

How Deep Learning Pedagogy Shapes Literacy and Numeracy in an Indonesian Islamic Primary School

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ARTICLE INFO

Keywords:

Keyword 1; learning

Keyword 2; literacy

Keyword 3; numeracy

Keyword 4; student

Article history:

Received 2025-01-28

Revised 2025-02-12

Accepted 2025-04-01

ABSTRACT

Literacy and numeracy are foundational competencies that require more than procedural mastery, particularly in primary education where students' cognitive, metacognitive, and motivational processes are still developing. This study investigates how deep learning pedagogy shapes literacy and numeracy in an Indonesian Islamic primary school, with particular attention to the learning mechanisms through which pedagogical practices influence students' meaning-making and reasoning. A qualitative case-study design was employed at MI Muhammadiyah 2 Probolinggo, involving Grade VI students and teachers. Data were collected through classroom observations, semi-structured interviews, and open-ended questionnaires and were analyzed using reflexive thematic analysis. The findings reveal four interrelated mechanisms through which deep learning pedagogy supports literacy and numeracy development: meaningful learning, cognitive engagement, metacognitive reflection, and motivational support. Contextual learning and dialogic interaction enabled students to connect new information with prior experience, while explanatory and reflective activities strengthened reasoning, strategy selection, and self-monitoring. These mechanisms contributed simultaneously to text comprehension, inference, interpretation, problem representation, and solution evaluation, indicating that literacy and numeracy develop through overlapping rather than isolated learning processes. The study proposes a process-oriented model in which pedagogical practices activate psychological learning mechanisms that subsequently shape foundational competencies. These findings extend current discussions of deep learning pedagogy by highlighting the mediating role of cognitive, metacognitive, and motivational processes in an Islamic primary-school context. The study therefore underscores the importance of designing contextual, dialogic, and reflective learning experiences to strengthen literacy and numeracy in madrasah education.

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1. INTRODUCTION

Within global educational psychology, academic success is increasingly understood not merely as an outcome of cognitive ability, but as the product of interactions among motivation, engagement, self-regulation, emotion, and the quality of learning experiences that enable pupils to

construct understanding actively (Ryan & Deci, 2020; Wong & Liem, 2022). This perspective is important because motivation and academic achievement are reciprocal: successful performance can strengthen motivation, while adaptive motivation encourages engagement and persistence in deeper learning (Vu et al., 2022). In literacy, a meta-analysis of 132 studies identified a positive relationship between motivation and reading achievement and demonstrated that these two factors influence one another throughout pupils' development (Toste et al., 2020). At primary-school level, supportive teacher–pupil interactions and high-quality instructional support are also associated with metacognition and self-regulated learning; consequently, literacy and numeracy should be understood as psychological processes requiring meaning-making, reflection, and strategic thinking rather than the mere reproduction of information or procedures (de Ruig et al., 2023; Fyfe et al., 2022).

International evidence suggests that deeper learning has the potential to shape academic competence through conceptual understanding, reflection, and active engagement (Agger & Koenka, 2020; Sølvik & Glenna, 2022). In the United States, pupils attending schools oriented towards deeper learning demonstrated higher levels of self-efficacy, mastery-goal orientation, and academic engagement; however, direct effects on mathematics achievement were not consistently observed, indicating that the mechanisms linking pedagogy and learning outcomes remain insufficiently explained (Agger & Koenka, 2020). In Norway, opportunities for deeper learning increased when teaching provided space for pupil participation, conceptual dialogue, metacognition, and the development of understanding (Sølvik & Glenna, 2022). Among sixth-grade pupils in Greece, Finland, France, and Portugal, deeper learning has been operationalised through the integration of knowledge and fascination with subject matter, while research in China indicates that deep learning in language education involves motivation, engagement, learning strategies, and directional competence (Otto et al., 2020; Jiang, 2022). In primary mathematics, reflective questions embedded within instruction have been shown to improve accuracy, metacognitive monitoring, and conceptual retention, suggesting one potential mechanism through which numeracy may be strengthened (Fyfe et al., 2022).

Nevertheless, the existing literature remains fragmented across subject areas, educational levels, and types of learning outcome, and therefore does not yet provide an integrated explanation of how deep learning pedagogy simultaneously shapes literacy and numeracy among primary-school pupils (Agger & Koenka, 2020; Otto et al., 2020; Jiang, 2022). Previous studies have largely emphasised motivation and engagement, the integration of scientific knowledge, language learning among university students, or general classroom practice, rather than the relationship between pedagogical processes and two foundational competencies within a single learning context (Agger & Koenka, 2020; Sølvik & Glenna, 2022; Otto et al., 2020; Jiang, 2022). Research in educational psychology at primary-school level also indicates a shortage of cross-cultural evidence and a tendency to rely on self-report measures, leaving the actual processes of self-regulation and metacognition in classroom interaction insufficiently understood (de Ruig et al., 2023). Accordingly, the research gap addressed in this study concerns not simply whether deep learning pedagogy is effective, but how cognitive, metacognitive, motivational, and contextual processes interact to shape literacy and numeracy within the ecology of an Indonesian madrasah ibtidaiyah (Vu et al., 2022; de Ruig et al., 2023).

The novelty of this study lies in its process-oriented analytical framework, which links deep learning pedagogy to observable changes in how pupils comprehend texts, reason with information, model problems, explain strategies, and reflect on their responses (Fyfe et al., 2022; Toste et al., 2020). Operationally, the study examines four mechanisms: the activation and integration of prior knowledge, cognitive engagement in reasoning, metacognitive monitoring through reflection and strategy checking, and motivational support that strengthens autonomy and persistence (Nachtigall et al., 2022; Ryan & Deci, 2020; de Ruig et al., 2023). Literacy is analysed through processes of meaning construction, information integration, inferencing, and

idea explanation, whereas numeracy is examined through the interpretation of quantitative situations, the selection of representations, reasoning, and the evaluation of the plausibility of solutions (Toste et al., 2020; Fyfe et al., 2022). This framework moves beyond outcome-based studies by tracing the chain linking pedagogical actions, pupils' psychological responses, and manifestations of literacy and numeracy in an Islamic primary-school context that has thus far been underrepresented in cross-cultural research (Sølvik & Glenna, 2022; de Ruig et al., 2023).

On the basis of this gap, the study aims to explain how deep learning pedagogy shapes pupils' literacy and numeracy in an Indonesian Islamic primary school and to identify the mechanisms through which these changes occur (Agger & Koenka, 2020; Sølvik & Glenna, 2022). The first research question is: how is deep learning pedagogy implemented, and how does it shape pupils' literacy and numeracy practices in an Indonesian madrasah ibtidaiyah? (Sølvik & Glenna, 2022; Otto et al., 2020). The second research question is: through which cognitive, metacognitive, motivational, and contextual mechanisms does deep learning pedagogy shape pupils' literacy and numeracy? (Ryan & Deci, 2020; Fyfe et al., 2022; de Ruig et al., 2023). By focusing on the question of how, the study is expected to make a conceptual contribution by explaining underlying mechanisms, an empirical contribution by providing process-based evidence from a madrasah context, and a practical contribution by informing the design of more meaningful, reflective, and foundational-competency-oriented learning (Nachtigall et al., 2022; Sølvik & Glenna, 2022).

2. METHODS

This study employed a qualitative approach using a single-case study design to gain an in-depth understanding of how deep learning pedagogy shapes literacy and numeracy practices within the natural context of an Islamic primary school (Fearon et al., 2021). The case study design was selected because it enables complex pedagogical phenomena to be examined contextually through multiple perspectives and data sources, without separating them from the social environment in which learning takes place (Fearon et al., 2021). The study was conducted in January 2025 at MI Muhammadiyah 2 Probolinggo, East Java, which was positioned as a bounded case within the context of an urban Indonesian madrasah ibtidaiyah, with the case boundaries defined by Grade VI learning and practices related to literacy and numeracy (Fearon et al., 2021). The study focused on pedagogical practices, pupils' learning responses, and the cognitive, metacognitive, motivational, and contextual mechanisms linking deep learning pedagogy with the development of literacy and numeracy (Braun & Clarke, 2022).

In the operational design of the study, the main participants comprised 12 Grade VI pupils and three teachers who were directly involved in the learning process and in designing literacy and numeracy activities (Braun & Clarke, 2021a). Participants were selected using purposive maximum-variation sampling to capture a range of experiences based on learning engagement, pupil characteristics, and literacy and numeracy profiles reflected in classroom activities and teachers' instructional documentation (Braun & Clarke, 2022). The selection of 12 pupils was not intended to achieve statistical representation, but rather to generate rich, relevant, and diverse data in accordance with the exploratory aims of qualitative research (Braun & Clarke, 2021b). The three teachers were selected on the basis of their direct involvement in Grade VI teaching, enabling them to provide information regarding lesson planning, implementation, pupils' responses, and learning evaluation during the research period in January 2025 (Fearon et al., 2021).

Data were collected through classroom observations, semi-structured interviews, and open-ended questionnaires, allowing the phenomenon to be understood through the triangulation of multiple qualitative data sources (Craig et al., 2021). Non-participant observations were conducted across six learning sessions in January 2025, focusing on meaning-making activities, problem-solving, the use of prior knowledge, reflective dialogue, pupil engagement, and literacy and numeracy activities emerging during lessons (Fearon et al., 2021). Semi-structured interviews were

conducted individually for approximately 20–30 minutes with pupils and 40–60 minutes with teachers, with questions exploring learning experiences, reasoning processes, reflection, motivation, and perceived changes in understanding texts and solving numerical problems (Braun & Clarke, 2022). The questionnaire consisted of 8–10 open-ended questions designed to capture variations in pupils' experiences without changing the research design into a quantitative survey (Braun et al., 2021). The research instruments included a semi-structured interview guide, observation sheets, an open-ended questionnaire, and field notes, all of which were developed on the basis of the research questions and indicators of the deep learning pedagogy process (Braun & Clarke, 2022).

Data collection was conducted in stages throughout January 2025, beginning with research permission, participant recruitment, classroom observation, questionnaire completion, interviews, transcription, and verification of data completeness in order to establish an audit trail (Braun & Clarke, 2021a). As the participants included primary-school-aged children, pupil participation took place only after parental or guardian consent and pupil assent had been obtained, with clear emphasis that participation was voluntary and would not affect their academic assessment (Kirby, 2020). All pupil and teacher names were replaced with codes or pseudonyms, while recordings and transcripts were stored under restricted access to maintain participant confidentiality (Kirby, 2020). Data credibility was strengthened by comparing observation findings, interview data, questionnaire responses, and field notes in order to identify convergence as well as differences in experiences across data sources (Craig et al., 2021).

The data were analysed using reflexive thematic analysis because this technique enables the identification of patterns of meaning that interpretively explain pedagogical processes and mechanisms (Braun & Clarke, 2021a). The analysis followed six iterative processes: familiarisation with the data, initial coding, construction of initial themes, reviewing and developing themes, defining and naming themes, and producing the analytical narrative (Braun & Clarke, 2021a; Braun & Clarke, 2022). Coding was conducted through a combined approach, taking into account initial categories including cognitive engagement, knowledge integration, metacognitive reflection, motivational support, literacy practices, and numeracy reasoning, while remaining open to the emergence of inductive codes from the field data (Braun & Clarke, 2022). Interpretive consistency was maintained through reflexive memoing, documentation of analytical decisions, identification of cases that did not conform to dominant patterns, and triangulation across data sources, rather than through inter-rater reliability, which is not a requirement in reflexive thematic analysis (Braun & Clarke, 2021a). No statistical tests were employed because the questionnaire functioned as a qualitative data source, while the quality of the analysis was determined by coherence among the research questions, data collection process, interpretation, and thematic argumentation (Braun et al., 2021; Braun & Clarke, 2022).

3. FINDINGS AND DISCUSSION

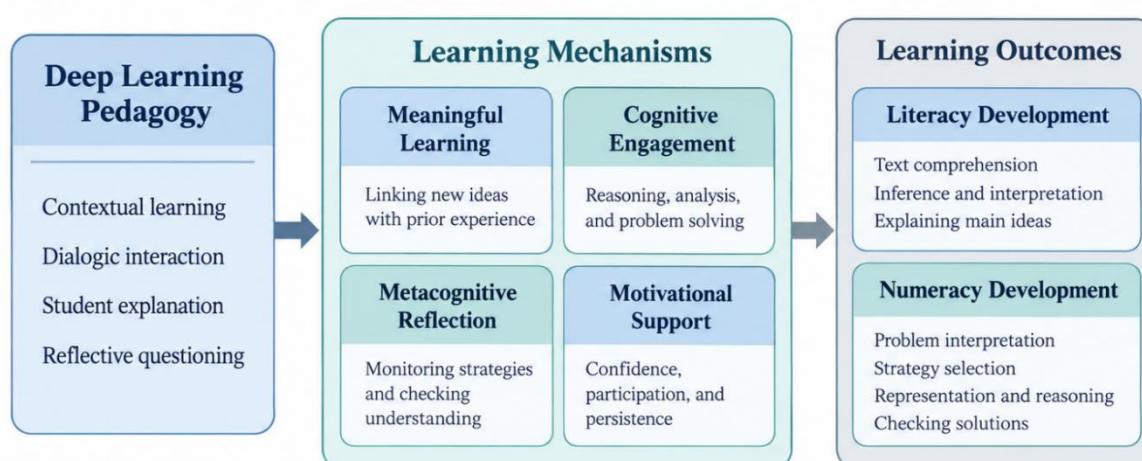
The thematic analysis of the interview data showed that deep learning pedagogy shaped pupils' literacy and numeracy through four main mechanisms: meaningful learning, cognitive engagement, metacognitive reflection, and motivational support. In terms of meaningful learning, instruction connected learning content with pupils' real-life experiences, so that reading activities and problem-solving were not perceived as tasks detached from everyday life. Pupils were able to relate information in texts to their prior experiences, while numeracy problems were understood through contextual situations. This pattern indicates that meaning-making constituted an initial stage linking learning experiences with the development of literacy and numeracy.

In terms of cognitive engagement, pupils were not only directed towards producing correct answers but were also encouraged to explain the reasons, strategies, and thinking processes underlying their responses. In literacy activities, cognitive engagement was evident in the

processes of comprehending texts, identifying main ideas, making inferences, and interpreting information. In numeracy activities, this pattern was reflected in problem interpretation, the selection of solution strategies, the use of representations, and the provision of reasons for the solutions chosen. Metacognitive reflection subsequently emerged when pupils reviewed their answers, recognised errors, and evaluated the strategies they had used. Teachers' reflective questions functioned as prompts that encouraged pupils to articulate what they had understood and to reconsider the processes through which they arrived at their solutions.

The findings also showed that motivational support strengthened these mechanisms by increasing pupils' confidence, participation, and persistence in completing learning activities. Engagement in discussion and opportunities to explain answers created space for pupils to participate more actively in the learning process. Overall, the thematic pattern indicates that deep learning pedagogy shapes literacy and numeracy through the pathway pedagogical practices → psychological learning mechanisms → competency development. As illustrated in Figure 1, contextual learning, dialogic interaction, pupil explanations, and reflective questioning activate processes of meaning-making, cognitive engagement, metacognitive reflection, and motivational support, which ultimately contribute to the development of text comprehension and numerical reasoning.

Model of How Deep Learning Pedagogy Shapes Literacy and Numeracy



Context: Grade VI students and teachers at MI Muhammadiyah 2 Probolinggo

Further findings indicate that the development of literacy and numeracy does not occur as two entirely separate processes, but rather overlaps through activities involving reasoning, interpretation, and communication. When pupils are asked to understand contextual information, identify relevant information, and explain the reasons for their answers, they simultaneously draw on reading comprehension and quantitative reasoning skills. This pattern is particularly evident in problem-based activities, in which pupils are required to read a situation, identify important information, select an appropriate solution strategy, and then communicate their thinking process. Thus, *deep learning pedagogy* shapes literacy and numeracy through integrated learning experiences that position pupils as active agents in constructing meaning, rather than merely as recipients of information or users of predetermined procedures.

In addition, the role of the teacher emerges as an important factor linking pedagogical practices with pupils' psychological responses. Teachers function not only as transmitters of

subject matter, but also as facilitators who provide prompting questions, opportunities for dialogue, chances to try different strategies, and feedback that encourages pupils to reconsider their understanding. Such interactions create a learning environment in which pupils are able to demonstrate confidence, persistence, and openness in articulating their thinking processes. Based on this pattern, the research model shows that the influence of *deep learning pedagogy* on literacy and numeracy operates through a layered process: instructional practices activate cognitive and psychological mechanisms, which are then reflected in pupils' abilities to comprehend texts, make inferences, interpret numerical problems, select strategies, and evaluate solutions.

DISCUSSION

Figure 1 is more appropriately interpreted as a model of pedagogical mechanisms rather than as a direct relationship between deep learning pedagogy and literacy–numeracy attainment, because the influence of deeper learning appears to operate through psychological processes that alter how pupils make meaning, monitor their understanding, and sustain engagement in learning (Agger & Koenka, 2020; Sølvi & Glenna, 2022). This finding extends the conception of deeper learning, which positions conceptual understanding and knowledge integration as its principal characteristics, by showing that such integration requires mediating processes in the form of cognitive engagement, metacognitive reflection, and motivational support (Otto et al., 2020; Wong & Liem, 2022). Thus, the conceptual contribution of this study lies in shifting the focus from whether deep learning pedagogy improves learning outcomes to how pedagogical practices are transformed into literacy and numeracy capabilities through specific learning mechanisms (Agger & Koenka, 2020; de Ruig et al., 2023).

The positioning of meaningful learning as one of the principal mechanisms in the model can be explained through the role of authentic contexts in helping pupils connect new information with existing knowledge structures and prior experiences (Nachtigall et al., 2022; Otto et al., 2020). This interpretation supports previous research showing that deeper learning develops when pupils do not merely reproduce information, but instead integrate knowledge and identify the personal and conceptual relevance of the material being learnt (Otto et al., 2020; Sølvi & Glenna, 2022). However, the use of real-life contexts does not automatically produce deeper understanding because authenticity can generate different cognitive effects depending on task design, pupils' perceptions of task relevance, and the forms of instructional support available (Nachtigall et al., 2022). Therefore, everyday contexts within the madrasah should be regarded as resources for activating meaning-making processes rather than as strategies that, in themselves, guarantee the development of literacy and numeracy (Nachtigall et al., 2022).

The roles of cognitive engagement and metacognitive reflection in Figure 1 indicate that the development of foundational competencies depends on the depth of pupils' cognitive processing, particularly when they are asked to explain their reasoning, evaluate strategies, and review their own understanding (Wong & Liem, 2022; de Ruig et al., 2023). This interpretation is supported by experimental evidence from Fyfe et al. (2022), who found that integrating metacognitive questions into primary mathematics instruction improved pupils' conceptual understanding and retention compared with instruction without metacognitive support (Fyfe et al., 2022). In literacy, a comparable mechanism emerges when pupils move from recognising information towards meaning-making, inference, and the regulation of reading strategies, while the quality of engagement constitutes an important condition for sustaining such learning activity (Toste et al., 2020; Wong & Liem, 2022). Accordingly, these shared psychological mechanisms help explain why literacy and numeracy in the present model need not be treated as entirely separate competencies, as both require interpretation, monitoring of understanding, reasoning, and strategy evaluation (Fyfe et al., 2022; de Ruig et al., 2023).

The dimension of motivational support further demonstrates that deeper learning cannot be reduced solely to cognitive activity, because pupils' willingness to sustain effort is strongly

influenced by experiences of autonomy, competence, and supportive classroom relationships (Ryan & Deci, 2020; Vu et al., 2022). The meta-analysis by Toste et al. (2020) demonstrated a positive relationship between motivation and reading achievement among K–12 pupils, suggesting that perceived competence, interest, and persistence can be understood as part of the psychological ecology that enables literacy development (Toste et al., 2020). This interpretation is also consistent with findings indicating that schools oriented towards deeper learning can foster higher levels of self-efficacy, mastery orientation, and academic engagement than more conventional learning environments (Agger & Koenka, 2020). However, Agger and Koenka (2020) did not identify a direct relationship between attendance at deeper learning schools and mathematics achievement, indicating that improvements in motivation and engagement should not be assumed automatically to produce higher numeracy attainment (Agger & Koenka, 2020).

These apparently contrasting findings in fact strengthen the interpretation of Figure 1 by suggesting that pedagogical effects are likely to be sequential and conditional: teachers' practices trigger psychological mechanisms, but the transformation of these mechanisms into academic competencies depends on task quality, the intensity of engagement, and pupils' opportunities to construct and evaluate understanding (Agger & Koenka, 2020; Nachtigall et al., 2022). Theoretically, this study therefore proposes that deep learning pedagogy in Islamic primary education should be understood as a configuration of interactions between instructional design and pupils' psychological processes, rather than as a single instructional technique operating linearly on learning outcomes (Sølvik & Glenna, 2022; de Ruig et al., 2023). The model also extends discussions within educational psychology by positioning meaning-making, cognitive engagement, metacognitive monitoring, and motivation as mechanisms capable of linking pedagogy simultaneously with two foundational competencies (Vu et al., 2022; Wong & Liem, 2022). As this study is qualitative, the relationships represented in Figure 1 should be regarded as mechanistic propositions grounded in empirical patterns that require quantitative or longitudinal testing before they can be interpreted as causal relationships (Agger & Koenka, 2020; Vu et al., 2022).

The practical implication is that madrasah teachers should not simply provide pupils with more literacy or numeracy exercises, but should design activities that require them to connect subject matter with experience, explain their reasoning, consider alternative strategies, and reflect on their thinking processes (Sølvik & Glenna, 2022; Fyfe et al., 2022). Support for autonomy and competence should also be embedded within these processes through opportunities to ask questions, make productive errors, and receive feedback that emphasises the development of understanding rather than merely the correctness of answers (Ryan & Deci, 2020; de Ruig et al., 2023). In the context of Madrasah Ibtidaiyah, authentic tasks may draw upon social, religious, environmental, and everyday situations familiar to pupils, provided that such contexts are used to enhance the quality of reasoning rather than functioning merely as narrative decoration within tasks (Nachtigall et al., 2022). Thus, the practical contribution of Figure 1 lies in providing a framework through which teachers can evaluate learning not only on the basis of pupils' final answers, but also according to the quality of meaning-making, reasoning, reflection, engagement, and persistence that underpins the development of their literacy and numeracy (Wong & Liem, 2022; de Ruig et al., 2023).

4. CONCLUSION

This study demonstrates that deep learning pedagogy shapes the literacy and numeracy of madrasah ibtidaiyah pupils through learning processes that extend beyond subject-matter mastery by integrating meaning-making, cognitive engagement, metacognitive reflection, and motivational support. The principal novelty of the study lies in its explanation that literacy and numeracy development does not occur through separate mechanisms, but rather through a shared

pedagogical pattern comprising contextual learning, dialogic interaction, pupil explanation, and reflective questioning, all of which promote interpretation, reasoning, strategy evaluation, and persistence in learning. These findings extend current discussions of deep learning pedagogy by positioning pupils' psychological mechanisms as the link between instructional practices and the development of foundational competencies. Theoretically, the study highlights the importance of conceptualising deeper learning as a dynamic configuration of pedagogical design and cognitive, metacognitive, and motivational processes. Practically, the findings imply that madrasah teachers should design learning experiences that provide pupils with opportunities to connect prior experiences with new knowledge, explain their reasoning, test alternative strategies, and reflect on their thinking processes. Within the broader literature, the findings support the view that the quality of engagement and self-regulation constitutes an important component of meaningful learning. Nevertheless, the study is limited by its focus on a single madrasah context and its qualitative design; therefore, the findings should be generalised with caution. Future research should test the proposed model through multisite studies, longitudinal designs, or mixed-methods approaches to examine the stability of the model, the relationships among its components, and its effects on literacy and numeracy outcomes more robustly.

REFERENCES

- Agger, C. A., & Koenka, A. C. (2020). Does attending a deeper learning school promote student motivation, engagement, perseverance, and achievement? *Psychology in the Schools*, 57(4), 627–645. <https://doi.org/10.1002/pits.22347>
- Braun, V., & Clarke, V. (2021a). One size fits 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>
- Craig, S. L., McInroy, L. B., Goulden, A., & Eaton, A. D. (2021). Engaging the senses in qualitative research via multimodal coding: Triangulating transcript, audio, and video data in a study with sexual and gender minority youth. *International Journal of Qualitative Methods*, 20, 1–12. <https://doi.org/10.1177/16094069211013659>
- de Ruig, N. J., de Jong, P. F., & Zee, M. (2023). Stimulating elementary school students' self-regulated learning through high-quality interactions and relationships: A narrative review. *Educational Psychology Review*, 35, Article 71. <https://doi.org/10.1007/s10648-023-09795-5>
- Fearon, D., Hughes, S., & Brearley, S. G. (2021). Constructivist Stakian multicase study: Methodological issues encountered in cross-cultural palliative care research. *International Journal of Qualitative Methods*, 20, 1–10. <https://doi.org/10.1177/16094069211015075>
- Fyfe, E. R., Byers, C., & Nelson, L. J. (2022). The benefits of a metacognitive lesson on children's understanding of mathematical equivalence, arithmetic, and place value. *Journal of Educational Psychology*, 114(6), 1292–1306. <https://doi.org/10.1037/edu0000715>
- Jiang, R. (2022). Understanding, investigating, and promoting deep learning in language education: A survey on Chinese college students' deep learning in the online EFL teaching context. *Frontiers in Psychology*, 13, Article 955565. <https://doi.org/10.3389/fpsyg.2022.955565>
- Kirby, P. (2020). 'It's never okay to say no to teachers': Children's research consent and dissent in conforming schools contexts. *British Educational Research Journal*, 46(4), 811–828. <https://doi.org/10.1002/berj.3638>
- Nachtigall, V., Shaffer, D. W., & Rummel, N. (2022). Stirring a secret sauce: A literature review on the conditions and effects of authentic learning. *Educational Psychology Review*, 34, 1479–1516.

<https://doi.org/10.1007/s10648-022-09676-3>

- Otto, S., Körner, F., Marschke, B. A., Merten, M. J., Brandt, S., Sotiriou, S., & Bogner, F. X. (2020). Deeper learning as integrated knowledge and fascination for science. *International Journal of Science Education*, 42(5), 807–834. <https://doi.org/10.1080/09500693.2020.1730476>
- 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, Article 101860. <https://doi.org/10.1016/j.cedpsych.2020.101860>
- Sølvik, R. M., & Glenna, A. E. H. (2022). Teachers' potential to promote students' deeper learning in whole-class teaching: An observation study in Norwegian classrooms. *Journal of Educational Change*, 23, 343–369. <https://doi.org/10.1007/s10833-021-09420-8>
- Toste, J. R., Didion, L., Peng, P., Filderman, M. J., & McClelland, A. M. (2020). A meta-analytic review of the relations between motivation and reading achievement for K–12 students. *Review of Educational Research*, 90(3), 420–456. <https://doi.org/10.3102/0034654320919352>
- Vu, T., Magis-Weinberg, L., Jansen, B. R. J., van Atteveldt, N., Janssen, T. W. P., Lee, N. C., van der Maas, H. L. J., Raijmakers, M. E. J., Sachisthal, M. S. M., & Meeter, M. (2022). Motivation-achievement cycles in learning: A literature review and research agenda. *Educational Psychology Review*, 34(1), 39–71. <https://doi.org/10.1007/s10648-021-09616-7>
- Wong, Z. Y., & Liem, G. A. D. (2022). Student engagement: Current state of the construct, conceptual refinement, and future research directions. *Educational Psychology Review*, 34, 107–138. <https://doi.org/10.1007/s10648-021-09628-3>
- Agger, C. A., & Koenka, A. C. (2020). Does attending a deeper learning school promote student motivation, engagement, perseverance, and achievement? *Psychology in the Schools*, 57(4), 627–645. <https://doi.org/10.1002/pits.22347>
- Ahmed, Y., Miciak, J., Taylor, W. P., & Francis, D. J. (2022). Structure altering effects of a multicomponent reading intervention: An application of the Direct and Inferential Mediation (DIME) model of reading comprehension in upper elementary grades. *Journal of Learning Disabilities*, 55(1), 58–78. <https://doi.org/10.1177/0022219421995904>
- Braithwaite, D. W., & Sprague, L. (2021). Conceptual knowledge, procedural knowledge, and metacognition in routine and nonroutine problem solving. *Cognitive Science*, 45(10), e13048. <https://doi.org/10.1111/cogs.13048>
- Braun, V., & Clarke, V. (2021a). 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>
- Craig, S. L., McInroy, L. B., Goulden, A., & Eaton, A. D. (2021). Engaging the senses in qualitative research via multimodal coding: Triangulating transcript, audio, and video data in a study with sexual and gender minority youth. *International Journal of Qualitative Methods*, 20, 1–12. <https://doi.org/10.1177/16094069211013659>
- Cui, R., & Teo, P. (2021). Dialogic education for classroom teaching: A critical review. *Language and Education*, 35(3), 187–203. <https://doi.org/10.1080/09500782.2020.1837859>
- de Ruig, N. J., de Jong, P. F., & Zee, M. (2023). Stimulating elementary school students' self-regulated learning through high-quality interactions and relationships: A narrative review. *Educational Psychology Review*, 35, Article 71. <https://doi.org/10.1007/s10648-023-09795-5>

- Denton, C. A., Hall, C., Cho, E., Cannon, G., Scammacca, N., & Wanzek, J. (2022). A meta-analysis of the effects of foundational skills and multicomponent reading interventions on reading comprehension for primary-grade students. *Learning and Individual Differences*, 93, 102062. <https://doi.org/10.1016/j.lindif.2021.102062>
- Dignath, C., & Veenman, M. V. J. (2021). The role of direct strategy instruction and indirect activation of self-regulated learning—Evidence from classroom observation studies. *Educational Psychology Review*, 33, 489–533. <https://doi.org/10.1007/s10648-020-09534-0>
- Fearon, D., Hughes, S., & Brearley, S. G. (2021). Constructivist Stakian multicase study: Methodological issues encountered in cross-cultural palliative care research. *International Journal of Qualitative Methods*, 20, 1–10. <https://doi.org/10.1177/16094069211015075>
- Fyfe, E. R., Byers, C., & Nelson, L. J. (2022). The benefits of a metacognitive lesson on children's understanding of mathematical equivalence, arithmetic, and place value. *Journal of Educational Psychology*, 114(6), 1292–1306. <https://doi.org/10.1037/edu0000715>
- Grenell, A., Nelson, L. J., Gardner, B., & Fyfe, E. R. (2022). Children's confidence using incorrect strategies on mathematical equivalence problems. *Cognitive Development*, 62, 101167. <https://doi.org/10.1016/j.cogdev.2022.101167>
- Jiang, R. (2022). Understanding, investigating, and promoting deep learning in language education: A survey on Chinese college students' deep learning in the online EFL teaching context. *Frontiers in Psychology*, 13, 955565. <https://doi.org/10.3389/fpsyg.2022.955565>
- Kim, J. S., Burkhauser, M. A., Mesite, L. M., Asher, C. A., Relyea, J. E., Fitzgerald, J., & Elmore, J. (2021). Improving reading comprehension, science domain knowledge, and reading engagement through a first-grade content literacy intervention. *Journal of Educational Psychology*, 113(1), 3–26. <https://doi.org/10.1037/edu0000465>
- Kirby, P. (2020). 'It's never okay to say no to teachers': Children's research consent and dissent in conforming schools contexts. *British Educational Research Journal*, 46(4), 811–828. <https://doi.org/10.1002/berj.3638>
- Koivuniemi, M., Järvenoja, H., Järvelä, S., & Thomas, V. (2021). An overview of instruments for assessing and supporting elementary school students' self-regulated learning. *Learning: Research and Practice*, 7(2), 109–146. <https://doi.org/10.1080/23735082.2020.1859123>
- Maine, F., & Čermáková, A. (2021). Using linguistic ethnography as a tool to analyse dialogic teaching in upper primary classrooms. *Learning, Culture and Social Interaction*, 29, 100500. <https://doi.org/10.1016/j.lcsi.2021.100500>
- Maplethorpe, L., Kim, H., Hunte, M. R., Vincett, M., & Jang, E. E. (2022). Student-generated questions in literacy education and assessment. *Journal of Literacy Research*, 54(1), 74–97. <https://doi.org/10.1177/1086296X221076436>
- Nachtigall, V., Shaffer, D. W., & Rummel, N. (2022). Stirring a secret sauce: A literature review on the conditions and effects of authentic learning. *Educational Psychology Review*, 34, 1479–1516. <https://doi.org/10.1007/s10648-022-09676-3>
- Oppermann, E., Vinni-Laakso, J., Juuti, K., Loukomies, A., & Salmela-Aro, K. (2021). Elementary school students' motivational profiles across Finnish language, mathematics and science: Longitudinal trajectories, gender differences and STEM aspirations. *Contemporary Educational Psychology*, 64, 101927. <https://doi.org/10.1016/j.cedpsych.2020.101927>