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Identifying Key Factors Influencing the Development of Higher Order Thinking Skills (HOTS) in Students: A Systematic Literature Review

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ABSTRACT

Higher-order thinking skills (HOTS), encompassing critical thinking, creative thinking, and problem-solving, are essential competencies for 21st-century learners. Despite extensive research, a holistic synthesis of the multidimensional factors influencing HOTS remains limited. This study employed a Systematic Literature Review (SLR) following PRISMA guidelines to identify and analyze factors affecting HOTS. A total of 42 peer-reviewed articles indexed in Scopus, published between 2014 and 2024, were reviewed. Articles were assessed for quality using CASP and JBI checklists, and thematic analysis was conducted using NVivo software. Analysis revealed six main dimensions influencing HOTS: individual, learning environment, teacher, curriculum, contextual and cultural, and affective, encompassing 16 sub-themes. The individual dimension emerged as the most influential (26%), followed by learning environment (24%), teacher (23%), curriculum (11%), contextual and cultural (9%), and affective (7%). The findings highlight the multifaceted nature of HOTS development, with particular emphasis on internal student attributes and teacher competence. Practical implications include the need for personalized learning approaches, enhanced teacher training in problem-based pedagogy, and adaptive, culturally responsive curricula. These insights can inform educational policy and classroom practice aimed at fostering HOTS across educational levels.

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1. INTRODUCTION

Education plays a crucial role in preparing individuals to face the complex challenges of the 21st century. One of the most essential skills required is the ability to think critically and creatively, and solve problems. According to Brookhart (2010), higher-order thinking skills (HOTS) involve more complex cognitive processes, such as analysis, evaluation, and creation, beyond merely remembering and understanding basic concepts.

The development of HOTS is a key educational goal in many countries, as these skills are considered primary predictors of academic and professional success in the future (Zohar & Dori, 2003).

Critical thinking and creative thinking are essential elements in modern education that are necessary to equip students for the complexities of the real world.

However, the education system in Indonesia has not yet optimally developed students' critical thinking skills. In many schools, teacher-centered learning methods, lecture-based instruction, and memorization still dominate. As a result, students do not receive adequate training to develop higher-order thinking skills such as analysis, evaluation, and design. This issue is reinforced by the results of the 2018 Program for International Student Assessment (PISA), which ranked Indonesia 72nd out of 77 countries in science, reading, and mathematics (OECD, 2019). Only about 28% of Indonesian students were able to apply higher-order thinking skills to solve unfamiliar problems. These findings indicate that Indonesia's education system has not fully prepared students to face 21st-century challenges. This is due to PISA's assessment framework, which emphasizes students' ability to reason, solve problems, construct arguments, and communicate by developing higher-order thinking skills.

HOTS is a complex thinking process that involves various skills such as analysis, synthesis, comparison, inference, interpretation, evaluation, inductive reasoning, and deductive reasoning. These skills are used to solve unfamiliar problems (Smith, 1992; Zohar & Dori, 2003). Students with higher-order thinking skills are characterized by their tolerance for risk, curiosity, enthusiasm for seeking facts, ability to plan and demonstrate the most appropriate methods, systematic thinking, careful reasoning, evidence-based rational thinking, and frequent self-monitoring (Shari et al., 1993). Students with these skills can create new knowledge and make accurate and logical decisions. Various studies have examined the concept of HOTS and the factors influencing it. Previous research has explored the impact of classroom environments, family characteristics, psychological traits, and intelligence on HOTS (Horan, 2007; Silvia, 2008; Pannells & Claxton, 2008; Lim & Smith, 2008; Chini et al., 2009; Pascarella et al., 2013).

Despite the extensive research on HOTS and its influencing factors, a significant research gap remains: there is a lack of systematic integration of diverse findings and concepts. Moreover, many previous studies have been fragmented, focusing on specific contexts without providing a holistic overview of the interrelationships among key factors influencing HOTS. Some relationships between variables have also been reported inconsistently or even contradictorily, making it difficult to draw comprehensive conclusions (Montazemi & Hamed, 2015).

To bridge this gap, a Systematic Literature Review (SLR) is chosen as the most appropriate approach. SLR allows for the methodological and transparent synthesis of evidence from various relevant studies, resulting in a more comprehensive and integrated understanding. By following PRISMA guidelines, this SLR will provide a systematic and transparent analysis of the factors influencing HOTS. The findings from this SLR are expected to serve as a foundation for developing more effective learning strategies to enhance HOTS among students at various educational levels.

2. METHODS

This study adopts a systematic review methodology, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, and relies on secondary data sources. Data were collected from the Scopus database using the keywords "Critical Thinking," "Creative Thinking," and "Problem Solving" within the publication range of 2014 to 2024. The initial search yielded a total of 505 journal articles, which formed the basis for the subsequent screening and analysis process.

To minimize selection bias, a rigorous article selection process was implemented. Two independent researchers systematically reviewed the titles and abstracts of the retrieved articles to determine their relevance. In instances where discrepancies arose, discussions were held to reach a consensus. If consensus could not be achieved, a third researcher was consulted to mediate and finalize the decision, ensuring objectivity and consistency in the inclusion process.

Following selection, all eligible articles underwent a quality assessment using standardized appraisal tools. Specifically, the Critical Appraisal Skills Programme (CASP) was applied to evaluate qualitative studies, while the Joanna Briggs Institute (JBI) Critical Appraisal Checklists were used for quantitative and mixed-methods research. Only those studies that achieved a minimum quality threshold of 75% were included in the final analysis. This criterion ensured that the synthesis was based on high-quality and credible research, thereby enhancing the reliability and validity of the findings.

The qualitative data analysis was conducted using thematic analysis, supported by NVivo software to facilitate efficient and systematic coding of the data. The analysis proceeded through several key stages: (1) data familiarization, which involved reading and reviewing selected articles to understand their context; (2) initial coding, where relevant information related to factors influencing higher-order thinking skills (HOTS) was identified and coded; (3) theme identification, in which codes were grouped into potential thematic categories; (4) theme review, to verify consistency and alignment between themes and data; (5) theme definition and naming, where clear definitions were formulated for each theme and sub-theme; and (6) report writing, where findings were presented according to the identified themes, supported by illustrative quotes and data extracted from the reviewed articles.

Ultimately, based on the relevance to the research title and the focus on HOTS, a total of 42 journal articles met the inclusion and quality criteria. This methodical and transparent approach enabled a comprehensive synthesis of current literature, offering critical insights into the factors influencing higher-order thinking skills in educational contexts. The complete PRISMA flowchart illustrating the article selection process is presented in Figure 1.

Table 1. The criteria for inclusion

Criteria	Inclusion
Publication Timeline	Articles published between 2014 and 2024
Document Type	Only research articles, including quantitative, qualitative, or mixed methods studies
Publication Language	Articles in English
Research domain/Subject	Articles relevant to the following fields: ▪ General education ▪ Technology-based education ▪ STEM education (Science, Technology, Engineering, and Mathematics)
Research Focus	Articles explicitly addressing one or more of the following: • Student Factors • Teacher Factors • Environmental Factors • Curriculum factors • Assesment factors
Research Methodology	o Quantitative (e.g., experiments, surveys) o Qualitative (e.g., case studies, interviews) o Mixed methods
Research Participants	o Students at primary, secondary, or tertiary education levels (K-12 to university) o Teachers or educators as complementary subjects (optional)
Accessibility	o Open access or through academic database subscriptions
Article Quality	o Reputable indexed databases such as Scopus, Web of Science, or Sinta (for Indonesian articles)
Relevance to HOTS Topics	o HOTS (Higher Order Thinking Skills) o HOTS sub-components: Critical Thinking, Creative Thinking, Problem-Solving

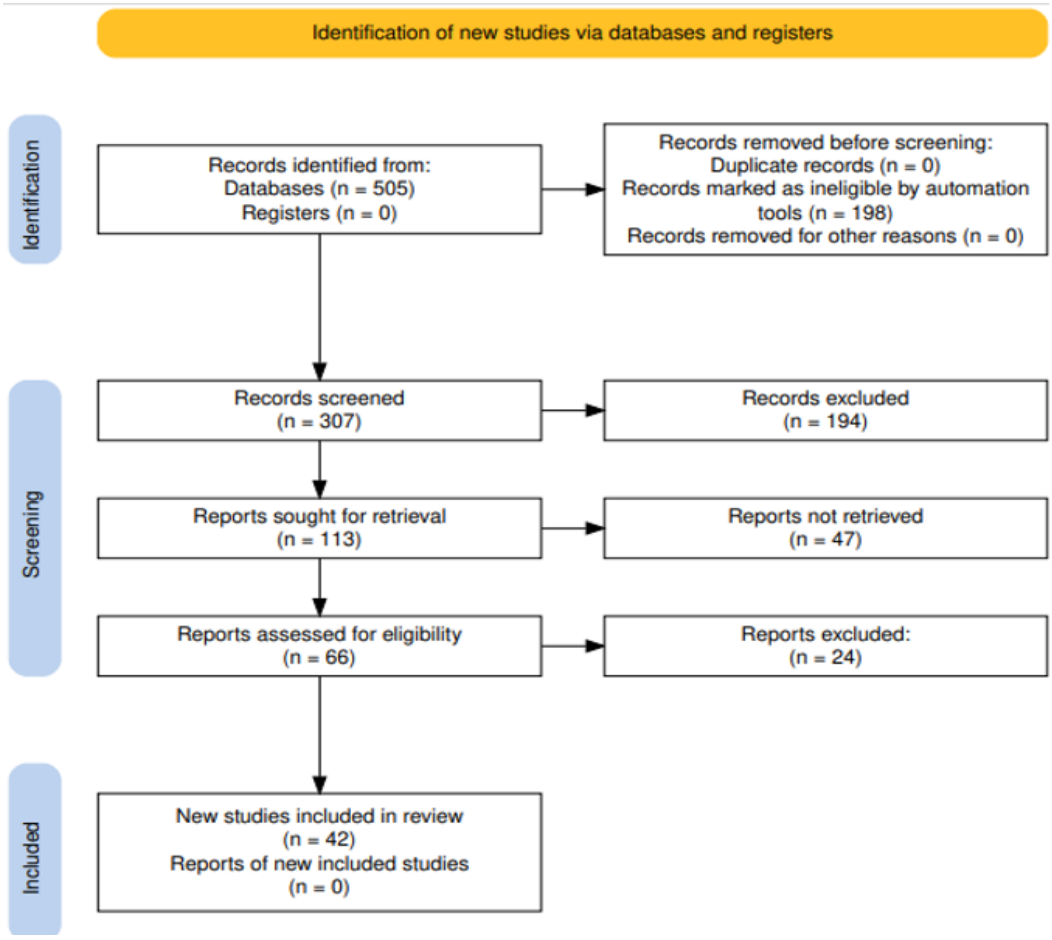

Figure 1. The Steps of Prisma for SLR Studies (Haddaway, 2022)

3. FINDINGS AND DISCUSSION

A total of 42 journal articles related to higher-order thinking skills (HOTS) were selected from the Scopus database using the keywords *"critical thinking," "creative thinking,"* and *"problem solving."* Among these, 1 article was published in a Quartile 1 (Q1) journal, while the remaining 41 articles appeared in Quartile 2 (Q2) journals, reflecting a consistent level of publication quality. In terms of research design, the selected articles comprised 21 quantitative studies, 13 qualitative studies, and 8 mixed-methods studies, indicating a diverse methodological approach within the existing literature.

The results of the systematic literature review (SLR) are summarized in Table 2, which presents the distribution of articles by publication year, journal title, and journal ranking. Further details for each article included in the review, such as authorship and research focus, are provided in Table 3.

Through the application of thematic analysis, the review identified six main themes and sixteen subthemes that capture the key factors influencing HOTS. The main themes are categorized as follows: individual dimension, learning environment dimension, teacher dimension, curriculum dimension, contextual and cultural dimension, and affective dimension. These themes offer a comprehensive framework for understanding the various educational and contextual factors that impact the development of higher-order thinking skills.

Table 2. SLR result based on year, number of published articles, title of journal, and rankings

Year	Number of published articles	Title of Journal	Journal Impact Quartile
2024	7	Smart Learning	Q1
		Design Thinking	Q2
		Higher-order thinking	Q2
		mathematics teaching	Q2
		TPACK	Q2
		Creative Problem-Solving	Q2
		Mathematical Thinking	Q2
2023	9	Project-Based Learning and Problem-Based Learning	Q2
		teachers' attitudes	Q2
		Case-Based Learning Framework	Q2
		PBL Collaborated with PjBL	Q2
		Context of Blended Learning	Q2
		Thinking Styles and Inventive Problem-Solving	Q2
		Open book environment	Q2
		Blending Creative Approaches	Q2
		Perception of the Teaching and Learning Environment	Q2
2022	6	Digital age	Q2
		Developing Computational Thinking Competencies	Q2
		sustainable development ability	Q2
		Science Teaching Approach	Q2
		Quantum Flipped Learning	Q2
		Creative Thinking, Critical Thinking, Interactional Skills	Q2
2021	5	Problem-Based Learning	Q2
		STEM Inquiry Method	Q2
		Online Problem-Solving Instruction	Q2
		Cooperative learning	Q2
		Thematic-Integrative Learning	Q2
2020	1	scaffolding-problem based learning	Q2
2019	4	The strategically ambiguous assignment	Q2
		Analysing Learning Outcomes	Q2
		critical and creative thinking	Q2
		Flexible learning	Q2
2018	5	problem-based learning	Q2
		learning style	Q2
		Teachers' actual and preferred	Q2
		a visual programming environment	Q2
		Development Of Thinking Skills	Q2
2016	2	Mobile problem-based science dictionary application	Q2
		critical thinking, creative thinking and problem-solving skills	Q2
2015	2	digital gaming	Q2
		problem-solving performance	Q2
2014	1	Developing creative and critical thinking	Q2

In Figure 2 below, we can see the research trend related to HOTS. In 2014, there was 1 journal that discussed higher-order skills. This number increased to 2 journals in 2015 and remained constant in 2016. No journals were published in 2017. However, in 2018, the number of journals covering this topic increased significantly to 5 journals. This upward trend continued in 2019 with 4 journals. In 2020, only 1 journal was published, but this number increased again in 2021 with 5 journals. The year 2022 saw a further increase with 6 journals published. The peak came in 2023 with 9 journals addressing higher-

order skills. Despite a slight decline, in 2024 there were still 7 journals published. This data shows an increase in interest and attention to research on higher-order skills over the past decade.

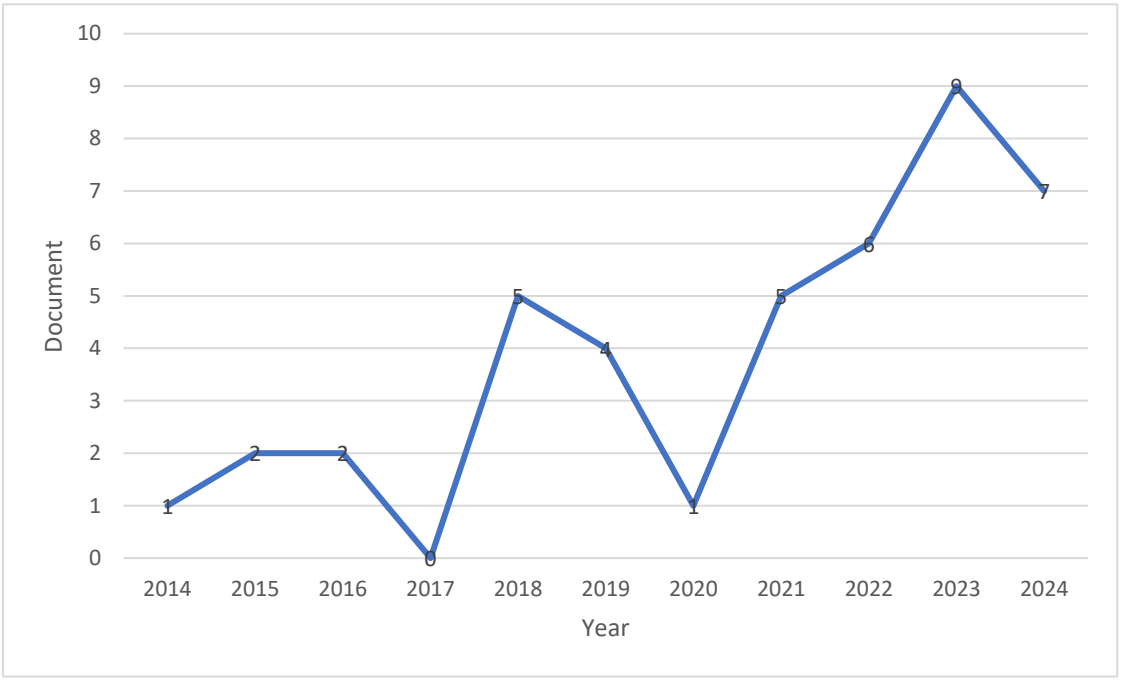

Figure. 2. Research trends related to HOTS

As illustrated in Figure 2, the trend in research related to higher-order thinking skills (HOTS) has shown a general upward trajectory over the past decade. In 2014, only a single journal publication focused on HOTS, and this modest interest continued in 2015 and 2016 with two and two publications respectively. Notably, there was a temporary gap in 2017 with no publications recorded. However, beginning in 2018, there was a marked increase, with five publications, followed by four in 2019. Although 2020 saw a brief decline with only one publication—likely influenced by global disruptions such as the COVID-19 pandemic—the trend quickly rebounded. In 2021, five articles were published, increasing to six in 2022. The field reached its peak in 2023 with nine journal articles, reflecting growing academic interest and recognition of HOTS as a critical component of 21st-century education. Despite a slight decrease in 2024 to seven publications, the sustained high volume suggests continued relevance and scholarly engagement. Overall, the data indicate a strengthening research focus on HOTS, driven by the increasing demand for critical, creative, and problem-solving competencies in education.

Following the identification of research trends in Figure 2, this study further explores the specific dimensions that influence the development of higher-order thinking skills (HOTS) among students. Through a thematic analysis of 42 selected studies, six major dimensions emerged, each representing critical factors that contribute to or hinder HOTS development in educational contexts. These dimensions—namely the individual, learning environment, teacher, curriculum, contextual and cultural, and affective dimensions—reflect a holistic framework for understanding how cognitive, pedagogical, social, and emotional elements interact to shape students' higher-order thinking capabilities. The following sections (3.1 to 3.6) provide a detailed analysis of each dimension, supported by relevant empirical findings and theoretical perspectives.

3.1 Individual Dimension

The individual dimension refers to the internal characteristics of learners that influence how they process, analyze, and apply information in learning contexts. Key factors identified include cognitive

abilities, learning motivation, self-regulated learning, and learning styles (Resnick, 1987; Stein & Lane, 2017; Pintrich & Schunk, 2002; Panadero, 2017).

Cognitive abilities are foundational to HOTS, as they determine how students interpret and manipulate complex information. These abilities form the basis for critical, creative, and analytical thinking (Resnick, 1987). Motivation, particularly intrinsic motivation, enhances students' engagement and persistence in challenging tasks, thereby mediating the extent to which students participate in cognitively demanding activities (Pintrich & Schunk, 2002). Self-regulated learning enables learners to plan, monitor, and reflect on their learning strategies, which strengthens their metacognitive control and facilitates independent problem-solving (Panadero, 2017). Learning styles, while sometimes debated in educational psychology, still appear relevant in determining students' preferred approaches to learning and the types of tasks that best stimulate HOTS (Brookhart, 2019).

Causal Relationship: Cognitive ability acts as a prerequisite for HOTS, while motivation and self-regulation serve as mechanisms that drive its active development. Learning styles may moderate the effectiveness of instructional strategies aimed at enhancing HOTS.

3.2 Learning Environment Dimension

The learning environment dimension encompasses the physical, social, and technological contexts in which learning occurs. Factors under this theme include learning strategies, technology integration, and the availability of resources (Schunk & Zimmerman, 2007; Jonassen, 2000; Harris et al., 2009; Koesnandar et al., 2022).

Learning strategies, such as inquiry-based or collaborative learning, promote deeper engagement with content and encourage the development of analytical and evaluative skills (Schunk & Zimmerman, 2007). The use of educational technology—including digital simulations, online platforms, and interactive software—expands access to diverse learning experiences and supports creative and critical thinking (Jonassen, 2000; Harris et al., 2009). Meanwhile, the availability of learning resources ensures that students have the tools needed to explore complex problems and apply higher-order cognitive skills (Koesnandar et al., 2022).

Causal Relationship: Effective learning strategies directly influence the depth of student thinking. Technology and resources act as mediators and enhancers, increasing exposure to tasks that require critical and creative engagement.

3.3 Teacher Dimension

The teacher dimension represents a central influence on students' HOTS development. Key subthemes include pedagogical competence, technology integration, and feedback provision (Shulman, 1987; Mishra & Koehler, 2006; Schunk & Zimmerman, 2007).

Pedagogical competence refers to the ability of teachers to design, implement, and assess instruction that challenges students cognitively. Teachers who employ inquiry-based, student-centered strategies are more likely to foster HOTS (Shulman, 1987). Technology integration enhances student engagement and enables the design of complex learning tasks (Mishra & Koehler, 2006). Finally, feedback—when timely, constructive, and specific—helps students reflect on their learning and make adjustments that promote metacognitive development (Schunk & Zimmerman, 2007).

Causal Relationship: Teachers with strong pedagogical and technological competence create environments where HOTS can thrive. Feedback functions as a critical feedback loop that nurtures reflective and strategic thinking.

3.4 Curriculum Dimension

The curriculum dimension includes curriculum design competence and assessment appropriateness as its two major subthemes. These factors reflect the alignment between instructional goals, content delivery, and assessment tools (Kemdikbud, 2021, 2013).

Curriculum design competence entails structuring learning objectives and content that emphasize analysis, synthesis, and evaluation—core components of HOTS. A curriculum lacking in such focus may inadvertently reinforce rote memorization rather than critical thinking (Kemdikbud, 2021). Assessment appropriateness refers to the use of authentic assessments that require students to apply knowledge in real-world contexts. The use of multiple-choice tests alone, for instance, fails to capture the depth of student understanding and HOTS development (Kemdikbud, 2013).

Causal Relationship: When curricula and assessments are well-aligned with HOTS objectives, they act as catalysts for cognitive development. Misalignment, however, may lead to instructional inefficacy in promoting HOTS.

3.5 Contextual and Cultural Dimension

This dimension considers how social support, cultural values, and the school environment influence student learning (Hamruni, 2021; Meutiawati, 2021; OECD, 2013; Johnson et al., 2010; Wang et al., 2023).

Social support, especially from teachers and peers, increases student engagement and resilience, both of which are necessary for HOTS (Hamruni, 2021). Cultural factors—including societal attitudes toward education and thinking—shape both student expectations and teacher practices (Meutiawati, 2021). A supportive school environment, characterized by adequate infrastructure, flexible policies, and an inclusive culture, enhances opportunities for the development of complex thinking (OECD, 2013; Johnson et al., 2010; Wang et al., 2023).

Causal Relationship: Supportive cultural and institutional contexts provide the socio-emotional and cognitive scaffolding needed for HOTS. Conversely, rigid or resource-poor contexts may hinder students' opportunities to engage in deep learning.

3.6 Affective Dimension

The affective dimension highlights the role of self-confidence and emotions in learning (Brookhart, 2019; Paputungan & Inaku, 2022). These factors influence learners' willingness to engage in cognitively challenging tasks.

Self-confidence enables students to take intellectual risks and persevere through complex problems. Confident learners are more likely to engage deeply with content and use feedback productively (Brookhart, 2019). Meanwhile, emotions such as curiosity, enjoyment, and frustration play a central role in shaping students' cognitive processes. Positive emotions foster persistence and flexibility, while negative emotions like anxiety can obstruct critical engagement (Paputungan & Inaku, 2022).

Causal Relationship: Self-confidence and positive emotional experiences encourage active exploration and intellectual risk-taking, both of which are essential for HOTS. Emotional dysregulation, on the other hand, can impede problem-solving and reflective thinking.

To provide a comprehensive overview of how the identified dimensions are addressed across the selected studies, Table 3 presents a detailed mapping of the 42 articles included in this systematic literature review. Each study is categorized based on its research type—quantitative, qualitative, or mixed-methods—and analyzed for the presence of factors within the six key dimensions: individual, learning environment, teacher, curriculum, contextual and cultural, and affective. The table highlights specific indicators, such as basic cognitive ability, learning strategies, pedagogical competence, curriculum design, social support, and emotional engagement, among others. This synthesis offers valuable insight into the distribution and emphasis of HOTS-related factors across a decade of research, illustrating both the diversity of focus and emerging patterns in the scholarly exploration of higher-order thinking skills.

Table 3. SLR on HOTS in 2014 to 2024

No	Authors	Type of Study	Individual Dimension				Learning Environment Dimension			Teacher Dimension			Curriculum Dimension		Contextual and Cultural Dimension			Affective Dimension	
			BCA	LM	SRL	LS	LSg	UT	ALR	PC	AIT	PF	CD	AS	SS	CF	SE	SC	EL
1	Yasa (2024)	QT		/			/	/		/			/		/				
2	Indrianto (2024)	QT	/				/			/					/				
3	Fongkanta (2024)	QT	/				/	/				/							
4	Youssef (2024)	QT	/						/	/		/			/				
5	Cojorn (2024)	QT						/		/	/								
6	Fathonah (2024)	MM	/					/		/			/						
7	Zhou (2024)	MM	/		/					/			/						
8	Suradika (2023)	QT	/	/	/		/			/			/						
9	Wijnen (2023)	QL	/					/		/	/				/				
10	Lavi (2023)	MM	/							/	/		/				/		
11	Hariyadi (2023)	QT	/					/	/	/			/				/		
12	Nurrijal (2023)	QT	/	/			/	/		/			/				/		
13	Nasir (2023)	QT				/		/					/						
14	Jayalakshmi (2023)	QL					/		/	/			/						
15	Ahmed (2023)	QT					/	/		/			/		/				
16	Farah (2023)	QL	/		/		/	/	/	/			/		/				
17	Mahmud (2022)	MM	/	/			/	/	/	/			/						
18	Voon (2022)	MM	/					/		/			/						
19	Li (2022)	MM	/	/			/	/		/			/						
20	Winarto (2022)	QL	/							/			/						
21	Agustini (2022)	QT	/				/	/		/			/						
22	Onoda (2022)	QL	/				/			/			/				/		
23	Hursen (2021)	QT	/				/	/		/			/		/				/
24	Chen (2021)	QT	/	/	/					/			/		/				/
25	Wang (2021)	QT	/	/			/			/			/		/				/
26	Saenz (2021)	QT	/	/			/			/						/			
27	Zaqiah (2021)	MM	/	/				/	/	/		/				/			
28	Sukatiman (2020)	MM	/	/	/		/	/	/	/	/	/							
29	Bratslavsky (2019)	QL	/	/				/		/	/	/							
30	Kapanadze (2019)	QL	/	/				/	/	/	/	/			/	/			
31	Poce (2019)	QL	/	/				/	/	/	/				/	/			
32	Lord (2019)	QL	/	/			/	/	/	/			/		/			/	
33	Ulger (2018)	QT	/	/						/		/			/			/	/
34	Priyaadharshini (2018)	QT	/	/		/	/	/	/									/	
35	Sang (2018)	QL		/			/	/		/		/	/					/	/
36	Pinto-Llorente (2018)	QL	/					/		/		/	/					/	
37	M.K. Ážahiİ‡n (2018)	QL	/				/		/			/	/					/	
38	Ãœlger (2016)	QT	/	/				/	/	/		/	/					/	
39	Karadeniz (2016)	QT	/	/	/					/		/	/					/	
40	Yang (2015)	QT	/	/	/			/	/	/			/			/		/	
41	Hwang (2015)	QT	/	/	/			/		/	/		/		/	/		/	/

42	Yeen-Ju (2014)	QL	/	/	/	/	/	/	/	/	/	/	/

Individual Dimension	Learning Environment Dimension	Teacher Dimension	Curricullum Dimension	Contextual and Cultural Dimension	Affective Dimension
1. BCA=Basic Cognitive Ability 2. LM=Learning Motivation 3. SRL=Self-Regulated Learning 4. LS=Learning Style	1. LSg=Learning Strategy 2. UT=Use of Technology 3. ALR=Availability of Learning Resources	1. PC=Pedagogical Competence 2. AIT= Ability to integrate Technology 3. PF=Providing Feedback	1. CD=Curriculum Design 2. AS=Assessment Suitability	1. SS=Social Support 2. CF=Cultural Factors 3. SE=School Environment	1. SC=Self-Confidence 2. EL=Emotions in Learning

As shown in Table 3, the analysis of the 42 selected articles reveals that the six main dimensions examined in this study gave rise to 16 subdimensions, each representing specific factors that influence the development of higher-order thinking skills (HOTS).

Within the Individual Dimension, four key subdimensions were identified. Basic cognitive abilities were the most frequently addressed, with 36 articles highlighting their foundational role in supporting HOTS. This suggests that students' ability to process, analyze, and synthesize information is widely recognized as essential for developing higher-order cognitive skills. Learning motivation was discussed in 22 articles, emphasizing its significance in sustaining students' engagement with challenging learning tasks. Self-regulated learning, which relates to how students plan, monitor, and evaluate their learning processes, was addressed in 9 studies, reflecting growing interest in metacognitive strategies. Meanwhile, learning styles were mentioned in only 2 articles, indicating that this subdimension remains relatively under-researched in the context of HOTS.

In the Learning Environment Dimension, three subdimensions were observed: learning strategies, use of technology, and availability of learning resources. Learning strategies were discussed in 21 articles, illustrating the importance of instructional approaches—such as problem-based and collaborative learning—in fostering HOTS. The integration of technology emerged in 27 studies, underscoring the role of digital tools in enhancing access to complex learning experiences. Learning resources were addressed in 14 articles, reinforcing the view that access to diverse and high-quality materials supports the development of critical and creative thinking.

The Teacher Dimension included three critical subdimensions. Pedagogical competence was the most prominent, featured in 40 studies, affirming that teachers' instructional expertise is a cornerstone in promoting HOTS. Technology integration by teachers appeared in 8 articles, focusing on their ability to effectively utilize digital tools to support student learning. Additionally, feedback provision was highlighted in 12 studies, emphasizing the role of constructive and timely feedback in guiding students toward reflective and critical thinking.

The Curriculum Dimension comprised two subdimensions. Curriculum design was addressed in 28 articles, demonstrating the importance of aligning instructional content and objectives with HOTS development. In contrast, assessment appropriateness was notably absent from all reviewed studies. This lack of attention suggests a significant gap in the literature, particularly concerning how assessment practices align with the goals of HOTS. The omission highlights an opportunity for future research to explore how evaluation methods can more effectively measure and support higher-order thinking.

For the Contextual and Cultural Dimension, three subdimensions were identified: social support, cultural factors, and school environment. Social support was discussed in 14 studies, particularly in relation to the importance of teacher and peer relationships in fostering a supportive learning climate. Cultural factors were addressed in 7 articles, suggesting that cultural values and norms play a role in shaping students' attitudes toward critical and creative thinking. However, only 4 articles explored the school environment, indicating that its impact on HOTS may be underrepresented in current research.

Finally, the Affective Dimension included self-confidence and emotions in learning. Self-confidence was highlighted in 11 articles, reflecting its influence on students' willingness to engage in complex tasks and persist in the face of challenges. The subdimension of emotions in learning appeared

in 7 studies, pointing to the role of affective states—such as curiosity, enjoyment, or anxiety—in either facilitating or hindering cognitive engagement.

Overall, these findings indicate that research on HOTS spans a diverse range of influencing factors. However, certain areas, such as assessment appropriateness and learning styles, remain underexplored. A more comprehensive understanding of these dimensions can support the development of targeted and effective educational interventions aimed at enhancing students' higher-order thinking skills. Future research should address these gaps to ensure a more holistic approach in fostering critical, creative, and reflective learners.

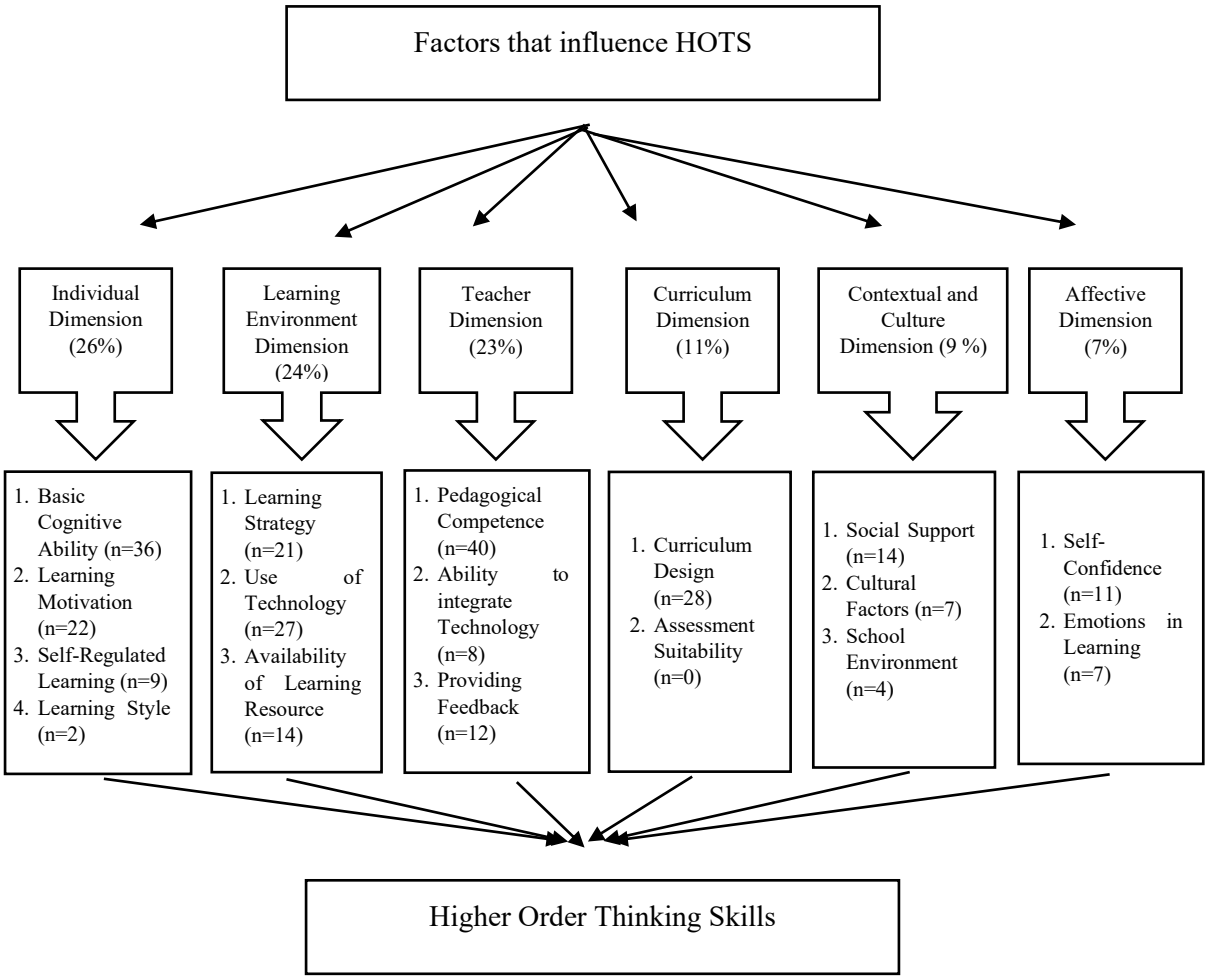

Figure 3. Summary of HOTS dimensions based on SLR (n refers to the number of articles)

Compared to previous research, this study reinforces earlier findings by Resnick (1987) and Shulman (1987), particularly regarding the essential role of cognitive abilities and pedagogical competence in the development of higher-order thinking skills (HOTS). The prominence of these two factors across the reviewed literature affirms their foundational influence on students' capacity to engage in complex cognitive tasks. However, this study also challenges certain assumptions by exposing a significant gap in the existing research—namely, the lack of attention to the alignment between assessment practices and HOTS objectives. None of the analyzed articles explicitly addressed this issue, suggesting that while teaching methods and curricular content have evolved to emphasize HOTS, assessment strategies may not have kept pace. Additionally, this study broadens the scope of prior research by emphasizing the role of cultural and contextual influences. By recognizing how

societal norms, values, and educational environments shape students' thinking processes, the study contributes to a more holistic understanding of the factors that facilitate or hinder HOTS development.

The findings of this review have several important implications for educational policy and practice. First, teacher training and professional development programs should prioritize the enhancement of pedagogical competence and the integration of technology in classroom instruction. These programs should also include a strong focus on developing assessment strategies that are aligned with HOTS, such as performance-based evaluations, open-ended questions, and formative assessments that encourage critical and creative thinking. Second, there is a pressing need for curriculum reform. Policymakers should revise existing curricula to embed authentic assessments that go beyond factual recall and instead assess students' ability to analyze, evaluate, and create. Incorporating project-based learning and inquiry-driven activities can help achieve this goal. Third, schools must invest in expanding access to learning resources, particularly digital tools and platforms that support interactive and exploratory learning. Such investments are crucial for enabling students to engage in higher-order thinking tasks both in and out of the classroom. Lastly, fostering a supportive and inclusive learning environment is essential. Educational institutions should cultivate a positive school culture that promotes collaboration, critical dialogue, and the integration of social and emotional learning. Together, these strategies can create a more conducive environment for nurturing the higher-order thinking skills that are vital for academic success and lifelong learning.

4. CONCLUSION

This study concludes that students' higher-order thinking skills (HOTS) are influenced by multiple interrelated factors across six key dimensions—individual, learning environment, teacher, curriculum, contextual and cultural, and affective. Drawing on data from 42 Scopus-indexed articles analyzed through the PRISMA method, the findings indicate that the individual dimension and teacher pedagogical competence are the most dominant contributors to HOTS development. The individual dimension encompasses core internal factors such as cognitive ability, learning motivation, self-regulated learning, and learning styles, highlighting that students' intrinsic capabilities and motivation form the foundation for cultivating higher-order thinking. Meanwhile, teacher pedagogical competence plays a pivotal role in shaping learning experiences that foster critical, creative, and problem-solving skills, underscoring the teacher's central influence in promoting HOTS (Shulman, 1987). Despite these significant insights, the study has several limitations, primarily related to its reliance on secondary data from Scopus, which may exclude relevant studies indexed elsewhere or published in non-English languages. Additionally, the review's descriptive nature limits the ability to establish causal relationships among the identified factors. Future research should therefore employ empirical and longitudinal designs to explore how these dimensions interact dynamically in classroom settings. Comparative studies across cultural and linguistic contexts are also recommended to enhance global understanding of HOTS development. Furthermore, future investigations should address underexplored areas such as assessment alignment and learning styles to provide a more comprehensive framework for developing effective educational strategies that strengthen students' higher-order thinking skills.

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