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RECEIVED 04 December 2024

ACCEPTED 28 July 2025

PUBLISHED 12 August 2025

CITATION

Xu KM, Leferink J and Wijnia L (2025) A review of the relationship between student growth mindset and self-regulated learning. *Front. Educ.* 10:1539639. doi: 10.3389/feduc.2025.1539639

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A review of the relationship between student growth mindset and self-regulated learning

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Self-regulation is a crucial life skill. In particular, self-regulated learning (SRL) is an important factor in achieving academic success. Recent research has studied the association between SRL and growth mindset, a belief that emphasizes the importance of effort, perseverance, and the use of SRL strategies. Although recent research indicates positive associations, some findings are contradictory. This review systematically synthesized recent literature on the relationship between students' growth mindset and SRL in educational settings (e.g., school, college and university students), based on 10 peer-reviewed empirical studies with 15 samples published in English between 2010 and 2023. The studies were coded using a coding scheme. All studies examined a direct relationship between a growth mindset and SRL. The results showed that having a growth mindset is positively associated with SRL strategies overall ($r = 0.40$). The systematic review then revealed that there are positive associations across all phases of SRL, although with substantial variation in the strengths of the association across studies (also supported by Q statistic, $p < 0.001$). The results further suggest that the operationalization of mindset measures and socioeconomic disadvantage may moderate the association between mindset and SRL; however, more research is needed on the moderating and mediating factors that affect the relationship between growth mindset and SRL strategy use. These findings suggest that promoting a growth mindset could be a promising factor in interventions designed to foster SRL. Future research could further explore this area of research by taking into account how different contexts and conditions influence this relationship, for example, whether this relationship vary for growth mindset in different school subjects.

KEYWORDS

systematic review, motivation, self-regulated learning, growth mindset, academic achievement

1 Introduction

Self-regulation is considered a crucial life skill. It refers to individuals' ability to consciously direct their attention, thoughts, emotions, and behaviors toward personal goals across various domains (Inzlicht et al., 2021). High levels of self-regulation predict better academic achievement, greater professional success and fulfillment, higher income, stronger personal relationships, and better health (Burnette et al., 2013; De Ridder et al., 2012; Duckworth et al., 2011). In the context of academic settings, self-regulation is referred to as self-regulated learning (SRL). Research indicates that many learners struggle to regulate their learning process effectively (Bjork et al., 2013; Zimmerman, 2002; Zimmerman and Moylan, 2009). A lack of SRL can negatively impact academic performance (Blackwell et al., 2007; Kizilcec et al., 2017; Yeager and Dweck, 2020).

Growth mindset has emerged as a promising factor regarding enhancing learners' ability to self-regulate their learning (Burnette et al., 2013). A growth mindset is the belief that

personal qualities, such as intellectual skills, can be developed through practice and effort (Yeager and Dweck, 2020). The growth mindset theory was initially formulated as implicit theory of intelligence, describing individuals' view on the malleability of their intelligence (Hong et al., 1995). An incremental view (i.e., a growth mindset) considers intelligence to be malleable with effort and practice, whereas an entity view considers intelligence to be fixed. The growth mindset can affect academic achievement through a variety of channels related to SRL strategies (Forbes-McKay et al., 2025), such as motivation (Burnette et al., 2013), perseverance (Lou and Noels, 2016), the use of deep processing strategies (Grant and Dweck, 2003), and understanding the importance of self-testing (Yan et al., 2014). The reasoning behind the assumed association between a growth mindset and SRL is that learners with a growth mindset are more likely to invest effort and practice in their learning process (Yeager and Dweck, 2020). Furthermore, motivational beliefs also play an integral role in the SRL process, as they can promote and initiate the use of SRL strategies. The SRL process, especially learning strategies such as self-testing (Pan et al., 2024), requires a considerable amount of effort and practice. Since a growth mindset fosters a belief in the value of effort, it is plausible that learners with a growth mindset are also more likely to be self-regulated learners in their use of effective learning strategies.

Recent studies showed a positive relationship between a growth mindset and SRL (e.g., Bai et al., 2021; Bai and Wang, 2021; Hertel and Karlen, 2021). In an influential review, Burnette et al. (2013) also reported a significant link between a growth mindset and self-regulation in several domains, while emphasizing the need to investigate the role of moderators that can affect this relationship, such as academic risk status (Sisk et al., 2018).

The current systematic review aims to address the central research question: What is the relationship between students' growth mindset and SRL in schools, colleges, and universities; and what is the potential moderating effect of low prior achievement for this association? While Burnette et al. (2013) examined self-regulation across various domains, to our knowledge, no recent review has specifically focused on the relationship between a student's growth mindset and SRL within educational settings (e.g., school, college and university students). This is a relevant gap, as SRL is an important factor in academic success (Zimmerman, 2002). Focusing on educational contexts provides clearer guidelines for further research and educational practice that aim to improve student learning. This review further extends prior research by identifying potential factors (such as low prior achievement) that can affect the relationship between students' mindset and SRL. The findings may offer a foundation for designing effective interventions to foster SRL skills through the cultivation of a growth mindset.

1.1 Self-regulated learning

The SRL is generally viewed as a proactive process that learners apply to acquire academic skills, such as setting goals, selecting and deploying strategies, and self-monitoring their effectiveness, rather than being a reactive process that happens to students due to external, impersonal forces (Zimmerman, 2008). As Winne (2018) noted, during SRL, the learner is in charge. To better understand SRL, researchers have proposed several theoretical models (for a review, see Panadero, 2017). These models provide basic conceptual frameworks

for understanding the cognitive, metacognitive, motivational, and emotional aspects of SRL. In a review of the SRL models, Panadero (2017) identified four assumptions that most SRL models share: (a) learners are active participants in their learning process, (b) learners can monitor, control, and regulate aspects of their cognition, motivation, emotion, and behavior, (c) there is a goal or standard that allows learners to compare their learning progress, and (d) self-regulation of cognition, motivation, emotion, and behavior mediates the relationships between the individual, the context, and the final learning achievement.

In the last two decades, one of the most widely used models to describe the concept of SRL has been the framework proposed by Zimmerman (2002). He proposed a three-phase cyclical model in which learners apply different SRL strategies, consisting of a forethought phase, a performance phase, and a self-reflection phase. The forethought phase involves processes that learners perform to analyze tasks, define learning goals, plan activities, and self-motivate their learning process. The performance phase includes processes that learners perform to self-monitor and self-control themselves while carrying out tasks to achieve their goals. Finally, in the self-reflection phase, learners self-evaluate their learning process and take actions to help them achieve their learning goals in the future.

In this model, it is important to note that, due to the cyclical interdependence, self-regulatory processes can become self-sustaining, as processes and beliefs in each phase create inertia that can facilitate learning efforts during subsequent phases (Zimmerman and Moylan, 2009). Furthermore, Zimmerman and Moylan (2009) stated that any comprehensive account of a learner's self-regulatory efforts should include their motivational beliefs and feelings about learning at various points during cyclical feedback loops. Thus, these motivational beliefs are seen as both a cause and an effect of students' efforts to learn. In line with this reasoning, a learner's mindset could act as a motivational belief that impacts their aptitude for SRL, as outlined in the following sections.

1.2 Growth mindset

Mindsets are motivational beliefs about whether personal qualities, such as intelligence or extraversion, are fixed or malleable (Dweck, 2008). These beliefs exist along a continuum between two opposing poles: a fixed mindset (entity belief) and a growth mindset (incremental belief). Individuals with a fixed mindset view a given quality as an immutable trait ("you have got what you have got"), whereas those with a growth mindset see it as something that can be developed through learning and effort. Although mindset beliefs tend to be relatively stable over time, they can also be situationally induced (Robins and Pals, 2002).

Research has examined mindsets across various domains, including intellectual, physical, managerial, and personality domains (Burnette et al., 2013; Dweck and Molden, 2005; Paunesku et al., 2015). Findings generally show that students with a growth mindset tend to embrace effort, persist in the face of challenges, and engage actively in learning processes (Burnette et al., 2013). In contrast, students with a fixed mindset are more likely to believe that their abilities are predetermined and unchangeable, often leading to maladaptive learning behaviors such as avoidance, procrastination,

and disengagement when confronted with difficulties (Dweck, 2006; Dweck and Leggett, 1988).

Building on this foundation, Yeager and Dweck (2020) proposed that learners with a growth mindset believe intellectual abilities can be developed through practice and perseverance. SRL itself can be a challenging process. Some learning strategies, for example retrieval practice, although effective, can be quite effortful (Agarwal et al., 2021). Mindset may affect the belief related to SRL (Hertel and Karlen, 2021), such as the use of learning strategies. Students with a fixed mindset might see SRL strategies as unnecessary or ineffective, assuming that success primarily depends on innate ability. In contrast, students with a growth mindset are more likely to recognize the importance of SRL strategies, appreciating their role in overcoming learning challenges and achieving academic success through thoughtful and sustained effort (Hertel and Karlen, 2021).

In their systematic literature review, Burnette et al. (2013) found mixed evidence regarding the positive association between a growth mindset and self-regulation processes in both academic and non-academic domains. While some studies reported positive effects (Kray and Haselhuhn, 2007; Nussbaum and Dweck, 2008; Thompson and Musket, 2005), others found no effects (Biddle et al., 2003; Doron et al., 2009; Ommundsen et al., 2005), or even negative effects (Bråten and Strømsø, 2005). These mixed findings might be explained by several factors, such as domain of study and the conceptualization of self-regulation. Regarding domain, Burnette et al. (2013) observed that association between growth mindset and self-regulation tended to be stronger in non-academic settings (e.g., sport, work, and health) compared to academic settings. However, as noted by Yeager and Dweck (2020), interventions in educational contexts often yield relatively small effects (e.g., Platte et al., 2025), as single variables like growth mindset typically have limited impact amid the considerable variability present in real-world academic environments. Moreover, SRL is a complex, multidimensional construct, often examined across subprocesses corresponding to different phases, such as forethought, performance, and self-reflection, with motivation as an important part across all the phases (Zimmerman, 2002). In line with this perspective, a growth mindset may be particularly associated with goal-setting strategies (forethought phase), goal operating and monitoring (performance phase) within SRL or with the use of cognitive and metacognitive strategies (performance phase; Burnette et al., 2013; Karlen et al., 2021).

1.3 Growth mindset and goal-related SRL strategies

Burnette et al. (2013) reviewed literature across diverse domains (68% academic but also other contexts such as weight loss and dieting). They found that a growth mindset is linked to higher engagement in various goal-related self-regulation strategies, such as goal setting (or goal orientation adoption), goal operating, and goal monitoring.

Goal setting involves establishing specific reference points or desired end states and is connected to the forethought phase (Carver and Scheier, 1982; Moskowitz and Grant, 2009; Zimmerman, 2002). Goals can be specific to tasks, but can also encompass broad motivational tendencies, such as goal orientations. The types of goals individuals pursue can also be shaped by their mindset (Dweck and

Leggett, 1988). Learners with a growth mindset are more likely to set goals and adopt mastery-oriented goals, aiming to develop their competence and deepen their understanding, whereas those with a fixed mindset tend not to set goals, or prioritize performance-oriented goals, focusing on demonstrating ability and avoiding signs of incompetence (Burnette et al., 2013; Dweck and Leggett, 1988; Elliot and McGregor, 2001).

Goal operating is a self-regulation process whereby individuals engage in activities directed toward achieving their goals (Burnette et al., 2013; Carver and Scheier, 1998) and can be linked to the performance phase of SRL (Zimmerman, 2002). Burnette et al.'s (2013) review has shown that goal operating is positively and significantly associated with a growth mindset, meaning that individuals with a growth mindset are more inclined to employ mastery-oriented learning strategies, which involve seeking out challenging tasks and the maintenance of effective striving under failure. In contrast, individuals leaning toward a fixed mindset are more likely to adopt helpless-oriented strategies, such as giving up quickly in the face of obstacles or avoiding challenges (Dweck and Leggett, 1988). These strategies reflect a belief that their abilities are fixed and cannot be improved through effort. Therefore, goal operating can be viewed as the process by which individuals adjust their behaviors and strategies to achieve their goals.

Goal monitoring involves considering potential constraints on, and available resources for, achieving success and takes place during the performance phase of SRL (Carver and Scheier, 1982; Zimmerman, 2002). Burnette et al. (2013) identified several studies that found significant, positive associations between a learner's growth mindset and goal monitoring. Goal monitoring plays an important role in SRL because it helps reveal what an individual has or has not accomplished, which also helps in identifying the most appropriate strategies for the subsequent learning process. For example, consider a case where the goal of a student in an economics program is to start a business as part of a course. A student with a growth mindset might evaluate potential challenges that could hinder the business's success. This student might also actively seek help and ask advice from mentors and explore various solutions to address the challenges they face and be determined to learn from any setbacks. In contrast, another student with a fixed mindset might accept the obstacles and avoid addressing them properly, thus poorly monitor their learning process and ultimately does not complete the learning goal.

1.4 Growth mindset and metacognitive and cognitive strategies

There has also been research that investigated the relationship between metacognition and mindset (Karlen et al., 2021). Metacognition—defined as thinking about one's thinking—is essential across all SRL but particularly important in the performance phase, where learners assess and adjust their learning progress (Panadero, 2017; Zimmerman, 2002). It involves higher-order processes used to monitor and control task-related activities and shapes how learners select and apply effective SRL strategies (Flavell, 1979; Nelson and Narens, 1994). Through metacognitive strategies, students can plan, monitor, and evaluate their learning activities, which in turn supports the effective use of other SRL strategies

(Karlen et al., 2021; Pintrich, 1999; Zimmerman, 2002). Closely related to metacognitive strategies are cognitive strategies, such as mnemonics and self-testing (also known as retrieval practice). These strategies focus on the rehearsal, elaboration, and organization of information to support the acquisition and retention of knowledge (Pintrich, 1999, 2004).

A growth mindset could affect both meta-cognitive and cognitive strategies. Effort perceptions might be a pivoting aspect (Xu et al., 2021a,b; Xu et al., 2024). Learning strategies such as planning and self-testing are effort-intensive (Karpicke et al., 2009). It is possible that the important role of effort for a growth mindset can help students adopt these strategies. For instance, a student with a growth mindset is willing to invest effort thus might engage in deeper cognitive learning strategies that relate new material to prior knowledge or personal experiences to achieve a richer understanding. In contrast, a student with a fixed mindset might avoid making an effort, thus choosing to focus narrowly on shallow strategies such as rereading learning content expected to appear on an exam.

1.5 Influencing factors for the relationship between growth mindset and SRL

There might be potential mediating or moderating factors that influence the relationship between growth mindset and SRL (Burnette et al., 2013), such as having low achievement levels (SES; Dweck and Leggett, 1988; Paunesku et al., 2015; Sisk et al., 2018).

It was also suggested that learners who are at greater academic risk (e.g., lower achievement) benefit the most from mindset interventions (Sisk et al., 2018). Paunesku et al. (2015) found that a growth mindset intervention significantly improved academic performance, particularly among low-achieving students. Therefore, it is important to explore the moderating role of lower academic achievement.

In summary, the present study aims to review prior studies that have examined the association between a learner's growth mindset and their use of self-regulated learning (SRL) strategies (Burnette et al., 2013) in schools, colleges, and universities. The research questions of the current systematic literature review thus are: What is the relationship between students' growth mindset and SRL in schools, colleges, and universities; and what is the potential moderating effect of low prior achievement for this association?

2 Method

2.1 Search strategy

The search strategy used for this systematic literature review was designed to comprehensively identify relevant studies that examine the relationship between a growth mindset and the development of self-regulation skills for learners within an academic context. To ensure the review of the literature was comprehensive, studies were searched for using the EBSCOhost platform. The chosen databases for the search included APA PsycInfo, eBook Collection, eBook Open Access Collection, ERIC, Library Information Science & Technology Abstracts, Psychology and Behavioral Sciences Collection, OpenDissertations, CINAHL, Business Source Complete, and

Academic Search Premier. These databases were selected due to their extensive coverage of scientific literature in the fields of psychology and education, and related disciplines. The primary search terms included "growth mindset" and "self-regulated learning." Variations of these terms were included to broaden the scope of the search, as outlined in Table 1.

2.1.1 Inclusion and exclusion criteria

The inclusion and exclusion criteria regarding participants, educational context, data, outcome measures, and study method were applied during the selection process (see Table 2). The search was conducted using only reputable databases, which are known for their coverage of high-quality research in psychology and education. The two-step screening process (a title/abstract review followed by a full-text review) ensured the relevance and transparency of the selected studies.

2.1.2 Study identification and selection process

A graphical representation of this process is shown in Figure 1. In the initial phase of this research, relevant studies were identified through comprehensive searches in the aforementioned scholarly databases. This resulted in an initial count of 639 studies from eight distinct databases, as further outlined in Appendix A. The selected studies were then assessed based on a process consisting of two steps. First, the 364 remaining articles, after duplicate removal, were screened based on their titles and abstracts. Articles were excluded if no direct relationship was described between a growth mindset and SRL, resulting in the exclusion of 331 articles. In the second step, 33 articles were assessed for eligibility. The full-text versions of these articles were thoroughly screened based on the inclusion and exclusion criteria presented in Table 2. This led to the exclusion of 25 articles, with reasons for these exclusions specified. The primary search resulted in 10 articles that were included in the final review, as shown in Figure 1.

A backward search was then conducted on the reference lists of the eight final articles resulting from the primary search. This backward search followed the same steps of identification and screening as the primary search. First, 634 references were identified based on the nine final articles from the primary search. All these articles were then screened based on their titles and abstracts to assess the potential relationship between a growth mindset and SRL. This resulted in the exclusion of 627 articles from further research. Seven articles were then assessed for eligibility and subjected to a thorough examination based on the applied inclusion and exclusion criteria. This process led to the identification of two additional articles that met the predetermined criteria, which were added to the final set of studies included in the review. The primary search and backward search together resulted in 10 articles being selected for the final review.

TABLE 1 Search terms used in databases.

Abstract	Abstract
Growth mindset* OR fixed mindset* OR incremental OR entity OR implicit theories of intelligence OR Dweck	AND Self-regulat* OR SRL OR selfregulat* OR selfregulated learning OR self-control OR selfcontrol OR Zimmerman

TABLE 2 Inclusion and exclusion criteria.

Category	Inclusion criteria	Exclusion criteria	Rationale
1. Publication type	Full text of a peer-reviewed journal article, paper, or book.	No full paper available, or not peer-reviewed research.	Ensures the reliability and credibility of the sources included in the review.
2. Publication language	The publication is in English.	The publication is not in English.	Practical considerations for the scope of the review.
3. Participants	Samples of learners from all age groups, education levels, and educational contexts.	Participants outside of a school setting.	Ensures a broad range of studies and strong generalizability across diverse research populations.
4. Educational context	The study is based on a sample of learners within an academic context.	The study is not based on a sample of learners within an academic context.	Specifies the scope of the review of relevant literature and promotes generalizability.
5. Date	Published between November 2010 and October 2023.	Published before November 2010 or after October 2023.	Specifies the scope of recent literature to build on Burnette et al. (2013) after October 2010.
6. Outcome measures	The study examines the direct association between a growth mindset and SRL.	The study does not examine the direct association between a growth mindset and SRL.	Specifies the scope of the research to directly address the main research question.
7. Method	SRL was measured with instruments with proper reliability (e.g., Cronbach's $\alpha > 0.60$).	SRL was not measured with validated instruments, or reliability of instruments was weak (Cronbach's $\alpha < 0.60$).	Ensures the inclusion only of studies with strong methodological foundations, enhancing the quality of the review.

2.2 Coding and data analysis

Data from the 10 selected studies were analyzed through a comprehensive review and coded using the template presented in [Appendix B](#). For each study, the following information was recorded: the research report, objectives, study setting and treatment, a description of participants per sample, and details of any control group. Regarding the constructs of growth mindset, self-regulation, and influencing factors, the scales used were coded, the specific items included, and the reported reliability of these measures.

The SRL strategies were categorized into the forethought, performance, or self-reflection phases, following [Zimmerman and Moylan's \(2009\)](#) framework. Categorization was based on either the authors' descriptions or the definitions and items reported in the studies (see [Appendix C](#)). When a measure appeared to span multiple SRL phases, it was coded as "all phases/general SRL."

For each study's results, the reported associations were coded between mindset and SRL, including the direction and size of the effects. Effect sizes were interpreted using [Cohen's \(1988, 1992\)](#) benchmarks for Pearson's r , with values of at least 0.10 considered small, 0.30 medium, and 0.50 large. Correlations below 0.10 were considered negligible.

To estimate the overall relationship between growth mindset and SRL, Comprehensive Meta-Analysis software was used (Version 4.0; [Borenstein et al., 2009](#)) and applied a random-effects model based on reported correlations and sample sizes. When a study reported multiple correlations between growth mindset or implicit theory and SRL outcomes, a combined mean effect size was calculated. Average correlations per SRL phase was also computed. Heterogeneity across studies was assessed using the Q and I^2 statistics ([Borenstein et al., 2009](#); [Higgins and Thompson, 2002](#)), with I^2 values interpreted as low (25%), moderate (50%), or high (75%) heterogeneity.

3 Results

This section presents the results of the 10 included studies. An overview of the main results of the studies is presented in [Table 3](#). In

some cases, studies reported results for multiple studies ([Karlen and Compagnoni, 2017](#)) or subgroups ([Bai and Guo, 2021](#); [Townley-Flores et al., 2022](#)), resulting in a total of 15 samples across the 10 studies. To answer the main research question, firstly, the mean correlation across the 10 studies was calculated to estimate the overall association between mindset and SRL. For studies that reported multiple correlations between growth mindset or implicit theory and SRL, a combined mean correlation was calculated before inclusion in the meta-analysis. The overall analysis yielded a medium-sized correlation of $r = 0.40$, 95% CI [0.31, 0.48]. However, the effect showed substantial heterogeneity, $Q(14) = 497.71$, $p < 0.001$, $I^2 = 97.19$, suggesting considerable variation between studies and the presence of potential moderating factors (e.g., by focusing on the specific SRL phase that was examined; [Table 3](#)).

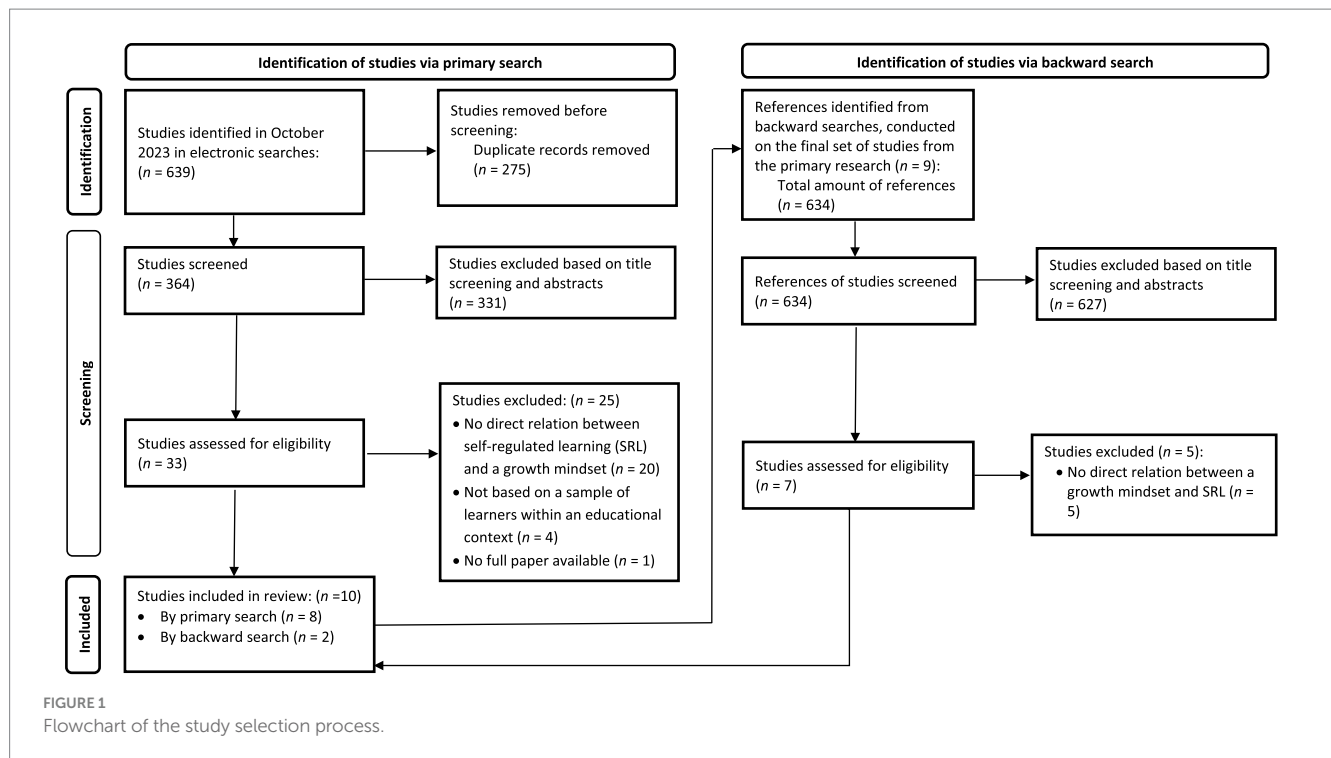
Given that the study by [Compagnoni et al. \(2019\)](#) reported a low reliability for the growth mindset measure (Cronbach's $\alpha = 0.51$), a sensitivity analysis was conducted by excluding this study. The resulting mean correlation remained similar, $r = 0.41$, 95% CI [0.32, 0.49], confirming the robustness of the finding. Despite the low reliability, this study was retained in the main analysis due to its unique contribution in offering insights into the relationship between mindset and SRL in kindergarten.

3.1 What is the relationship between students' growth mindset and SRL in schools, colleges, and universities?

In the following paragraphs, results will be discussed regarding the relationship between a growth mindset and specific SRL strategies within the three phases of the SRL process: the forethought phase, the performance phase, and the self-reflection phase.

3.1.1 Forethought phase

Five studies (7 samples) examined the relationship between a growth mindset and SRL strategies in the forethought phase of SRL ([Bai et al., 2021](#); [Bai and Guo, 2021](#); [Bai and Wang, 2021, 2023](#); [Karlen and Compagnoni, 2017](#)). Planning was investigated in four studies



(Bai et al., 2021; Bai and Guo, 2021; Bai and Wang, 2021; Karlen and Compagnoni, 2017), planning combined with goal setting was investigated in one study (Bai and Wang, 2023), and two studies investigated self-initiating in the context of writing, which refers to strategies aimed at improving writing outside of the formal school context (Bai et al., 2021; Bai and Wang, 2021). All five studies reported positive correlations between having a growth mindset and the use of forethought-phase SRL strategies, suggesting that when learners believe that their abilities are malleable, they are more likely to plan their work in advance, set goals, and practice skills in their free time (i.e., self-initiating strategies). Combining the studies resulted in a large correlation of $r = 0.55$ (95% CI [0.48, 0.61]).

3.1.2 Performance phase

The association between growth mindset and SRL strategies used during the performance phase of SRL was investigated in 8 out of 10 studies (see Table 3). A range of SRL strategies were examined within this phase, with metacognitive strategies—such as monitoring and subsequent control of learning processes—being the most frequently studied (7 studies). Cognitive learning strategies were examined in four studies, while only one or two studies addressed less commonly studied strategies, such as feedback seeking, effort regulation, motivation regulation, and resource management.

Although correlations ranged from negligible to large, when combined, these studies yielded a medium-sized, positive correlation of $r = 0.49$, 95% CI [0.36, 0.60], between having a growth mindset and engaging in performance-related SRL strategies. This suggests that learners with a growth mindset are generally more likely to monitor and control their learning, apply cognitive learning strategies (including text generation), manage their time and learning environment, consult with peers, regulate their motivation and effort,

and actively seek feedback (Bai et al., 2021; Bai and Guo, 2021; Bai and Wang, 2021, 2023; Compagnoni et al., 2019; Hertel and Karlen, 2021; Karlen and Compagnoni, 2017; Xu, 2022).

Two studies warrant further discussion due to their distinctive approaches. While most studies conceptualized mindset as a single continuum—with higher scores reflecting stronger growth mindset beliefs—Xu (2022) analyzed growth and fixed mindsets as separate constructs. Xu (2022) found a medium-sized positive correlation between growth mindset and feedback seeking, whereas fixed mindset was unrelated to feedback seeking and significantly associated with feedback avoidance (see Table 3). These results suggest that higher levels of growth mindset have a stronger effect on SRL, indicating a possible positive interaction effect of mindset.

Hertel and Karlen (2021) also added nuance by distinguishing between two types of mindset beliefs: a domain-specific implicit theory of SRL and a more general implicit theory of intelligence. Their findings indicated that implicit theories of SRL were more strongly associated with SRL behaviors than were implicit theories of intelligence. Moreover, the correlation between the two belief types was negligible ($r = 0.07$), suggesting that they represent conceptually distinct constructs.

3.1.3 Self-reflection phase

Four studies examined the link between a growth mindset and SRL strategies in the self-reflection phase of SRL (Bai et al., 2021; Bai and Guo, 2021; Bai and Wang, 2021; Karlen and Compagnoni, 2017). Combined, the studies resulted in a large correlation of $r = 0.52$ (95% CI [0.41, 0.61]), suggesting that students with a growth mindset are more likely to engage in evaluation strategies and revisions, as well as act on feedback.

TABLE 3 Overview of study results concerning the relationship between mindset and self-regulated learning (SRL).

#	Study	Country	Level and subject	N	Analyses	Mindset	SRL	SRL phase	Effect sizes (r)	
1	Xu (2022)	China (Chonqing)	Higher education; English writing	311	Correlation and path analysis	Growth mindset in L2 learning ($\alpha = 0.75$)	Feedback seeking orientation	Performance	0.33	Medium
							Feedback avoiding orientation ^b	Performance	−0.15	Small
							Cognitive strategies	Performance	0.40	Medium
							Metacognitive strategies	Performance	0.43	Medium
							Social behavior strategies	Performance	0.28	Small
							Motivational regulation strategies	Performance	0.47	Medium
						Fixed mindset in L2 learning ($\alpha = 0.89$) ^a	Feedback seeking orientation	Performance	0.01	Negligible
							Feedback avoiding orientation	Performance	0.27	Small
							Cognitive strategies	Performance	0.01	Negligible
							Metacognitive strategies	Performance	0.03	Negligible
							Social behavior strategies	Performance	0.06	Negligible
							Motivational regulation strategies	Performance	0.03	Negligible
2	Bai and Wang (2021)	China (Hong Kong)	Secondary school (8th grade); English writing	540	Correlation and SEM	Growth mindset in English writing ($\alpha = 0.84$)	Planning	Forethought	0.53	Large
							Self-initiating	Forethought	0.56	Large
							Text-generating	Performance	0.47	Medium
							Self-monitoring	Performance	0.59	Large
							Revising	Self-reflection	0.49	Medium
							Acting on feedback	Self-reflection	0.48	Medium
3	Bai et al. (2021)	China (Hong Kong)	Primary school (4th grade); English writing	511	Correlation and SEM	Growth mindset in English writing ($\alpha = 0.89$)	Planning	Forethought	0.53	Large
							Self-initiating	Forethought	0.52	Large
							Text-generating	Performance	0.53	Large
							Self-monitoring	Performance	0.53	Large
							Revising	Self-reflection	0.51	Large
							Acting on feedback	Self-reflection	0.51	Large
							Collaborative learning	All phases	0.38	Medium
4a	Bai and Guo (2021) – High Achievers	China (Hong Kong)	Primary school (4th grade); English writing	141	Correlation and SEM	Growth mindset in English writing ($\alpha = 0.89$)	Planning	Forethought	0.62	Large
							Self-monitoring	Performance	0.67	Large
							Acting on feedback	Self-reflection	0.60	Large
4b	Bai and Guo (2021) – Average Achievers	China (Hong Kong)	Primary school (4th grade); English writing	241	Correlation and SEM	Growth mindset in English writing ($\alpha = 0.89$)	Planning	Forethought	0.57	Large
							Self-monitoring	Performance	0.63	Large
							Acting on feedback	Self-reflection	0.62	Large

(Continued)

TABLE 3 (Continued)

#	Study	Country	Level and subject	N	Analyses	Mindset	SRL	SRL phase	Effect sizes (r)	
4c	Bai and Guo (2021) – Low Achievers	China (Hong Kong)	Primary school (4th grade); English writing	141	Correlation and SEM	Growth mindset in English writing ($\alpha = 0.89$)	Planning	Forethought	0.66	Large
							Self-monitoring	Performance	0.71	Large
							Acting on feedback	Self-reflection	0.64	Large
5	Bai and Wang (2023)	China (Hong Kong)	Primary school (4th grade); English learning	690	Correlation and SEM	Growth mindset in English learning ($\alpha = 0.88$)	Goal setting and planning	Forethought	0.58	Large
							Monitoring	Performance	0.63	Large
							Effort regulation	Performance	0.74	Large
6a	Townley-Flores et al. (2022) – Low-Risk	USA	4th–8th grade; learning in general	7,144	Correlation and path analysis	Growth mindset of intelligence ($\alpha = 0.72$)	Self-regulation	All phases	0.30	Medium
6b	Townley-Flores et al. (2022) – FRPM	USA	4th–8th grade; learning in general	9,009	Correlation and path analysis	Growth mindset of intelligence ($\alpha = 0.68$)	Self-regulation	All phases	0.18	Small
6c	Townley-Flores et al. (2022) – HHM	USA	4th–8th grade; learning in general	779	Correlation and path analysis	Growth mindset of intelligence ($\alpha = 0.65$)	Self-regulation	All phases	0.11	Small
7a	Karlen and Compagnoni (2017) – Study 1	Switzerland	Higher education; academic writing	49	Correlation	Implicit theory of writing ability ($\alpha = 0.68$)	Metacognitive strategy knowledge	All phases	0.42	Medium
7b	Karlen and Compagnoni (2017) – Study 2	Switzerland	Higher education; academic writing	113	Correlation and path analysis	Implicit theory of writing ability ($\alpha = 0.80$)	Metacognitive strategy knowledge	All phases	0.34	Medium
							Planning strategies	Forethought	0.21	Small
							Monitoring strategies	Performance	0.20	Small
							Evaluation strategies	Self-reflection	0.12	Small
8	Karlen et al. (2021)	Switzerland	Lower secondary school; learning in general	225	Correlations and path analysis	Growth mindset about SRL ($\alpha = 0.68$)	Strategy knowledge (researcher-coded)	All phases	0.21	Small
9	Compagnoni et al. (2019)	Switzerland	Kindergarten; classroom behavior	147	Correlation, ANOVA, and SEM	Growth mindset of ability ($\alpha = 0.51$)	Classroom behavioral self-regulation (teacher-reported)	Performance	0.18	Small

(Continued)

TABLE 3 (Continued)

#	Study	Country	Level and subject	N	Analyses	Mindset	SRL	SRL phase	Effect sizes (r)	
10	Hertel and Karlen (2021)	Germany	Higher education; learning in general	254	Correlation and regression	Implicit theory of malleability of SRL ($\alpha = 0.89$)	Metacognitive knowledge	All phases	0.27	Small
							Cognitive learning strategies	Performance	0.11	Small
							Metacognitive learning strategies	Performance	0.35	Medium
							Resource management strategies	Performance	0.11	Small
						Implicit theory of relevance of SRL ($\alpha = 0.86$) ^a	Metacognitive knowledge	All phases	0.08	Negligible
							Cognitive learning strategies	Performance	0.18	Small
							Metacognitive learning strategies	Performance	0.19	Small
							Resource management strategies	Performance	0.16	Small
						Implicit theory of malleability of intelligence ($\alpha = 0.87$)	Metacognitive knowledge	All phases	0.02	Negligible
							Cognitive learning strategies	Performance	0.15	Small
							Metacognitive learning strategies	Performance	0.04	Negligible
							Resource management strategies	Performance	0.04	Negligible
						Implicit theory of relevance of intelligence ($\alpha = 0.89$)	Metacognitive knowledge	All phases	0.07	Negligible
							Cognitive learning strategies	Performance	0.08	Negligible
							Metacognitive learning strategies	Performance	0.15	Small
							Resource management strategies	Performance	0.09	Negligible

α = Cronbach's alpha; SEM, structural equation modeling; FRPM, students receiving free and reduced price meals; HHM, students identified as homeless and highly-mobile.
^aAll other correlations expressed the relationships between growth mindset or malleability beliefs and SRL; therefore, these correlations between fixed mindset and SRL and between implicit theories of relevance were not included when calculating the mean correlation across studies.
^bA negative correlation between a growth mindset and feedback avoidance is viewed as a positive effect.

In summary, a growth mindset was positively associated with SRL strategies across all three phases of the learning cycle, with moderate to large correlations ranging from $r = 0.49$ in the performance phase to $r = 0.55$ in the forethought phase.

3.2 What are the potential moderating effect of low prior achievement for this association?

In the introduction, low prior achievement was identified as potential academic risk factors. Few studies examined the role of achievement levels (Bai and Guo, 2021). Bai and Guo (2021) explored these associations separately for low, average, and high achievers. Across all three groups, a growth mindset was positively associated with the three examined SRL strategies in both the correlation and SEM analyses, suggesting that having a growth mindset may positively influence SRL strategy use regardless of achievement level. Although differences in the strength of these associations between groups were not statistically tested, the magnitude seemed comparable, thus indicating a lack of moderating effect for achievement.

4 Discussion and conclusion

This study has examined the nuanced dynamics of the relationship between a growth mindset and SRL. Our results revealed that, overall, the studies resulted in a medium-sized correlation between growth mindset and SRL. Below, the results are discussed concerning the association between a growth mindset and specific SRL strategies within the three phases of the SRL process—forethought, performance, and self-reflection.

4.1 To what extent is a growth mindset associated with different phases of SRL?

4.1.1 Forethought phase

All of the examined SRL strategies in the forethought phase were found to be positively and significantly associated with having a growth mindset in recent research. Learners with a growth mindset are more likely to plan their work and set specific study goals (Bai et al., 2021; Bai and Guo, 2021; Bai and Wang, 2021, 2023; Karlen and Compagnoni, 2017), resulting in a combined large correlation of $r = 0.55$. A growth mindset seems to invoke the initial stage of the SRL process through which a learner is able to set a goal and make plans for the learning process to take place. From the perspective of achievement goal orientation, learners with a growth mindset are more likely to adopt mastery goals, which focus on improving knowledge and skills (see Dweck and Leggett, 1988), in line with the knowledge acquisition nature of self-regulated processes of learning. Findings from the present review align with previous research indicating that students who believe that intelligence can be developed are more engaged in goal setting and the forethought phase (Burnette et al., 2013).

4.1.2 Performance phase

Many of the included studies examined the relationship between a growth mindset and performance-phase strategies. Various strategies were examined, but overall the results showed that learners with a growth mindset were more likely to monitor and control their learning process, apply cognitive learning strategies, regulate their motivation and effort, and actively seek feedback (Bai et al., 2021; Bai and Guo, 2021; Bai and Wang, 2021, 2023; Compagnoni et al., 2019; Hertel and Karlen, 2021; Karlen and Compagnoni, 2017; Xu, 2022).

However, the strength of the associations between mindset and SRL strategies varied considerably across studies (see Table 3). For instance, when examining self-monitoring, Karlen and Compagnoni (2017) reported a small correlation, whereas Bai and Wang (2023) found a large one. Overall, the correlations reported by Bai et al. (2021), Bai and Guo (2021), and Bai and Wang (2021, 2023) in Hong Kong samples during the performance phase were consistently larger than those reported by Karlen and Compagnoni (2017) and Hertel and Karlen (2021) in German and Swiss samples.

These discrepancies may partly reflect cultural and societal influences as well as differences in how mindset was operationalized. Prior research suggests that cross-cultural differences in motivation exist (Lo et al., 2024; Xu et al., 2021a) and that the effects of a growth mindset on student outcomes can vary across cultural contexts (Dong and Kang, 2022; Lou and Li, 2023). In Confucian-influenced societies, such as China, effortful learning is highly valued (Tweed and Lehman, 2002), yet students tend to endorse more fixed views of intelligence than their Western peers (Lou and Li, 2023; Sun et al., 2021). Notably, Wang and Ng (2012) found that Chinese secondary students distinguished between beliefs about intelligence and beliefs about school performance, viewing the latter as more malleable. Echoing this, Lou and Li (2023) argued that students in Asian contexts may hold growth-oriented beliefs about academic performance while maintaining relatively fixed views of intelligence, captured in the notion: “I can make an effort to improve my test score, but I cannot change my fundamental intelligence” (p. 137). Consistent with this distinction, the studies by Bai et al. (2021), Bai and Guo (2021), and Bai and Wang (2021, 2023) focused on growth mindset in relation to performance, specifically in English language learning and writing, rather than on general beliefs about the malleability of intelligence and ability.

Furthermore, the studies by Xu (2022) and Hertel and Karlen (2021) suggested that the way mindset is operationalized may influence its observed associations with SRL. Typically, mindset is measured along a continuum from fixed to growth, with fixed mindset items reverse-coded to reflect a growth orientation (Yeager and Dweck, 2020). However, some researchers argued that fixed and growth mindset items may capture distinct constructs and relate differently to outcomes such as learning engagement and self-efficacy (Grüning et al., 2024). Supporting this view, Xu (2022) found that when growth and fixed mindsets were measured separately, they showed different patterns of association with SRL strategies of the performance phase. In addition, Hertel and Karlen (2021) emphasized the importance of considering the domain-specificity of mindset. This view is supported by other studies, which show that mindset can vary across academic domains (Chan et al., 2022; Diederich and Spatz, 2024). Taken together, these findings highlight that both the structure and content of mindset measures—such as whether growth and fixed mindsets are assessed separately and whether the measure is

domain-general or domain-specific—can affect whether and how mindset relates to student outcomes.

4.1.3 Self-reflection phase

Few of the included studies specifically examined the relationship between a growth mindset and the use of SRL strategies during the self-reflection phase. When the results were aggregated, the average correlation was large, yet substantial variation existed across studies. For instance, [Bai et al. \(2021\)](#), [Bai and Guo \(2021\)](#), and [Bai and Wang \(2021\)](#) reported medium to large correlations, suggesting that primary and secondary school students with a growth mindset were more likely to revise their work and act on feedback. In contrast, [Karlen and Compagnoni \(2017\)](#) found only a small correlation between growth mindset and the use of evaluation strategies among higher education students.

Several explanations may account for these discrepancies. First, as noted earlier, cultural differences in the value placed on effortful learning may play a role ([Tweed and Lehman, 2002](#); [Lou and Li, 2023](#)). Second, [Karlen and Compagnoni \(2017\)](#) themselves noted that their evaluation strategies scale may have captured relatively superficial revision behaviors—strategies that might be employed regardless of students' mindset. In contrast, the studies by Bai and colleagues used more specific measures focused on meaningful revision and acting on feedback, potentially providing a more sensitive assessment of self-reflection processes. Third, individual differences in how students process and act on feedback may also contribute to the variation in findings. Some students may receive feedback but not engage with it meaningfully, whereas others may actively use it to revise their work ([Bouwter and Dirkx, 2023](#)), highlighting the importance of distinguishing between feedback reception and its actual use. Finally, differences in educational level may have influenced the results. While [Bai et al. \(2021\)](#), [Bai and Guo \(2021\)](#), and [Bai and Wang, 2021](#) focused on primary and secondary students, [Karlen and Compagnoni \(2017\)](#) investigated university students, who may be expected to take greater initiative in revising their work. This higher level of autonomy may weaken the observable link between mindset and revision behavior in older students.

4.2 Limitations and practical implications

This systematic review aimed to examine the relationship between a growth mindset and SRL by synthesizing recent research. However, the small number of included studies ($N = 10$) limited the depth of analyses in some areas. For instance, there was limited data on the connection between a growth mindset and SRL strategies related to the self-reflection phase as well as the role of potential moderators influencing the relationship between mindset and SRL. Drawing conclusions from such a limited dataset increases the risk of bias and reduces the reliability of findings ([Lilienfeld, 2017](#)). Nevertheless, the results may serve as a valuable starting point for further research to refine and expand our understanding of how mindset and SRL interact.

A second limitation concerns the geographic and authorship concentration of the included studies. Many focused on related constructs within similar cultural contexts and came from just two main research groups. Four studies were conducted in Hong Kong ([Bai et al., 2021](#); [Bai and Wang, 2021, 2023](#); [Bai and Guo, 2021](#)), primarily investigating SRL strategies in English writing. Another four

were based on Swiss and German samples ([Compagnoni et al., 2019](#); [Hertel and Karlen, 2021](#); [Karlen et al., 2021](#); [Karlen and Compagnoni, 2017](#)), focusing on the general SRL or the role of metacognitive (strategy) knowledge. While the role of cultural differences was addressed in our discussion, the concentration of studies in specific contexts limits the generalizability of the findings. Future research should include more diverse cultural and educational settings and compare the relationships across cultures (e.g., [Lo et al., 2024](#)) to determine whether the associations between growth mindset and SRL strategies hold across different populations.

Although our review highlights generally positive associations between growth mindset and SRL strategies, critiques have emerged regarding the overall impact of growth mindset on academic outcomes. [Sisk et al. \(2018\)](#) found only a weak overall correlation between mindset and academic achievement ($r = 0.10$), with substantial heterogeneity across studies. Their meta-analysis of mindset interventions revealed a small average effect on academic performance ($d = 0.08$), with many studies reporting null effects. Notably, none of the individual studies included in their analysis showed an effect size larger than $d = 0.35$, and all effect sizes fell well below the average effect size of $d = 0.57$ observed in some of other forms of educational interventions ([Hattie et al., 1996](#)). [Sisk et al. \(2018\)](#) concluded that mindset interventions may offer limited benefits overall and that only students from low socioeconomic backgrounds or those at academic risk may benefit; however, even this subgroup effect should be interpreted with caution. Similarly, [Macnamara and Burgoyne \(2023\)](#) reported a small effect of mindset interventions on academic achievement ($d = 0.05$), which became non-significant after adjusting for publication bias. They found no evidence that intervention effects varied by socioeconomic status or other potential moderators, further challenging the robustness of claims about the effectiveness of mindset interventions in educational settings.

In response to these critiques, [Yeager and Dweck \(2020\)](#) argued that focusing on null findings can be misleading. They argued for the importance of developing specific hypotheses about heterogeneity to better detect where and for whom mindset effects occur. They also questioned the benchmark of $d = 0.57$ proposed by [Sisk et al. \(2018\)](#), noting that it reflects short-term effects, whereas longer-term follow-ups often show a decline in effect sizes to around $d = 0.10$ ([Hattie et al., 1996](#); [Yeager and Dweck, 2020](#)).

Some promising findings suggest that mindset interventions can be more effective when specifically targeted. For example, [Mrazek et al. \(2018\)](#) found that promoting growth mindsets related to self-regulation improved students' appraisal and exertion of effort. Given the ongoing debate about the effectiveness of mindset interventions, further research is needed to determine whether—and under what conditions—interventions targeting growth mindsets for SRL are effective. As [Yeager and Dweck \(2020\)](#) emphasized, meaningful interventions require a deep understanding of the growth mindset construct. Without such understanding, there is a risk that educators and policymakers will invest in superficial or ineffective approaches.

The current review also highlights a recent shift in the literature—from general assessments of growth mindset to domain-specific approaches focused on SRL (e.g., [Hertel and Karlen, 2021](#); [Karlen and Compagnoni, 2017](#)), and the need to distinguish between fixed and growth mindset beliefs ([Grüning et al., 2024](#); [Xu, 2022](#)). Future studies

should examine how the measurement of mindset—particularly in terms of domain specificity, separate assessment of growth and fixed beliefs, and perceived relevance—influences its relationship with SRL. A domain-specific approach may improve the precision and validity of findings on students' motivational and regulatory behavior. Drawing on the theoretical framework by Robins and Pals (2002), which suggests that mindset beliefs are generally stable but context-sensitive, a growth mindset is suggested to be inherently domain-specific. For example, a student may believe that their abilities in mathematics can grow through effort, but hold fixed beliefs about their potential in English. This perspective aligns with Yeager and Dweck's (2020) recommendation that educators fully understand the complexity of growth mindset before implementing interventions. Consequently, professional development and mindset programs should emphasize contextual sensitivity and avoid one-size-fits-all solutions.

The diverse measurement of mindset and SRL could also be a confounding factor in the results. The differences in these measurement instruments could mean that specific measures are more sensitive to changes than others in general or for specific areas, thus studies using these instruments would appear to yield stronger effect sizes. Future studies on the psychometric properties of mindset and SRL can provide valuable insights regarding the specific features of different measurements, thus providing useful information for review studies on related topics.

Relatedly, the result could also be confounded by the low literacy rates of participants from low SES families or schools (Salas and Pascual, 2023). If an accurate understanding of the growth mindset or SRL measurement becomes an issue, then the low reliability of the instruments could potentially lower the effect sizes observed in the sample. Future studies should investigate the effect of literacy levels in low SES student populations.

4.3 Conclusion

In conclusion, this systematic review shows that a growth mindset is typically positively associated with SRL in academic settings. However, as this is an evolving field of research, much remains to be learned about how a growth mindset interacts with various SRL strategies, as well as possible factors influencing this relationship. Building on growth mindset theory, researchers and teachers are therefore encouraged to explore this topic with an open mind and with curiosity, and to embrace opportunities for further learning and discovery.

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KX: Conceptualization, Methodology, Supervision, Writing – review & editing. JL: Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft. LW: Methodology, Supervision, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research and/or publication of this article.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2025.1539639/full#supplementary-material>

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