

REVIEW

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Teachers' intelligence mindset and teaching practices: a systematic review

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Abstract

The different beliefs or assumptions teachers have about themselves and their students greatly influence their expectations, teaching methods, and how students view their own mindsets, and there is a scarcity of in-depth reviews that focus on how teachers' intelligence mindsets affect their teaching methods and the possible impact on the learning environment. In this systematic review, we investigated how intelligence mindset influences teaching experiences. In contrast to previous reviews that highlighted intervention effects or student outcomes, this review takes a process-oriented perspective and synthesizes how teachers' intelligence mindsets manifest in their affective dispositions, instructional practices, and professional development. Following the PRISMA framework, we collected data systematically from SCOPUS and Web of Science databases and imported the extracted studies into RAYYAN to review the titles and abstracts of each study against the inclusion/exclusion criteria. Of the 1615 studies, we selected 24 studies published between 2017 and 2024 for the systematic review. The majority of the studies employed quantitative designs and were conducted across diverse educational contexts, particularly in Asia and Europe. The findings of this systematic review emphasize the significant influence of teachers' intelligence mindsets on multiple aspects of teaching methods, classroom participation, and professional growth. Three main themes emerged from the review— affective constructs, pedagogical implementation, and transformative growth—illustrating how intelligence mindsets shape teaching practices. The findings suggest that teachers with a growth mindset see significant enhancements in emotional interactions, strengthen their teaching practices, and foster transformative development. These outcomes highlight the broad impact of cultivating a growth mindset, as it not only shapes teachers' attitudes but also improves their instructional practices and personal growth.

Keywords Teachers' intelligence mindset, Growth mindset, Teaching, Systematic review, Quality education

1 Introduction

Teachers' beliefs are central to the type of teaching and learning that emerges in classrooms. Within these beliefs, teachers' implicit theories about intelligence (teachers' intelligence mindset) have recently received much attention in educational research, as



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they may shape what teachers think, say, and do in relation to students, classrooms, and their own professional development. Drawing on Dweck's [9] implicit theories approach, intelligence mindset is defined as individuals' beliefs about the malleability of intelligence, often characterized along a continuum from fixed to growth-oriented beliefs.

While growth mindset has frequently been studied as a learner characteristic, growing evidence indicates that teachers' intelligence mindsets serve as an essential cognitive-motivational lens through which teachers perceive students' abilities, confront classroom challenges, and deliver pedagogical practices [30]. From such a perspective, teachers' mindsets function as wider belief systems that impact not only their choices about pedagogy but also feedback practices, expectations, and interpretations of student effort and failure [14]. Recent studies demonstrate that these beliefs are also rooted in classroom and school contexts and shape the learning environments teachers establish and into which students have an opportunity to experience challenge and growth [31].

In educational settings, teachers' intelligence mindset is not only a personal belief but can also serve as a pedagogical motive. Research on teacher cognition and beliefs has suggested that these decisions are rarely neutral; they are mediated by teachers' underlying beliefs about learning, ability, and change [47, 55]. Intelligence mindset, from this point of view, can be identified as such a mechanism shaping teachers' pedagogical orientations: those who hold higher levels of growth-based belief tend to interpret the difficulties experienced by their students as challenges for improvement and embrace appropriate teaching strategies in return; they also cultivate performance on effort-oriented classroom cultures, whereas teachers with more fixed beliefs may emphasize performance outcomes and ability-based judgments [65].

The theoretical backgrounds in educational psychology shed additional light on the mechanism underlying teachers' intelligence mindset to teaching practice. According to attribution theory, beliefs about the causes of success and failure influence instructional responses to student performance, especially when students have difficulty [9]. This directly explains why they would subsequently implement teaching practices such as offering differentiated instruction, encouraging persistence, or providing process-oriented feedback, all of which are designed to develop controllable aspects [13, 27].

In the same vein, self-determination theory also explains that teachers' beliefs shape their autonomy-supportive and controlling teaching behaviors, which in turn influence students' motivation and engagement [45]. Since teachers with growth mindsets perceive learning as an incremental and improvable process, they are more inclined to experiment with instructional practices, prioritize feedback that emphasizes learning processes rather than outcomes, and modify their instruction to accommodate students' changing requirements.

Though there is a rising empirical interest in teachers' intelligence mindset, the current literature still lacks unity of concept and methodology. There are several studies which have focused their attention on the relationship between teachers' intelligence mindset and affective variables (or psychological constructs), such as self-efficacy, well-being, grit or work engagement [17, 24, 33]. Additional research has investigated the relationship between mindset and instructional practices such as types of feedback, differentiated instruction methods, student on-task behavior, and technology use in the classroom. However, strands of work in this area have been largely paralleled but distinct across different disciplines and research methodologies, limiting the possibility for coherent

insights into how teachers' intelligence mindset systematically influences teaching practice and professional development over time.

Several recent reviews focused on related aspects of mindset research, but some important gaps have persisted. Previous meta-analytic work has been more concerned with establishing a relationship between teachers' intelligence mindset and specific outcomes, providing little information about the manner in which these beliefs manifest in day-to-day teaching and decision-making. For example, Bardach et al. [2], in a multi-level meta-analysis of 50 studies reported small overall effects across the outcomes with small-to-moderate positive associations found, primarily for motivational variables like self-efficacy and mastery goals. Although they are informative, such findings offer little explanatory purchase in terms of instructional processes and classroom settings.

Intelligence mindset was also investigated in other systematic reviews in terms of interventions or school-level practices. In their review of 131 studies in primary education, Savvides and Bond [53] found that intelligence mindset published work is predominantly underpinned by small-scale process and outcome evaluations, whether delivered as targeted interventions or more pervasive cultural activities within subject curriculum disciplines. Similarly, Bui et al. [5] reviewed 16 studies of mindset interventions in mathematics classrooms and found that the literature is overwhelmingly quantitative and focused on students, with little concern for teachers' instructional decision-making or domain-specific enactment of mindset beliefs. Laine and Tirri's work [31] was the most directly related to teachers' intelligence mindset within extant reviews as a pedagogical construct. Their review of 64 studies pointed to consistent associations between teachers' intelligence mindset, instruction that focuses on growth-oriented practices, student mindsets, and learning outcomes, as well as promising programs for developing teachers' growth-focused beliefs. However, this line of research is open for further efforts in working toward an integrated model that systematically links teacher mindset beliefs to affective dispositions, instructional practice, and professional learning routes.

Although previous meta-analyses and systematic reviews offer useful information about the results linked to teachers' intelligence mindset, they mostly treat mindset as an intervention target or an outcome-related variable. As a result, little is known about how teachers make decisions on a daily basis and how instructional procedures work. Previous reviews tend to emphasize affective or student-level outcomes, offering limited insight into how teachers' beliefs are enacted through pedagogical practices across contexts. By combining empirical data through a process-oriented perspective, the current research fills this vacuum and positions teachers' intelligence mindset as a multifaceted belief system that influences professional development, emotional experiences, and instructional enactment. In doing so, this study builds on earlier syntheses and offers a more comprehensive theoretical understanding of the role intelligence mindsets plays in instructional practice.

In addition to review studies, a great many empirical studies that investigate the association between teachers' intelligence mindset and teacher beliefs or psychological constructs are conducted on well-being [24], self-efficacy [61], engagement in teaching [36] and professional beliefs [66]. Although these studies offer important information, their findings are scattered and not combined well with research on teaching practices to the construction of cumulative knowledge.

Together, these studies suggest a necessity for more integrative syntheses that present teachers' intelligence mindset as not an isolated belief but rather as a multidimensional system shaping affective processes, instructional enactment, and professional development. In an attempt to fill this gap, the current systematic review integrates empirical evidence concerning teachers' intelligence mindset and has a particular interest in its effect on teaching behavior and teaching-related experiences. Instead of viewing growth mindset as a standalone construct or intervention variable, this is a view that conceptualizes teachers' intelligence mindset at the core beliefs that shape how teachers interpret challenges, plan instruction, interact with students and develop professionally. Leveraging a thematic synthesis approach, this study seeks to transcend merely describing findings and instead reveal the processes by which teachers' intelligence mindset functions in school settings.

Based on the theoretical assumption that teachers' intelligence mindset is a belief-based process influencing their instructional decision-making, this systematic review seeks to collate empirical knowledge on how these beliefs manifest in the professional lives of teachers. Rather than focusing on isolated findings, it is a process-oriented look at how teachers' intelligence mindset functions in affective, pedagogical, and professional domains. Therefore, the review aims to answer the following research questions:

1. How is teachers' intelligence mindset associated with affective constructs related to teaching?
2. How does teachers' intelligence mindset influence pedagogical implementation?
3. How is teachers' intelligence mindset reflected in professional growth?

This review is significant in the sense that it integrates fragmented evidence regarding teachers' intelligence mindset, as well as framing these findings as a practically relevant dimension of teaching quality instead of simply an individual-level psychological attribute. By organizing the evidence around affective, pedagogical, and professional domains, the review provides a structured perspective for understanding where and how teachers' mindset beliefs influence teaching practices. The review also has implications for teacher education and policy. The findings imply that mindset-related beliefs should be considered not only as individual attitudes but also as components of the design process of instructional decision-making, feedback execution and teachers' reactions to learning challenges that students have. Thus, professional development initiatives and policy frameworks may benefit from integrating mindset awareness with pedagogical training to support adaptive teaching and continuous professional learning.

2 Literature review

2.1 Teachers' belief systems and instructional practices

Research on teacher beliefs has consistently shown that teachers' assumptions about learning, ability, and student potential influence how they plan lessons, respond to student difficulties, provide feedback, and evaluate learning outcomes [47, 55]. These beliefs operate largely implicitly [37, 62], particularly in moments of instructional uncertainty, such as when students struggle, fail, or deviate from expected learning trajectories.

Within this body of research, beliefs are understood as relatively stable yet malleable mental representations that mediate between knowledge and practice. Teachers do not merely apply pedagogical strategies in a mechanical manner; instead, they actively

interpret classroom events and make real-time decisions shaped by their underlying belief structures. Consequently, understanding teaching practice requires not only an examination of what teachers do but also an analysis of the belief systems that inform why they do it.

Taken together, research on teacher belief systems suggests that interpretative frameworks significantly influence instructional practices in conjunction with pedagogical expertise. Beliefs on learning and capability serve as cognitive filters that influence the perception, evaluation, and response to classroom events, especially in contexts of ambiguity. From this point of view, teaching techniques can be seen as actions based on teachers' beliefs about students' potential, learning processes, and development, rather than just technical responses to curriculum requirements. This theoretical framework helps explain the significance of intelligence mindset in shaping teachers' instructional orientations and practices.

2.2 Mindset

Mindset refers to a person's approach to the malleability of some traits, such as intelligence or creativity, over time and in response to their efforts. Dweck [9] contended that individuals hold a systematic belief or set of beliefs about themselves or specific traits, such as intelligence, which form an implicit theory reflecting their social perceptions. This argument is grounded in well-established attribution theories in social perception and social cognition studies. The idea was advanced that these systematic beliefs influence goal-oriented actions and individual motivation levels [15].

According to Dweck [11], mindset defines people's beliefs about the nature of human attributes such as intelligence. People's beliefs encompass their internalized conceptions of the nature and functioning of the self, their interpersonal interactions, and the outside world. These beliefs are formed in humans early on and are considered a crucial component of personality [10]. People may hold either a growth mindset, which holds that change is possible, or a fixed mindset, which holds that change is not possible. This belief is critical because it establishes the boundaries of how much effort a person will put into the relevant field. Individuals with a growth mindset are convinced that they can attain success through diligent effort and effective strategies, as they do not perceive their current cognitive abilities as an insurmountable barrier [14]. Conversely, those with a fixed mindset hold the belief that exerting effort and working hard are characteristics of individuals lacking intelligence. They fear that if they demonstrate effort, others will infer that they are not sufficiently intelligent [12]. Consequently, they tend to shy away from tasks that challenge them and demand effort.

2.3 Teachers' intelligence mindset

People's mindsets significantly influence their behaviors and interactions, and this is particularly evident in educational settings, where teachers' intelligence mindsets play a pivotal role in shaping the classroom environment. As a contextual factor, it is asserted that a teacher's mindset, beliefs, and practices are crucial in fostering students' consideration of their own mindsets and in developing thinking strategies to enhance their learning, as they are important socializers of students' beliefs about their own abilities [51]. To facilitate this, teachers must adopt the perspective of their students, offer support, and scaffold to help them become autonomous learners. It is suggested that teachers' beliefs

have the most substantial influence on student achievement and hold the potential to exert the greatest impact [23]. Consequently, the various mindsets or assumptions that teachers hold about themselves and their students significantly shape their expectations, teaching practices, and students' perceptions of their own mindsets.

Theoretically and psychologically, the intelligence mindset in learning affects teaching through various channels. According to attribution theory, teachers' beliefs about intelligence influence the way they account for students' success and failure, which in turn affects their instructional responses such as encouragement, remediation, or withdrawal of support [58, 59]. Teachers with incremental beliefs may be more likely to explain difficulties as caused by controllable factors such as effort or strategy use, which in turn results in feedback focusing on learning processes rather than quantity of ability [13, 27]. In addition, attitudes emphasizing effort and perseverance from teachers, providing mastery-oriented practices such as preparing plenty of opportunities to truly comprehend the content, practices focusing on processes and efforts rather than outcomes, setting a classroom goal structure, norm setting such as stressing the significance of mistakes and struggles and uttering different versus similar expectations for students could be prevalent themes as feedback and can encourage students to adopt an increasing growth mindset [20, 26, 38]. To illustrate, Rattan et al. [43], as cited in [38] assert that teacher-delivered messages like, "I know you are a talented student in general—it's just not the case that everyone is a 'math person'" correlated with students' judgements of a fixed mindset, while the remarks like "I want to assure you that you are a talented student in general... I want you to change your study strategies and consider working with a tutor" were related to their perceptions of a growth mindset. Therefore, fixed beliefs may lead to ability-based interpretations that limit instructional flexibility and responsiveness [9, 43].

Self-determination theory provides additional insight into the function of teachers' beliefs in intelligence and their influence on autonomy-supportive/controlling teaching behavior [44, 52]. Teachers who believe in students' capabilities to change are more likely to valorize autonomy, perseverance, and mastery approaches than teachers endorsing stable views of ability, who might emphasize performance results and external regulation [9, 45]. Through these mechanisms, the teachers' intelligence mindset becomes embedded in their day-to-day pedagogic performance [46].

Combining attribution theory with self-determination theory makes it easier to understand how teachers' intelligence mindset affects teaching practices. Teachers' beliefs about the malleability of intelligence influence how they interpret students' success, difficulties, and failures, which in turn shape their instructional decisions and teaching practices. When teachers see learning problems as chances to improve instead of signs of fixed ability, they are more likely to use adaptive solutions like process-oriented feedback, changing the way they teach, and giving students more freedom. Over time, these decisions based on beliefs become habits, which shape stable patterns of how teaching is executed. Therefore, an intelligence mindset is not a static belief; rather, it is a dynamic process that affects the construction and maintenance of teaching practices.

Taken together, this body of research indicates that teacher intelligence mindset may serve as a belief system from which affective responses to feedback, instructional decision-making, and professional engagement are derived. Nevertheless, the literature in question is still fragmented across theories, methods, and outcomes, so a complete

picture of how these processes interrelate is lacking. To bridge this gap, the current study employs a systematic review method to synthesize empirical findings in relation to teachers' intelligence mindset and its impact on teaching practices.

2.4 Method

In the present study, in order to address the research topic, a systematic review endeavoring to compile empirical findings in line with the predetermined qualifying criteria was applied to carry out a detailed review of influencing factors of teachers' intelligence mindset on teaching practices. In this vein, we complied with the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines proposed by Liberati et al. [34] in the process of identifying, selecting, and appraising the studies. The review process applied both qualitative and quantitative studies to provide a comprehensive, detailed, and thorough understanding of the topic. Certain steps, such as formulating research questions, developing selection criteria, setting an appropriate search strategy, selecting appropriate studies, quality appraisal, the coding process, and data analysis, were followed in the systematic review process.

2.5 Search strategy

Following the formulation of the research question, in order to identify the relevant studies aligned with the aim of the current review, a thorough and comprehensive search strategy was applied. In order not to miss out on any related study, systematic research and a meticulous review were carried out through electronic databases SCOPUS and Web of Science. Providing wide-ranging and easily accessible coverage of peer-reviewed literature, their extensive usage in systematic reviews especially within the fields of social sciences as well as educational psychology, and credibility of the literature search, SCOPUS and Web of Science were deliberately selected as the target databases. The search strategy included a combination of keywords and terms related to intelligence mindset, such as "teacher mindset", "teachers' intelligence mindset", "teacher implicit theories", "teacher growth and fixed mindset". The search was confined to the articles published in peer-reviewed journals between January 1, 2000, and March 16, 2024.

2.6 Study selection

The scholarly quality and the relevance of the articles were taken into account in developing the inclusion criteria. The following baselines were established to select studies that particularly explored and addressed the research topic: Each article is required (1) to be in a peer-reviewed journal; (2) to ensure scholarly accuracy and precise findings; (3) to focus on teachers' intelligence mindset and its reflections, either on teaching practices, students' outcomes, or professional development; (4) to be written in English; (5) to have deducible findings; (6) to be conducted either in qualitative or quantitative methods; (7) to be published within the timeframe spanning from January 1, 2000, to March 16, 2024. We excluded the studies that (1) were not written in English; (2) were only presented in conferences; and (3) were in the forms of research reports, book chapters, master's and doctoral dissertations.

The studies identified through the search strategy were imported into RAYYAN [40]. Following the removal of duplicates, all the authors independently reviewed the titles

and abstracts of each study against the inclusion/exclusion criteria. Any discrepancies between the authors' lists of included studies were resolved through consensus.

Following this search, we reviewed all retrieved articles by examining their titles and abstracts and identified studies focusing on teachers' intelligence mindset. The database search took place on March 16, 2024, resulting in the retrieval of a total of 1615 hits published between 2000 and 2024. Out of these articles, 591 were found to be duplicates. After removing the duplicates, the remaining 1024 articles were initially examined based on their titles and abstracts. Following the initial screening of titles and abstracts of the relevant studies, the full-text review stage was conducted by researchers. 1000 studies were excluded from the study due to several reasons, such as inadequate findings, inaccessibility, and an inappropriate sample. 24 studies included in the study were appraised by two independent experts in order to ensure the quality and reliability of the review process by using the established criteria. Figure 1 presents the flow diagram of the selection process.

Table 1 presents the studies that were included in the review analysis following the selection criteria.

2.7 Data collection

For accuracy, transparency and reliability of data extraction and analysis all authors participated in all phases of the review. A standard data abstraction form was created and used for all included studies at the first stage. This template included basic study details such as publication date, research type and sample data (population media), as well as publication source and context of the studies. A single reviewer from each group independently screened the final list of studies to confirm that they met the predetermined criteria; any disputes were discussed until consensus was reached.

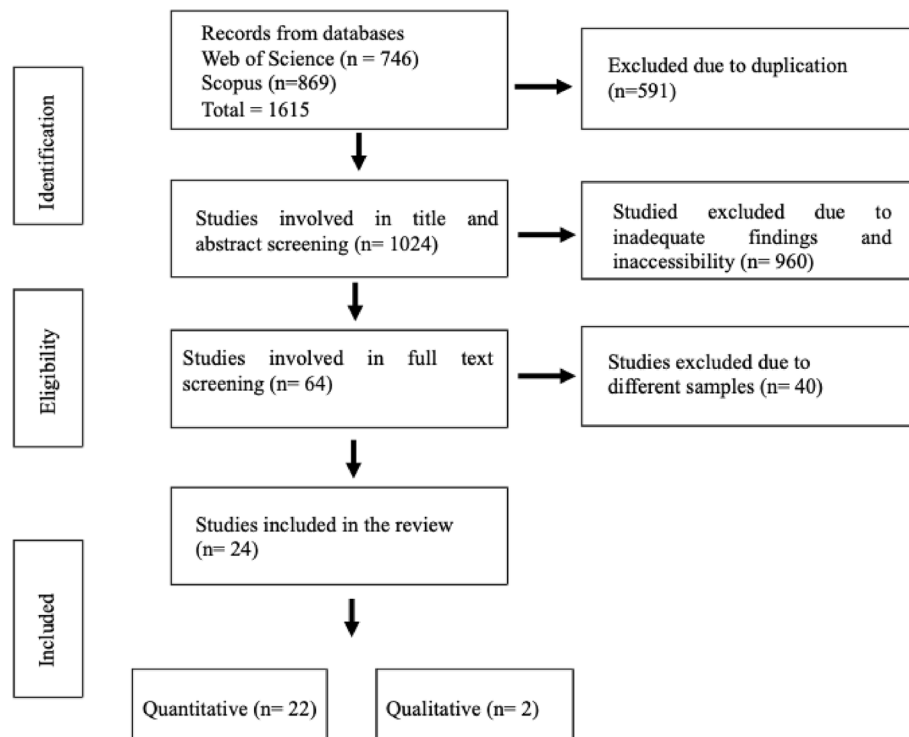


Fig. 1 Flow diagram of study selection

Table 1 The studies in the review

Authors	Year	Publisher	Country	Design	Sample
Baharuddin et al.	2024	Emerald	Indonesia	Quantitative	1095
Bates et al.	2024	Springer	The USA	Quantitative	300
Bostwick et al.	2020	Elsevier	Australia	Quantitative	1505
Chen et al.	2019	Frontiers	China	Quantitative	1384
De-Kraker-Pauw et al.	2017	Frontiers	The Netherlands	Quantitative	106
Griful-Freixenet et al.	2020	Routledge	Flanders	Quantitative	598
Hasanah et al.	2023	IJLTER	Indonesia	Quantitative	161
He et al.	2023	Frontiers	China	Quantitative	547
Huang	2023	Springer	Taiwan	Quantitative	560
Kim and Kim	2024	UK Zhende	Korea	Quantitative	308
Lee et al.	2023	Sage	Hong Kong	Quantitative	341
Lin et al.	2022	MPDI	China	Quantitative	1297
Liu et al.	2023	Frontiers	China	Quantitative	486
Nalipay et al.	2021	Springer	The Philippines	Quantitative	547
Rissanen et al.	2021	Frontiers	Finland	Qualitative	5
Ronkainen et al.	2019	IJLTER	Finland	Quantitative	63
Roose et al.	2019	Elsevier	Flanders	Quantitative	462
Shoshani	2021	Routledge	Israel	Quantitative	155
Tang et al.	2021	Springer	China	Quantitative	214
Toding et al.	2023	Science Direct	Estonia	Quantitative	150
Vermote et al.	2020	Springer	Belgium	Quantitative	357
Zarrinabadi and Afsharmehr	2022	Sage	Iran	Qualitative	20
Zeng	2019	Frontiers	China	Quantitative	472
Zilka et al.	2023	Routledge	Israel	Quantitative	281

During the second stage, an intensive qualitative content analysis was executed on how intelligence mindset was conceptualized, addressed and interpreted among-as well as across- studies. In order to improve coding consistency, a preliminary coding framework was built upon research questions, aims of study, methods used and findings reported. The initial framework was subsequently pilot tested in a selection of the included studies by two authors independently to evaluate its clarity, comprehensiveness and applicability.

After the pilot coding, all included studies were independently coded by at least 2 researchers using the finalized coding frame. Intercode reliability was tested by comparing coded segments systematically. Differences in coding were noted and prespecified weekly consensus meetings discussing any contradictions, which were resolved simultaneously by agreement or return to original texts. In cases of need, the coding frame was revised to more effectively allow emerging themes to be recorded and eliminate overlap. This recursive process served to enhance the credibility and consistency of the coding.

Upon coding all codes, themes were induced in a meticulous thematic analysis process. Codes were analyzed, clustered and compared among studies to find common themes and overarching conceptual structures. Analysis of themes included recurrent reviewing of coded data, constant comparison, and refining of themes to maintain internal consistency and clear conceptual distinction between the concepts. This method facilitated a detailed synthesis of the literature, resulting in strong thematic descriptions of both teachers' intelligence mindset and its manifestations through their teaching practice, impact on student outcomes, relationship with a range of professional development and affective constructs as prompted by the research question.

3 Results

3.1 Information about the studies

Upon examining the included studies, it can be stated that they were conducted in a number of different locations and nations. Out of 24 selected studies, seven studies were carried out in China, two studies were conducted in Indonesia, two studies concentrated on Flanders (Belgium), two studies were carried out in Israel, and two studies were from Finland. Countries such as the USA, Australia, Taiwan, Korea, the Netherlands, Hong Kong, the Philippines, Estonia, Belgium, and Iran followed these with a study each (Fig. 2).

As for the methods applied in studies, it is seen that only two studies were conducted using the qualitative method. The rest of the studies ($n = 22$) utilized quantitative methods applying data collection tools (Fig. 3).

The findings also show that the publication year of the studies ranges from 2017 to 2024 (Fig. 4). The total sample size of the studies included in the review is 11,414.

3.2 The themes

In the present systematic literature review, we identified three main themes that emerged from the coding process: affective constructs, pedagogical implementation, and transformative growth. These themes encapsulated the ideas that the codes pointed to, and they highlighted the comprehensive and multifaceted nature of the concept “teachers’ intelligence mindset” on the basis of the fact that how teachers’ intelligence mindset was reflected in teaching practices, how it affected in-class processes as well as student outcomes, and its reflections in professional development along with affective constructs. It can be concluded that the themes that emerged from the data provide significant insights and comprehension into how teachers’ intelligence mindset influences the processes in educational settings and the efficiency of instruction.

Conceptually, the three themes considered in this review are interrelated rather than separate. More specifically, affective constructs stand for the foundational psychological dispositions that derive from teachers’ intelligence mindset and inform the implementation of pedagogical in classroom practices. Such pedagogical practices subsequently

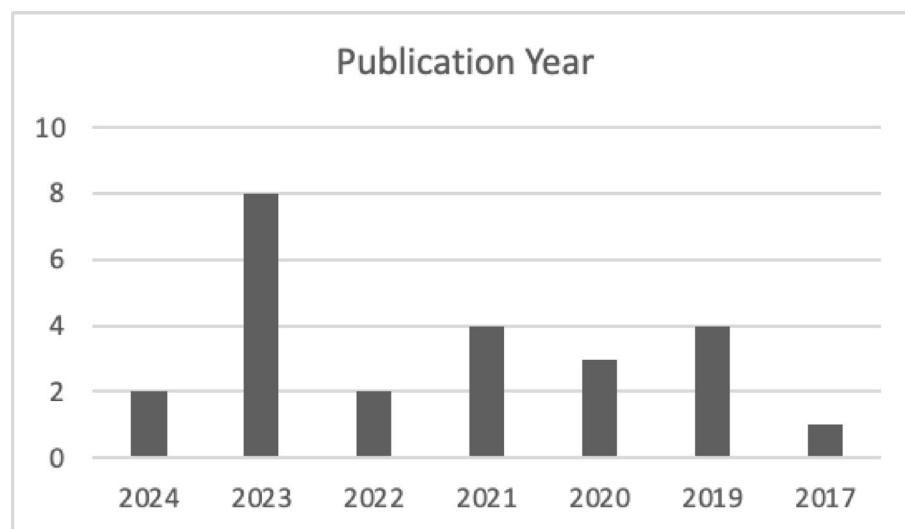


Fig. 2 Publication years of the selected studies

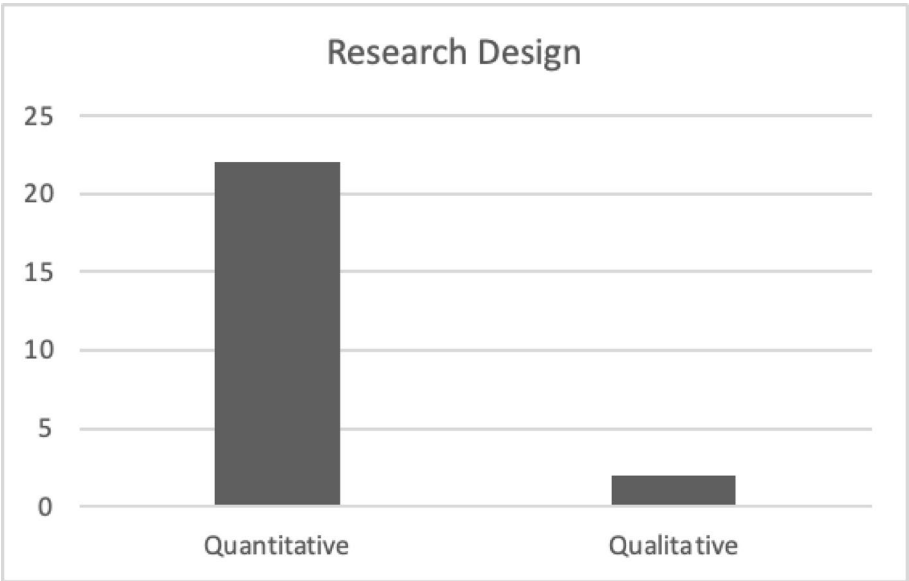


Fig. 3 Methods used in the selected studies

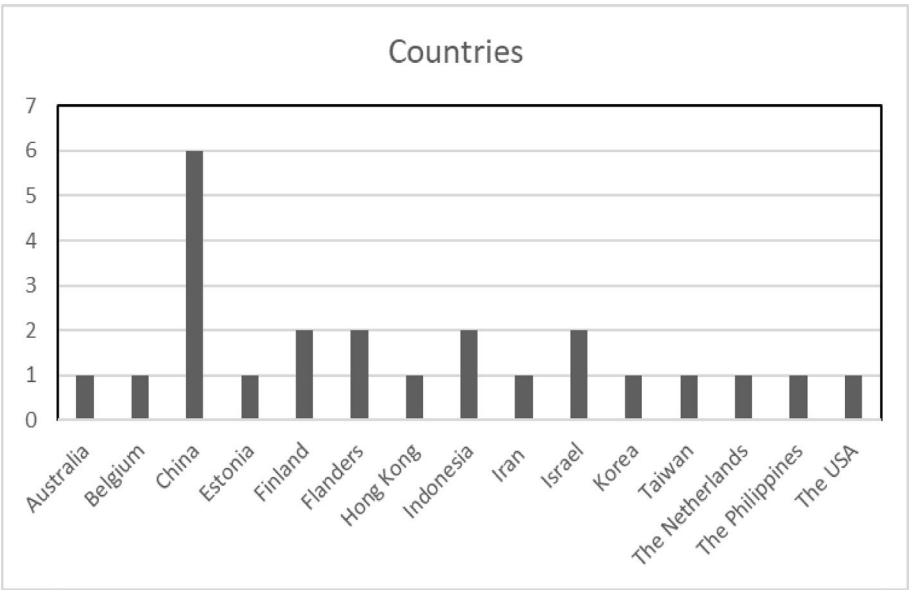


Fig. 4 The countries where the studies were conducted

influence teachers’ ongoing professional development and identity development, defined in this literature review as transformative growth. Therefore, the themes seem to represent a complex and evolving pathway in which teacher intelligence mindset matters in educational contexts at an emotional, pedagogical, and professional level. The themes presented in Table 2 provide the organizational framework for the synthesis reported in the following sections.

3.3 Affective constructs

The term affect is generally related to feelings, emotions, motivations, attitudes, and so on. The theme of affective constructs in this study also refers to emotional and

Table 2 Analysis of the studies

Authors	Year	Affective constructs	Pedagogical implementation	Transformative growth
Baharuddin et al.	2024	- Self-confidence promotion - Higher sense of control - More autonomy - Raised motivation - Higher levels of self-esteem	- Developing new competencies - Implementing and mastering new practices - Adopting and incorporating unique in-class strategies	- More engagement in teachers' professional development - Offering opportunities for life-long learning - Facilitating continuous education - Boosting the willingness to personal development - Analyzing and recognizing students' learning methods and preferences
Bates et al.	2024	- Enhanced motivation - Higher sense of perseverance	- Refining teaching competencies - Cultivating and enhancing teachers' observational acuity regarding students - Strengthening teachers' attentiveness to students' educational needs and responses	- Raised awareness regarding the teaching profession - Refinement of teaching abilities - Enhanced enthusiasm to learning and improvement - Pedagogical development for educators
Bostwick et al.	2020	- Raised motivation - Experiencing more enjoyment - Higher sense of aspiration	- Boosting student and classroom achievement - More classroom engagement - Increase in students' participation in in-class activities - Refined adaptive instructional behaviors	-
Chen et al.	2019	- Enhanced sense of well-being - Elevated self-efficacy - Improved self-belief - Better overall sense of hope and optimism - Enhanced resilience - Higher self-confidence - Greater determination	- Cultivating teaching strategies - Strengthening learning practices	- Assessing failures as growth opportunities (learning from mistakes and failures) - Adopting flexibility for professional development
De-Kraker-Pauw et al.	2017	- Fostering student motivation - Enhancing students' feeling of competence - Higher sense of autonomy - Promoting intrinsic motivation - Higher sense of self-confidence - Enhanced self-regulation	- Appraisal of students' achievement more - More frequent growth-oriented feedback - Focusing on fostering achievement and improvement more	-

Table 2 (continued)

Authors	Year	Affective constructs	Pedagogical implementation	Transformative growth
Griful-Freixenet et al.	2020	-	- Advancing and refining teachers' perceptual skills in relation to student behavior - More diverse and inclusive pedagogical approaches and practices - Heightened adaptability of students' behaviors - Adopting optimized instructional strategies for diverse learners - Enhancing students' interests and readiness	- Refinement of ethical beliefs - Willingness to adopting new teaching behaviors
Hasanah et al.	2023	- Elevated teaching willingness - Higher awareness of integrating psychological constructs with teachers' beliefs	- Attaching more importance to differentiated learning - Enhancing teaching strategy implementation - Paving way for attaining more teaching and learning goals	- Enhanced feeling of competence - Engaging teacher leaders to enhance the implementation proficiency
He et al.	2023	- Boosted teachers' grit - Enhanced sense of well-being - Elevated autonomy and motivation - Higher sense of self-regulation - Better self-control - Elevated perseverance	-	- Enhanced engagement in the profession - Elevated occupational well-being - Enhanced motivation in the profession - Less feeling of fatigue - Greater professional satisfaction - Realizing opportunities for professional development more - Higher sense of accomplishment in the career - Perceiving challenges as opportunities for occupational growth
Huang	2023	- Boosted teachers' grit	- Utilizing novel and more effective teaching methods	- Elevated assessment of the value of learning and effort
Kim and Kim	2024	- Low levels of depression and despair - Higher sense of resilience	-	- Readiness for change and the improved ability to accept the novelty
Lee et al.	2023	- Increased life satisfaction and contentment - Higher levels of perseverance - Greater autonomy - Higher sense of self-efficacy - Promoted emotional and motivational regulation (self-regulation) - Higher sense of well-being	- Providing more opportunities for students' counselling - Higher levels of adaptive behaviors - Ensuring more attempts to design unique plans	- Balancing occupational demands and resources - Stimulating personal development - Awareness of the need for cultivating new skills

Table 2 (continued)

Authors	Year	Affective constructs	Pedagogical implementation	Transformative growth
Lin et al.	2022	- Higher sense of self-efficacy - Developing positive beliefs - Higher sense of perseverance	- Developing positive attitudes towards classroom teaching - Higher levels of adoption of desirable teaching strategies - Cultivating and embracing diversified teaching strategies - Higher flexibility and creativity in in-class activities	- Enhancing positive professional beliefs - Creating collective beliefs about professional abilities - Shifting from self-interest to collective interest
Liu et al.	2023	- Higher sense of teacher grit - Enhanced teaching enjoyment in classrooms - Greater sense of well-being - Increased stages of perseverance - Teachers' broadened behavioral repertoire - Increased motivation	- Being involved in teaching activities more emotionally, physically and mentally - Higher engagement in practical instructional activities	- Higher levels of work engagement - Exerting beneficial influence on academic pursuits - Enhancing professional performance levels
Nalipay et al.	2021	- Superior motivation - Promoted autonomy - Higher levels of self-efficacy - Enhanced self-determination levels - Higher awareness on psychological meaningfulness - Enhanced levels of self-regulation - Having more approval from peers - Increased willingness and enthusiasm	- Teaching with more enthusiasm - Allocating more time to develop teaching materials and lesson plans - Engaging more in teaching activities	- Higher levels of work engagement - Pursuing mastery-oriented goals and strategies - Higher dedication to teaching profession - Higher absorption (concentration-engagement) - Greater enthusiasm in career
Rissanen et al.	2021	- Posing more emotional regulation - Focusing on the interpretation of learning - Higher sense of persistence - Greater malleability of beliefs	- Putting emphasis on formative assessment - Encouraging challenge among students - Providing adequate opportunities for changes - Focusing more on learning rather than achievement or performance (outcome) - Highlighting individual learning process	- Higher sense of process focused pedagogical thinking - Promoting mastery orientation
Ronkainen et al.	2019	- Greater sense of malleability - Noticing that the feelings are subject to change - Increased sense of adaptability and flexibility - Promoted levels of persistence	- Supporting students' individual learning - Fostering students' process-focused thinking - Promoting mastery orientation - Giving more positive feedback	- Developing professional awareness about personal strengths and weaknesses
Roose et al.	2019	- Higher awareness of personal beliefs	- Efficient teacher-student interaction - Being far more attuned to the requirements of diverse groups - Amplifying the developmental potential of students	-

Table 2 (continued)

Authors	Year	Affective constructs	Pedagogical implementation	Transformative growth
Shoshani	2021	- Higher emotional regulation - Increased well-being - Posing more positive emotions - Having higher emotional teaching efficacy - Higher sense of malleability - Increased enthusiasm - Higher efficacy to manage emotions - Increased resilience	- Providing higher student enrolment - Lessening students' drop-out rates - Higher engagement in learning activities - Supporting to obtain higher achievement rates - Developing positive learning environment	- Higher sense of meaning in career - More satisfaction in career - Higher levels of professional well-being
Tang et al.	2021	- Posing more behavioral intention - Higher sense of confidence in ability	- Higher effective use of online teaching platforms	- Higher intention to adapt technology in the profession
Toding et al.	2023	- Promoted autonomy - Higher sense of relatedness	- Demonstrating more efforts in creating learner-centered environment - Designing more conducive instructional settings for students - Being inclined to create autonomy-supported learning process - Valuing more support on entrepreneurial attitudes	- More receptive towards student-centered pedagogical approaches - More aspiration for competence
Vermote et al.	2020	- Increased autonomy - Promoted motivation - Higher sense of malleability	- Cultivating autonomy-supported strategies - Focusing on process-oriented learning - Engaging in a variety of need-supporting strategies - Adopting much more motivating teaching styles	- Focusing on competence development - Developing more sense of commitment to teaching
Zar-rinabadi and Afsharmehr	2022	- Higher sense of motivation - Having more passion	- Praising students' efforts - Encouraging students to perform better - Focusing on hard work to for the better - Developing verbal encouragement	-
Zeng	2019	- Higher sense of well-being - Sustained commitment to endeavors	- Promoting students' higher engagement in school - Providing valuable opportunities for promoting self-growth	- Positively influencing work engagement in organizational settings
Zilka et al.	2023	- Higher levels of critically reflective behaviors - Feeling less burn-out - Enhanced enjoyment - Promoted motivation - Displaying higher sense of self-efficacy - Increased well-being	-	- Higher commitment to work - Higher levels of engagement in activities at work - Having more positive feelings at work

psychological factors formed by teachers' intelligence mindset. The synthesis of the studies revealed that teachers with a growth mindset pose far more positive affective profiles and characteristics. Specifically, the researchers highlighted the significance and higher levels of motivation that teachers with growth mindset provide for students (e.g., [1, 3, 4,

8, 24, 36, 39, 60, 63, 66]). Additionally, the sense of well-being, autonomy, perseverance, self-confidence, and self-efficacy were among the most-covered affective constructs that the researchers reported to have significant, positive, and profound impacts on learners (e.g., [1, 3, 6, 8, 24, 32, 35, 36, 39, 54, 56, 57, 60, 64, 66]).

Studies, overall, have shown that teachers with a higher sense of growth mindset are more inclined to view obstacles as opportunities for personal growth, which paves the way for much more positive emotional responses to classroom challenges and setbacks. Additionally, it can be inferred from the theme that teachers with a growth mindset tend to enhance the beliefs and confidence of students' capacity for improvement through efforts instead of loading them with frustration and disappointment. This connotes the idea that affective components lead students to feel that when they struggle and strive to do something, they will be aware of their capabilities.

3.4 Pedagogical implementation

The theme of pedagogical implementation in this systematic review emphasizes the direct significance of teachers' intelligence mindset over student involvement in in-class activities and educational practices. It is observed that teachers with growth mindsets have a tendency towards developing and implementing unique teaching strategies (e.g., [1, 6, 19, 22, 28, 35, 57, 60]) that capture the interest and attentiveness of students, resulting in teaching effectiveness and promoting learning outcomes. Additionally, the theme also connotes the idea that teachers take the initiative to design unique and tailored learning experiences that address diverse groups.

In addition, a number of researchers also highlighted the students' enhanced classroom engagement through teachers' growth mindset (e.g., [4, 36, 54, 64]). It is seen that teachers with a growth mindset strive to develop unique designs that naturally lead to more student participation and engagement, fostering positive learning experiences and promoting outcomes. While Ronkainen et al. [49] highlighted that through growth mindset teachers provided more positive feedback in the class, Zarrinabadi and Afsharmehr [63] emphasized growth mindset importance in terms of verbal encouragement of students by their teachers. Furthermore, the value of formative assessment and the focus on the process rather than the outcome [8, 48], creativity and flexibility in in-class activities [35], positive teacher-student interaction [50], and higher effective use of online teaching platforms [56] were among the leading points that are observed in the classrooms of teachers with a growth mindset.

Hence, these findings suggest that the theme of pedagogical implementation underscores the fact that teachers with a growth mindset are more likely to create effective learning experiences in classrooms, to develop unique and tailor-made designs that address diverse groups, and to have more efficient instructional practices.

3.5 Transformative growth

The theme of transformative growth in this review refers to teachers' active participation in their own learning and a means which teachers can improve themselves throughout their careers. The synthesis of the studies revealed that the growth mindset of teachers contributed in a certain amount to their transformative growth as it allowed them to seek out learning opportunities and ways through which they could improve themselves. Specifically in the synthesis, one of the points the researchers mostly underscored was

that growth mindset enabled teachers to be engaged more in professional development [1, 24, 32, 36, 39, 66]. Additionally, it was revealed that growth mindset of teachers paved the way for offering more opportunities for life-long learning [1], raised awareness in teaching profession [3, 49, 54], enhanced enthusiasm and motivation [3, 24, 39], more job commitment and satisfaction [24, 39, 54, 60, 66], more flexibility as well as readiness for change and improved ability to accept novelty [6, 29], enhancing positive beliefs [35, 66] and elevated occupational well-being [24].

It was observed that quantitative studies mainly found significant relationships between teachers' growth mindset and affective outcomes such as motivation, self-efficacy, well-being and perseverance; pedagogical outcomes as well as transformative growth (e.g. [1, 24, 39, 54]). Qualitative research, on the other hand, has offered rich descriptions of how teachers perceive challenges as an opportunity for learning, how they focus on learning processes rather than performance outcomes, and how they promote pedagogical thinking (e.g., [48, 63]).

In all, it can be deduced that transformative growth emerged from the findings as an important component in intelligence mindset in that it promotes positive feelings about the profession, contributes to reflective practices, enhances the sense of openness to learning, and fosters a higher sense of dedication and commitment to the profession.

4 Discussion

Teachers' beliefs are the mental representations that direct actions and decisions in the classroom; thus, they have an appropriate role to play in decisions about their instructional practices and interactions with students [47, 55]. The systematic review findings indicate that teachers' intelligence mindset is associated with multiple dimensions of teaching practice, classroom engagement and professional development.

Teachers' intelligence mindset and the notion that attributions of affective constructs are in concert with Dweck's [9] assertion that people who believe in their skills and abilities learn through effort and perseverance seem directly linked to her theory in which those possessing such beliefs are more open to challenges/ability persistence in adversity. It seems that in teaching, a growth mindset equips teachers even more with purpose and grit; not only will it increase their ownership and morale but also allow them to be on a sagacious fueling of this behavior within their students. The approach supports autonomy by providing the teachers an attitude and behavior, which help in developing a more supportive environment for the teachers in taking responsibility for their careers and increasing self-efficacy with the belief that they can enhance success through efforts.

The second theme relates to the pedagogical implementation, looking at how teachers' intelligence mindsets are embodied in their practice and instruction. Research in this review indicated teachers with a growth mindset are more likely to have researched and enacted innovative, dynamic teaching methods that appeal to the students, which drives active learning. Effective teaching has been widely characterized as requiring adaptability to contextual demands and real-time classroom dynamics [16, 42]. Being adaptive means a teacher can change delivery in real time to cater to the learning on its feet and be responsive to the adaptive classroom environment. This will involve instant changes along with the impact of so many that it might mean not necessarily sticking to the plan as originally conceived. They can be as diverse as unanticipated student contributions, misunderstandings, or classroom dynamics [18]. This review provided clues for the

realization of this adaptability in believing that students and teachers can get better with hard work and practice (and thus is an intelligence mindset understanding). Teachers with growth mindsets are flexible in what they teach so that all students, regardless of background or ability, can engage in learning and realize their academic potential.

In addition, the findings highlight the relevance of teachers' intelligence mindset for ongoing professional learning. Teachers with growth mindset appear more engaged in professional development activities and more committed to lifelong learning. This orientation is associated with higher levels of motivation, professional engagement, and job satisfaction, suggesting that intelligence mindset shapes teaching through interconnected affective and pedagogical processes.

This review directly addresses the gaps identified in previous systematic reviews by moving beyond outcome-based associations and offering a process-oriented synthesis of teachers' intelligence mindset. Whereas prior reviews have primarily emphasized intervention effects or quantified relationships, the present synthesis integrates affective processes, instructional enactment, and professional learning within a single analytical framework. By explicitly linking teachers' beliefs about intelligence to instructional decision-making and professional learning, this review provides a more comprehensive understanding of how intelligence mindset operates in teaching contexts.

Related research in leadership and organizational theory also support the effects of intelligence mindsets on self-enhancement. Studies (e.g., [25]) also show that a leader with a growth mindset engages in learning goals and views challenges as an opportunity for improvement, leading to higher performance and resiliency at the workplace. In addition, Han and Stieha [21] review of research shows training programs that utilize growth mindset principles are stronger. Employees who demonstrate a growth mindset not only learn the material better when they are trained but also see major gains in performance [7, 41]. Utilizing the growth mindset framework in training allows people to break out of their perfection mentality and creates an environment of learning by doing; they fail fast and learn fast, leading to agility and further iteration in the workplace. Therefore, it may be applied in both a classroom setting and feed-forward of professional development. Dweck's mindset framework is an effective mechanism for producing real transformative change.

From a methodological perspective, the patterns identified in this review should be interpreted in light of the characteristics of the included studies. The predominance of cross-sectional research designs may partly account for the strength of the reported associations, while simultaneously limiting causal interpretations regarding the relationship between teachers' intelligence mindset and teaching practices. In addition, variations in sample characteristics (e.g., teaching level, years of experience, subject domain, and cultural context), educational settings, and measurement instruments may have influenced how teachers' intelligence mindset was operationalized and linked to teaching-related outcomes.

While the present review identifies relatively consistent associations between teachers' intelligence mindset and affective, pedagogical, and professional outcomes, previous studies and reviews have not always reported effects of comparable strength or scope. Such discrepancies can be understood in light of differences in research focus and design, particularly in studies emphasizing student-level outcomes or short-term intervention effects, which may overlook the gradual and process-oriented ways in which

teachers' beliefs shape instructional decision-making. By adopting a process-oriented synthesis that integrates affective responses, instructional enactment, and professional learning, the present review offers an explanatory perspective that helps reconcile inconsistencies observed across the existing literature.

In sum, this systematic review presents strong evidence that teachers who exhibit a growth mindset considerably improve their classroom effectiveness by fostering positive emotional climates, employing adaptive teaching methods, and actively participating in ongoing professional development. The findings underscore the importance of prioritizing growth mindset development in teacher professional training. Teachers with a growth mindset, by prioritizing adaptability, resilience, and continuous professional development, are likely to cultivate more dynamic and effective educational environments, ultimately improving outcomes for both teachers and students. Teacher professional development programs may benefit from integrating mindset-oriented components directly into instructional training. Instead of simply discussing growth mindset as an abstract belief, professional learning could involve other concrete tasks: reflective analysis of classroom scenarios, training teachers in giving structured feedback that emphasizes effort and strategies for learning, exploring how teachers react when a student does not succeed or struggles. Furthermore, models of coaching and peer observation may help facilitate teachers' translation of growth-oriented mindsets into classroom interactions, feedback practices, and responsive instructional choices. Embedding such practices in professional development programs might help ensure that mindset-related beliefs are associated with observable teaching practices. Together, these practices may also support teachers' basic psychological needs, thereby strengthening their motivation and sense of self-efficacy in instructional practice.

5 Concluding remarks

The findings suggest that teachers with a growth mindset see significant enhancements in emotional interactions, strengthen their teaching practices, and foster transformative development. These outcomes highlight the broad impact of cultivating a growth mindset, as it not only shapes teachers' attitudes but also improves their instructional practices and personal growth. Crucially, by integrating affective, pedagogical and transformative dimensions within a single framework, our review further advances previous reviews that have concentrated more specifically on outcome-focused associations or intervention impact, and which are no longer available to address the research gaps identified in this earlier synthesis.

Nurturing a growth mindset in educators is essential for achieving lasting improvements in teaching effectiveness and student outcomes. Consequently, it is crucial for educational institutions to incorporate intelligence mindset training into professional development, making it a top priority for educational stakeholders. However, the need for further research on teachers' intelligence mindset is evident. Studies included in the current systematic review largely center upon intelligence mindset's reflections on affirmative emotional constructs, effective and fruitful in-class activities, and productive career development. Among others, intelligence mindset, however, highlights many other aspects and ingredients, such as embracing difficulties, dealing with obstacles, deducing from criticisms, inspirations, self-evaluation, perceiving challenges as opportunities for self-development, etc., in the existing literature.

Given its multifaceted nature and various constituents, future studies could also focus on these aspects. Furthermore, it is suggested that the intelligence mindset of teachers has some reflections on students' achievement, motivation, and their school engagement as well. Hence, future studies could aim to address these arguments to gain far more elaborate insights into the concept. In addition, intelligence mindset's impact on creating and sustaining positive learning environments and effective classroom management, along with adapting to diverse learning needs, could be further areas of interest for future studies. To make future research directions more concrete, studies could use longitudinal and mixed-methods approaches to explore how specific aspects of teachers' intelligence mindset, such as responses to failure, use of feedback, and instructional risk-taking, develop over time and are reflected in everyday classroom practices. Contextual differences in how mindset is enacted may be further clarified by studies that concentrate on certain subject areas or educational levels. Furthermore, more detailed proof of the mechanisms relating teacher's intelligence mindset to teaching practices may be obtained using multiple-source designs that combine teacher self-reports, classroom observations, and student-reported outcomes.

Despite these contributions, the findings of the present review should be interpreted in light of several limitations. Although a limited number of studies were analyzed in the review given the specific nature of the subject matter, the scarcity of qualitative research has still drawn attention to the reflections of the intelligence mindset of teachers in educational settings.

Second, the use of peer-reviewed journal articles could have included a publication bias as studies reporting non-significant or mixed findings are less likely to be published. In addition, the exclusion of grey literature (e.g., thesis, conference proceedings, etc.) may have resulted in the omission of relevant evidence, particularly practice-oriented or context-specific insights that are less frequently captured in journal publications.

Finally, the current studies are in a quantitative literature that is biased toward statistical associations over situated and process-oriented understandings of teaching practices. More saturation with qualitative studies may have allowed for further insight into the actualization of intelligence mindset in practice by teachers and perhaps different or more nuanced conclusions would have emerged. Exploring further and more elaborately on the topic with different kinds of qualitative and mixed method designs could therefore make a great contribution.

Author contributions

SS and NY-the conceptualization and research design, drafting the manuscript, data collection, and interpretation of the data. UA-the conceptualization and research design, data analysis, drafting the manuscript .

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Data availability

No datasets were generated or analysed during the current study.

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Not applicable.

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