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The Relevance of Collaborative Learning in the Perspective of Lev Vygotsky's Social Constructivism: A Literature Review

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Abstract: This study aims to analyze the relevance of collaborative learning within the theoretical framework of Lev Vygotsky's social constructivism, particularly by examining how the concepts of the Zone of Proximal Development (ZPD) and scaffolding are operationalized in collaborative practices. Although collaborative learning has been widely implemented in contemporary classrooms, limited literature explicitly integrates it with Vygotskian constructs in a comprehensive theoretical review. This research employed a qualitative library research design using a systematic literature review approach. Academic sources published between 2015 and 2025 were identified through major databases, screened using inclusion and exclusion criteria, and analyzed thematically following PRISMA procedures. The analysis focused on four dominant themes: collaboration as a mechanism of ZPD, layered scaffolding (cognitive, metacognitive, and socio-emotional), socio-emotional dynamics in group interaction, and digital collaborative learning in relation to 21st-century skills. The findings indicate that collaborative learning functions as the practical operationalization of ZPD through peer interaction and shared meaning-making. Scaffolding is most effective when distributed across teachers, peers, and digital agents. Socio-emotional factors, such as trust and conflict regulation, serve as active mechanisms supporting cognitive internalization. The novelty of this study lies in proposing the concept of group-ZPD and integrating multi-modal scaffolding, socio-emotional learning, and digital mediation into a unified Vygotskian framework. This study contributes theoretically by extending social constructivism into digital contexts and practically by offering design principles for collaborative learning aligned with 21st-century competencies.

***Abstrak**: Penelitian ini bertujuan untuk menganalisis relevansi pembelajaran kolaboratif dalam kerangka konstruktivisme sosial Lev Vygotsky, khususnya dengan menelaah bagaimana konsep Zone of Proximal Development (ZPD) dan scaffolding dioperasionalisasikan dalam praktik kolaboratif. Meskipun pembelajaran kolaboratif telah banyak diterapkan, masih terbatas kajian yang secara eksplisit mengintegrasikannya dengan konstruksi teoretis Vygotsky dalam suatu tinjauan konseptual yang komprehensif. Penelitian ini menggunakan desain penelitian kepustakaan kualitatif dengan pendekatan systematic literature review. Sumber akademik yang dipublikasikan antara tahun 2015–2025 diidentifikasi melalui basis data bereputasi, diseleksi menggunakan kriteria inklusi dan eksklusi, serta dianalisis secara tematik berdasarkan prosedur PRISMA. Analisis difokuskan pada empat tema utama: kolaborasi sebagai mekanisme ZPD, scaffolding berlapis (kognitif, metakognitif, dan sosial-emosional), dinamika sosial-*

emosional dalam interaksi kelompok, serta pembelajaran kolaboratif digital dalam kaitannya dengan keterampilan abad ke-21. Hasil penelitian menunjukkan bahwa pembelajaran kolaboratif merupakan bentuk operasionalisasi ZPD melalui interaksi sebaya dan konstruksi makna bersama. Scaffolding paling efektif ketika didistribusikan kepada guru, teman sebaya, maupun agen digital. Faktor sosial-emosional seperti kepercayaan dan regulasi konflik berperan sebagai mekanisme aktif dalam mendukung proses internalisasi kognitif. Kebaruan penelitian ini terletak pada pengajuan konsep group-ZPD serta integrasi scaffolding multi-modal, pembelajaran sosial-emosional, dan mediasi digital dalam satu kerangka Vygotskian yang utuh. Studi ini berkontribusi secara teoretis dengan memperluas konstruktivisme sosial ke konteks digital serta secara praktis dengan menawarkan prinsip desain pembelajaran kolaboratif yang selaras dengan kompetensi abad ke-21.

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INTRODUCTION

Teacher-centered learning results in limited student engagement in the learning process, thereby reducing opportunities for developing critical thinking skills. According to Thornhill-Miller et al (2023), and Dilekçi & Karatay (2023), improving students' thinking abilities is crucial because competencies such as critical thinking, creativity, communication, and collaboration are central to 21st-century education. However, traditional lecture-based teaching approaches are no longer adequate to meet these demands, as they emphasize passive reception of knowledge rather than active participation. This condition highlights the urgent need for alternative pedagogical strategies that can foster students' higher-order thinking and active involvement.

In this context, collaborative pedagogy emerges as a relevant response to the challenges of contemporary education. Collaborative learning emphasizes cooperation among students, teachers, and broader learning environments, enabling participants to construct knowledge through interaction. According to Alharbi et al (2022); and Supena et al (2021), collaborative learning utilizes small groups where students work together to maximize learning outcomes. Group formation in this model has been proven to enhance effectiveness, foster peer discussion, and promote mutual assistance in understanding material. Nugroho et al. (2023); Pattipeilohy and Wijaya (2020) argue that this approach creates dynamic and participatory environments, aligning with the principles of interaction and cooperation that modern education requires.

In recent years, collaborative learning has gained increasing attention in higher education. Research demonstrates its potential to encourage meaningful interaction, build trust, and deepen understanding among learners (Zamhariroh & Thobroni, 2024). Moreover, studies have confirmed that collaborative strategies provide opportunities for students to share perspectives, solve problems collectively, and develop social competencies that support lifelong learning (Mubarok et al., 2024). These findings suggest that collaborative learning contributes not only to academic achievement but also to interpersonal growth.

Parallel to this development, Vygotsky's social constructivism offers a strong theoretical foundation for collaborative learning. Developed in the early 20th century, the theory posits that knowledge is constructed through social interaction and that learning occurs in two stages: first through collaboration with others, then through independent internalization (Rahayu et al., 2024). Vygotsky emphasizes that interaction between learners and teachers fosters essential skills such as mutual respect, negotiation, and perspective-taking. Furthermore, he believed that while children are born with basic mental abilities, these capacities are significantly enhanced through direct social engagement, which provides access to cognitive tools, skills, and interpersonal relationships (Nurhayani & Dewi, 2022).

Despite this alignment, most previous studies have tended to focus on the technical implementation of collaborative learning in classrooms rather than its conceptual relationship to Vygotskian principles. Wibowo et al. (2023) highlight that the concepts of the Zone of Proximal Development (ZPD) and scaffolding are central to social constructivism, yet there remains limited scholarly effort to explicitly connect these constructs with collaborative pedagogy in literature reviews. Thus, a theoretical and integrative analysis is still lacking, creating a gap that needs to be addressed.

This study seeks to bridge the gap by explicitly linking collaborative learning to the principles of Vygotsky's social constructivism. While existing literature has explored either collaborative pedagogy or Vygotskian theory separately, few have comprehensively examined how collaborative practices reflect and reinforce ZPD and scaffolding. By addressing this, the present study contributes to both theoretical enrichment and practical application in the field of education.

Another novelty of this research lies in its conceptual orientation. Unlike empirical studies that merely describe classroom practices, this article highlights how collaborative learning can be analyzed as a framework rooted in Vygotskian constructs. Such a perspective not only clarifies the theoretical relevance of collaboration but also provides new insights into how learning design can be optimized to foster higher-order thinking, communication, and social competencies.

The purpose of this literature review is to analyze the relevance of collaborative learning within the framework of Lev Vygotsky's social constructivism, with particular focus on how the concepts of ZPD and scaffolding are manifested in collaborative practices.

This study argues that collaborative learning is not only an effective pedagogical strategy but also a theoretical actualization of Vygotsky's social constructivism. By examining peer interaction, scaffolding processes, and shared knowledge construction, collaborative learning can be positioned as a bridge between theory and practice, offering a model for enhancing student learning in the 21st century.

The importance of this research lies in its contribution to contemporary education. By making explicit the theoretical linkages between collaborative pedagogy and Vygotskian concepts, the study provides educators and policymakers with a clearer understanding of how to design dynamic, interactive, and socially grounded learning environments. Such insights are essential for ensuring that education not only addresses academic goals but also equips learners with the critical and collaborative competencies needed in modern society.

METHOD

This study employed a qualitative library research design using a systematic literature review framework. Library research is carried out by collecting, analyzing, and synthesizing information from academic sources such as reference books, journal articles, previous studies, and research reports relevant to the problem under investigation. Library research consists of four essential activities, namely recording findings related to the research problem, integrating findings across different sources, analyzing findings critically, and providing constructive critiques and insights (Mathiasson, 2022; Sari, 2020).

To ensure methodological rigor, this study followed a structured process beginning with the identification of relevant literature. Sources were collected from major academic databases such as Scopus, Web of Science, and ScienceDirect, as well as from Google Scholar and national databases including Garuda and DOAJ Indonesia. The keywords used in the search included *collaborative learning*, *social constructivism*, *Vygotsky*, *Zone of Proximal Development (ZPD)*, and *scaffolding*. After the initial identification stage, the screening process was conducted by applying inclusion and exclusion criteria. The inclusion criteria covered peer-reviewed journal articles published between 2015 and 2025, written in English or Indonesian, and explicitly discussing collaborative learning and/or Vygotsky's social constructivism. Meanwhile, the exclusion criteria included non-academic sources, publications that were not written in the required languages, and articles lacking methodological clarity.

The next stage was data extraction and thematic analysis. Each eligible article was carefully reviewed to extract information related to its objectives, methodology, findings, and theoretical contributions. The extracted data were then analyzed thematically and grouped into several dominant themes, namely collaborative learning as a mechanism of ZPD, scaffolding as a multi-modal process, social-emotional dimensions of collaboration, and digital collaborative learning in relation to 21st-century skills. These themes were subsequently synthesized to formulate a comprehensive understanding of the relevance of collaborative learning within

Vygotsky's social constructivism. The synthesis also emphasized the dual significance of collaborative learning, both as a theoretical construct for internalizing knowledge and as a practical strategy for designing effective classroom learning.

To ensure transparency and replicability, the process of literature selection and analysis was documented using a PRISMA flowchart. This documentation illustrates the number of articles identified, screened, excluded, and finally included in the review. Through this structured and systematic approach, the present study seeks to produce a comprehensive and accountable literature review that bridges theoretical perspectives and practical implications of collaborative learning within the framework of Vygotsky's social constructivism.

RESULT AND DISCUSSION

RESULT

Lev Vygotsky's Social Constructivism

According to Vygotsky, unlike animals that merely respond to their surroundings, human beings possess the capacity to actively transform their environment to suit their needs. This philosophical view of human nature laid the foundation for the birth of social constructivism, a theory which explains that children's cognitive abilities are built and developed through social interaction. Vygotsky placed strong emphasis on the role of meaningful activities within socio-cultural environments as essential elements in shaping a child's cognitive construction. For this reason, his theoretical orientation is often referred to as the *sociocultural perspective* (Tohari & Rahman, 2024).

Within this framework, Vygotsky argued that human development is shaped primarily by three interconnected factors: interpersonal or social interactions, historical-cultural influences, and individual elements. The central principle of Vygotsky's constructivism, as highlighted by Ormrod, is that humans are able to use their mental functions to enhance learning, memory, and logical reasoning. While the basis of human mental functions is biologically determined, Vygotsky asserted that their development requires the active role of society and culture, which serve as mediators in the learning process (Wibowo et al., 2023).

Vygotsky also emphasized the significance of both interpersonal and institutional levels of social context. He believed that direct engagement with others plays a crucial role in the development of mental functions, as such interactions provide access to cognitive tools, skills, and interpersonal relationships. Consequently, children's mental development is not an isolated process but is instead constructed through the organization of experiences within cultural and social interactions (Nurhayani & Dewi, 2022).

Furthermore, Vygotsky underlined the inseparable connection between language and action in the learning process. During educational activities, language and social behaviors influence one another in shaping cognition. On this basis, Vygotsky concluded that all learning is inherently constructive and must take place

within a social context. This perspective gave rise to the recognition of educational theorists who adopt this approach as *social constructivists* (Tohari & Rahman, 2024).

Two of the most important and widely applied concepts in Vygotsky's theory are the *Zone of Proximal Development (ZPD)* and *scaffolding*. The ZPD represents the range of tasks that learners cannot yet perform independently but can accomplish with guidance from teachers, peers, or other mediators. Scaffolding refers to the gradual support provided to learners to help them progress from assisted performance toward independent mastery. These two concepts remain central to understanding the practical relevance of Vygotsky's theory in collaborative learning contexts (Wibowo et al., 2023).

The findings above indicate that Vygotsky's social constructivism provides not only a descriptive explanation of cognitive development but also a normative framework for designing learning environments. By situating learning within social and cultural interactions, Vygotsky positions knowledge construction as a collaborative process rather than an individual endeavor. This reinforces the argument that effective pedagogy must go beyond content transmission and instead facilitate interaction, dialogue, and scaffolding opportunities. Therefore, Vygotsky's theory serves as a conceptual bridge between the psychological foundations of learning and the practical design of collaborative classrooms, making it highly relevant for addressing the demands of 21st-century education.

Learning Collaborative

According to David W. Johnson, collaborative learning is a teaching approach in which small groups of learners with equal status work together to complete tasks, achieve shared objectives, and evaluate results collectively (Mimhamimdala, 2022). Barkley, Cross, and Major further emphasize that through active interaction between students, collaborative learning can generate immersive learning experiences that promote deeper engagement with content. The integration of digital technology into collaborative learning environments also makes it possible to adapt activities to the specific needs of each student, thereby increasing motivation and fostering personalized learning opportunities. This combination creates dynamic and supportive settings in which learners benefit from the guidance of both teachers and peers (Siregar, 2022).

The primary goal of collaborative learning is to enhance student interaction so that academic tasks can be accomplished more effectively and efficiently. This aligns directly with Vygotsky's social learning theory, which emphasizes the fundamental role of social processes in cognitive development. The concept of the *Zone of Proximal Development (ZPD)* is particularly relevant in this context, as it describes the range of tasks learners can accomplish with the help of teachers or more capable peers but cannot yet achieve independently. Vygotsky argued that higher mental abilities such as reasoning, problem-solving, and critical thinking typically emerge first through cooperative dialogue and shared experiences before becoming internalized as individual skills (Mimhamimdala, 2022).

Collaborative learning also embodies three defining characteristics as outlined by Barkley, Cross, and Major: intentional design, cooperation, and meaningful learning. *Intentional design* refers to the deliberate structuring of tasks and roles to ensure all participants are engaged. *Cooperation* emphasizes equality and shared responsibility within the group, avoiding dominance by a single individual. Finally, *meaningful learning* occurs when students co-construct knowledge through authentic and relevant activities, making their learning experience more lasting and impactful.

The findings suggest that collaborative learning is more than a classroom strategy; it represents a pedagogical philosophy grounded in interaction, cooperation, and shared responsibility. Its compatibility with Vygotsky's ZPD highlights its theoretical robustness, while its reliance on peer dialogue and mutual support demonstrates its practical significance in modern classrooms. Moreover, the integration of digital tools into collaborative settings extends its relevance to contemporary learning environments, where flexibility and personalization are increasingly important. Thus, collaborative learning functions not only as a method for improving academic achievement but also as a vehicle for cultivating 21st-century competencies such as communication, teamwork, and problem-solving.

Literature Review Synthesis Findings

Collaboration as the Main Mechanism of ZPD

The reviewed literature consistently indicates that collaborative learning is a practical means of actualizing Vygotsky's *Zone of Proximal Development (ZPD)*. Interactions with more competent or equally skilled peers enable learners to achieve performance beyond their independent capabilities. This aligns with Vygotsky's theoretical assumptions and has been confirmed in active learning practices (Erbil, 2020). Collaborative group dynamics often result in the emergence of a *group-ZPD*, where collective capabilities exceed the sum of individual contributions, demonstrating the powerful explanatory capacity of the ZPD framework in understanding collaboration.

Scaffolding as a Multi-Modal Process

Recent empirical evidence, including meta-analyses, suggests that scaffolding is most effective when it is multi-modal, encompassing cognitive (hints, prompts), metacognitive (strategy modeling, co-regulation), and social-emotional (motivational support) dimensions. Structured interventions such as collaboration scripts, rubrics, and digital agents have been shown to improve participation and learning outcomes. Research highlights that scaffolding is not limited to teacher-led instruction but may also be provided effectively by peers or even digital systems (Jingjing Shao et al., 2023).

The Social-Emotional Dimension of Collaboration

Another important finding concerns the socio-emotional dimension, which plays a decisive role in determining the quality of collaborative work. Studies show that trust, conflict management, emotional regulation, and social responsibility are essential in shaping effective collaboration. These elements are not merely

supportive conditions but active drivers of shared cognitive processes (Borge & Xia, 2023). Conversely, without socio-emotional balance, collaborative tasks often fail to achieve their cognitive objectives, as conflicts or uneven participation can undermine group performance.

Digital Collaborative Learning

Research conducted between 2020 and 2025 reveals two contrasting patterns in digital collaboration. On the one hand, digital platforms and collaborative tools expand opportunities for asynchronous work, process tracking, and artifact integration, thereby enhancing group productivity. On the other hand, without sufficient social-metacognitive scaffolding and proper design, the quality of collaboration tends to decrease. Several surveys highlight stakeholder concerns that graduates of online programs often display weaker collaborative skills compared to those trained in traditional settings. This underscores the importance of integrating digital scaffolding mechanisms into online learning designs to ensure meaningful collaboration.

Direct Link to 21st-Century Skills

The literature also confirms a strong connection between Vygotsky's theoretical constructs and the competencies required in the 21st century. Collaborative activities within the ZPD nurture communication, problem-solving, and critical thinking skills, while digital scaffolding through online platforms promotes creativity and digital literacy. However, the extent of these outcomes is highly dependent on the quality of learning design. Without well-structured scaffolding, digital collaboration risks becoming superficial and ineffective (Rigopouli et al., 2025). Many recent studies have mapped collaborative learning outcomes such as negotiation, argumentation, and problem-solving to 21st-century competencies like communication, collaboration, critical thinking, creativity, and digital literacy. Preliminary evidence suggests that ZPD-aware learning designs combined with scaffolding strategies can effectively foster these competencies.

The synthesis of findings shows that collaborative learning, when linked to Vygotskian principles, provides both conceptual clarity and practical guidance for modern education. Collaboration functions as the operationalization of the ZPD, while scaffolding (whether cognitive, metacognitive, or socio-emotional) ensures that learning interactions are productive. Furthermore, socio-emotional factors emerge as critical determinants of collaborative success, and digital platforms expand learning opportunities but require intentional scaffolding to be effective. These insights demonstrate that collaborative learning not only reflects the theoretical foundations of social constructivism but also directly contributes to the development of essential 21st-century skills, thereby bridging theory and practice in contemporary pedagogy.

Table 1. Summary of Findings

Main Theme	Implications Practical
ZPD in collaboration	Task design based on group & individual ZPD
Layered scaffolding	Use rubrics, scripts, digital agents to support interactions
Implications social-emotional	Teach SEL, practice communication skills & conflict management
Digital collaboration	Integrate digital scaffolding; evaluation impact to 21st century skills

The findings confirm that collaborative learning operationalizes Vygotsky's *Zone of Proximal Development (ZPD)* by enabling learners to exceed individual capacities through group interaction. Practically, this highlights the importance of designing tasks that consider both individual and group ZPD (Erbil, 2020). The novelty lies in expanding Vygotsky's concept to a *group-ZPD*, showing how collective capacity emerges in collaboration.

Scaffolding is shown to be most effective when layered (cognitive, metacognitive, and socio-emotional) using rubrics, scripts, and digital agents (Jingjing Shao et al., 2023). The practical implication is adopting multi-modal scaffolding strategies. The novelty is that scaffolding is not limited to teachers but can also be mediated by peers and technology.

Socio-emotional dynamics, such as trust, conflict management, and communication, are proven to be central drivers of collaboration (Borge & Xia, 2023). This implies the need for integrating *Social Emotional Learning (SEL)* into collaborative pedagogy. The novelty is treating socio-emotional factors as active scaffolding mechanisms, not just supportive conditions.

Digital collaboration expands learning capacity but risks shallow interactions without adequate scaffolding. Stakeholders also express concern over online graduates' collaboration skills. Practically, this requires integrating digital scaffolding and evaluating its impact on 21st-century skills (Rigopouli et al., 2025). The novelty lies in applying Vygotskian principles to digital contexts through the concept of *digital scaffolding*.

Overall, the study's novelty is the explicit integration of ZPD, layered scaffolding, socio-emotional learning, and digital collaboration into a comprehensive model that links Vygotskian theory with the demands of 21st-century education.

DISCUSSION

ZPD in Collaborative Learning

The *Zone of Proximal Development (ZPD)* remains a powerful conceptual framework for explaining why collaboration is effective in educational settings. Within groups, the *More Knowledgeable Other (MKO)* may take the form of a teacher,

a peer, or even a technological resource. Through verbal interaction, joint task completion, and shared reflection, learners gradually internalize cognitive functions that are initially social in nature (Erbil, 2020). A review of theory and intervention studies, including flipped and cooperative learning models, confirms that active learning approaches explicitly utilizing the ZPD tend to improve conceptual understanding, particularly when tasks are designed at the threshold of learners' ZPD. However, this effectiveness depends largely on the ability of instructional designers to identify both group and individual ZPD levels (Erbil, 2020). From a Vygotskian perspective, these findings reinforce that the ZPD is not merely an individual attribute but is often socially constructed. The notion of a *group-ZPD* emerges when interactions foster the exchange of strategies and collective meaning-making, suggesting that ZPD assessment must account for group dynamics as well as individual progress.

Scaffolding in Group Interaction

Scaffolding in collaborative learning is most effective when it is layered, incorporating cognitive (step-by-step instructions), metacognitive (reflection prompts, co-regulation), and social (role facilitation, emotional support) dimensions. Structured mechanisms such as collaboration scripts, peer-assessment rubrics, and interaction-tracking tools have been shown to significantly improve both the quality of group processes and the final outcomes. Meta-analyses and recent empirical studies further confirm that integrating scaffolding improves self-regulation strategies and academic performance (Jingjing Shao et al., 2023). A distinctive shift in the past decade has been the move toward *distributed social-cognitive scaffolding*, whereby peers and digital tools, not only teachers, play an active role in providing support. Recent studies also explore the use of AI and digital agents as scaffolding providers, demonstrating that varied levels of scaffolding can influence both task quality and learner satisfaction (Dhillon, 2024). These developments mark an important evolution of scaffolding theory into technology-mediated contexts. Practically, this implies that collaborative learning design should include clear task scripts, explicit rubrics, assigned roles, and reflection phases. For online classes, additional tools that enable process tracking (e.g., logs, document versioning) and metacognitive scaffolding are essential to maintain interaction quality.

Social-Emotional Implications of Vygotsky's Perspective

Social-emotional factors (such as trust, empathy, and conflict regulation) are shown to enhance motivation to collaborate and enable the productive dialogue required for cognitive internalization. Consistent with Vygotsky's view that higher psychological functioning arises from social interactions, modern empirical studies confirm that social-emotional interactions serve as strong predictors of collaboration satisfaction and learning outcomes (Gao et al., 2024). Comparative research between 2020 and 2024 has also produced new metrics for measuring social-emotional aspects in *Computer-Supported Collaborative Learning (CSCL)* environments, while SEL (Social Emotional Learning) interventions integrated with collaborative activities have proven to increase group stability and the quality of outputs. A critical point is that neglecting this dimension risks undermining

collaborative benefits, as task inequities, unmanaged conflicts, or lack of empathy can reduce both group cohesion and the cognitive gains derived from ZPD-based activities.

Mapping Vygotsky to 21st-Century Skills and Digital Collaborative Learning

Recent literature links Vygotsky's concepts (particularly ZPD and internalization through social interaction) to the development of 21st-century skills such as communication, critical thinking, creativity, cross-platform collaboration, and digital literacy. When used intentionally, digital tools can act as mediators of ZPD and scaffolding, facilitating both synchronous and asynchronous collaboration. Emerging studies have even explored the role of AI and large language models as adaptive scaffolding mechanisms, offering personalized levels of guidance (Rigopouli et al., 2025). Comparative research over the past decade highlights the rise of learning models that explicitly integrate Vygotsky's theory with technology-mediated design, signaling a significant expansion of constructivist theory into digital learning environments. However, risks remain. Evidence shows that poorly designed digital collaboration may result in shallow engagement, while stakeholder surveys report concerns about the insufficient collaborative skills of graduates from online programs. Thus, while the potential of digital collaboration is considerable, its success depends on intentional scaffolding design and careful evaluation of its impact on 21st-century competencies.

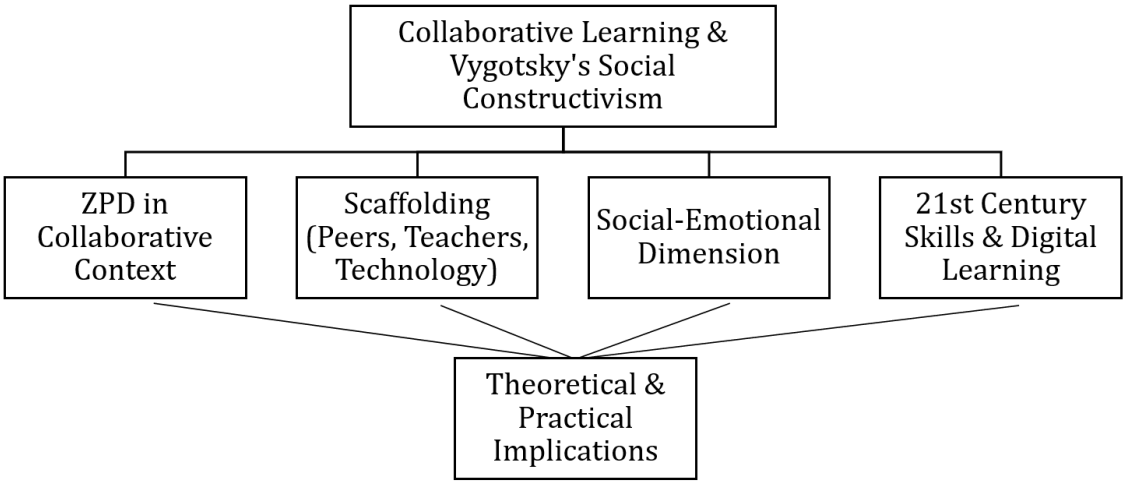

Figure 1. Theoretical Implications and Contributions

Taken together, the findings demonstrate that Vygotsky's social constructivism continues to provide a robust and adaptable framework for explaining collaborative learning in modern contexts. At the theoretical level, this study contributes to extending Vygotsky's ideas in several important ways. First, the notion of a *group-ZPD* advances the classical concept of ZPD from an individual-centered model toward a collective one, showing that learning potential emerges not only within individuals but also through group interactions. This reconceptualization highlights that collaboration itself can function as a learning unit, thereby enriching Vygotsky's sociocultural perspective.

Second, scaffolding theory is expanded to include multiple layers (cognitive, metacognitive, and socio-emotional) while also recognizing the role of diverse agents such as peers, teachers, and digital tools. The integration of AI and digital agents as scaffolding providers represents a significant theoretical advancement, suggesting that scaffolding is no longer confined to human interaction but can be distributed across human and technological mediators. This positions scaffolding as a flexible, multi-modal construct that aligns with the dynamics of 21st-century learning environments.

Third, the study emphasizes the centrality of socio-emotional interactions in the internalization process. While Vygotsky underlined the social basis of higher mental functions, contemporary evidence highlights that trust, empathy, and emotional regulation are not only supportive conditions but active mechanisms that shape cognitive growth. This deepens the theoretical understanding of social constructivism by demonstrating how emotional and relational factors co-determine the success of collaborative learning.

Fourth, the incorporation of Vygotskian principles into digital and technology-mediated learning environments extends the theory into new domains. By mapping ZPD and scaffolding onto online and AI-supported contexts, the study illustrates how traditional constructs can be reinterpreted for digital pedagogy. This represents a theoretical contribution by bridging classical sociocultural learning theory with the realities of technology-enhanced education.

Practically, the findings stress the importance of intentional task design that aligns with learners' ZPD, the systematic use of layered scaffolding, and the integration of Social Emotional Learning (SEL) to sustain collaboration. Furthermore, digital scaffolding strategies must be embedded into online platforms to ensure that collaborative interactions are meaningful and lead to the development of 21st-century skills such as critical thinking, creativity, communication, and digital literacy.

Ultimately, this synthesis illustrates that Vygotsky's social constructivism remains highly relevant for addressing the challenges of contemporary education. By extending the theory through group-ZPD, multi-modal scaffolding, socio-emotional centrality, and digital mediation, the study not only reinforces the enduring value of Vygotsky's insights but also offers a roadmap for their application in preparing learners for the complex demands of the 21st century.

CONCLUSION

This study confirms that collaborative learning holds strong relevance to Lev Vygotsky's social constructivism framework, particularly through the operationalization of the *Zone of Proximal Development (ZPD)* and the practice of scaffolding. Collaborative interactions (whether mediated by teachers, peers, or technology) serve as essential mechanisms for facilitating the internalization of knowledge, enhancing reasoning and problem-solving skills, and fostering communication and collaboration abilities. These findings reinforce that learning is

a fundamentally social process and that the quality of interaction strongly determines cognitive outcomes.

Beyond cognitive aspects, the study highlights the centrality of socio-emotional dimensions, including trust, empathy, and conflict regulation, in shaping productive collaboration. Without attention to these factors, collaborative efforts risk becoming unbalanced or unproductive. Integrating *Social Emotional Learning (SEL)* into collaborative designs is therefore crucial to ensuring both academic and interpersonal growth.

The expansion of scaffolding theory into multi-modal and technology-mediated forms also marks an important advancement. Scaffolding is no longer limited to teacher-led guidance but can be distributed across peers and digital agents, including AI-based systems. This reflects a novel extension of Vygotskian theory into technology-enhanced learning environments, demonstrating its adaptability in the digital age.

Furthermore, the study shows that collaborative learning directly contributes to the cultivation of 21st-century competencies, such as critical thinking, creativity, communication, collaboration, and digital literacy, when supported by intentional task design, layered scaffolding, and socio-emotional integration. At the same time, it cautions that poorly designed digital collaboration may result in superficial engagement and reduced learning outcomes, underscoring the importance of thoughtful pedagogical planning.

In conclusion, collaborative learning is not only theoretically robust within the framework of Vygotsky's social constructivism but also practically applicable in addressing the challenges of contemporary education. By bridging cognitive, socio-emotional, and technological dimensions, collaborative pedagogy offers a comprehensive pathway to preparing learners for the complex demands of modern society. This synthesis thus contributes both to the refinement of Vygotskian theory and to the practical design of innovative learning environments that integrate social interaction, emotional competence, and digital mediation.

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