anticipated in the transition from understanding to practice. It contributes a context-specific account that interprets teachers' reflections through three routes of disorientation (logical, kinaesthetic, and moral), offered as an analytical interpretation of one training event rather than a classification tested across settings.

METHODS

Research Approach

This study employed a descriptive qualitative design with reflexive thematic analysis (Braun & Clarke, 2019, 2021) to portray teachers' day-to-day shifts in thinking, feeling, and belief as closely as possible to their own words. Procedures specific to phenomenology, such as *epoché*, were not undertaken, and themes were treated as constructed through the researchers' active engagement with the data rather than simply "discovered" in them (Braun & Clarke, 2021; Byrne, 2022).

Training Context and Participants

The training was organised by Yayasan Hosana at Yayasan Hosana School, Tebas, West Kalimantan, on 15–19 December 2025, with facilitators from the GASING team, including the first author. It ran for five days of about eight hours each on the principle that teachers first become GASING students before becoming GASING teachers: Day 1 introduced the GASING philosophy, the 8C principles, and the concrete–abstract–mental arithmetic sequence; Day 2 covered arithmetic practice and a comparison of conventional and GASING lesson plans; Day 3 consisted of simulations, games, songs, and discussions; Day 4 of microteaching with peer feedback; and Day 5 of consolidation and implementation planning.

All 22 participants met the inclusion criteria (completing a reflection sheet on at least one day and agreeing to its use for research); sixteen completed reflections on all five days and six on one to four days. All signed informed consent after an explanation of the aims, their right to withdraw, and confidentiality, and permission was obtained from the head of the foundation and each school principal. Identities were replaced with codes P1–P22, and photographs are presented with participants' permission. About 73% of the participants were primary school teachers (Table 1), and four were not accustomed to teaching mathematics, a group that shows how the training worked for teachers who started furthest from the subject.

Table 1. Characteristics of the Research Participants (n = 22)

Characteristic	Category	n	%
Teaching level	Kindergarten	1	4.5
	Primary	15	68.2
	Primary and senior high	1	4.5
	Junior high	4	18.2
	Senior high	1	4.5
Experience in teaching mathematics	Teaches mathematics regularly	18	81.8
	Teaches mathematics irregularly or has never taught it	3	13.6
	Novice teacher (± 3 months of teaching)	1	4.5

Research Instrument and Data

Data came from structured daily reflection sheets completed on paper at the end of each day, each with two open-ended questions (Table 2) and no limit on response length. The items were developed by the first author with reference to dimensions of teachers' beliefs about mathematics, learning, and teaching (Angel-Cuervo et al., 2024) and to the phases of transformative learning (Mezirow, 2018); their content was reviewed by two

master's students in mathematics education and educational psychology, and their readability was piloted with 80 teachers outside the participant group. Affective readiness was identified mainly from Day 3 R2 and Day 5 R1, pedagogical readiness from Day 4 R1 and Day 5 R1, and planning readiness from Day 4 R2 and Day 5 R2. No structured observation of the Day 4 microteaching was recorded, so the data show how teachers perceived their learning and readiness rather than verified changes in practice.

Table 2. Focus of the Daily Reflection Questions

Day	Code	Focus Dimension
1	R1	Initial perceptions of mathematics and the impact of the first GASING day
1	R2	'Aha' moments and their relevance to students' thinking processes
2	R1	Understanding vs. doubts about the GASING steps
2	R2	Comparison of conventional vs. GASING lesson plans
3	R1	Dynamics of enthusiasm and doubt during simulations/discussions
3	R2	Impact of the training on beliefs and correction of old beliefs
4	R1	Development of specific skills in microteaching
4	R2	Parts that felt 'stiff' and anticipated student responses
5	R1	Three most meaningful changes (thoughts, feelings, skills)
5	R2	Changes in handling the most challenging classroom situations

Data Analysis

The unit of analysis was one participant's response to one item; of 220 possible narratives (22 participants × 10 items), 190 were collected. The analysis followed the six phases of reflexive thematic analysis (Braun & Clarke, 2022), from familiarisation and semantic–latent coding to generating, reviewing, and naming themes and writing the analytic narrative. Codes were generated inductively and then reread through the lens of transformative learning, using a Microsoft Excel matrix containing the codebook, supporting quotations, and a tally of participants per subtheme. The initial grouping of quotations was assisted by an artificial intelligence assistant (Claude, Anthropic); every coding decision was reviewed and finalised by the researchers. Quotations were translated from Indonesian into English by the authors.

Trustworthiness followed Nowell et al. (2017): data triangulation across time and persons, an audit trail in the codebook, peer debriefing with the second and third authors, analysis of negative cases, and thick description. Regarding positionality (Olmos-Vega et al., 2023), the first author facilitated the training and was known to the participants, which aided contextual understanding but raised the possibility that participants wrote what would please the facilitator. The items therefore asked explicitly about doubts and parts that felt

stiff, narratives of doubt or criticism received particular attention, and interpretive tendencies were recorded in a reflexive journal.

RESULTS AND DISCUSSION

Analysis of 190 reflection narratives generated four themes (Table 3). Theme 1 addresses the first research objective, Themes 2 and 3 the second, and Theme 4 the third. Because the number of respondents varied from day to day, the counts reported are not comparable measures of prevalence or of the magnitude of change.

Table 3. Summary of the Thematic Findings

Theme/Subtheme	Representative Codes	n	Day
Theme 1. Mathematics as a burden			
1a. Mathematics is difficult, boring, or frightening	difficult, boring, frightening, strict teachers, "stupid" students	20	D1, D5
1b. Teachers' self-doubt	guilt, not knowing where to start, no teaching strategy yet, difficulty controlling emotions	8	D1, D5
Theme 2. Three routes of disorientation			
2a. Logical route	concrete–abstract–mental arithmetic, adding from the largest place value, orderly sequences and patterns	19	D1–D3
2b. Kinaesthetic route	games, songs, movement, field simulations, manipulatives, fingers	17	D1, D3
2c. Moral route	8C, teaching with the heart, no child is stupid, not passing judgment, not getting angry	6	D1, D4, D5
Theme 3. From fear to readiness			
3a. Self-confidence and teacher identity	more confident, motivated, "it turns out it is not difficult"	17	D3, D5
3b. Skills and action plans	manipulatives, concrete examples, getting students moving, concrete–abstract sequence	18	D4, D5
Theme 4. The mental arithmetic paradox and barriers to practice			
4a. The mental arithmetic paradox	hesitant when answering orally, forgetting numbers, broken concentration, fear of making mistakes	11	D2–D4
4b. Old habits and supporting conditions	students used to old ways, diverse student abilities, shyness, heat, sleepiness	16	D2–D5

Note: n = number of participants (out of 22) whose narratives mentioned the subtheme at least once. This figure is neither the frequency of occurrences nor an indicator of the strength or magnitude of change; because one participant could mention several subthemes, the n values do not add up to 22. D = reflection day. Number of respondents per day: D1 = 20, D2 = 21, D3 = 18, D4 = 18, D5 = 18.

Theme 1: Mathematics as a Burden – Teachers' Initial Perceptions

Most Day 1 reflections portrayed mathematics as difficult, boring, or frightening, and the difficulty concerned not only content but also teachers' sense of not knowing where to begin.

> *"Mathematics is a frightening subject—the teachers are strict and the subject is difficult, so some students are considered unable to keep up (stupid)." — P22 (primary)*
>
> *"As a class teacher, I felt very, very guilty towards the children, because when I was teaching I did not know where to start." — P7 (primary; Day 5 reflection on the situation before the training)*

Primary teachers worried about students' weak conceptual foundations, whereas junior high teachers blamed concepts that should have been mastered earlier. P1, who had never taught mathematics, wrote that it had been "the subject I least wanted to teach". Eight teachers combined the assumption that mathematics is inherently difficult with doubts about their own ability to teach it; one exception was P5, who found mathematics "quite enjoyable" from the first day. These beliefs may stem from teachers' own schooling (Calleja, 2022), although the items did not ask about school histories. Because teachers' mathematics anxiety has been linked to students' learning (Schaeffer et al., 2021), the affective side of this starting point, namely fear and guilt, deserves as much attention as gaps in teaching knowledge.

Theme 2: Three Routes of Disorientation – Turning Points in Thinking

The "aha" moments in which something confusing became clear or something difficult suddenly felt easy formed three routes according to their triggers: the logic of the method, bodily experience, and a moral message about children.

a. The Logical Route: The Concrete–Abstract–Mental Arithmetic Sequence

The three-stage sequence was the most frequently mentioned trigger and grew stronger on Day 2, when participants compared their usual lesson plans with GASING lesson plans. The difference most often highlighted was the direction of calculation: the conventional method adds from the smallest place value, whereas GASING starts from the largest.

> *"The significant change that needs to be made is adding from the front, or from the largest place value, because the concept of adding from the ones that we have used so far is wrong." — P11 (junior high)*

P11 called the old method "wrong" rather than merely less effective, signalling strong dissonance about a procedure taught for years. This route appeared across school levels, including among junior high teachers who had mastered arithmetic. The sequence resembles the established concrete–representational–abstract approach (Bouck et al., 2018); what was new was going through it themselves.

b. The Kinaesthetic Route: Synchronising Brain, Speech, and Movement

Other participants highlighted the involvement of the whole body in learning mathematics.

> *"The most important moment for me was learning how to synchronise the brain, speech, and movement so that it breaks the ice and makes the atmosphere interesting ..." — P1 (primary)*

On Day 3, twelve of the 18 teachers who completed reflections named games, simulations, songs, or practice as their moments of highest enthusiasm (Figure 1).



Figure 1. Teachers Taking Part in Games, Songs, and Movement Activities During the Day 3 Simulation

Here beliefs were unsettled by experience rather than argument: tense teachers found themselves laughing, moving, and still understanding the material, in line with embodied design, which treats movement as part of mathematical reasoning (Abrahamson et al., 2020), although games are meaningful only when designed with adequate pedagogical content knowledge (Nuraeni et al., 2025). This route was most evident among teachers who had been reluctant to teach mathematics or had never taught it.

c. The Moral Route: Teaching with the Heart and "No Child Is Stupid"

For some teachers, the turning point came from the principle of teaching with the heart, explained through the 8C.

> *"A new mindset: there is no child who cannot do mathematics (stupid). There are only teachers who cannot apply the right method to the children." — P22 (primary)*

In a single Day 1 response, P22 first described students "considered unable to keep up (stupid)" and then shifted that label to teachers. This is better read as a stirring moment that may open the way to change than as evidence of sustained change. The shift from "the child cannot" to "I have not yet found the way" is the core of the GASING philosophy (Monalisa et al., 2026) and of the mathematical mindset (Boaler, 2016); the dissonance is ethical, because teachers confront the possibility that their judgements of students were unfair. The routes are not mutually exclusive, but each participant usually foregrounded the trigger that left the deepest impression.

Theme 3: From Fear to Readiness – Forms of Transformation

a. Self-Confidence and Identity as a Mathematics Teacher

Many participants reported increased self-confidence, especially those who had admitted disliking mathematics.

> *"This training made me realise that it is not that I am bad at mathematics, but that I had not yet received the right training for myself." — P2 (primary)*

This shift in attribution, from one's own ability to inappropriate ways of learning, matters because teacher self-efficacy is closely related to classroom processes and teachers' well-being (Zee & Koomen, 2016). P7 described their view as having "changed 180 degrees", but teachers who started from strong rejection used cautious language, such as "quite like it" (P14) or "a little motivated to learn" (P1), consistent with the gradual nature of belief change (Hoggan, 2016). These statements reflect perceived affective readiness, not confidence tested in real classrooms.

b. Skills and Action Plans: Microteaching as a Mirror

In the Day 4 microteaching (Figure 2), participants most often reported developing the use of manipulatives, concrete examples close to students' lives, constructive responses to students' answers, and the integration of movement.

> *"Skills: calculating addition, multiplication, subtraction, and division by teaching them starting from the concrete, moving on to the abstract, and up to ways of improving mental arithmetic skills." — P16 (junior high)*



Figure 2. A Participant Using Manipulatives and Concrete Examples During the Day 4 Microteaching Session

Because these skills were self-reported and practised only in microteaching, they indicate increased perceived pedagogical and planning readiness rather than verified change in classroom practice. Even so, such formulations show that teachers had internalised a pedagogical sequence, not merely a calculation technique.

Theme 4: The Mental Arithmetic Paradox and Barriers to Practice

a. The Mental Arithmetic Paradox

Behind the enthusiasm, the mental arithmetic stage consistently emerged as the greatest source of doubt.

> *"What made me doubtful was answering orally; it made me hesitant and I forgot the numbers I was about to add." — P12 (kindergarten)*

The teachers understood how to add from the largest place value but felt hindered when doing so orally, quickly, and in front of others. This doubt appeared among eleven teachers and recurred on Day 4, when mental arithmetic still most often felt "stiff"; P19 admitted it was what they feared most, and P4 wrote twice that their concentration "breaks very easily". In contrast, P10 enjoyed being "trained in the speed of thinking", so mental arithmetic can be experienced as a challenge or as a threat depending on how safe teachers feel. Herein lies the paradox: the early days eased anxiety through concrete experience and an enjoyable atmosphere, yet the culminating stage of GASING brought back the very situation that triggers anxiety, namely calculating under time pressure while being watched. As it appeared across school levels, including for the kindergarten and non-mathematics teachers, the problem does not lie solely in content mastery.

b. Old Habits, Anticipated Student Responses, and Supporting Conditions

Teachers also anticipated that students long accustomed to conventional methods would resist the new approach or feel awkward singing and moving.

> *"Even though it will feel harder to start with this method, because the children are already used to the old ways." — P7 (primary)*

P10 expected the method to "take quite a long time, extra patience, repetition", and P17 felt "unprepared, hot, and unable to concentrate" when creating games, a reminder that physical conditions matter. These findings echo the obstacles reported by Ulpah and Rostini (2026), such as limited materials, teacher workload, and inconsistent implementation; without anticipation and mentoring, changes made during training risk not carrying over into classrooms (Kennedy, 2016; Sims & Fletcher-Wood, 2021).

Discussion

a. Three Routes of Disorientation within the Transformative Learning Framework

In transformative learning terms (Mezirow, 2018), the belief that mathematics is difficult and that some students are simply incapable functions as a long-standing *meaning perspective*, and experiencing mathematics as easy and enjoyable created a disorienting dilemma that the daily reflections helped teachers process. The theory, however, does not

specify where such a dilemma comes from. In this training, it can be interpreted as arising through rational evidence that old procedures are inadequate (logical), enjoyable bodily experience that contradicts memories of stressful mathematics (kinaesthetic), and the ethical realisation that labelling a child "stupid" may be unjust (moral). This is consistent with the view that transformation occurs in different domains (Hoggan, 2016) and supports the critique that the original theory overemphasises rationality (Hoggan & Hoggan-Kloubert, 2022), since two of the three routes rest on the body and on values. The kinaesthetic route also appeared to work fastest for teachers distant from mathematics, a conjecture for future testing. As the routes come from 22 teachers in one training event, they are a context-specific interpretive lens rather than a validated typology.

b. The Mental Arithmetic Paradox

Time pressure and social evaluation are strong triggers of mathematics anxiety, which is negatively related to achievement (Barroso et al., 2021; Ramirez et al., 2018), and Boaler (2016) criticises timed drills for fostering anxiety early. For teachers who are still learning, the difference between mental arithmetic as "a reflection of understanding" and as "a speed test" is not always felt, especially when performing before colleagues. The paradox is potentially contagious, because teachers' unresolved anxiety may be transmitted to students (Schaeffer et al., 2021) and weaken their reasoning (Agustin et al., 2024). The success of GASING therefore depends not only on the correct sequence but also on managing teachers' affect during speed practice.

c. Dialogue with Previous GASING Research and Training Design

This study complements the positive student outcomes of GASING (Kambu et al., 2026; Rahmawati et al., 2026; Yusuf et al., 2026) from the teachers' side: such outcomes may be partly mediated by belief change, particularly through the moral route, without which the GASING steps may be carried out mechanically. Whereas a report on GASING training in Tuban described optimistic participants demonstrating fast calculation (Cristina Wati et al., 2026), written reflections also captured doubts invisible in public demonstrations. Experiencing learning as students allowed the experiential learning cycle to unfold (Morris, 2020) through active engagement, collaboration, and practice with feedback, hallmarks of effective professional development (Darling-Hammond et al., 2017; Sims & Fletcher-Wood, 2021). Yet five days is too short to ensure sustainability, which also depends on school support, learning communities, and repeated classroom implementation (Hadiyah et al., 2025; Sancar et al., 2021).

d. Practical Implications

Training should deliberately provide all three types of experience: logical explanation of the learning sequence, physical activities and games, and discussion of how teachers view students. The mental arithmetic stage should be accompanied by anxiety management, for example, paired practice before performing in front of the group, rhythmic games that reduce the sense of being tested, and written reflection on the anxiety that arises. Training should also be followed by school-based mentoring so that new beliefs can be tested in real classrooms.

e. Limitations

The analysis relied exclusively on written self-reflections without independent observation of teaching, so the findings describe perceived readiness and self-reported change rather than demonstrated competence. The data covered only the training period, captured only what participants chose to write, and were not confirmed through member checking. Because the first author facilitated this single training event, transferability must be judged by readers and socially desirable responses cannot be ruled out. Six participants did not complete all reflections, so their trajectories could not be traced in full.

CONCLUSION

The reflections indicate that a five-day GASING training was associated with shifts in teachers' reported beliefs about mathematics and about themselves as teachers, although the change was not uniform. In line with the research objectives, the conclusions are as follows.

1. Most teachers began the training believing that mathematics is difficult and frightening, accompanied by doubts about their own ability to teach it.
2. These beliefs were unsettled through logical, kinaesthetic, and moral routes of disorientation, and the changes were reported as increased self-confidence and more concrete action plans, reflecting perceived rather than demonstrated teaching readiness.
3. The main anticipated barriers to practice were the mental arithmetic paradox, students' old habits, and supporting conditions in schools.

Theoretically, the three routes offer a context-specific lens for interpreting transformative learning in mathematics teacher training. Practically, the success of GASING depends on its pedagogical sequence, on managing teachers' anxiety during speed practice, and on post-training mentoring. Future research should include longitudinal studies with classroom observation, comparisons of teachers with and without mentoring, and

experiments testing whether anxiety management sessions mitigate the mental arithmetic paradox.

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DECLARATIONS

Author Contribution	:	**Lisbet Evy Sartika Br Simamora:** Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, and Writing – Original Draft. **Mubiar Agustin:** Conceptualization, Supervision, Validation, and Writing – Review & Editing. **Asep Deni Gustiana:** Validation (peer debriefing), Formal Analysis, and Writing – Review & Editing. **Esya Anesty Mashudi:** Methodology and Writing – Review & Editing. **Yohanes Surya:** Resources (GASING method and training materials) and Writing – Review & Editing.
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Conflict of Interest	:	Yohanes Surya is the initiator of the GASING method. The first author served as a facilitator in the GASING training examined in this study; this role and the steps taken to limit its influence are described in the Methods section. The authors declare no other conflict of interest.
Additional Information	:	Informed consent was obtained from all participants, and permission to conduct the study was granted by Yayasan Hosana and the principals of each school level. An AI assistant (Claude, Anthropic) was used only to support the initial grouping of quotations; all coding decisions and interpretations were made by the authors.

REFERENCES

Abrahamson, D., Nathan, M. J., Williams-Pierce, C., Walkington, C., Ottmar, E. R., Soto, H., & Alibali, M. W. (2020). The future of embodied design for mathematics teaching and learning. *Frontiers in Education*, *5*, 147. https://doi.org/10.3389/feduc.2020.00147

Agustin, F. S., Fauziyah, N., & Khikmiyah, F. (2024). Analysis of mathematical reasoning ability based on mathematics anxiety in junior high school students. *Mathline: Jurnal Matematika Dan Pendidikan Matematika*, *9*(2), 347–364. https://doi.org/10.31943/mathline.v9i2.609

Angel-Cuervo, Z.-M., Briceño-Martínez, J.-J., & Bernal-Ballén, A. (2024). Validation of a questionnaire to evaluate mathematics teachers' beliefs about mathematics, teaching, and learning. *Eurasia Journal of Mathematics, Science and Technology Education*, *20*(5), em2435. https://doi.org/10.29333/ejmste/14447

Barroso, C., Ganley, C. M., McGraw, A. L., Geer, E. A., Hart, S. A., & Daucourt, M. C. (2021). A meta-analysis of the relation between math anxiety and math achievement. *Psychological Bulletin*, *147*(2), 134–168. https://doi.org/10.1037/bul0000307

Boaler, J. (2016). *Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages and innovative teaching*. Jossey-Bass.

Bouck, E. C., Satsangi, R., & Park, J. (2018). The concrete–representational–abstract approach for students with learning disabilities: An evidence-based practice synthesis. *Remedial and Special Education*, *39*(4), 211–228. https://doi.org/10.1177/0741932517721712

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*(4), 589–597. https://doi.org/10.1080/2159676X.2019.1628806

Braun, V., & Clarke, V. (2021). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology*, *18*(3), 328–352. https://doi.org/10.1080/14780887.2020.1769238

Braun, V., & Clarke, V. (2022). *Thematic analysis: A practical guide*. SAGE Publications.

Byrne, D. (2022). A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Quality & Quantity*, *56*(3), 1391–1412. https://doi.org/10.1007/s11135-021-01182-y

Calleja, J. (2022). Changes in mathematics teachers' self-reported beliefs and practices over the course of a blended continuing professional development programme. *Mathematics Education Research Journal*, *34*(4), 835–861. https://doi.org/10.1007/s13394-021-00366-x

Cristina Wati, F., Yuliastuti, R., Ningrum, D. F. S., Tanti, D. M., Dewi, D. T. T., Safitri, F. R., & Rohmatillah, E. N. (2026). Pelatihan implementasi metode GASING dalam pembelajaran matematika bagi guru sekolah dasar Gugus 04 Bima Jaya Tuban [Training on implementing the GASING method in mathematics learning for primary school teachers of Cluster 04 Bima Jaya, Tuban]. *KALANDRA: Jurnal Pengabdian Kepada Masyarakat*, *5*(5), 202–209. https://doi.org/10.55266/kalandra.v5i5.692

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute. https://learningpolicyinstitute.org/product/effective-teacher-professional-development-report

Hadiyah, K. N., Surahmat, S., & El Walida, S. (2025). Teacher readiness level in implementing the deep learning mathematics approach to senior high school students in Batu City. *Mathline: Jurnal Matematika Dan Pendidikan Matematika*, *10*(3), 833–846. https://doi.org/10.31943/mathline.v10i3.990

Hoggan, C. D. (2016). Transformative learning as a metatheory: Definition, criteria, and typology. *Adult Education Quarterly*, *66*(1), 57–75. https://doi.org/10.1177/0741713615611216

Hoggan, C., & Hoggan-Kloubert, T. (2022). Critiques and evolutions of transformative learning theory. *International Journal of Lifelong Education*, *41*(6), 666–673. https://doi.org/10.1080/02601370.2022.2164434

Kambu, A. M., Abidin, Y., & Kurniawan, D. T. (2026). Improving elementary school students' numeracy skills through the GASING method in Maybrat. *Jurnal Pembelajaran, Bimbingan, Dan Pengelolaan Pendidikan*, *6*(11), 13. https://doi.org/10.17977/um065.v6.i11.2026.13

Kennedy, M. M. (2016). How does professional development improve teaching? *Review of Educational Research*, *86*(4), 945–980. https://doi.org/10.3102/0034654315626800

Mezirow, J. (2018). Transformative learning theory. In K. Illeris (Ed.), *Contemporary theories of learning: Learning theorists ... in their own words (2nd ed.)* (pp. 114–128). Routledge.

Monalisa, A., Abidin, Y., & Dewi, D. A. (2026). From anxiety to joy: Transforming mathematics learning through the humanistic GASING method. *International Journal of Education, Vocational and Social Science*, *5*(3), 2042–2068. https://doi.org/10.63922/ijevss.v5i03.4520

Morris, T. H. (2020). Experiential learning – a systematic review and revision of Kolb's model. *Interactive Learning Environments*, *28*(8), 1064–1077. https://doi.org/10.1080/10494820.2019.1570279

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, *16*(1), 1–13. https://doi.org/10.1177/1609406917733847

Nuraeni, R., Jupri, A., & Nurlaelah, E. (2025). Mathematics learning process through game-based methods: A pedagogical content knowledge perspective. *Mathline: Jurnal Matematika Dan Pendidikan Matematika*, *10*(3), 739–748. https://doi.org/10.31943/mathline.v10i3.891

Olmos-Vega, F. M., Stalmeijer, R. E., Varpio, L., & Kahlke, R. (2023). A practical guide to reflexivity in qualitative research: AMEE Guide No. 149. *Medical Teacher*, *45*(3), 241–251. https://doi.org/10.1080/0142159X.2022.2057287

PISA 2022 results (Volume I): The state of learning and equity in education. (2023). OECD Publishing. https://doi.org/10.1787/53f23881-en

PISA 2025 results (Volume I): Future-ready students. (2026). OECD Publishing. https://doi.org/10.1787/73451bc5-en

Purnomo, Y. W., Suryadi, D., & Darwis, S. (2016). Examining pre-service elementary school teacher beliefs and instructional practices in mathematics class. *International Electronic Journal of Elementary Education*, *8*(4), 629–642.

Rahmawati, R. S. A., Sopandi, W., & Turmudi, T. (2026). Metode GASING (Gampang, Asyik, dan Menyenangkan) dalam meningkatkan kemampuan berpikir matematis siswa sekolah dasar [The GASING (Easy, Fun, and Enjoyable) method in improving primary school students' mathematical thinking ability]. *Jurnal Yudistira: Publikasi Riset Ilmu Pendidikan Dan Bahasa*, *4*(4), 1–9. https://doi.org/10.61132/yudistira.v4i4.3020

Ramirez, G., Shaw, S. T., & Maloney, E. A. (2018). Math anxiety: Past research, promising interventions, and a new interpretation framework. *Educational Psychologist*, *53*(3), 145–164. https://doi.org/10.1080/00461520.2018.1447384

Ransus, F., Sinaga, V., Sinaga, A. A., & Hutabarat, C. E. M. (2026). Teachers' beliefs about teaching and learning and their implications for meaningful learning practices in

elementary school in Bandung: A phenomenological study. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, *15*(3), 762–771. https://doi.org/10.33578/jpfkip.v15i3.762-771

Sancar, R., Atal, D., & Deryakulu, D. (2021). A new framework for teachers' professional development. *Teaching and Teacher Education*, *101*, 103305. https://doi.org/10.1016/j.tate.2021.103305

Schaeffer, M. W., Rozek, C. S., Maloney, E. A., Berkowitz, T., Levine, S. C., & Beilock, S. L. (2021). Elementary school teachers' math anxiety and students' math learning: A large-scale replication. *Developmental Science*, *24*(4), e13080. https://doi.org/10.1111/desc.13080

Sims, S., & Fletcher-Wood, H. (2021). Identifying the characteristics of effective teacher professional development: A critical review. *School Effectiveness and School Improvement*, *32*(1), 47–63. https://doi.org/10.1080/09243453.2020.1772841

Sun, D., & Zhang, Q. (2024). Evolution of teachers' teaching beliefs about mathematics in a teacher education program. *Behavioral Sciences*, *14*(10), 934. https://doi.org/10.3390/bs14100934

Ulpah, M., & Rostini, D. (2026). Manajemen pembelajaran matematika berbasis metode GASING untuk meningkatkan kemampuan perkalian siswa SMA: Studi kasus di SMAN 1 Tegalwaru dan SMAN 1 Pangkalan [GASING-based mathematics learning management to improve senior high school students' multiplication skills: A case study at SMAN 1 Tegalwaru and SMAN 1 Pangkalan]. *ARMADA: Jurnal Penelitian Multidisiplin*, *4*(9), 5465–5479. https://doi.org/10.55681/armada.v4i9.3947

Yusuf, D. A., Muslihin, H. Y., & Apriani, I. F. (2026). Effectiveness of the GASING method based on dice games in improving multiplication skills of primary school students. *Indonesian Journal of Primary Education*, *10*(1), 167–186. https://doi.org/10.17509/ijpe.v10i1.98405

Zee, M., & Koomen, H. M. Y. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research*, *86*(4), 981–1015. https://doi.org/10.3102/0034654315626801

Zee, M., Koomen, H. M. Y., & de Jong, P. F. (2018). How different levels of conceptualization and measurement affect the relationship between teacher self-efficacy and students' academic achievement. *Contemporary Educational Psychology*, *55*, 189–200. https://doi.org/10.1016/j.cedpsych.2018.09.006