International Journal of Education, Vocational and Social Science
https://e-journal.citakonsulindo.or.id/index.php/IJEVSS
E-ISSN : 2963 4954
IJEVSS

Teacher Factors Influencing Elementary Students' Mathematics Learning Motivation: a PRISMA 2020 Systematic Review

Ofir Nokas[1]
Psikologi Pendidikan, Sekolah Pasca Sarjana, Univeristas Pendidikan Indonesia, Bandung, Indonesia
Idat Muqodas[2*]
Psikologi Pendidikan, Sekolah Pasca Sarjana, Univeristas Pendidikan Indonesia, Bandung, Indonesia
Tina Hayati Dahlan[3]
Psikologi Pendidikan, Sekolah Pasca Sarjana, Univeristas Pendidikan Indonesia, Bandung, Indonesia
Mubiar Agustin[4]
Psikologi Pendidikan, Sekolah Pasca Sarjana, Univeristas Pendidikan Indonesia, Bandung, Indonesia
Corresponding Author: *idatmuqodas@upi.edu*

Abstract

Elementary students' mathematics learning motivation declines systematically across early schooling and predicts subsequent academic achievement, yet no prior systematic review has integrated the instructional, relational, emotional, and epistemological dimensions of teacher influence within a single framework. This systematic review followed PRISMA 2020 guidelines, searching Scopus on 30 March 2025 using a PEO-based Boolean strategy; 531 unique records were screened, yielding 16 included studies whose methodological quality was appraised using MMAT 2018 and synthesized through thematic narrative synthesis. Findings indicate that autonomy-supportive instruction and formative assessment enhance intrinsic motivation, positive teacher-student relationships correlate with motivation while conflict and dependency undermine it, teacher mindfulness programs yield modest but causally demonstrated effects, and inquiry-oriented epistemological beliefs indirectly raise student motivation through teacher efficacy. An integrated four-channel model of teacher influence is proposed, providing an evidence base for teacher professional development programs that simultaneously target instructional, relational,

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

emotional, and epistemological competencies, particularly relevant to Indonesia's Kurikulum Merdeka reform.

Keywords: Elementary Education, Mathematics Learning Motivation, Self-Determination Theory, Systematic Literature Review, Teacher Factors

INTRODUCTION

Mathematics is fundamental to elementary education, supporting not only science and technology learning but also data literacy and everyday decision-making (Wigfield & Eccles, 2000). Numeracy skills developed in primary school are strong predictors of later academic success. However, substantial disparities in mathematics achievement persist. In Indonesia, TIMSS 2019 ranked the country 44th among 58 participating countries in fourth-grade mathematics, with an average score of 397, below the international midpoint (Mullis et al., 2020). Beyond cognitive ability, learning motivation is a key psychological factor underlying students' engagement and achievement. Motivation, reflected in competency beliefs, intrinsic value, and goal orientation, is associated with persistence, deeper learning strategies, and resilience (Lazowski & Hulleman, 2016). This is particularly important in mathematics, where perceived difficulty may undermine interest and affect longer-term academic development. Moreover, intrinsic motivation and mathematical ability beliefs tend to decline throughout primary school, with longitudinal evidence indicating that this decline may begin as early as Grades 1–2 (Lehtinen et al., 2017). Thus, elementary education represents an important period for sustaining mathematics motivation.

Teachers play a central role in shaping students' motivational experiences through instructional practices, feedback, task design, responses to difficulties, and enthusiasm for mathematics. In Indonesia, National Assessment data show that many elementary students have not achieved minimum numeracy competency, with substantial variation across school contexts (Pratiwi et al., 2025). Three theoretical perspectives explain how teachers may influence motivation: Self-Determination Theory (SDT), which emphasizes autonomy, competence, and relatedness (Ryan & Deci, 2020); Expectancy-Value Theory (EVT/SEVT), which highlights students' beliefs about their capabilities and the value of mathematics; and Attachment Theory, which emphasizes affective teacher-student relationships as a basis for psychological safety and engagement . Empirical evidence supports the importance of these factors. A meta-analysis of 99 studies found that positive teacher-student relationships were strongly associated with engagement, particularly at the elementary level, while a meta-analysis of 74 motivational

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

interventions showed that changes in teacher behavior could produce substantial learning-related effects.

Despite this evidence, existing reviews rarely integrate four dimensions of teacher influence instructional practices, teacher-student relationships, teacher well-being and emotions, and epistemological beliefs within a framework specifically focused on elementary students' mathematics motivation. Evidence from Southeast Asia and other developing-country contexts is also underrepresented (Lazowski & Hulleman, 2016; OECD, 2023), and systematic synthesis treating ages 6–12 as a critical period remains limited. Furthermore, the combined application of PRISMA 2020, the Population-Exposure-Outcome (PEO) framework, and MMAT 2018 has rarely been applied to this topic (Hong et al., 2018; Page et al., 2021).

Therefore, this systematic literature review (SLR) aims to map, integrate, and critically assess empirical evidence published between 2000 and 2025 on four interconnected dimensions of teacher influence: instructional practices, teacher-student relationships, teacher well-being and positive emotions, and teachers' epistemological beliefs. The review addresses four research questions concerning how each dimension influences elementary students' mathematics learning motivation. Using PEO to define teacher factors as exposure variables, MMAT 2018 to appraise heterogeneous study designs, and PRISMA 2020 to ensure transparent study selection, this review seeks to provide a coherent theoretical and empirical framework for understanding teacher influences on mathematics motivation . The findings are expected to contribute to theory by integrating SDT, EVT, and Attachment Theory and to practice by informing initial teacher education (PPG) and in-service professional development within Indonesia's Kurikulum Merdeka transformation.

RESEARCH METHOD

This systematic literature review (SLR) followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines and employed qualitative thematic narrative synthesis. This approach was selected because the included studies used heterogeneous designs, including experimental, correlational, longitudinal, and qualitative approaches, making statistical meta-analysis inappropriate (Siddaway et al., 2019). The review was not prospectively registered in PROSPERO because it was a theoretical-thematic review without statistical meta-analysis; however, the protocol was documented internally and is available upon request.

The research questions and eligibility criteria were developed using the Population-Exposure-Outcome (PEO) framework, which is appropriate for non-interventional studies examining

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

exposure-outcome relationships without requiring a comparison group (Methley et al., 2014). The framework also ensured that teacher factors were treated as primary exposure variables rather than merely as users or facilitators of technology or curriculum.

Search Strategy

A systematic search was conducted in Scopus (Elsevier) on March 30, 2025. Scopus was selected for its multidisciplinary coverage and relevance to educational psychology and mathematics education. To reduce potential database coverage bias, backward citation tracking was conducted for all included studies and key review articles, including Lazowski and Hulleman (2016) and Roorda et al. (2011). No additional eligible studies were identified. Two complementary Boolean search strings were developed based on three PEO blocks: population (elementary school students), exposure (teacher factors), and outcome (mathematics learning motivation). The strings incorporated synonyms and wildcard operators and were restricted to publications from 2000–2025, in English or Indonesian, and available through open access. The combined search results produced 554 records in Mendeley. After deduplication by DOI and, where unavailable, article title, 531 unique records remained for screening. This procedure followed the principles of systematic identification and deduplication recommended in PRISMA-based reviews (Moher et al., 2015).

Eligibility and Study Selection

Eligibility criteria were established to ensure that the review specifically addressed teacher factors and elementary students' mathematics motivation. Studies were required to be peer-reviewed empirical articles; explicitly assess mathematics learning motivation; position a teacher-related factor as the primary exposure; involve elementary students aged 6–12 years or Grades 1–6; and be published between 2000 and 2025. Reviews, commentaries, editorials, conference papers, theses, studies focused primarily on technology or curriculum rather than teacher factors, and studies involving predominantly secondary-school populations were excluded.

The critical criterion was that the teacher factor had to constitute the primary exposure. Thus, studies examining digital tools, augmented reality, or student strategies as the principal exposure were excluded (Cascales-Martínez et al., 2016; Faber et al., 2017). In contrast, technology-related studies were retained when the focus was on teachers' pedagogical decisions in selecting, structuring, or organizing technology use, as illustrated by Jarvoll (2018). A pilot screening of 10 articles was conducted to check the consistency of the criteria.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

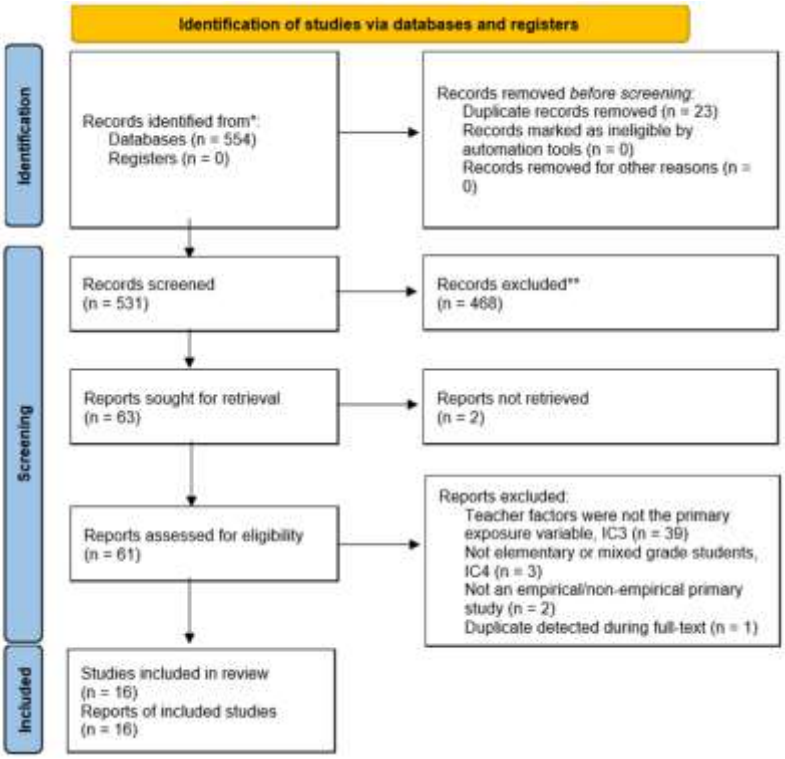


Figure 1. *PRISMA 2020 study selection flow: 554 records identified → 531 unique records after deduplication → 63 reports retrieved → 61 assessed for eligibility → 16 studies included.*

Following PRISMA 2020, 531 records underwent title and abstract screening, resulting in 63 reports for retrieval. Two reports were inaccessible, leaving 61 for full-text assessment. Of these, 45 were excluded: 39 because the primary exposure was not a teacher factor, 3 because the population was not elementary or lacked separate elementary-level analysis, 2 because they were non-primary empirical studies, and 1 because of duplication. Thus, 16 studies met all inclusion criteria and were included in the final synthesis. Borderline decisions were documented with explicit rationale (Higgins et al., 2023).

Quality Assessment and Data Extraction

The methodological quality of the 16 included studies was assessed using the Mixed Methods Appraisal Tool (MMAT) 2018 (Hong et al., 2018). MMAT was selected because it accommodates qualitative, quantitative descriptive, quantitative experimental, and mixed-

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

methods designs within a common appraisal framework. The assessment consisted of two general screening questions and five design-specific questions. Scores represented the proportion of "yes" responses and were used to evaluate the strength of evidence rather than as grounds for study exclusion (Higgins et al., 2023; Popay et al., 2006). Data were extracted using a standardized 16-column form covering bibliographic information, sample characteristics, research design, motivational constructs, teacher factors, main findings, effect sizes where available, and methodological quality (Page et al., 2021; Siddaway et al., 2019). Extraction was conducted by the first author through full-text review and cross-checking against the original articles (Higgins et al., 2023).

Data Synthesis

Because the 16 studies varied in research design, geographic context, motivational constructs, and operationalization of teacher factors, quantitative meta-analysis was not conducted. Instead, thematic narrative synthesis was applied to integrate evidence across study designs while retaining contextual differences. Findings were organized according to the four research questions and synthesized based on convergence and divergence of findings, types of motivational outcomes, study designs, and methodological quality. The strength of evidence was interpreted in relation to MMAT assessment and research design.

Methodological Limitations

Four methodological limitations were recognized: reliance on Scopus as the sole database, use of an open-access filter, restriction to English and Indonesian publications, and screening by a single reviewer without formal inter-rater reliability assessment. To mitigate these limitations, backward citation tracking, explicit eligibility criteria, pilot screening, systematic documentation of borderline decisions, and cross-checking of extracted data were employed.

RESULT

This section provides a thematic narrative synthesis of 16 featured papers, structured around four research questions (RQ1–RQ4). The principal findings of the included studies for each research question are presented, accompanied by summary tables and, when applicable, flowcharts. The subsequent Discussion section presents an interpretation of these findings, comparisons with prior research, practical consequences, strengths and limitations, and recommendations for future research.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

RQ1: Influence of Teachers' Instructional Practices on Elementary Students' Mathematics Learning Motivation

Seven papers in the inclusive corpus studied how instructors' instructional approaches influence elementary school pupils' motivation to learn mathematics. Six of these were quantitative and quasi-experimental studies: (Aust et al., 2024; Baten et al., 2020; Bishara, 2018; Christodoulou et al., 2024; Valjarević et al., 2025; Winarno et al., 2019). The seventh study, by Jarvoll (2018), was a qualitative case study that offered supportive data about teachers' selection and framing of instructional resources.

Table 1. *Summary of Included Studies for RQ1: Teachers' Instructional Practices*

Study / Design / MMAT	Instructional Practice	Motivation Construct	Key Findings
(Baten et al., 2020) - Belgium, N=479, Grade 4; RCT factorial 2×2; MMAT: 5/5	Autonomy-supportive (AS) vs. controlling instruction	Autonomy & competence satisfaction/frustration (SDT)	AS instruction buffers negative effect of difficult tasks; η^2p=0.04 (autonomy); autonomy frustration: 0.00 (AS) vs. 0.22 (control)
(Bishara, 2018) - Israel, N=40, Grades 4-6 LD; Quasi-experiment; MMAT: 3/5	Active vs. traditional teaching	Mathematics learning motivation (3 subscales)	Active > traditional: ηp^2=0.84; teaching approach > teacher experience (ΔR^2=0.20)
(Aust et al., 2024) - Germany, N=613, Grade 3; Quasi-experiment 3 groups; MMAT: 4/5	Formative assessment (LPA vs. LPA+)	Intrinsic motivation; PCS (SDT)	LPA→PCS: β=0.29*; PCS→IM: β=0.21***; indirect effect significant

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

(Winarno et al., 2019) - Indonesia, N=375 Elementary; R&D; MMAT: 3/5	Humanistic Assessment for Learning (AfL-H)	Motivation & learning awareness (observational)	Significant linear trend: $F(1,147)=138.26$; $p<0.001$; motivation increased
(Christodoulou et al., 2024) - Cyprus, N=762, Grades 5-6; Survey path analysis; MMAT: 5/5	Mastery goal structure (teacher-created)	Self-efficacy & mathematics interest (AGT)	Teacher mastery goal → self-efficacy → interest; teacher influence > parental influence
(Valjarević et al., 2025) - Serbia, N=316 Elementary; Correlational survey; MMAT: 3/5	Teaching clarity; teacher attitude; assessment fairness	Mathematics learning motivation (multidimensional)	Teaching clarity = largest motivational barrier (36%); assessment fairness & teacher attitude significant

Note. LD = Learning Disabilities; AS = Autonomy-Supportive; PCS = Perceived Competence Support; AGT = Achievement Goal Theory; SDT = Self-Determination Theory; IM = Intrinsic Motivation; LPA = Learning Progress Assessment.

The strongest causal evidence comes from Baten et al., (2020), the only RCT in RQ1 (MMAT 5/5). In a 2×2 factorial experiment with 479 fourth-grade students in Belgium, autonomy-Supportive teaching considerably mitigated the detrimental impact of unduly hard math tasks on students' autonomy satisfaction (η^2 p = 0.04) and intrinsic motivation. In contrast, controlling instruction led in significantly increased autonomy frustration (η^2 p = 0.22 vs. 0.00 in the autonomy-supportive condition). These findings provide causal evidence that teaching style, not just task difficulty, is a changeable determinant of motivation.

Consistently, Bishara (2018) compared active and traditional instruction with 40 elementary school kids with learning challenges in Israel. Active teaching, which included warm interactions, active engagement, and a range of methods, resulted in higher motivation (ηp^2 = 0.84). Hierarchical regression analysis showed that teaching style explained more variance in motivation than teaching experience ($\Delta R^2 = 0.20$; $p < 0.001$).

According to Aust et al., (2024) provided mechanistic evidence through a quasi-

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

experimental method with 613 third-grade kids in Germany. Learning progress assessment (LPA) positively influenced students' perceived competence support (PCS; β = 0.290; p = 0.020), which in turn predicted intrinsic motivation (β = 0.213; p < 0.001). The indirect effect of LPA on intrinsic motivation through PCS was substantial (β = 0.062; 90% CI [0.007, 0.117]). This study is the only one in the corpus to test and corroborate the mediation pathway from formative evaluation to intrinsic motivation at the elementary school level.

Christodoulou et al., (2024) discovered, in a path model with 762 fifth- and sixth-grade children in Cyprus, that students' perceived mastery goal structures created by instructors comprised the highest predictor of mathematics self-efficacy and interest (β = 0.36), surpassing parental impact. Complementing these findings from a different setting, Valjarević et al., (2025) revealed that clarity of instruction was the instructional aspect most frequently reported by students as the largest barrier to motivation (36% of respondents). Finally, Winarno et al., (2019), through a Research & Development study with 375 elementary school students in Salatiga, Indonesia, demonstrated that the Humanistic Assessment for Learning (AfL-H) model linearly improved students' mathematics performance and, based on observational data, increased motivation, self-awareness, and responsibility for learning. A seventh study, Jarvoll (2018), presented supportive qualitative evidence for the contextual and varied effects of teachers' use of instructional resources. In a case study of sixth-grade Norwegian elementary schools, specific teacher decisions in designing and integrating Minecraft for mathematics learning were found to alter student motivation; however, the effect depended heavily on the alignment between the teacher's learning goals and the students' perceptions of the activity as "play" or "learning." These findings underscore that the motivational influence of any learning tool is mediated by the teacher's pedagogical framework, reinforcing the key RQ1 mechanism that it is not the objective tool or practice, but the teacher's intentional implementation and students' subjective interpretations of it, that ultimately matter. Despite challenges in quantifying motivation, this study provides contextual evidence from Indonesia. The mediating routes discovered from two significant studies in the corpus are displayed in Figure 2.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

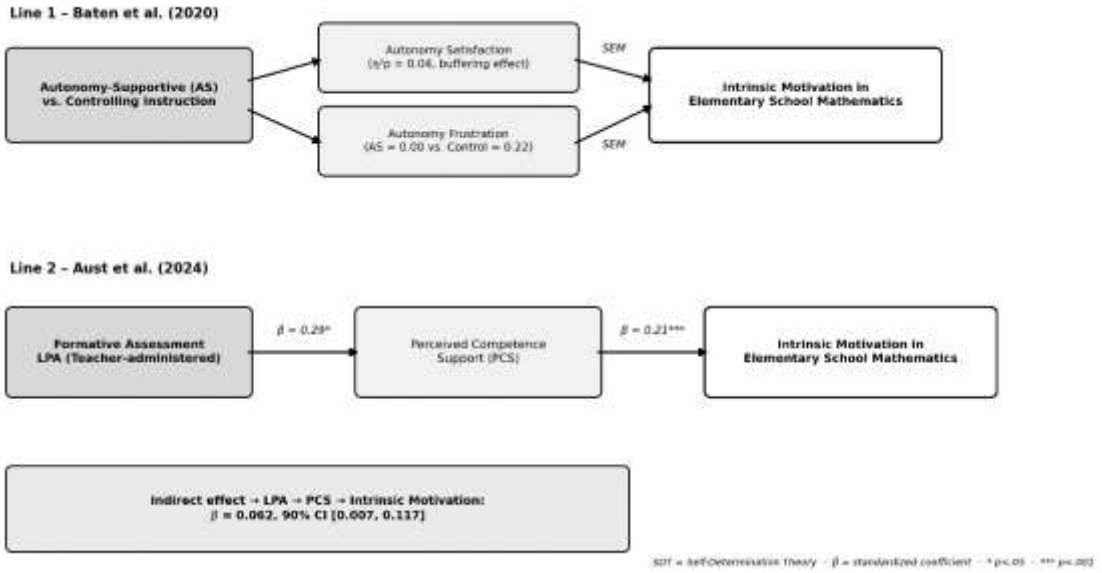


Figure 2. *Mediating Path from Teacher Instructional Practices to Elementary School Students' Intrinsic Mathematics Motivation. Line 1 (Baten et al., 2020): Autonomy-Supportive vs. Controlling Instruction → Autonomy Satisfaction (η^2p = 0.04) and Autonomy Frustration (AS = 0.00 vs. Control = 0.22) → Intrinsic Motivation. Line 2 (Aust et al., 2024): Formative Assessment (LPA) → Perceived Competence Support (PCS) → Intrinsic Motivation (β = 0.29*, β = 0.21***; indirect effect β = 0.062*).**

RQ2: Influence of Teacher-Student Relationship Quality on Elementary Students' Mathematics Learning Motivation

Three articles specifically explored the relational dimension: (Bosman et al., 2018; Hughes et al., 2012; Koeppen et al., 2025). The fourth study, McLean et al., (2024), examined teacher enjoyment, an emotional trait whose relational implications are explored in RQ3 but also has indirect relevance for relationship quality through emotional contagion. To avoid double-counting, McLean et al. is formally allocated to RQ3; its cross-cutting consequences are stated in the relevant space. Table 2 highlights the characteristics and main findings of the three core relationship investigations.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

Table 2. *Summary of Included Studies for RQ2: Teacher-Student Relationship Quality*

No. / Author (Year)	Design / MMAT	Teacher Relational Factors	Motivational Construct	Key Findings
Koeppen et al. (2025) - Germany, N=1,730, Grades 3-6	Cross-sectional survey; MMAT: 5/5	Communion (warmth) vs. teacher agency	Relatedness need satisfaction; self-determined motivation (SDT)	Communion → relatedness satisfaction (β=0.125, p=0.010); excessive agency → reduced competence satisfaction (β=−0.083) & self-determined motivation
Hughes et al. (2012) - USA, N=714, Grades 3-4	Longitudinal 2 years; MMAT: 5/5	Student-perceived conflict	Mathematics competence beliefs (EVT)	Perceived conflict longitudinally predicts decline in mathematics competence beliefs (r=−0.21)
Bosman et al. (2018) - Netherlands, N=1,300, K-6	7-year longitudinal; MMAT: 4/5	Dependency trajectory	Mathematics achievement (proxy)	Low-increasing dependency → lowest math achievement at Grade 6 (d=0.63)

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

RQ3: Influence of Teacher Well-Being and Positive Emotions on Elementary Students' Mathematics Learning Motivation

Three articles explored this dimension: (Brown et al., 2023; Carmichael et al., 2017; McLean et al., 2024). Table 3 highlights the characteristics and significant conclusions.

Table 3. *Summary of Included Studies for RQ3: Teacher Well-Being and Positive Emotions*

No. / Author (Year)	Design / MMAT	**Teacher Well-Being/Emotion Factor**	**Motivation Construct**	**Key Findings**
(Brown et al., 2023) - USA, N=92 teachers, Elementary	Elementary; Cluster RCT; MMAT: 5/5	CARE mindfulness program for teachers	Learning engagement & motivation (general scale)	ES=0.07 on student motivation; larger effect (ES=0.15) for teachers with low baseline mindfulness
(McLean et al., 2024) - USA, N=443, Grades 4	Multi-level survey; MMAT: 4/5	Teacher enjoyment of teaching mathematics	Behavioral engagement in mathematics	Enjoyment → engagement (B=0.17, p<0.05); effect stronger for low-SES students
(Carmichael et al., 2017) - Australia, N=471 students,	Correlational survey; MMAT: 4/5	Teacher self-efficacy enthusiasm (TSE) vs. student-perceived teacher enthusiasm (STE)	Cognitive and intrinsic interest in mathematics	STE → positive interest; TSE → cognitive interest NEGATIVE (β=−0.57, p<0.01) - 'enthusiasm

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

No. / Author (Year)	Design / MMAT	**Teacher Well-Being/Emotion Factor**	**Motivation Construct**	**Key Findings**
Grades 3–10; 44 teachers.				paradox'

RQ4: Influence of Teachers' Beliefs about Mathematics on Elementary Students' Mathematics Learning Motivation

Three publications explored the epistemological dimension: (Day, 2020; Pikk et al., 2025; Radišić et al., 2024).

Table 4. *Summary of Included Studies for RQ4: Teachers' Beliefs about Mathematics*

No. / Author (Year)	Design / MMAT	**Teacher Beliefs (Exposure)**	**Motivation Construct**	**Key Findings**
Radišić et al. (2024) - 6 countries, N=11,782 students; 686	Cross-national survey; MMAT: 5/5	Teacher beliefs about mathematics (inquiry vs. procedural)	Intrinsic motivation, mathematics self-concept (gender)	Teacher beliefs moderate gender-motivation relationship, but only in 2 of 6 countries; effects are context-dependent
Pikk et al. (2025) - Estonia, N=237 elementary teachers	Survey SEM; MMAT: 4/5	INQUIRY vs. RULES beliefs	Teacher cognitive activation efficacy (proxy)	INQUIRY → efficacy (β=0.45, p<0.001); RULES → efficacy negative (β=−0.22, p<0.01)

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

No. / Author (Year)	Design / MMAT	**Teacher Beliefs (Exposure)**	**Motivation Construct**	**Key Findings**
Day (2020) - US, N=3 elementary teachers	Qualitative case study; MMAT: 3/5	Reformist beliefs about mathematics	Not directly measured (observation of practice)	Belief-practice gap identified: inquiry beliefs do not translate to practice due to structural barriers

Cross-RQ Synthesis: Distribution of Study Designs Across the Four Channels

The four study questions collectively suggest that teacher factors exert effect through four interconnected and mutually reinforcing channels: instructional (RQ1), relational (RQ2), emotional (RQ3), and epistemological (RQ4). The four channels constitute an interdependent system and demonstrate considerable variance in the research approaches employed to collect evidence. The instructional channel employed diverse methodologies, comprising one randomized experiment (Baten et al., 2020), three quasi-experiments (Aust et al., 2024; Bishara, 2018; Winarno et al., 2019), two correlational surveys (Christodoulou et al., 2024; Valjarević et al., 2025), and one qualitative case study (Jarvoll, 2018). The relational channel is predominantly demonstrated through longitudinal designs (Bosman et al., 2018; Hughes et al., 2012), which offer temporal evidence although need experimental confirmation, and is corroborated by a comprehensive, multi-informant cross-sectional investigation conducted by Koeppen et al. (2025). The well-being/emotional channel comprises one cluster-randomized trial (Brown et al., 2023) and two cross-sectional survey studies (Carmichael et al., 2017; McLean et al., 2024), whereas the epistemological channel is substantiated by two cross-sectional surveys (Pikk et al., 2025; Radišić et al., 2024) and one qualitative case study (Day, 2020). This distribution indicates that causal evidence predominantly highlights instructional and well-being channels, while relational and epistemological channels primarily depend on observational designs, either longitudinal or cross-sectional, that restrict causal inference despite their temporal or methodological advantages.

Based on the cross-RQ synthesis, an integrated model integrating all four channels of instructor impact is provided in Figure 3.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

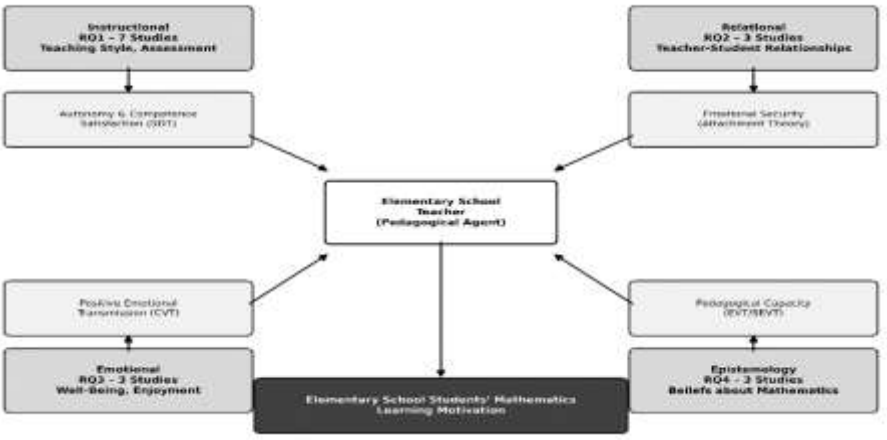


Figure 3. *Integrated Four-Channel Model of Teacher Factor Influence on Elementary School Students' Mathematics Learning Motivation.*

Figure 4. Model: Epistemological Beliefs (RQ4) → Well-Being & Emotions (RQ3) → Instructional Practices (RQ1) & Relationship Quality (RQ2) → Mathematics Learning Motivation. The dotted line shows an inferential method that requires further empirical testing.

Note: The dashed line in the RQ4→RQ3→RQ1/RQ2 pathway indicates that the evidence for this indirect channel is inferential and requires more empirical testing. The four channels, instructional, relational, emotional, and epistemological, collectively form an integrated system that impacts elementary school kids' motivation to learn mathematics.

DISCUSSION

This section discusses the findings in relation to established theoretical and empirical literature. The discussion is organized according to the four research questions (RQ1–RQ4), followed by an integrated synthesis of the four dimensions of teacher influence.

1. RQ1: Influence of Teachers' Instructional Practices on Elementary Students' Mathematics Learning Motivation

The findings indicate that instructional practices addressing students' psychological needs, particularly autonomy and competence, are important classroom factors associated with mathematics learning motivation. This mechanism appears to operate through students' perceptions of teachers' behaviors rather than through teachers' intentions alone. Aust et al. (2024), for example, demonstrate the mediating role of PCS, suggesting that students' interpretations of instructional practices are important in understanding motivational outcomes.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

These findings are consistent with the meta-analysis of Lazowski and Hulleman (2016), which demonstrated the effectiveness of motivation interventions grounded in Self-Determination Theory (SDT). The present review extends this evidence by focusing specifically on teacher-related factors as the primary exposure. Christodoulou et al. (2024) further contribute to the literature through their examination of teacher mastery goal structures, highlighting the relevance of Achievement Goal Theory to teachers' instructional practices and students' motivational experiences.

These findings have practical implications for elementary mathematics teacher development. Professional development should include autonomy-supportive pedagogy and formative assessment strategies that strengthen students' perceived competence. Within Indonesia's Kurikulum Merdeka, the humanistic assessment approach proposed by Winarno et al. (2019) may provide a relevant pedagogical reference because of its alignment with student-centered educational objectives.

The strength of this synthesis lies in the triangulation of evidence from different research designs. Nevertheless, much of the available evidence remains correlational, while several studies provide limited psychometric assessment of mathematics motivation. Evidence from Southeast Asia, particularly countries other than Indonesia, is also limited. Future studies should therefore employ longitudinal and experimental designs to examine how autonomy-supportive teaching and formative assessment relate to changes in mathematics motivation across different cultural contexts. For PPG programs, formative assessment modules could specifically emphasize strategies for strengthening students' perceived competence.

2. RQ2: Influence of Teacher-Student Relationship Quality on Elementary Students' Mathematics Learning Motivation

The findings indicate that the emotional quality of teacher-student relationships is closely associated with students' mathematics motivation. From an Attachment Theory perspective, supportive teachers provide a secure interpersonal context for learning, whereas SDT emphasizes relatedness as a fundamental psychological need. At the same time, evidence concerning dependency and excessive teacher intervention suggests that relational support needs to be balanced with students' autonomy.

Although examined primarily under RQ3, McLean et al. (2024) reported that teacher enjoyment positively predicted student behavioral engagement (B = 0.17). This finding also has

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

relational relevance because teachers' positive emotional expressions may contribute to more supportive classroom interactions and thereby reinforce motivational processes.

The findings are consistent with the meta-analysis by Roorda et al. (2011), which demonstrated that positive teacher-student affective relationships are associated with stronger academic engagement, with particularly pronounced benefits during the elementary school years. The present synthesis further highlights the importance of relational quality in mathematics learning, while recognizing that the available evidence does not always use mathematics-specific motivational outcomes.

The practical implication is that teacher professional development should address relational competencies, including warmth, attentiveness to students' emotional cues, and appropriate levels of instructional support. McLean et al. (2024) also reported effects among students from disadvantaged socioeconomic backgrounds, indicating that teacher relational competencies may have particular relevance for students facing educational disadvantage.

The evidence varies in methodological strength. Hughes et al. (2012) and Bosman et al. (2018) used longitudinal designs covering two and seven years, respectively, providing stronger temporal evidence than cross-sectional research. Koeppen et al. (2025), although cross-sectional, used multiple informants by combining teacher-reported behaviors with child-reported needs and motivation. This approach can reduce concerns associated with reliance on a single informant, although Bosman et al. (2018) relied exclusively on teacher reports for relational predictors. A further limitation is that some motivational outcomes were not mathematics-specific; for example, the motivation task assessment in Bosman et al. (2018) was predominantly generic. Future research should therefore use dyadic teacher-student designs and repeated measurements to examine changes in warmth, dependency, and conflict over time. Cross-cultural studies and mathematics-specific outcomes would further clarify whether relational mechanisms operate similarly across educational contexts.

3. RQ3: Influence of Teacher Well-Being and Positive Emotions on Elementary Students' Mathematics Learning Motivation

The findings suggest that teacher well-being, emotional regulation, and positive emotions are relevant educational factors rather than merely individual characteristics of teachers. Two potential mechanisms are particularly important: emotional regulation and emotional contagion. Teachers with stronger emotional regulation may be better able to maintain supportive interactions under stressful conditions, while their emotional expressions may be communicated

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

to students through classroom behaviors and non-verbal cues. Carmichael et al. (2017), however, highlight an enthusiasm paradox in which highly engaging instructional content may unintentionally create performance-related pressure or fear among elementary students.

This finding extends research on emotional processes in education and is supported by Brown et al. (2023), which provides experimental evidence concerning the relationship between teacher mindfulness and student motivation. The inclusion of well-being and positive emotions therefore broadens conventional discussions of teacher effectiveness by recognizing teachers' emotional states as part of the classroom motivational environment. From a practical perspective, teacher education and professional development should incorporate well-being and mindfulness strategies, particularly in demanding educational environments. Initial Teacher Education (PPG) may also emphasize pedagogical enthusiasm that supports inclusive and student-centered teaching rather than focusing exclusively on enthusiasm for mathematics content.

A methodological strength is the availability of randomized controlled trials, which provide stronger evidence for evaluating intervention-related relationships. However, the evidence base remains limited by small samples in several qualitative and correlational studies. Future research should conduct additional randomized controlled trials in non-Western contexts and employ longitudinal designs that simultaneously monitor teacher well-being and student motivation. Particular attention should be given to identifying the mediating mechanisms through which teacher well-being is associated with students' mathematics motivation.

4. RQ4: Influence of Teachers' Beliefs about Mathematics on Elementary Students' Mathematics Learning Motivation

The findings indicate that teachers' beliefs about mathematics may influence student motivation through an indirect chain involving teacher efficacy, instructional practices, students' perceptions, and motivational responses. A possible pathway can therefore be conceptualized as beliefs → teacher efficacy → instructional practices → student perceptions → student motivation. However, this relationship is context-dependent, and differences between teachers' stated beliefs and classroom practices suggest that changing beliefs alone may be insufficient without appropriate institutional and structural support.

These findings extend research on teachers' epistemological beliefs by highlighting potential mediating and contextual mechanisms. They also indicate that teacher beliefs should be considered together with the instructional conditions in which those beliefs are enacted rather than treated as isolated predictors of student motivation.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

The practical implications concern both teacher education and broader pedagogical reform. PPG programs could incorporate experiences designed to develop inquiry-oriented views of mathematics, including inquiry-based mathematics education. At the institutional level, pedagogical reform may require alignment among curriculum demands, instructional expectations, and assessment systems. Such alignment is important because teachers' beliefs may not translate into classroom practices when structural conditions constrain instructional choices.

The cross-national scope of the evidence is a strength, but the predominantly correlational nature of the research limits conclusions about causal mechanisms. The qualitative evidence is also constrained by limited sample sizes. Future studies should experimentally or longitudinally examine whether changes in teachers' mathematical beliefs are followed by changes in instructional practices and student motivation. Research in Southeast Asia is particularly important because evidence from this region remains comparatively limited.

5. Cross-RQ Synthesis: An Integrated Model of Teacher Influence

Taken together, the four dimensions indicate that teacher influence on elementary students' mathematics motivation is multidimensional and interconnected. Instructional practices provide the immediate pedagogical context through which students experience autonomy and competence (RQ1); teacher-student relationships shape relatedness and psychological security (RQ2); teacher well-being and positive emotions influence the emotional climate of learning (RQ3); and teachers' beliefs about mathematics provide a cognitive and epistemological foundation for instructional decisions (RQ4).

Rather than operating as isolated factors, these dimensions can be understood as interconnected pathways through which teachers shape students' motivational experiences. For example, teachers' beliefs may influence their instructional choices, instructional practices may affect students' perceptions of competence and autonomy, and teachers' emotional well-being may shape both classroom interactions and the implementation of those practices. This integrated perspective is consistent with the complementary assumptions of SDT, EVT, and Attachment Theory.

Overall, the evidence suggests that understanding mathematics motivation at the elementary level requires attention not only to what teachers do, but also to how they relate to students, how they experience and regulate their own emotions, and how they conceptualize mathematics and its learning. The synthesis therefore provides a basis for viewing teacher

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

development as a multidimensional process encompassing instructional, relational, emotional, and epistemological competencies.

CONCLUSION

This systematic literature review mapped, synthesized, and critically analyzed empirical evidence on teacher factors associated with primary school students' mathematics learning motivation in studies published between 2000 and 2025. Based on a thematic narrative synthesis of 16 studies selected through the PRISMA 2020 process from 531 unique Scopus records, the findings indicate that teacher influence operates through four interconnected dimensions: instructional, relational, emotional, and epistemological. For RQ1, autonomy- and competence-supportive instructional practices, including formative assessment, were associated with stronger mathematics motivation through students' perceived competence. For RQ2, warm and supportive teacher-student relationships were positively associated with motivation and engagement, whereas conflict and excessive dependency were detrimental. For RQ3, teacher well-being, self-awareness, emotional regulation, and enjoyment of teaching emerged as relevant factors in students' motivational experiences, while the enthusiasm paradox highlights the importance of how enthusiasm is expressed in teaching. For RQ4, inquiry-oriented mathematical beliefs were linked to instructional quality and student motivation through indirect pathways, although the belief-practice gap indicates that changes in beliefs may require supportive structural conditions.

Theoretically, this SLR integrates four teacher-factor dimensions within a coherent framework and demonstrates the complementary relevance of Self-Determination Theory, Expectancy-Value Theory, and Attachment Theory. Methodologically, it illustrates the applicability of PRISMA 2020, PEO, and MMAT 2018 for synthesizing heterogeneous evidence. Practically, the findings provide a basis for professional development that addresses instructional, relational, emotional, and epistemological competencies, including within Indonesia's PPG system and the implementation of the Kurikulum Merdeka. Future research should prioritize longitudinal and experimental designs examining the interaction of these four dimensions, expand evidence from Southeast Asia and other underrepresented contexts, and employ dyadic and multi-informant designs to better capture teacher-student dynamics and reduce common method bias. Overall, the evidence highlights the importance of addressing teacher-related factors during the elementary school years, when mathematics motivation is still developing and may influence students' subsequent engagement with mathematics.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

REFERENCES

Aust, L., Schütze, B., Hochweber, J., & Souvignier, E. (2024). Effects of formative assessment on intrinsic motivation in primary school mathematics instruction. European Journal of Psychology of Education, 39(3), 2177–2200. https://doi.org/10.1007/s10212-023-00768-4

Baten, E., Vansteenkiste, M., De Muynck, G. J., De Poortere, E., & Desoete, A. (2020). How can the blow of math difficulty on elementary school children's motivational, cognitive, and affective experiences be dampened? The critical role of autonomy-supportive instructions. Journal of Educational Psychology, 112(8), 1490–1505. https://doi.org/10.1037/edu0000444

Bishara, S. (2018). Active and traditional teaching, self-image, and motivation in learning math among pupils with learning disabilities. Cogent Education, 5(1). https://doi.org/10.1080/2331186X.2018.1436123

Bosman, R. J., Roorda, D. L., van der Veen, I., & Koomen, H. M. Y. (2018). Teacher-student relationship quality from kindergarten to sixth grade and students' school adjustment: A person-centered approach. Journal of School Psychology, 68, 177–194. https://doi.org/10.1016/j.jsp.2018.03.006

Brown, J. L., Jennings, P. A., Rasheed, D. S., Cham, H., Doyle, S. L., Frank, J. L., Davis, R., & Greenberg, M. T. (2023). Direct and moderating impacts of the CARE mindfulness-based professional learning program for teachers on children's academic and social-emotional outcomes. Applied Developmental Science, 27(4), 343–357. https://doi.org/10.1080/10888691.2023.2268327

Carmichael, C., Callingham, R., & Watt, H. M. G. (2017). Classroom motivational environment influences on emotional and cognitive dimensions of student interest in mathematics. ZDM, 49(3), 449–460. https://doi.org/10.1007/s11858-016-0831-7

Cascales-Martínez, A., Martínez-Segura, M.-J., Pérez-López, D., & Contero, M. (2016). Using an Augmented Reality Enhanced Tabletop System to Promote Learning of Mathematics: A Case Study with Students with Special Educational Needs. EURASIA Journal of Mathematics, Science and Technology Education, 13(2), 355–380. https://doi.org/10.12973/eurasia.2017.00621a

Christodoulou, A., Tsagkaridis, K., & Malegiannaki, A.-C. (2024). A multifactorial model of intrinsic/environmental motivators, personal traits and their combined influences on math performance in elementary school students. European Journal of Psychology of Education, 39(4), 4113–4135. https://doi.org/10.1007/s10212-024-00846-1

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

Day, C. T. (2020). Expectancy Value Theory as a Tool to Explore Teacher Beliefs and Motivations in Elementary Mathematics Instruction. International Electronic Journal of Elementary Education, 13(2), 169–182. https://doi.org/10.26822/iejee.2021.182

Faber, J. M., Luyten, H., & Visscher, A. J. (2017). The effects of a digital formative assessment tool on mathematics achievement and student motivation: Results of a randomized experiment. Computers & Education, 106, 83–96. https://doi.org/10.1016/j.compedu.2016.12.001

Higgins, J. P. T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M. J., & Welch, V. A. (2023). Cochrane Handbook for Systematic Reviews of Interventions: Version 6. Cochrane. https://doi.org/10.1002/9781119536604

Hong, Q. N., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M.-P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M.-C., Vedel, I., & Pluye, P. (2018). The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. Education for Information, 34(4), 285–291. https://doi.org/10.3233/EFI-180221

Hughes, J. N., Wu, J. Y., Kwok, O.-M., Villarreal, V., & Johnson, A. Y. (2012). Indirect Effects of Child Reports of Teacher-Student Relationship on Achievement. Journal of Educational Psychology, 104(2), 350–365. https://doi.org/10.1037/a0026339

Jarvoll, A. B. (2018). "I'll have everything in diamonds!": Students' experiences with Minecraft at school. Studia Paedagogica, 6(4), 67–89. https://doi.org/10.5817/SP2018-4-4

Koeppen, K., Kreutzmann, M., Roswag, M., Frühauf, M., Valcárcel Jiménez, M., & Hannover, B. (2025). How teacher agency adapted to child competencies and teacher communion relate to student needs fulfillment and motivation. Learning and Individual Differences, 119. https://doi.org/10.1016/j.lindif.2025.102663

Lazowski, R. A., & Hulleman, C. S. (2016). Motivation interventions in education: A meta-analytic review. Review of Educational Research, 86(2), 602–640. https://doi.org/10.3102/0034654315617832

Lehtinen, E., Hannula-Sormunen, M., McMullen, J., & Gruber, H. (2017). Cultivating mathematical skills: From drill-and-practice to deliberate practice. ZDM, 49(4), 625–636. https://doi.org/10.1007/s11858-017-0856-6

McLean, L., Espinoza, P., Janssen, J., Jimenez, M., & Lindstrom Johnson, S. (2024). Relationships between elementary teachers' enjoyment and students' behavioral engagement in mathematics. School Psychology, 39(1), 3–14. https://doi.org/10.1037/spq0000633

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., Stewart, L. A., & Group, P.-P. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Systematic Reviews, 4(1), 1. https://doi.org/10.1186/2046-4053-4-1

Mullis, I. V. S., Martin, M. O., Foy, P., Kelly, D. L., & Fishbein, B. (2020). TIMSS 2019 International Results in Mathematics and Science. TIMSS & PIRLS International Study Center. https://timssandpirls.bc.edu/timss2019/international-results/

OECD. (2023). PISA 2022 Results (Volume I): The State of Learning and Equity in Education. OECD Publishing.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., & Moher, D. (2021). PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. BMJ, 372.

Pikk, K., Leijen, Ä., Radišič, J., & Uibu, K. (2025). Exploring the relationship between teachers' beliefs on the nature and learning of mathematics and self-efficacy in teaching mathematics at the primary school level. LUMAT: International Journal on Math, Science and Technology Education, 13(5). https://doi.org/10.31129/LUMAT.13.1.2504

Pratiwi, I., Samosir, I., Ekowati, D. R., Wicaksono, M. E., Krismahardika, B. G., Rihardika, A., Krisna, F. N., & Martak, Y. F. (2025). Rapor Pendidikan Indonesia 2025: Capaian dan Agenda Perbaikan. Pusat Standar dan Kebijakan Pendidikan, Kementerian Pendidikan Dasar dan Menengah. https://pskp.kemendikdasmen.go.id/file/kebijakan/1767151837_file.pdf

Radišić, J., Buchholtz, N., Yang-Hansen, K., Liu, X., & Kaarstein, H. (2024). Do teachers' beliefs about the nature and learning of mathematics affect students' motivation and enjoyment of mathematics? Examining differences between boys and girls across six countries. European Journal of Psychology of Education, 39(2), 1587–1613. https://doi.org/10.1007/s10212-024-00809-6

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. Contemporary Educational Psychology, 61, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Siddaway, A. P., Wood, A. M., & Hedges, L. V. (2019). How to Do a Systematic Review: A Best Practice Guide for Conducting and Reporting Narrative Reviews, Meta-Analyses, and Meta-Syntheses. Annual Review of Psychology, 70(1), 747–770. https://doi.org/10.1146/annurev-psych-010418-102803

Valjarević, D., Stanojević-Ristić, Z., Petrović, M., & Tomović, K. (2025). Factors that influence

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

pupils' engagement in learning mathematics and their effects on general academic achievement. Croatian Journal of Education, 27(3), 891–918. https://doi.org/10.15516/cje.v27i3.6263

Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. Contemporary Educational Psychology, 25(1), 68–81. https://doi.org/10.1006/ceps.1999.1015

Winarno, W., Zuhri, M., Mansur, M., Sutomo, I., & Widhyahrini, K. (2019). Development of Assessment for the Learning of the Humanistic Model to Improve Evaluation of Elementary School Mathematics. International Journal of Instruction, 12(4), 49–64. https://doi.org/10.29333/iji.2019.1244a

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License