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REVIEW ARTICLE

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Teachers as architects of self-regulated learning: a systematic review of teacher practices for fostering self-regulated learning environments

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ABSTRACT

This systematic review synthesizes empirical research on teacher practices intended to support self-regulated learning (SRL) in K-12 education, including general and inclusive settings. Following PRISMA guidelines, 47 studies published between 2000 and 2026 were examined to map instructional practices, research methods, and educational contexts. The findings identify both direct and indirect approaches to SRL support, including explicit strategy instruction, goal setting, feedback, self-monitoring, reflection and self-assessment, student choice, collaborative learning, and supportive teacher–student interactions. These practices were examined in relation to the forethought, performance, and self-reflection phases of Zimmerman's cyclical model, as well as co-regulation and socially shared regulation. The review also highlights the role of technology-supported instruction while indicating that evidence remains limited in secondary and inclusive educational settings. Importantly, the findings distinguish practices reported or implemented in classrooms from evidence of changes in students' regulatory processes or academic outcomes; the effectiveness of practices should, therefore, be interpreted in light of study design and methodological quality. The review provides a descriptive synthesis of teacher practices investigated in empirical research and identifies priorities for future studies, including stronger outcome evaluation, greater attention to diverse learner populations and educational contexts, and closer examination of the interaction between learner regulation and external regulatory support.

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KEYWORDS
Self-regulated learning; SRL-oriented teacher practices; K-12 education; inclusive education; systematic review

Introduction

Self-Regulated Learning (SRL) has attracted increasing attention because of its well-established contribution to academic achievement (Boekaerts & Corno, 2005; Sadati & Simin, 2016; Schunk & Zimmerman, 2008; Xu et al., 2022). SRL comprises the cognitive, metacognitive, motivational, emotional, and behavioral processes through which learners plan, monitor, and regulate learning (Panadero, 2017; Shuey & Kankaraš, 2018). Strong SRL skills are associated with improved academic performance (Denham et al., 2012; Duckworth & Carlson, 2013; Heikkilä & Lonka, 2006; Schunk & Zimmerman, 2008), are recognized as essential twenty-first century competencies (Eggers et al., 2021), and support persistence, adaptive learning, academic achievement, lifelong learning, and inclusion of learners with disabilities (Blake, 2018; Chen, 2024; Dignath & Büttner, 2008; Greene & Azevedo, 2007; Gureasko-Moore et al., 2007; Kitsantas & Zimmerman, 2009; Levin, 2003; Loreman, 2017; Newman, 1994; Panadero & Järvelä, 2015; Schunk & Greene, 2017; UNESCO, 2020; Wang, 2021; Woltering & Shi, 2016; Zimmerman & Schunk, 2011).

Because SRL is teachable (Boekaerts, 1997; Zimmerman, 2002), teachers play a central role in developing students' capacity to regulate learning (James & McCormick, 2009; Karabenick & Zusho, 2015). SRL can be promoted through direct strategy instruction, modeling, authentic learning experiences, supportive learning environments, and meaningful student choice (Ardasheva et al., 2017; Banihashem et al., 2022;Boekaerts, 1997; Dignath & Büttner, 2008; Paris et al., 2001; Perry, 1998; Perry & Van de Kamp, 2000). Research shows that teachers can implement these approaches effectively through meaningful, cognitively demanding, and collaborative learning activities (Boekaerts & Corno, 2005; Dignath & Büttner, 2018; Kramarski &

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Revach, 2009; Perels et al., 2009; Perry, 2013; Spruce & Bol, 2015). Nevertheless, explicit SRL instruction remains limited in many classrooms (Eekelen et al., 2005; Spruce & Bol, 2015).

Importantly, SRL does not develop independently of the learning environment in which learning occurs. Contemporary research increasingly conceptualizes learning environments as active contexts that shape learners' opportunities to plan, monitor, regulate, and reflect on their learning. In particular, interactive learning environments can support SRL by providing opportunities for personalization, learner autonomy, collaboration, feedback, and flexible access to learning resources. Cenka et al. (2024) similarly highlighted the close relationship between personal learning environments and SRL, emphasizing personalization, learner ownership, flexibility, and student-centred learning as important features of environments that support self-regulation. Thus, the development of SRL should be considered not only a matter of teaching individual strategies but also a matter of designing learning environments that create meaningful opportunities for students to exercise and develop those strategies. Within such environments, teachers occupy a particularly important position because their instructional decisions determine the extent to which students encounter opportunities for autonomy, collaboration, strategic choice, feedback, monitoring, and reflection.

Several theoretical models conceptualize SRL, including those of Pintrich (2000), Zimmerman (2000), Winne and Hadwin (2008), Boekaerts (2011), and Hadwin et al. (2011), all emphasizing interactions among cognitive, metacognitive, motivational, behavioral, and emotional processes (Panadero, 2017). This review adopts Zimmerman's (2000) cyclical model because it provides a widely used framework for examining teacher practices across the forethought, performance, and self-reflection phases. Complementary models emphasize emotional regulation (Boekaerts, 2011), iterative monitoring (Winne & Hadwin, 2008), and collaborative regulation through co-regulation and socially shared regulation (Hadwin et al., 2017). Zimmerman's work (2000, 2002) further highlights teachers' role in scaffolding learners toward independent self-regulation (Corno, 2008; Perry & Rahim, 2011; White et al., 2015), whereas insufficient instructional support may hinder SRL development (Eggers et al., 2025; Kirschner et al., 2006; Prasse et al., 2024). In addition, recent theoretical developments emphasize that SRL should be understood in relation to the regulation provided by the learning environment, rather than solely as an individual learner process. The SRL–ERL (Externally-Regulated Learning) perspective conceptualizes personal self-regulation and external regulation as complementary factors whose interaction may shape learning processes and outcomes (de la Fuente-Arias, 2017; de la Fuente et al., 2017). More recent work also highlights the need to consider regulated, non-regulated, and dysregulated processes at both the individual and contextual levels (de la Fuente & Kauffman, 2026). These perspectives complement cyclical SRL models by drawing attention to how instructional guidance and learning conditions may support or constrain students' regulatory activity. Accordingly, the present review retains Zimmerman's model as its primary framework for classifying teacher practices and returns to the SRL–ERL perspective in the Discussion and Limitations as a lens for future research on how instructional support and learner regulation interact.

Teachers' implementation of SRL-oriented practices is shaped by their beliefs, self-efficacy, professional commitment, experiences, and SRL competencies (Dignath-van Ewijk, 2016; Harding et al., 2018; Kramarski, 2018; Lombaerts et al., 2009; Peeters et al., 2014; Vandevelde et al., 2012; Zimmerman & Moylan, 2009). Although classroom instruction has considerable potential to foster SRL among all learners, including those with disabilities (Dignath & Büttner, 2018; Rosário et al., 2017), existing syntheses have either aggregated intervention effects (Dignath & Büttner, 2008), examined long-term intervention impacts (Cousins et al., 2022), or focused specifically on classroom observation studies of teachers' direct and indirect SRL promotion (Dignath & Veenman, 2021). To our knowledge, no review has mapped teacher practices across the full range of research designs while also distinguishing individual, co-regulated, and socially shared regulation and differentiating evidence of implementation from evidence of change in students' regulation or outcomes. Such a synthesis is needed because teachers often value SRL but report uncertainty about its implementation, while technology-rich learning environments further increase the need for practical, evidence-based guidance (Cousins et al., 2022; Johnson et al., 2023; Peel, 2020; Wu et al., 2023).

Aim of the study

Despite growing recognition of self-regulated learning (SRL) as a key contributor to academic achievement and the central role of K-12 teachers in fostering SRL, no systematic review has synthesized teacher practices

across general and inclusive K-12 classrooms while jointly examining research designs, samples, and the type of evidence each study provides. As Alexander (2020) argued, the value of a systematic review lies not merely in addressing an unexplored topic but in meeting a genuine epistemic need. This review addresses that need by synthesizing fragmented evidence on SRL-oriented teacher practices reported in studies published between 2000 and 2026 and builds on the direct/indirect distinction introduced by Kistner et al. (2010) and Dignath and Büttner (2018). It further extends previous work by considering co-regulation and socially shared regulation (SSR), integrating methodological trends, sample characteristics, and classroom practices to bridge theory and practice. The findings provide implications for researchers, teacher education, curriculum development, and educational policy while identifying directions for future research on promoting SRL in K-12 education. The review is guided by the following research questions:

1. What teacher practices promote self-regulated learning (SRL) in K-12 classrooms, and how do these practices align with the forethought, performance, and self-reflection phases of Zimmerman's cyclical model and with co-regulation and socially shared regulation?
2. What research designs, data sources, and analytical approaches have been used to investigate teacher practices that promote SRL in K-12 education?
3. What are the characteristics of the contexts and learner populations represented in research on teacher practices that promote SRL in K-12 education, including educational level, learner population, and instructional context?

Method

The present study adopted a systematic descriptive and configurative review to map, categorize, and synthesize empirical evidence on SRL-oriented teacher practices in K-12 education. Rather than aggregating effect sizes, the review examined patterns in study characteristics, research methods, and instructional practices across diverse contexts, an approach well suited to the heterogeneity of the included studies. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure methodological rigor (Moher et al., 2015). Guided by an interpretive approach to research synthesis, the review conceptualized SRL-supportive teacher practices as contextually situated pedagogical processes rather than isolated instructional techniques. Accordingly, it examined how these practices were conceptualized, implemented, and justified across empirical studies, with particular attention to instructional processes that support students' planning, monitoring, and adaptation of learning. This perspective informed the research questions, inclusion criteria, and analytical synthesis. The selection criteria, search strategy, data coding, and analysis procedures are described below.

Eligibility criteria

The review employed a transparent and reproducible study selection process following recommendations from the Cochrane Handbook for Systematic Reviews of Interventions, including predefined eligibility criteria, a comprehensive search strategy, quality appraisal, and systematic synthesis (Chandler et al., 2019; Evans & Benefield, 2001). The inclusion and exclusion criteria are presented in Table 1.

Table 1. Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Published in English	Published in other languages
Published between 2000-2026	Articles published before 2000
Sampling K-12 learners and their teachers including inclusive/general education settings	Sampling Pre-K12, college or adult education
Involving in-person education	Online education and flipped education
Published in a peer-reviewed journal	Master's or PhD theses, editorial letters, book chapters, systematic reviews, literature reviews or meta-analyses, conference proceedings
Empirical and case studies of actual SRL teaching practices	Non-empirical/conceptual studies that do not report actual SRL teaching practices

Eligible studies were English-language, peer-reviewed empirical journal articles published from 2000 onward, reflecting the emergence of major SRL models (Puustinen & Pulkkinen, 2001). The review focused on teacher practices promoting SRL in K-12 classrooms. Dissertations, conference proceedings, book chapters, and book reviews were excluded to ensure methodological consistency with previous systematic reviews (e.g. Lee et al., 2019; Shadiev & Yang, 2020; Yang et al., 2023; Zou et al., 2019).

Search strategy

The search strategy was developed in line with the review objectives and refined through pilot searches and supplementary screening. The search process was completed on 8 October 2026. Five databases were searched: Web of Science (WOS), Scopus, JSTOR, the Education Resources Information Center (ERIC), and Wiley. The strategy combined terms describing teacher practices related to self-regulated learning (SRL) with terms identifying school-level educational contexts. The core search logic was: ("teaching practices promoting self-regulated learning" OR "self-regulatory teaching practices" OR "teaching self-regulation" OR "teaching self-regulated learning") AND ("K12" OR "elementary schools" OR "primary schools" OR "high schools" OR "junior high schools" OR "middle schools" OR "inclusive education" OR "mainstreaming education"). This strategy was adapted to the search fields and syntax supported by each database, as detailed in Supplementary Table S1. The database searches yielded 603 records from WOS, 586 from Scopus, 919 from JSTOR, 1,070 from ERIC, and 889 from Wiley, totaling 4,067 records. The review focused on English-language, peer-reviewed empirical journal articles published between 2000 and 2026 and examining actual teacher practices promoting SRL among K-12 learners in general or inclusive educational settings. Eligibility criteria were applied during screening. Backward and forward citation tracking and targeted searches were also undertaken; these supplementary methods did not identify additional studies for inclusion. Records were managed using EndNote 21 (Clarivate, 2023), and automation tools were used for duplicate detection and format-based exclusions.

Selection criteria

The study-selection process was informed by guidance from the Cochrane Handbook for Systematic Reviews of Interventions (Chandler et al., 2019; Evans & Benefield, 2001). As shown in Table 1, studies were eligible if they were English-language, peer-reviewed empirical journal articles published between 2000 and 2026 and examined actual teacher practices promoting SRL among K-12 learners in general or inclusive educational settings. Eligible studies addressed in-person instruction. Studies were excluded if they concerned pre-K, higher education, or adult education; focused on online or flipped education; or were theses, editorial letters, book chapters, reviews, meta-analyses, conference proceedings, or conceptual papers without empirical evidence of teacher practices promoting SRL. School-level terms guided retrieval but were not treated as independent exclusion criteria. Decisions were made through title-and-abstract screening followed by full-text assessment. The publication period was selected to cover research published from 2000 onward, following the development of major SRL models (Puustinen & Pulkkinen, 2001). Figure 1 summarizes the study-selection process.

Data coding and analysis

Content analysis (Krippendorf, 1980) was used to identify, categorize, and synthesize teacher practices that promote students' self-regulated learning (SRL). Following Pigott and Polanin (2020), coding was guided by a detailed codebook and standardized coding framework. Zimmerman's cyclical model was used as the primary framework for categorizing practices according to the forethought, performance, and self-reflection phases (Zimmerman, 2000, 2002). Co-regulation and socially shared regulation were treated as complementary perspectives and coded as distinct analytical categories to capture the social dimensions of regulation not fully represented by an individual SRL cycle (Hadwin et al., 2011; Panadero & Järvelä, 2015). Co-regulation referred to support for a learner's regulation by a teacher or peer, whereas socially shared regulation referred to the joint regulation of shared learning activities. These categories could overlap with Zimmerman's phases because social regulation may involve planning, performance, and reflection.

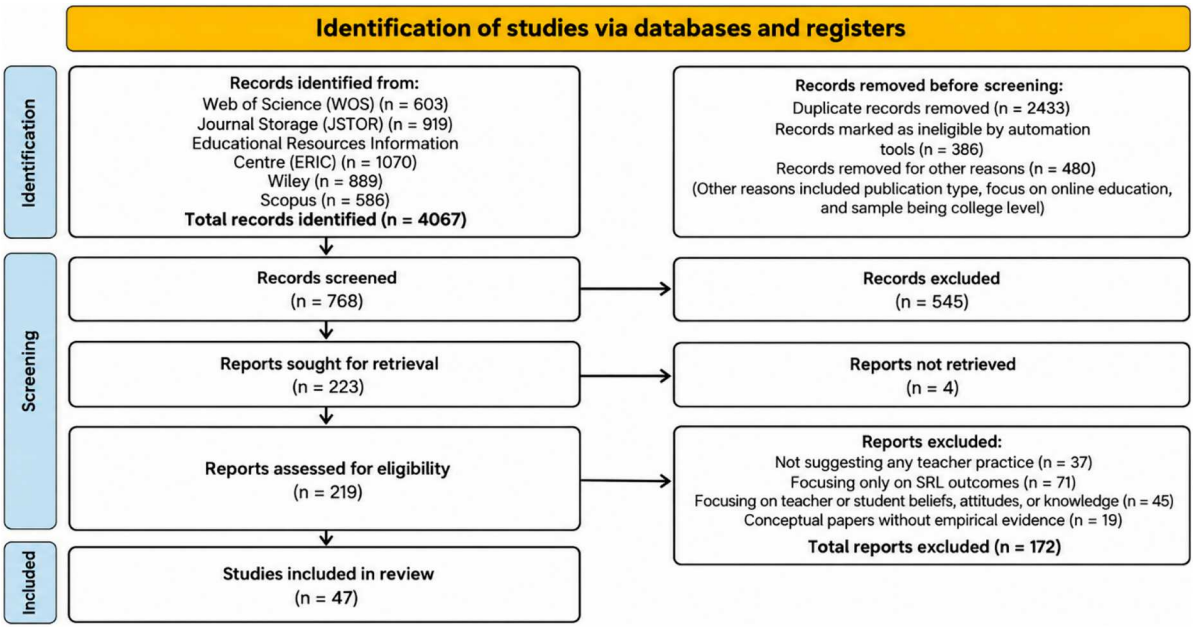


Figure 1. PRISMA flowchart.

The coding framework was organized directly around the three research questions. For RQ1, studies were coded for the teacher practices reported or implemented, the SRL phase(s) targeted (forethought, performance, and self-reflection), and the extent to which practices involved co-regulation or socially shared regulation. Teacher practices were further categorized as direct or indirect approaches to promoting SRL based on the established SRL literature and the emergent patterns identified during pilot coding. For RQ2, studies were coded according to research design, data sources, data collection methods, and data analysis approaches. For RQ3, studies were coded according to educational level, learner population, instructional context, and other relevant sample characteristics. Descriptive frequencies and percentages were used to summarize methodological and contextual characteristics, while content analysis was used to synthesize the nature and characteristics of teacher practices. This coding structure ensured direct correspondence between the research questions, extracted data, analytical procedures, and reported results.

Methodological quality appraisal

Given the methodological heterogeneity of the included studies, methodological quality was assessed using a structured, design-sensitive appraisal framework. For qualitative and case-study research, the appraisal considered the appropriateness of the research approach and case context, the transparency of data collection and analysis, the credibility of interpretations, the use of multiple data sources or triangulation where applicable, and the extent to which conclusions were supported by the reported evidence. For quantitative and intervention studies, the appraisal focused on the appropriateness of the research design, the adequacy and description of the sample and educational context, the use of comparison or control conditions where applicable, the quality of measurement, the appropriateness of analytical procedures, and whether conclusions about intervention effects or causal relationships were justified by the design and findings. For mixed-methods studies, both qualitative and quantitative components were assessed, together with the integration of these components and their contribution to addressing the research questions.

Both authors independently appraised all 47 included studies and assigned an overall judgment of low, moderate, or high methodological quality. Inter-rater agreement on these overall judgments was assessed using Cohen's kappa before consensus discussions. Cohen's kappa was .94, indicating very high agreement beyond chance. Discrepancies were subsequently discussed and resolved by consensus. No composite numerical quality score was calculated. Instead, the appraisal judgments were used to contextualize the synthesis and distinguish evidence describing the implementation of teacher practices intended to support self-regulated learning (SRL) from evidence demonstrating changes in students' regulatory processes or

academic outcomes. Particular attention was given to whether claims about relationships or intervention effects were supported by the research designs and reported findings.

Results

The methodological quality of the 47 included studies was assessed using the structured, design-sensitive appraisal framework described in the Methods section. The appraisal considered research design, sampling and context, data collection and measurement, analytical procedures, and the extent to which conclusions were supported by the reported evidence. Criteria were applied according to each study's methodological approach, with attention to the integration of qualitative and quantitative components in mixed-methods research. A key consideration was the extent to which the studies' findings supported claims about relationships between teachers' SRL-supportive practices and students' SRL-related behaviors or development. Of the 47 studies, 40 (85.1%) made causal claims about teacher practices and student behaviors. Observational, interview-based, and self-report studies primarily provided evidence about reported or enacted practices, whereas intervention and longitudinal studies offered different opportunities to examine changes over time. Throughout the synthesis, evidence concerning the implementation of SRL-supportive practices was distinguished from evidence of changes in students' regulatory processes and academic outcomes. Given the methodological heterogeneity of the studies, appraisal judgments were used to qualify the interpretation of findings rather than to calculate a single composite quality score.

RQ1. Teacher practices promoting self-regulated learning

The reviewed studies identified a wide range of teaching practices aligned with Zimmerman's SRL model as well as co-regulation and socially shared regulation frameworks. While many interventions addressed the full SRL cycle (forethought, performance, and self-reflection), others focused on specific phases or social forms of regulation. Figure 2 summarizes the SRL phases and regulatory approaches represented in the selected studies.

Most studies addressed all three SRL phases (n = 33), with the performance phase receiving the greatest attention (n = 37), whereas Arvatz et al. (2025) focused specifically on self-reflection. Co-regulation (n = 14) was examined more frequently than socially shared regulation (SSRL; n = 6). The five newly added studies expanded the range of instructional approaches represented in the review. P43 (Adıgüzel et al., 2023) highlighted role modeling and teacher scaffolding, addressing forethought, performance, self-reflection, and co-regulation. P44 (Schunk et al., 2022) and P45 (Wilburne & Dause, 2017) emphasized goal setting, action

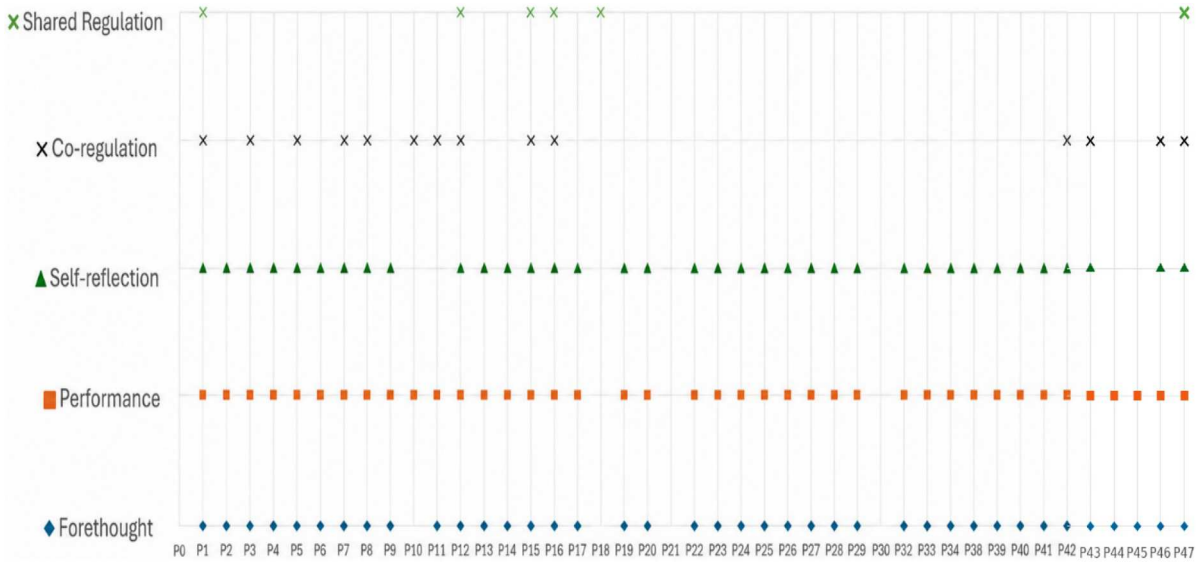


Figure 2. Different aspects of SRL addressed in the selected studies.

planning, and self-monitoring, primarily addressing forethought and performance. P46 (Kabrick & Duffin, 2026) addressed all three SRL phases through a structured framework for planning, performing, evaluating, and adjusting actions, with teacher guidance supporting co-regulation. P47 (de Acedo Lizarraga et al., 2003) addressed all three phases and both co-regulation and SSRL through teacher-supported self-regulatory activities and collaborative group tasks. Nevertheless, group work alone was not considered sufficient evidence of SSRL. For example, P5 (Ferreira & Simão, 2012) was excluded from this category because collaboration was limited to information sharing rather than joint task completion. Overall, most studies adopted Zimmerman's cyclical model, while some also incorporated co-regulation and SSRL perspectives, illustrating the relevance of both individual and socially mediated processes in supporting SRL. The identified practices were categorized as direct and indirect approaches to promoting SRL, as summarized in Table 2.

Table 2 shows a broad range of direct SRL-promoting practices. Arvatz et al. (2025) referred to the reciprocal process of supporting teachers' and students' regulation as self-regulated learning and teaching (SRL&T). Direct practices included modeling SRL through think-alouds (Callan et al., 2022) and using role modeling to make self-regulatory processes explicit to learners (Adıgüzel et al., 2023). Other practices involved teaching thinking processes (Alvi & Gillies, 2024), providing domain-specific SRL instruction, such as vocabulary-learning strategies (Kousalová, 2023), and integrating SRL strategy instruction into subject-specific learning. For example, Wilburne and Dause (2017) taught low-achieving fourth-grade students goal setting and self-monitoring to support perseverance during mathematical problem solving, while Kabrick and Duffin (2026) examined a structured framework for developing self-regulatory skills during private violin instruction. Schunk et al. (2022) further demonstrated the instructional use of mental contrasting and implementation intentions, which help students connect desired goals with anticipated obstacles and concrete action plans.

Self-assessment was promoted through co-constructing assessment criteria (Perry et al., 2020), facilitating self-reflection and self-assessment (Callan et al., 2022; Ferreira & Simão, 2012; Heirweg et al., 2022; *Perry et al., 2002, 2020; Peel, 2020; Spruce & Bol, 2015; Șuteu, 2021), and using checklists, rubrics, self-questioning prompts, reflection tasks, and learner self-evaluation. Kabrick and Duffin (2026) also examined a five-step framework involving planning, performing, listening, evaluating, and acting, intended to help students assess their own performance and make adjustments to their technique. Evaluation activities were generally described as non-threatening and mastery-oriented. Other direct practices included emphasizing the relationship between strategic actions and learning outcomes (Callan et al., 2022), providing process-oriented rather than grade-focused feedback (Callan et al., 2022; Kolovelonis et al., 2010; *Perry et al., 2002, 2020; Spruce & Bol, 2015), connecting prior learning with instructional goals and emphasizing transferable real-world skills (Peel, 2020), integrating information technologies (Chen & Feng, 2026; Cueli et al., 2017; Fütterer et al., 2026; Wong et al., 2020), using peer tutoring (Vandevelde et al., 2017), and contextualizing subject matter (Peel, 2020). However, technology-supported practices did not necessarily benefit all SRL phases equally. For example, Fütterer et al. (2026) reported that generative AI supported motivational beliefs associated with the forethought phase but did not significantly improve domain-specific knowledge or elaboration-based strategy use associated with the performance phase.

Practices supporting SRL among learners with disabilities were also identified. Providing instructional access for students with disabilities was reported to support the performance phase of SRL (Alraddadi & Zebehazy, 2025), whereas the MARS technique (Materials, Anticipate, Ready to Learn, and Stay on Task) supported both forethought and performance (Ness & Middleton, 2012). In the case study by Ness and Middleton (2012), the MARS strategy supported the development of SRL skills among learners with disabilities and may also have applicability for younger learners. These findings suggest that instructional adaptations and explicit strategies can provide learners with additional support for planning, engaging in, and monitoring learning activities.

The reviewed studies also identified several indirect approaches to promoting SRL. Fiction-based instruction was used as an indirect model of SRL by Azevedo et al. (2023), Cunha et al. (2023), and Ferreira and Simão (2012), with Yellow Trials and Tribulations employed by Cunha et al. (2023) and Azevedo et al. (2023) to foster SRL, particularly in elementary education. Adıgüzel et al. (2023) similarly highlighted the use of role modeling and teacher prompts to elicit students' self-regulatory thinking. Many studies emphasized the role of social interaction in supporting SRL (e.g. Balazinec et al., 2024; Callan et al., 2022; Cunha et al., 2023; Faith & Prowse, 2024; Ferreira & Simão, 2012; Kousalová, 2023; *Perry et al., 2002;

Table 2. Teaching practices fostering SRL.

SRL practice	Publications suggesting the practice
Direct promotion of SRL	
■modeling SRL by "thinking out loud"	**P3** (Callan et al., 2022)
■ providing effective feedback (particularly including how to learn)	**P3** (Callan et al., 2022), **P4** (Kolovelonis et al., 2010), **P8** (Perry et al., 2023), **P9** (Spruce & Bol, 2015), **P25** (Perry et al., 2020)
■ self-reflection and self-assessment	**P3** (Callan et al., 2022), **P5** (Ferreira & Simão, 2012), **P8** (Perry et al., 2023), **P9** (Spruce & Bol, 2015), **P12** (Șuteu, 2021), **P25** (Perry et al., 2020), **P27** (2022), **P31** (Peel, 2020), **P36 (Arvatz et al., 2025)**, **P40** (Kersna et al., 2025)
■ teaching them steps of thinking	**P26** (Alvi & Gillies, 2024), **P37** (Kaplan et al., 2025)
■ supplying instructional access to students with disabilities	**P35** (Alraddadi & Zebehazy, 2025)
■ emphasizing the link between strategic action and positive outcomes	**P3** (Callan et al., 2022), **P38** (Chen & Feng, 2026)
■ encouraging effective help seeking	**P3** (Callan et al., 2022), **P5** (Ferreira & Simão, 2012), **P40** (Kersna et al., 2025)
■ integrating SRL teaching with a subject matter	**P28** (Sins et al., 2024), **P38** (Chen & Feng, 2026), **P45** (Wilburne & Dause, 2017), **P46** (Kabrick & Duffin, 2026).
■ information technology	**P2** (Cueli et al., 2017), **P23** (2020), **P36 (**Arvatz et al., 2025), **P38** (Chen & Feng, 2026), **P42 (**Fütterer et al., 2026)**P41** (Dülger et al., 2025)
■ the use of MARS technique	**P34** (Ness & Middleton, 2012)
■ student tutoring method	**P29** (2017)
■ prioritizing real world transferable skills	**P31** (Peel, 2020)
■ connecting previous learning experiences with the purposeful learning objectives	**P31** (Peel, 2020)
■ co-constructing assessment criteria with students	**P25** (Perry et al., 2020)
■ initiating access to sources to support and monitor learning	**P31** (Peel, 2020)
■ instrumental support	**P8** (Perry et al., 2023), **P35** (Alraddadi & Zebehazy, 2025), **P40** (Kersna et al., 2025)
■ teaching domain specific SRL skills	**P10** (Kousalová, 2023), **P19** (Kistner et al., 2010), **P20** (Benick et al., 2021), **P33** (Lombaerts et al., 2007), **P32** (Tracy et al., 2009), **P21** (Bai & Wang, 2023), **P37** (Kaplan et al., 2025), **P39** (Lee et al., 2025)
■ Mental contrasting	**P44** (Schunk et al., 2022)
Indirect promotion of SRL	
■ a narrative	**P1** (Cunha et al., 2023), **P5** (Ferreira & Simão, 2012), **P14** (Azevedo et al., 2023)
■ supportive student teacher interaction	**P3** (Callan et al., 2022), **P16** (Schuler et al., 2024), **P27** (Heirweg et al.,2022), **P31** (Peel, 2020), **P36 (**Arvatz et al., 2025), **P40** (Kersna et al., 2025)
■ creating routines and participation structures	**P3** (Callan et al., 2022), **P12** (Șuteu, 2021), **P26** (Alvi & Gillies, 2024)
■ positioning all members as learners including the teacher	**P3** (Callan et al., 2022)
■ debates or posters valuing SRL above ability	**P3** (Callan et al., 2022)
■ eliciting SRL from the learners via questions, prompts or role modeling	**P3** (Callan et al., 2022), **P43** (Adıgüzel et al., 2023)
■ involving students in iterative learning activities and long-term learning projects	**P3** (Callan et al., 2022)
■ tasks whose level of difficulty is arranged according to the learner profile	**P3** (Callan et al., 2022), **P35** (Alraddadi & Zebehazy, 2025), **P40** (Kersna et al., 2025)
■ designing tasks requiring SRL	**P3** (Callan et al., 2022), **P6** (Dignath & Büttner, 2018), **P9** (Spruce & Bol, 2015), **P17** (Voskamp et al., 2022), **P24** (Randi, 2017), **P26** (Alvi & Gillies, 2024), **P27** (Heirweg et al.,2022,)**P31** (Peel, 2020), **P36 (**Arvatz et al., 2025), **P39** (Lee et al., 2025), **P47** (de Acedo Lizarraga et al., 2003)
■ encouraging co-learning or teamwork	**P1** (Cunha et al., 2023), **P3** (Callan et al., 2022), **P5** (Ferreira & Simão, 2012), **P8** (Perry et al., 2023), **P9** (Spruce & Bol, 2015), **P10** (Kousalová, 2023), **P12** (Șuteu, 2021), **P15** (Balazinec et al., 2024), **P16** (Schuler et al., 2024), **P18** (Faith & Prowse, 2024), **P47** (de Acedo Lizarraga et al., 2003)
■ experiential learning	**P6** (Alvi & Gillies, 2021), **P40** (Kersna et al., 2025)
■ providing students with choices	**P8** (Perry et al., 2023), **P12** (Șuteu, 2021), **P13** (Žerak et al., 2024), **P27** (Heirweg et al., 2022), **P30** (Bardach et al., 2023), **P40** (Kersna et al., 2025)
■ well-organized and/or interdisciplinary teaching materials	**P11** (Leidinger & Perels, 2012), **P17** (Voskamp et al., 2022), **P39** (Lee et al., 2025)
■ diverse teaching & culturally responsive teaching	**P13** (Žerak et al., 2024), **P22** (Anyichie et al., 2023), **P40** (Kersna et al., 2025)
■ structuring physical environment	**P26** (Alvi & Gillies, 2024), **P40** (Kersna et al., 2025)
■ acknowledging good work	**P26** (Alvi & Gillies, 2024), **P31** (Peel, 2020)
■ contextualizing subject matters	**P31** (Peel, 2020)
■ merging expectations, procedures and a common class language	**P31** (Peel, 2020)
■ discussing the nature of the learning tasks with learners	**P31** (Peel, 2020), **P36 (**Arvatz et al., 2025)
■ creating caring communities	**P31** (Peel, 2020)
■ assuming joint accountability of learning	**P31** (Peel, 2020)
■ adjusting outcome expectations and the learning processes	**P31** (Peel, 2020)
■ making students with disabilities a part of the class community	**P35** (Alraddadi & Zebehazy, 2025)

de Acedo Lizarraga et al., 2003; Spruce & Bol, 2015; Schuler et al., 2024; Şuteu, 2021). de Acedo Lizarraga et al. (2003) examined a portfolio-based intervention that combined self-regulatory strategies with social skills, including assertiveness and empathy, illustrating how SRL instruction can be integrated with opportunities to develop interpersonal competencies especially for students with special needs. The study highlighted the potential relevance of integrating individual self-regulatory activities with opportunities to engage in social learning. Similarly, fostering classroom inclusion for learners with disabilities (Alraddadi & Zebehazy, 2025), implementing culturally responsive teaching (Anyichie et al., 2023; Žerak et al., 2024), incorporating peer assessment (Callan et al., 2022), and adopting socially shared approaches to learning regulation (Faith & Prowse, 2024) were reported as indirect means of supporting SRL.

Several studies also highlighted the classroom environment as an important component of SRL promotion. Supportive teacher–student dialogue (e.g. Callan et al., 2022; Heirweg et al., 2022; Peel, 2020; Schuler et al., 2024), learning routines and participation structures (Alvi & Gillies, 2024; Callan et al., 2022; Şuteu, 2021), positioning all classroom members, including the teacher, as learners (Callan et al., 2022), encouraging help seeking (e.g. Callan et al., 2022; Ferreira & Simão, 2012), and organizing the physical learning environment (Alvi & Gillies, 2024) were identified as practices that support SRL. Teacher guidance was also central to the approaches described by Adıgüzel et al. (2023) and Kabrick and Duffin (2026), in which modeling, prompts, structured questions, and guided evaluation helped learners develop and apply self-regulatory strategies. These practices illustrate how teachers can create opportunities for regulation through scaffolding and feedback while gradually supporting students' independent regulation.

Task design also emerged as an indirect means of promoting SRL. Reported practices included negotiating task goals with learners (Peel, 2020), designing iterative long-term projects (Callan et al., 2022), using meaningful and cognitively challenging tasks (Alvi & Gillies, 2024; Callan et al., 2022; Heirweg et al., 2022), employing multidisciplinary instructional materials (Leidinger & Perels, 2012; Voskamp et al., 2022), and adjusting task difficulty to learners' needs (Alraddadi & Zebehazy, 2025; Callan et al., 2022). Wilburne and Dause (2017) illustrated the importance of designing subject-specific problem-solving activities in which learners could practice goal setting and self-monitoring while working through mathematical problems. Kabrick and Duffin (2026) similarly situated self-regulatory processes within the authentic demands of violin practice, using a structured sequence to guide learners in evaluating their performance and adjusting their actions. de Acedo Lizarraga et al. (2003) examined portfolio tasks that allowed students to practice self-regulatory and social skills throughout the school course. Together, these studies illustrate how meaningful tasks can provide opportunities for learners to plan, enact, monitor, and evaluate their approaches to learning.

In addition to specific instructional strategies, several overarching classroom practices were identified. Providing students with meaningful choices (Bardach et al., 2023; Heirweg et al., 2022; *Perry et al., 2002; Şuteu, 2021; Žerak et al., 2024), while maintaining collective responsibility for learning (Peel, 2020), supported learner autonomy within a collaborative environment. Aligning classroom expectations, procedures, and language (Peel, 2020), together with recognizing students' achievements (Alvi & Gillies, 2024; Peel, 2020), also emerged as practices that support SRL. The findings of de Acedo Lizarraga et al. (2003) further suggest that self-regulatory instruction can be combined with the development of social competencies, although social-skills instruction or group participation alone should not be interpreted as evidence of socially shared regulation. Rather, such a classification requires evidence that learners jointly regulate their goals, strategies, monitoring, or evaluation during collaborative activity.

Overall, the reviewed studies suggest that teachers can support SRL through a combination of explicit strategy instruction and the design of classroom environments, interactions, and tasks that create opportunities for students to regulate their learning. Direct practices make regulatory processes more visible through modeling, goal setting, strategy instruction, self-monitoring, and reflection, whereas indirect practices provide supportive conditions through feedback, meaningful choices, social interaction, inclusive participation, and appropriately challenging tasks. These approaches are complementary: explicit instruction can help students understand and practice regulatory strategies, while supportive learning environments provide opportunities to apply and develop those strategies in authentic learning situations. The studies also highlight the importance of distinguishing individual self-regulation from socially mediated regulation. Although peer interaction, teamwork, and supportive teacher guidance may create conditions for co-regulation or socially shared regulation, these processes should be identified only when the evidence

demonstrates support for, or joint regulation of, learning activities. Taken together, the findings offer a descriptive account of the range of practices reported in the literature, rather than evidence that all practices are equally effective across subjects, educational levels, or learner populations.

RQ2. Research designs, data sources, and analytical approaches

Although all 47 reviewed studies examined teacher practices for promoting self-regulated learning (SRL), they employed a diverse range of research designs, data collection methods, and analytical approaches (Table 3). When each study was assigned to one primary design category, qualitative or case-based designs were the most common (n = 17, 36.2%), followed by mixed-methods designs (n = 9, 19.1%) and quasi-experimental designs (n = 9, 19.1%). Six studies used quantitative designs (n = 6, 12.8%), while the remaining studies comprised randomized controlled field studies or trials (n = 2, 4.3%), an experimental design (n = 1, 2.1%), a longitudinal study (n = 1, 2.1%), an instructional intervention study (n = 1, 2.1%), and a microanalysis-based cross-case comparative design (n = 1, 2.1%).

Classroom observations were the most frequently reported data collection method, appearing in 18 studies (38.3%), followed by interviews in various formats, reported in 16 studies (34.0%). Other data sources included questionnaires and standardized scales, student work samples, achievement tests, teacher ratings, documents, learning diaries, think-aloud protocols, and digital records of learning activities. Several studies combined multiple sources to capture different aspects of teacher practice and student learning. For example, P12 (Şuteu, 2021) combined questionnaire data with open-ended responses, while P17 (Voskamp et al., 2022) integrated school documents, lesson observations, and teacher interviews. The newer studies also illustrate this methodological diversity: P43 (Adıgüzel et al., 2023) used lesson-plan rubrics, trainer feedback, and student products, whereas P46 (Kabrick & Duffin, 2026) used SRL microanalysis and cross-case comparisons.

Analytical approaches varied according to the research questions and study designs. Content analysis and thematic analysis were common approaches to qualitative data, while quantitative studies employed statistical techniques including ANOVA, ANCOVA, regression, multilevel modeling, and latent profile analysis. Mixed-methods studies combined qualitative and quantitative analyses, as illustrated by P12, which used descriptive statistics, correlations, and one-way ANOVA alongside inductive thematic analysis. P44 (Schunk et al., 2022), a randomized controlled field study, used regression-based analyses to examine intervention outcomes, while P47 (de Acedo Lizarraga et al., 2003) used ANCOVA and t-tests. Overall, the methodological diversity of the included studies reflects the use of both descriptive and intervention-based approaches to investigate how teachers promote SRL in K-12 education.

RQ3. Contextual and learner characteristics of the included studies

Figure 3 presents the distribution of the 47 selected studies published between 2000 and 2026.

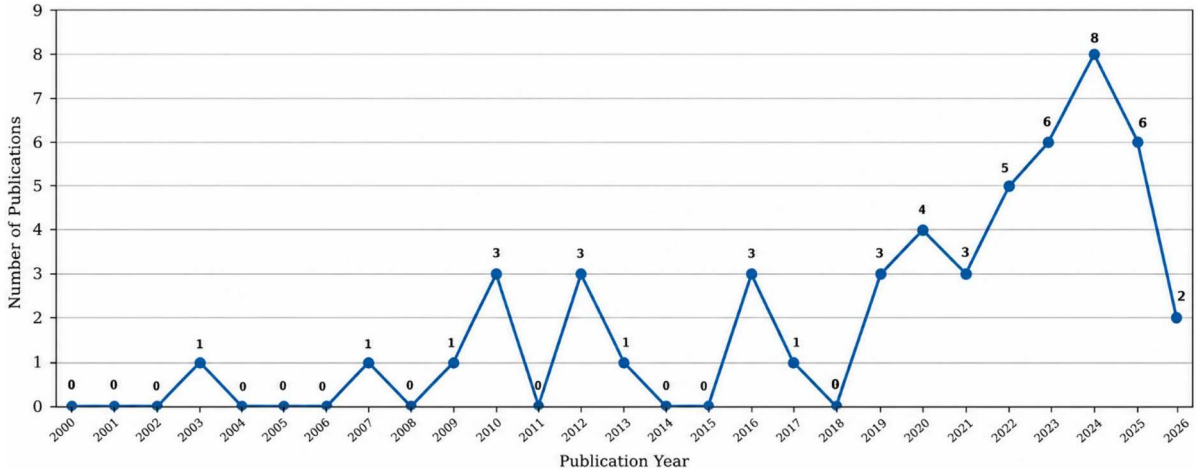


Figure 3. Distribution of publication years of selected studies.

Table 3. Research designs and data collection tools of the selected studies.

Publication No	Research design	Data collection tool	Data analysis method
P1	Qualitative Study	Observation Sheets & Final Sheets	Content Analysis
P2	Quantitative Survey Study	Perceived Knowledge of Self-Regulatory Strategies Questionnaire & Inventory of Self-regulatory Learning Processes	ANOVA & T-test
P3	Mixed Method Study	A Survey Including Open-ended Questions & A Demographics Survey	Content Analysis & Linear Regression
P4	Quantitative Study	Ratings of Dart Throwing Performance & Self-efficacy, Satisfaction & Intrinsic Motivation	MANOVA
P5	Qualitative Case Study	Classroom Observations & Classroom Documentation & Teacher Interviews	Content Analysis
P6	Qualitative Case Study	Classroom Observations & Semi-Structured Interviews	Content Analysis
P7	Qualitative Case Study	Video-based classroom observations & Semi-Structured Interviews	Content Analysis
P8	Qualitative Study	Classroom Observations & Semi-Structured Interviews	Content Analysis
P9	Mixed Method Study	Self-Regulated Teacher Belief Scale & Interviews & Observations	Descriptive Statistics & Content Analysis
P10	Qualitative Study	Video-based classroom observations	Content Analysis
P11	Quasi experimental research design	Self-Regulated Learning Questionnaire & Mathematics Test & Structured Learning Diaries	MANCOVA
P12	Mixed-methods study	Adapted Self-Regulated Learning Opportunities Questionnaire (SRLOQ); three open-ended questions; demographic items	SPSS-based quantitative analysis (descriptive statistics, correlations, one-way ANOVA); inductive thematic analysis of open-ended responses
P13	Quantitative cross-sectional survey study	Student self-reports: Questionnaire for Self-Regulated Learning (FSL-7); adapted Parenting Behaviors and Dimensions Questionnaire (PBDQ); Teacher's Interaction Styles scale; student academic achievement/SES indicators	Descriptive statistics and correlations; confirmatory factor analysis; latent profile analysis (R/Mplus)
P14	Quasi-experimental intervention study with three measurement points	Student self-report questionnaires on SRL strategies and academic performance; on-task measure	Longitudinal between-group analyses across three measurement points
P15	Comparative quantitative study (teacher-selected experimental and control groups)	Modified Motivated Strategies for Learning Questionnaire (MSLQ) and Achievement Emotions Questionnaire (AEQ); science knowledge test	Kolmogorov–Smirnov and Kruskal–Wallis tests; Mann–Whitney tests; linear regression
P16	Randomized controlled field trial with pretest, posttest, and follow-up	24-item student SRL questionnaire; standardized Frankfurter Leseverständnistest (FLVT); implementation/treatment-integrity information and teacher reports	Multilevel analyses using Mplus to estimate posttest and follow-up outcomes
P17	Instrumental case study across four Dutch secondary schools	School guides, policy/vision documents and websites; lesson observations and field notes; semi-structured and cued teacher interviews	Content analysis of documents; interview coding and thematic analysis in ATLAS.ti; iterative within-case and cross-case comparison
P18	Qualitative Study	Semi-structured Interviews	Content Analysis
P19	Mixed Method Study	Classroom Observation & Math Achievement Test	Content Analysis & Regression Analysis
P20	Quasi experimental research design	SRL Questionnaire & Math Achievement Test & German Achievement Test & Teachers' Training Evaluation	Cohen's d & ARIMA model
P21	Quantitative Study	Self-Regulated Reading-To-Write Scale & The Writing Self-Efficacy Scale and Reading Self-Efficacy Scale & Writing Competence Test	MANOVA
P22	Mixed Method Case Study	Classroom Observations & Document Review & Student Work Samples & Experience Sampling and Reflection Form & Student Engagement Instrument & Interviews	Descriptive Statistics & Content Analysis
P23	Case Study	SRL survey & Classroom Observations & Group Interviews	Descriptive Statistics & Content Analysis
P24	Case Study	Classroom Observations	Content Analysis
P25	Longitudinal Study with a Mixed Method Triangulation Approach	Classroom Observations & students' Self-assessments & Students' Writing processes & Products from Teacher-researcher Co-constructed Writing task	Content Analysis & Descriptive Statistics & Chi-square & Phi Co-efficient & Mann Whitney U
P26	Qualitative Case Study	Interviews & Classroom Observations & Informal Conversations	Content Analysis
P27	Quasi experimental research design	Self-Regulated Learning Teacher Belief Scale & Student Measures (Demographic information & SRL task & Self-reports)	ANOVA & ANCOVA

(*Continued*)

Table 3. Continued.

Publication No	Research design	Data collection tool	Data analysis method
P28	Quasi experimental research design	Video-Based Classroom Observations	ANCOVA
P29	Quasi experimental research design	Teacher Ratings & Self-Report Questionnaires & Think-Aloud Protocols	Descriptive Analysis & Hierarchical Cluster Analysis & ANOVA
P30	Longitudinal Study	Student Questionnaires & Parent Ratings & Standardized Achievement & Test Scores and Students' School Grades in Mathematics	Multilevel Latent Basis Growth Models
P31	Qualitative Case Study	Semi-Structured Interviews & Classroom Observations	Content Analysis
P32	Experimental design	Writing prompts	ANCOVA
P33	Quantitative Study	Self- Regulated Learning Inventory for Teachers & Students' grades	Multivariate Analysis Techniques
P34	Case Study	A Survey for the Teachers & Classroom Observation Ratings & Academic Volitional Strategy Inventory	Descriptive Statistics & Content Analysis
P35	Case Study	Running Record for Direct Classroom Observations & Student with VI Self-report Questionnaire & Classroom Teacher Self-report Questionnaire	Descriptive Statistics & Content Analysis
P36	Mixed Method Study	Student–teacher SRL questionnaire (T-SQsrl) & two rubrics developed to evaluate the development of reflective skill as indicators of SRL in students and SRL&T in teachers & interviews, written reflections, and ongoing WhatsApp discussions	ANOVA & Grounded Thematic Analysis
P37	Mixed Method Study	Writing Anxiety Test & Semi-Structured Interviews	ANCOVA & Content Analysis
P38	Quasi-experimental design	An adapted Rubric & Learning Attitude Scale	MANCOVA
P39	Quasi-experimental design	Self-reported Surveys	Mixed linear modeling analysis
P40	Qualitative Case Study	Semi-structured Interviews and Classroom Observations	Content Analysis
P41	Qualitative Case Study	Semi-structured Interviews	Content Analysis
P42	Quasi-experimental design	Surveys and Tests	ANOVA
P43	Mixed-methods case study	Role-modeling lesson plans evaluated with a researcher-developed rubric; trainer feedback; revised lesson plans; online student products	Quantitative rubric analysis; qualitative content/thematic analysis
P44	Randomized controlled field study	Child self-regulation and impulse-control measures; computer-based reading assessment; teacher assessments of reading and careless mistakes; later school-track enrollment records	Regression/least-squares models with school fixed effects and controls for baseline outcomes and other covariates
P45	Instructional intervention study	Experience Sampling Form (student self-reports of goals, concentration, and confidence); student mathematics work samples	Examination of trends and changes in self-reported perseverance and work-sample indicators
P46	Microanalysis with a cross-case comparative design (two cases)	Structured SRL microanalytic interviews adapted from Miksza's self-report measure; weekly practice tools; questioning during weekly lessons for practice/fidelity checks	Descriptive statistics, line graphs, and within-case and cross-case comparisons
P47	Quasi-experimental pretest–posttest design with experimental and control groups	Standardized measures: Learning Strategy Scales, EPIJ Personality Questionnaire scales, BAS-3 Social Scale; researcher-developed Teacher's ikReport Questionnaire	ANCOVA; pretest comparisons using t-tests; pre–post teacher-report comparisons using t-tests

Although the search period began in 2000, the earliest study that was found eligible was in 2003. Publication activity increased notably after 2019, indicating growing research attention to teacher practices for promoting self-regulated learning (SRL) in K-12 education in recent years.

The included studies were categorized according to the educational levels represented in their learner samples: elementary school (Grades 1–5), middle school (Grades 6–8), and high school (Grades 9–12), including studies that covered multiple educational levels. As shown in Figure 4, elementary school was the most frequently represented category, with 23 studies. Nine studies included learners from both elementary and middle school, while seven focused on middle school. Six studies included high school learners, and one study (P19) spanned middle and high school. One additional study (P47) included learners from elementary, middle, and high school. The categories were mutually exclusive: each study was assigned to a single category according to the educational levels represented in its sample. Studies previously classified as primary school were incorporated into the elementary school category. Overall, the distribution indicates

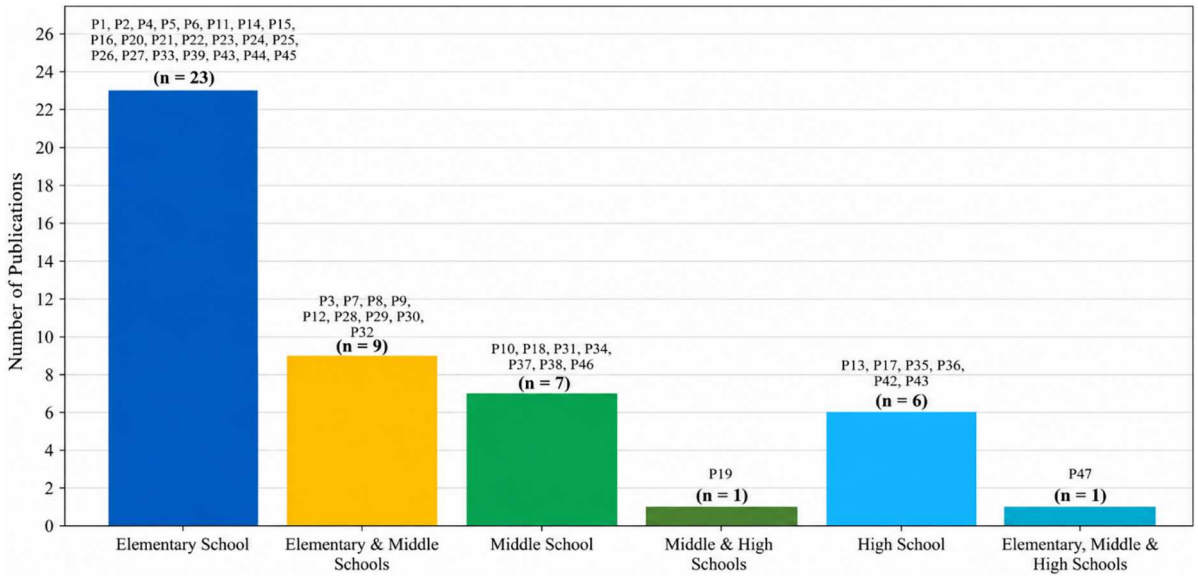


Figure 4. The samples of the selected publications.

that the reviewed literature predominantly addressed elementary-level learners, while fewer studies focused on middle and high school or examined learners across multiple educational levels.

Discussion

This systematic review synthesized evidence from 47 empirical studies published between 2000 and 2026 to examine teacher practices that promote self-regulated learning (SRL) in K-12 education, the research methods used to investigate these practices, and the educational contexts and learner populations represented in the literature. Overall, the findings suggest that teachers can support SRL through complementary instructional practices that address Zimmerman's cyclical phases of forethought, performance, and self-reflection (Zimmerman, 2000, 2002, p. 2011). These practices range from explicit strategy instruction, modeling, goal setting, monitoring, and reflection to the creation of supportive classroom environments, meaningful learning opportunities, and collaborative interactions. The reviewed studies also demonstrate the importance of considering co-regulation and socially shared regulation (SSRL) alongside individual SRL (Hadwin et al., 2017; Panadero & Järvelä, 2015). The predominance of practices directed toward the performance phase may partly reflect the greater visibility of students' strategy use, task engagement, and monitoring compared with the less observable cognitive and motivational processes involved in planning and reflection. Nevertheless, studies addressing goal setting, self-assessment, and reflection show that supporting SRL requires attention to the entire learning cycle rather than focusing exclusively on students' behavior during task completion (Callan et al., 2022; Ferreira & Simão, 2012; Kolovelonis et al., 2010; *Perry et al., 2002; Schuler et al., 2024; Spruce & Bol, 2015; Vandevelde et al., 2017). The additional studies further broaden this evidence base: Adıgüzel et al. (2023) examined the use of role modeling to teach self-regulation, Schunk et al. (2022) investigated a structured approach combining mental contrasting with implementation intentions, Wilburne and Dause (2017) focused on goal setting and self-monitoring during mathematical problem solving, Kabrick and Duffin (2026) examined a framework for teaching self-regulation in private violin instruction, and de Acedo Lizarraga et al. (2003) investigated an intervention integrating self-regulation strategies with social skills. Collectively, these studies reinforce the view that SRL is not a single technique but a set of processes that teachers can make visible, scaffold, and adapt to the demands of different learning activities and contexts.

A key contribution of this review is its synthesis of specific teacher practices rather than broad recommendations to promote learner autonomy or provide feedback. Direct practices include modeling regulatory thinking, explicitly teaching strategies, setting goals, monitoring progress, prompting self-assessment, and guiding reflection. For example, Adıgüzel et al. (2023) examined role modeling as a means of making

self-regulatory thinking more visible to learners, while Wilburne and Dause (2017) explored goal setting and self-monitoring to support perseverance in mathematical problem solving. Schunk et al. (2022) investigated mental contrasting combined with implementation intentions in a first-grade curriculum, illustrating how teachers can incorporate structured planning and action-oriented strategies into ordinary classroom instruction. Kabrick and Duffin (2026) extended this discussion beyond conventional classroom subjects by examining the PPLEA framework (Planning, Performing, Listening, Evaluating, and Acting) in private violin instruction. This study highlights the potential value of structuring practice and feedback around recurring opportunities to plan, perform, listen, evaluate, and adjust subsequent action. These examples complement previous findings on modeling, strategy instruction, feedback, and metacognitive support (Callan et al., 2022; Kolovelonis et al., 2010; Perry et al., 2020; Spruce & Bol, 2015). They also suggest that SRL-supportive instruction can be adapted to different subjects and performance contexts, although the evidence does not establish that a particular approach will be equally effective across educational levels or disciplines.

Direct strategy instruction, however, represents only one part of SRL-supportive teaching. Indirect practices shape the conditions in which students can exercise regulatory agency, including the provision of meaningful choices, appropriately challenging tasks, authentic learning experiences, constructive teacher–student interactions, and opportunities for collaboration. Such practices may support SRL by creating opportunities for students to set or pursue goals, make decisions, monitor progress, seek assistance, and reflect on their learning. Previous studies have highlighted the role of authentic learning activities, co-constructed assessment criteria, and feedback that helps students understand not only what they have achieved but also how they might improve (Peel, 2020; Perry et al., 2020). Technology-supported practices also provide opportunities to support monitoring, feedback, and engagement, although the presence of technology alone does not establish that SRL is being promoted. Its pedagogical value depends on how digital tools are incorporated into instructional activities and whether they help learners plan, monitor, evaluate, or adapt their learning (Chen & Feng, 2026; Cueli et al., 2017; Fütterer et al., 2026; Wong et al., 2020). The newer studies add examples of structured instructional support, including role modeling (Adıgüzel et al., 2023), mental contrasting and implementation intentions (Schunk et al., 2022), and guided planning and evaluation in music instruction (Kabrick & Duffin, 2026). These findings suggest that direct and indirect practices are complementary: explicit instruction can help learners understand regulatory strategies, while supportive tasks, feedback, and classroom interactions create opportunities to apply those strategies. Nevertheless, the studies vary in design and outcome measures, so the identification of a practice should not be interpreted as evidence of its effectiveness in every context.

The findings also highlight the need to distinguish individual SRL from co-regulation and SSRL. Co-regulation involves support through which another person, such as a teacher or peer, helps a learner regulate their learning, whereas SSRL involves the regulation of a shared activity through jointly negotiated goals, monitoring, and adaptation (Hadwin et al., 2017; Panadero & Järvelä, 2015). Collaboration or group work does not necessarily constitute SSRL: students may work together while regulating their learning individually, and peer interaction may involve information sharing without joint regulation of the task. Therefore, these categories should be assigned only when the study provides evidence of the relevant regulatory processes. The reviewed literature suggests that teachers can scaffold regulation through questioning, modeling, feedback, and structured interaction, gradually enabling students to assume greater responsibility for their learning (Perry & Rahim, 2011; White & DiBenedetto, 2015; Zimmerman, 2002). This interpretation is consistent with the view that regulatory competence develops through interactions among cognitive, metacognitive, motivational, behavioral, and emotional processes (Panadero, 2017). It also cautions against treating self-regulation as an exclusively individual capacity: depending on the task and instructional context, regulation may be supported by teachers, peers, and shared learning structures. Future studies should therefore specify whether they examine individual SRL, teacher-supported co-regulation, or regulation of a genuinely shared task, and should report how the relevant processes were operationalized and observed.

Inclusive education is another important consideration, although the evidence base remains limited. Alraddadi and Zebehazy (2025) examined how general classroom teachers in a Saudi Arabian secondary school used practices framed by SRL to support the inclusion of students with visual impairments. Drawing on classroom observations and teacher self-report, the study found that the teachers provided limited opportunities at a depth sufficient to promote inclusion and support students' SRL development. The authors emphasized the importance of targeted professional development, reconciling differences in

perceptions of inclusion, and empowering students with visual impairments to become active learners. This study illustrates that the presence of a learner with a disability in a general classroom does not automatically ensure access to meaningful participation or SRL-supportive teaching. de Acedo Lizarraga et al. (2003) offer a complementary perspective relevant to inclusive education. Their quasi-experimental study involved 40 middle-school students who experienced difficulties with self-reflection, self-inquiry, assertiveness, and empathy. The intervention used a Portfolio program to teach self-regulation strategies and social skills over the school year. The researchers reported significant differences between experimental and control groups on the measured criteria, including self-regulation and aspects of social functioning. Although the study did not identify its participants as students with formally diagnosed disabilities, it is relevant to inclusive pedagogy because it demonstrates how structured self-regulatory activities can be designed to address varied learning and social-emotional needs. It also broadens the discussion beyond academic strategy use by connecting regulation with communication, interpersonal behavior, and consideration for others. These two studies should not be treated as equivalent evidence: Alraddadi and Zebehazy (2025) directly examined inclusion for students with visual impairments, whereas de de Acedo Lizarraga et al. (2003) focused on students experiencing difficulties in self-regulation and social skills. Together, they support the importance of attending to learner diversity while underscoring the need for more research that directly investigates SRL-oriented teaching with learners with disabilities and in diverse inclusive settings.

The review also identifies methodological and contextual limitations that affect how the findings should be interpreted. The included studies used diverse research designs, data sources, and analytical approaches, ranging from qualitative and case-based investigations of classroom practice to surveys, quasi-experimental interventions, and randomized field studies. Qualitative studies can provide detailed accounts of teacher decisions, classroom interactions, and the ways practices are enacted in context, whereas quantitative and intervention studies can examine measured changes in regulatory processes and associated outcomes. For example, Schunk et al. (2022) used a randomized field design to investigate a structured intervention in first-grade classrooms; Wilburne and Dause (2017) examined self-regulation strategies in mathematical problem solving; and de Acedo Lizarraga et al. (2003) used a quasi-experimental pretest–posttest design to investigate changes in self-regulation and social skills. Kabrick and Duffin (2026), in contrast, used a small-scale case-based approach to examine the enactment of a self-regulation framework in private violin lessons. These studies answer different kinds of questions and should not be treated as providing equivalent evidence. In particular, evidence that a practice was implemented, evidence that students' regulatory processes changed, and evidence of improvements in academic outcomes are distinct. Studies reporting implementation or teacher perceptions can illuminate instructional processes but do not by themselves establish student-level effects; studies reporting changes in student measures provide more direct outcome evidence, but the strength of causal interpretation depends on the design, measurement quality, comparison conditions, and analysis. Mixed, null, or context-specific findings are therefore important to retain in the synthesis rather than interpreting all reported practices as uniformly successful. Further research would benefit from transparent reporting of intervention components, implementation fidelity, teacher support, measurement properties, and follow-up outcomes, alongside analyses of the conditions under which practices are feasible and useful.

Publication patterns and sample characteristics further indicate where the evidence base is concentrated and where important gaps remain. The studies included in this review span 2003–2026, with research activity increasing in more recent years. The concentration of research in elementary education is consistent with arguments for introducing SRL early, while the comparatively limited evidence from secondary education makes it difficult to determine how instructional practices should be adapted to increasingly specialized subject matter and adolescent learning demands (Dignath & Büttner, 2008; Panadero & Järvelä, 20151; Schunk & Greene, 2017; Wang, 2021; Zimmerman, 2011). The inclusion of studies from mathematical problem solving, early-grade curricula, and music instruction illustrates the diversity of contexts in which SRL practices have been investigated (Kabrick & Duffin, 2026; Schunk et al., 2022; Wilburne & Dause, 2017). At the same time, a broader range of disciplinary settings and learner populations is needed before conclusions can be drawn about the transferability of particular practices. The limited number of studies directly examining disability and inclusive education is especially important: it restricts the extent to which the review can make claims about the effectiveness or suitability of SRL-oriented practices for specific disability groups. Similarly, although teacher expertise, professional learning, and institutional conditions are plausible influences on implementation, claims about school-wide

support and structural barriers should be linked to evidence from the included studies rather than assumed to apply uniformly across contexts. Future research should investigate how teacher preparation, curriculum expectations, time, resources, and collaboration with specialist professionals shape the enactment and sustainability of SRL-supportive practices.

Taken together, this review provides a descriptive synthesis of how SRL-oriented teacher practices have been conceptualized and investigated in K-12 education. The findings indicate that SRL support encompasses explicit teaching of regulatory strategies as well as the design of tasks, feedback, interactions, and learning environments that enable students to exercise agency. They also show the importance of differentiating individual self-regulation from co-regulation and SSRL, and of distinguishing the implementation of a practice from evidence of changes in regulatory processes or academic outcomes. The additional studies strengthen the range of examples available across classroom curricula, mathematical problem solving, music instruction, and social-emotional learning, while also reinforcing the methodological heterogeneity of the evidence. However, the review does not establish that all identified practices are equally effective or that their outcomes generalize across learner populations and educational settings. Further work should use clearly specified regulatory frameworks, rigorous and context-sensitive designs, and more direct investigation of inclusive and secondary education. Such research could strengthen understanding of how teachers can adapt SRL-supportive instruction to learners' needs and how these practices can be sustained in everyday educational settings.

On a final note, it is important to state that although some identified practices, such as student choice, collaboration, and supportive classroom environments, are also features of effective pedagogy more broadly, their relevance to SRL lies in the regulatory processes they support. Student choice can promote goal setting and strategic decision-making; collaboration can facilitate co-regulation or socially shared regulation when learners regulate their learning individually with assistance or jointly as a group; and supportive environments can encourage help-seeking, persistence, and reflection. Similarly, feedback and instructional scaffolding support SRL when they help learners monitor progress, evaluate performance, and adjust their strategies (Hadwin et al., 2017; Panadero & Järvelä, 2015; Zimmerman, 2002, p. 2011). Thus, these practices are considered SRL-supportive not simply because they reflect good teaching, but because of their connection to learners' regulatory processes.

Conclusion

This systematic review synthesized 47 empirical studies examining teacher practices intended to support self-regulated learning (SRL) in K-12 education. Research in this area has expanded since 2007, with a particularly notable increase after 2019. However, the evidence base remains concentrated in elementary education, with fewer studies addressing secondary education, inclusive settings, and diverse educational contexts. The reviewed studies identified a range of direct and indirect approaches to supporting SRL, including explicit strategy instruction, goal setting, self-monitoring, reflection and self-assessment, strategy-focused feedback, student choice, collaborative learning, and instructional scaffolding. These practices can be understood in relation to the forethought, performance, and self-reflection phases of Zimmerman's cyclical model, while some also involve co-regulation between teachers and learners. Collaborative activity alone, however, does not establish that socially shared regulation of learning (SSRL) occurred.

The findings should be interpreted in light of the methodological characteristics of the included studies. The implementation of SRL-oriented practices, changes in students' regulatory processes, and improvements in academic outcomes are distinct forms of evidence and should not be treated as interchangeable. Although some studies reported promising findings, the available evidence does not support a uniform conclusion about the effectiveness of all identified practices across contexts or learner populations. In particular, the small number of studies involving learners with disabilities limits the conclusions that can be drawn about SRL-oriented teaching in inclusive education.

Taken together, this review provides a descriptive synthesis of teacher practices investigated in empirical K-12 research and clarifies how these practices relate to cyclical SRL and interpersonal forms of regulation. The findings suggest that teacher education and professional learning could give greater attention to explicit strategy instruction, opportunities for learners to monitor and reflect on their learning, and the purposeful use of feedback and scaffolding. Future research should employ transparent and rigorous designs, examine

both regulatory processes and academic outcomes, report mixed or null findings, and include more diverse educational levels and learner populations. It should also investigate how external instructional support interacts with learners' own regulatory activity, including when and how teacher guidance enables learners to assume greater responsibility for regulating their learning.

Limitations and suggestions for future research

This review has several limitations. It included only peer-reviewed journal articles retrieved from five databases, excluding gray literature. It also focused exclusively on face-to-face instruction, and the findings may vary under alternative coding frameworks. Future reviews should incorporate gray literature, compare SRL-supportive practices across face-to-face, online, and blended learning environments, and examine differences between general and special education, particularly given the limited evidence from inclusive settings. A further limitation is that this review mapped teacher practices and instructional contexts that may support SRL but did not directly examine the interaction between students' personal regulation and external regulation provided by teachers or learning environments. The SRL–ERL perspective offers a useful direction for extending this work by investigating how these regulatory processes combine to support or constrain learning (de la Fuente-Arias, 2017; de la Fuente & Kauffman, 2026). Future research should examine these interactions in K-12 settings, including how different levels of learner regulation and regulatory teaching relate to students' engagement, learning processes, and outcomes over time. Also, only one of the included studies examined generative AI as a tool for supporting SRL. Future research should investigate how teachers can integrate AI-supported feedback, metacognitive prompts, and reflection activities into SRL-oriented instruction, while ensuring that learners critically evaluate AI-generated guidance and retain responsibility for regulating their own learning.

Author contributions

CRediT: **Seda Aydan:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing; **Christoforos Mamas:** Conceptualization, Data curation, Formal analysis, Methodology, Supervision, Writing – original draft.

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No potential conflict of interest was reported by the author(s).

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