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Implementation of Deep Learning Strategies for Developing Empathy and Collaboration Students

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Abstract

The aims of this study is to explore how the implementation of deep learning strategies to foster empathy and collaboration among second-grade elementary school students. Anchored in Vygotsky's Sociocultural Theory and the Social Emotional Learning (SEL) framework, the research focuses on how project-based and inquiry-based learning approaches contribute to the development of students' social-emotional skills. The primary objective is to examine how these pedagogical strategies create meaningful learning experiences that nurture students' ability to understand others' perspectives and work cooperatively with peers. The study also explores the teacher's role in facilitating deep learning through guided interaction within the Zone of Proximal Development (ZPD), where support is tailored to students' developmental readiness. Data were collected through classroom observations, semi-structured interviews, and analysis of student-created learning artifacts. Thematic analysis revealed that deep learning strategies provide authentic contexts for social interaction, enabling students to engage in perspective-taking and constructive collaboration. As a result, students exhibited notable growth in their ability to empathize and collaborate, indicating that well-structured, emotionally responsive instruction can enhance both cognitive and interpersonal development in early primary education.

Keywords: collaborative learning, deep learning, inquiry-based learning, project-based learning, social-emotional learning

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1. Introduction

Modern educational paradigms increasingly emphasize the development of social-emotional competencies alongside academic knowledge. Among these, empathy and collaboration are recognized as foundational skills for lifelong success and positive social integration. However, conventional pedagogical models often prioritize individual achievement, providing limited opportunities for students to practice these complex interactive abilities in authentic contexts. Deep learning is nothing new. Developed European countries have been implementing it since the 1970s. This is a crucial effort to improve the quality of education across the board. Deep learning strategies, such as project-based and inquiry-

based learning, present a compelling alternative. By immersing students in complex, collaborative problem-solving scenarios, these approaches create the necessary conditions for the organic development of both empathetic understanding and effective teamwork within the elementary school classroom.

This research is conceptually grounded in the confluence of Vygotsky's Sociocultural Theory and the Social-Emotional Learning (SEL) framework (Isabella, 2022). Vygotsky posits that higher-order cognitive functions, including social skills, originate in social interaction, particularly within the Zone of Proximal Development (ZPD) where peer scaffolding occurs. The SEL framework provides a structure for defining and assessing these skills, with empathy falling under social awareness (Preston & De Waal, 2002) and collaboration under relationship skills. Together, these theories provide a powerful lens for examining how deep learning strategies create the specific social arenas where these essential competencies are practiced and internalized by young learners (Anggriyani et al., 2025).

This study employs a single instrumental case study design (Hayden, 2022) to conduct an in-depth analysis of these pedagogical dynamics. The research investigates the implementation of project-based and inquiry-based learning within a second-grade classroom at SD Negeri Gentan 03. This focused approach was chosen to provide a rich, contextualized understanding of how these strategies influence student behavior and skill development in a naturalistic setting. The primary objective is to illuminate the nuanced processes through which structured collaborative tasks foster measurable growth in empathy and collaboration among early elementary students, providing valuable insights for pedagogical practice.

This research is grounded in Vygotsky's Sociocultural Theory of Cognitive Development, which posits that learning is an inherently social process fundamentally shaped by cultural context and interaction (Rubino, 2024). This perspective challenges the notion of the learner as an isolated individual, instead emphasizing that higher-order mental functions originate in social activities. For early elementary students, this implies that cognitive growth, including the development of complex social skills, is not merely an internal process but is mediated through shared experiences with peers and educators, providing a foundation for examining collaborative learning.

Central to Vygotsky's theory is the concept of the Zone of Proximal Development (ZPD), defined as the space between what a learner can achieve independently and what they can accomplish with guidance. This guidance can be provided by a teacher or, crucially, a peer. Collaborative tasks situated within the ZPD create a natural impetus for communication, negotiation, and shared problem-solving. Therefore, deep learning strategies that foster peer-to-peer collaboration are not just instructional techniques but are essential mechanisms for cognitive advancement and skill acquisition in young learners (Khoirunissa & Nugroho, 2024).

This study also draws upon the framework of Social-Emotional Learning (SEL), particularly as defined by the Collaborative for Academic, Social, and Emotional Learning (CASEL). SEL is the process through which individuals acquire and apply the knowledge and skills to manage emotions, achieve goals, feel and show empathy for others, and establish positive relationships. The framework's five core

competencies self-awareness, self-management, social awareness, relationship skills, and responsible decision-making provide a comprehensive structure for analyzing the targeted development of both empathy and effective collaboration among students.

The integration of Sociocultural Theory and SEL provides a powerful lens for this research. The social interactions that Vygotsky identified as critical for cognitive development are the very arenas where SEL competencies are practiced and honed. Empathy, a key component of social awareness, is cultivated when students must engage with and understand the perspectives of their peers during collaborative tasks. Similarly, relationship skills are directly developed through the process of working together towards a common goal, navigating disagreements, and providing mutual support within a learning community.

Deep learning strategies, such as project-based and inquiry-based learning, serve as the pedagogical embodiment of these combined theories. These approaches move beyond rote memorization to create authentic, complex problem-solving scenarios that necessitate collaboration and perspective-taking. By structuring activities that require students to co-construct knowledge and negotiate meaning, these strategies create the specific social and emotional contexts required for the development of both collaborative efficacy and empathetic understanding. This study will analyze how such implementations function within the elementary classroom setting.

2. Method

This study employs a qualitative, single instrumental case study design to conduct an in-depth investigation into the implementation of deep learning strategies. The research is situated within a specific early elementary classroom at SD Negeri Gentan 03. This approach was selected for its capacity to provide a rich, holistic understanding of the complex social dynamics and pedagogical processes as they naturally unfold. By focusing intensively on a single bounded system, the research aims to illuminate the nuanced ways in which project-based and inquiry-based learning influence the development of empathy and collaboration among young students in their authentic educational context.

The methodological approach is philosophically grounded in an interpretivist paradigm (Amar et al., 2020), which aligns with the study's theoretical framework. This perspective assumes that reality is socially constructed and seeks to understand the subjective meanings that participants attribute to their experiences. Consistent with Vygotsky's Sociocultural Theory, this design prioritizes the examination of social interactions, language, and shared activities as the primary mechanisms for learning and development. It allows for a detailed exploration of the Zone of Proximal Development in action, observing how peer collaboration and guided inquiry foster the targeted social-emotional competencies within the classroom's unique cultural setting.

The unit of analysis, or the "case," is the pedagogical implementation of deep learning strategies within one second-grade classroom over a full academic semester. This bounded system includes the teacher's instructional practices and the students' interactions during specific collaborative, project-based learning modules. As an instrumental case study, the primary goal is not to generalize findings to all schools but to gain deep insight into the particular issue of fostering empathy and collaboration. This focused approach facilitates a detailed analysis of the interplay

between the intervention, the participants, and the specific context of SD Negeri Gentan 03.

The study was conducted at SD Negeri Gentan 03, a public elementary school located in a suburban community representative of the region's educational landscape. This setting was purposively selected due to its typical classroom composition and the school leadership's expressed interest in innovative, character-focused pedagogy. The school serves a diverse student body, providing a realistic context for examining the implementation of deep learning strategies. The research focused on a single second-grade classroom, as this age group (7-8 years old) is at a crucial developmental stage for forming empathetic understanding and foundational collaborative skills, aligning directly with the study's objectives.

The participants included one second-grade classroom teacher and her 28 students. The teacher was selected via purposive sampling, based on her five years of teaching experience, her formal qualifications in primary education, and her expressed enthusiasm for adopting project-based learning methods. Her role was central, acting as the facilitator of the deep learning strategies and a key informant for the research. The student cohort, comprising 15 boys and 13 girls, represented a heterogeneous mix of academic and social developmental levels, typical for a public school classroom, which allowed for the observation of interactions across a spectrum of abilities.

Ethical protocols were strictly followed to ensure participant protection and voluntary involvement. Informed written consent was obtained from the school principal and the participating teacher. Furthermore, detailed information sheets were provided to the parents or legal guardians of all 28 students, from whom written consent was also secured. Before any data collection began, the researcher explained the study to the students in age-appropriate language to obtain their verbal assent to participate. Anonymity and confidentiality were guaranteed for all participants through the use of pseudonyms and the secure storage of all collected data throughout the research process.

The intervention was implemented over one full academic semester, structured around two distinct, six-week modules integrated into the existing social studies and science curriculum. The first module employed a project-based learning (PBL) framework focused on "Our Community Helpers," while the second utilized an inquiry-based learning (IBL) approach to explore "Local Ecosystems." The researcher collaborated closely with the classroom teacher to design these modules, ensuring they aligned with national curriculum standards while explicitly embedding opportunities for collaboration and perspective-taking. Each module was designed to culminate in a shared product, requiring students to negotiate roles and synthesize diverse ideas.

The first module, “Our Community Helpers,” utilized a project-based learning approach. Students were organized into heterogeneous groups of four and tasked with creating a collaborative mural depicting various community roles. Each student first researched a specific helper, conducting a simple interview with a family member or using age-appropriate resources. This initial phase focused on understanding a different person's perspective and responsibilities. The groups then had to integrate their individual findings, collectively deciding on the mural's design, delegating tasks, and resolving creative differences. The teacher acted as a facilitator, guiding discussions on teamwork and respectful communication.

The second module shifted to an inquiry-based learning framework centered on the driving question: "How do living things in our schoolyard help each other?" In their established groups, students engaged in guided observations, documenting interactions between plants and animals. This process required them to share observations, listen to peers' interpretations, and co-construct explanations for the phenomena they witnessed. The collaborative task was to create a shared "web of life" diagram illustrating these interdependencies. This structure necessitated negotiation and consensus-building as students synthesized their individual data points into a single, coherent representation of the ecosystem.

To capture the dynamics of the learning environment, non-participant classroom observations were conducted twice weekly throughout the 12-week intervention. Using a semi-structured observation protocol (Tucker, 2023) the researcher documented instances of empathy and collaboration during the project-based and inquiry-based activities. The protocol guided the focus towards specific behaviors such as turn-taking, active listening, offering assistance, and verbal expressions of perspective-taking. Detailed field notes were recorded, capturing verbatim student dialogue, non-verbal interactions, and the teacher's facilitation techniques. This method provided rich, contextualized data on how the deep learning strategies manifested in real-time student interactions within their natural classroom setting.

Data collection was further enriched through semi-structured interviews and focus groups. The classroom teacher participated in three one-on-one interviews pre-intervention, mid-intervention, and post-intervention to explore her perceptions of the pedagogical implementation and student development. Following each of the two learning modules, student focus groups were conducted with small, randomly selected cohorts of four to five children. These sessions used age-appropriate, open-ended questions to elicit students' reflections on their collaborative experiences, challenges in working together, and their understanding of their teammates' roles and feelings, providing direct insight into their subjective experiences of the intervention.

A third data source involved the systematic analysis of documents and student-created artifacts. The primary artifacts collected were the final group products from each module: the collaborative "Community Helpers" mural and the "Web of Life" diagrams. These were analyzed to assess the integration of individual ideas and the evidence of shared decision-making. In parallel, the teacher maintained a weekly reflective journal, providing an ongoing narrative of her pedagogical choices, challenges encountered, and specific anecdotes of student behavior related to empathy and collaboration. This collection of tangible outputs and reflective accounts served to triangulate findings from observations and interviews.

All qualitative data, including interview and focus group transcripts, field notes, and journal entries, were analyzed using a thematic analysis approach, following the six-phase framework developed by Braun and Clarke (Marrazes et al., 2025). The initial phase involved transcribing all audio recordings verbatim and repeatedly reading the entire dataset to achieve deep familiarization. Subsequently, an inductive coding process was initiated, where data segments were systematically assigned initial codes. These codes were generated directly from the data, capturing specific instances related to empathy (e.g., "verbalizing another's feelings", "offering unprompted

help") and collaboration (e.g., "negotiating roles", "synthesizing ideas", "resolving conflict").

Following the initial coding, the analysis proceeded to the theme development phase. Codes were collated and sorted into potential themes that represented broader patterns of meaning across the dataset. This process was iterative, employing a constant comparative method to refine the thematic structure. Themes were reviewed against the coded extracts and the full dataset to ensure they were coherent, distinct, and accurately captured the essence of the participants' experiences. This led to the creation of a definitive thematic map, which visually organized the final themes and sub-themes, illustrating the relationships between deep learning strategies and the development of social-emotional competencies.

To enhance the credibility and trustworthiness of the findings, a process of data triangulation was systematically employed. Emergent themes from one data source, such as classroom observations, were cross-referenced with data from teacher interviews, student focus groups, and the teacher's reflective journal. For instance, an observed instance of collaborative problem-solving was validated against student descriptions of the event and the teacher's written reflections. Furthermore, the student-created artifacts the mural and diagrams were subjected to a qualitative content analysis, examining them for visual evidence of shared decision-making and the integration of diverse student contributions, thus corroborating the other data sources.

3. Result and Discussion

a. Development of Collaborative Skills through Project-Based Learning Activities

Analysis of classroom observation data from the initial phase of the project-based learning (PBL) module revealed significant challenges in student collaboration. During the first week of the "Our Community Helpers" mural project, field notes frequently documented students working in parallel rather than cooperatively. Instances of material hoarding, talking over one another, and a lack of shared focus were common. The teacher's initial reflective journal entries corroborated these observations, noting that students struggled to move beyond individualistic approaches to the shared task, establishing a clear baseline for skill development.

As the PBL module progressed, a notable shift towards active negotiation of roles and responsibilities emerged. Observational data captured groups engaging in explicit discussions to delegate tasks, such as deciding who would draw specific community helpers or color certain sections of the mural. In student focus groups, children articulated this process, with one stating, "We had to pick who was best at drawing people". This development aligns with Vygotsky's theory, where the shared goal provided a necessary context for social negotiation and the beginning of structured teamwork.

The structured nature of the PBL task created authentic opportunities for collaborative problem-solving (Ardanari et al., 2024). Field notes documented a key incident where one group debated how to visually represent the connection between a doctor and a hospital on their mural. After several failed individual attempts, they collectively decided to draw a path connecting the two elements. This transition from individual ideas to a co-constructed solution exemplifies learning within the Zone of Proximal Development, where peers

scaffold each other's thinking to overcome a shared cognitive challenge.

Furthermore, thematic analysis of observation transcripts and focus group data indicated a marked improvement in communication and conflict resolution skills. While early disagreements often resulted in disengagement or appeals to the teacher, later observations recorded students using emergent negotiation language like, "Okay, we can do your idea first, then mine." This finding suggests that the sustained collaborative context of the PBL activity provided a practical arena for students to practice and internalize foundational relationship skills, a core competency within the SEL framework.

Finally, the analysis of the completed murals served as tangible evidence of developed collaborative efficacy. The artifacts demonstrated a clear integration of individual contributions into a cohesive whole, rather than appearing as four disjointed pictures on a single page. The visual synthesis of different drawing styles and ideas into a unified theme corroborates observational data on shared decision-making. This outcome signifies that the PBL strategy successfully guided students from simple cooperation towards a more complex and integrated form of collaborative creation.

The PBL module showed clear growth in students' collaboration skills. Initially, they worked individually, struggled with communication, and often conflicted over materials. As the project progressed, students began negotiating roles, solving problems together, and using more supportive social language indicating movement into the Zone of Proximal Development through peer scaffolding. By the end, their murals demonstrated cohesive teamwork, reflecting improved conflict resolution, shared decision-making, and stronger social-emotional competencies.

Table 1. Thematic Findings on Social-Emotional Skill Development During Project and Inquiry-Based Learning

Aspect Analyzed	Initial Findings (Weeks 1–2)	Final Findings (Weeks 10–12)
Collaboration (PBL)	Worked individually, minor conflicts	Role negotiation, idea compromise
Empathy (IBL)	Focused on own outcome	Began to show sensitivity to peers' opinions
Social Language	Rarely asked questions, often silent	Actively asked questions, listened to peers

b. Cultivation of Empathy and Social Awareness via Inquiry-Based Learning

The inquiry-based learning (IBL) module, focused on local ecosystems, shifted the pedagogical emphasis from procedural collaboration to the cultivation of social awareness. Initial observations during the "Local Ecosystems" inquiry revealed that students often reported their individual findings without connecting them to their peers' observations. This baseline behavior highlighted a need for developing shared attention and perspective-taking. The module's driving question, "How do living things in our schoolyard help each other?" was intentionally framed to guide students beyond egocentric reporting toward a more relational understanding.

A significant finding from classroom observations was the emergence of perspective-taking language directly

prompted by the inquiry task. As students debated connections for their "web of life" diagram, their dialogue shifted from simple identification to explaining needs and relationships. For example, one student argued, "The bee needs the flower for its food, so they help each other." This verbalization of another entity's needs exemplifies a foundational form of empathy, aligning with the SEL framework's emphasis on understanding others' perspectives to build social awareness.

Analysis of focus group data indicated that the IBL structure fostered active listening as a necessary skill for task completion (Anjani et al., 2017). Students consistently reported that they "had to listen to everyone's part" to understand the whole ecosystem. This was corroborated by observational field notes documenting a decrease in interruptions and an increase in students asking clarifying questions about their peers' findings. This development of active listening is a core component of relationship skills, directly facilitated by the IBL process that required synthesizing multiple viewpoints.

The teacher's reflective journal provided longitudinal evidence of this growth in social awareness. She noted a distinct shift in group discussions from disjointed statements to a collective effort to build a shared narrative about the ecosystem. Her entries described students using more inclusive language like "we noticed" and actively helping peers articulate their observations. This transition reflects the development of a collaborative mindset where the group's collective understanding was valued over individual discovery, a key tenet of Vygotsky's sociocultural learning theory.

Finally, the process of creating the "web of life" diagram required students to practice empathy through cognitive negotiation. To form a coherent diagram, groups had to reconcile differing observations and interpretations. In one focus group, a student explained, "I didn't see the ant carrying a leaf, but he did, so we had to believe him and add it." This act of valuing and integrating a peer's unique experience into the shared product is a tangible application of empathy and social awareness within a learning context.

The inquiry-based learning module promoted empathy and social awareness by requiring students to connect their ecological observations with peers' insights. Initially focused on their own findings, students gradually developed perspective-taking, active listening, and inclusive language as they co-constructed a "web of life" diagram. Synthesizing different viewpoints encouraged them to value others' experiences, demonstrating increased empathy and collective social understanding aligned with SEL and sociocultural learning theory.

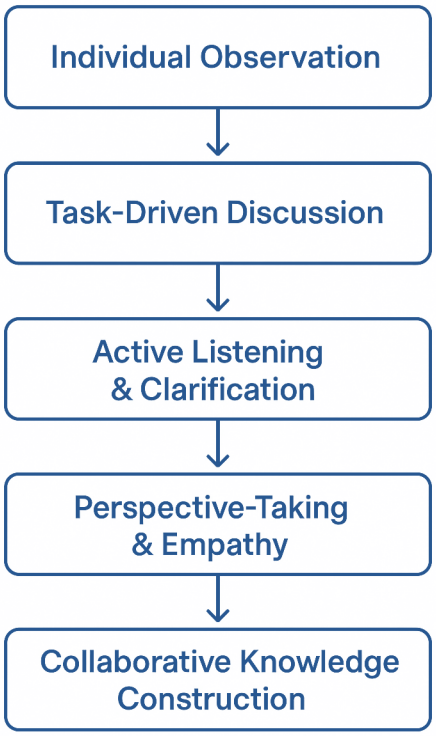

Figure 1. Evolution of Social Awareness through Inquiry-Based Learning (IBL)

c. The Teacher's Role in Facilitating Social-Emotional Growth within the Zone of Proximal Development

Analysis of the teacher's pre-intervention interview and initial reflective journal entries revealed an initial focus on managing task completion rather than mediating social processes. However, classroom observations showed a deliberate shift in her practice. She moved from providing direct solutions for group conflicts to acting as a facilitator, strategically guiding students to navigate their own social challenges. This evolution was crucial, positioning her as the "more knowledgeable other" not just for academic content, but for the social-emotional skills required by the collaborative tasks.

The teacher's facilitation was characterized by explicit scaffolding of collaborative behaviors. Field notes frequently documented her modeling of appropriate language, such as introducing phrases like "Can you explain your idea?" or "How can we combine our thoughts?" Her mid-intervention interview confirmed this was a conscious strategy to provide students with the verbal tools needed for negotiation (Bodrova & Leong, 2024). This direct intervention within the ZPD equipped students with concrete strategies for relationship management, a core SEL competency, moving them beyond rudimentary cooperation toward effective teamwork.

A key finding from observational data was the teacher's consistent use of strategic questioning to foster empathy. When conflicts arose, instead of arbitrating, she would ask, "How do you think that made your teammate feel?" or "What might your friend need to finish their part?" This Socratic approach prompted students to engage in perspective-taking, a foundational element of social awareness. Her post-intervention interview highlighted her belief that these questions were more effective than direct instruction for cultivating genuine empathetic understanding.

The teacher's reflective journal provided critical insight into her dynamic pedagogical reasoning. Her entries documented a process of diagnosing the specific social-emotional ZPD for different groups and adapting her support accordingly. For instance, she noted which groups needed more scaffolding in conflict resolution versus those who required prompts for equitable turn-taking. This reflective practice demonstrates a sophisticated application of Vygotsky's theory, where the facilitator continuously assesses and adjusts the level of guidance to meet students' evolving developmental needs.

Ultimately, the data indicates that the teacher's role as a facilitator was the critical mediating factor in translating the potential of the deep learning strategies into observable social-emotional growth. While the PBL and IBL modules provided the context, it was her targeted guidance, modeling, and questioning that activated the ZPD for empathy and collaboration. Her actions provided the necessary scaffolding that enabled students to internalize complex social skills, confirming that the educator's pedagogical intervention is indispensable for fostering these competencies.

The teacher played a crucial role in activating students' social-emotional development within the Zone of Proximal Development. She shifted from directing task completion to strategically facilitating collaboration modeling negotiation language, guiding conflict resolution through questioning, and adapting scaffolding to group needs. Her reflective and intentional support enabled students to internalize empathy, communication, and teamwork skills, demonstrating that teacher mediation is essential for translating PBL and IBL into meaningful SEL growth.

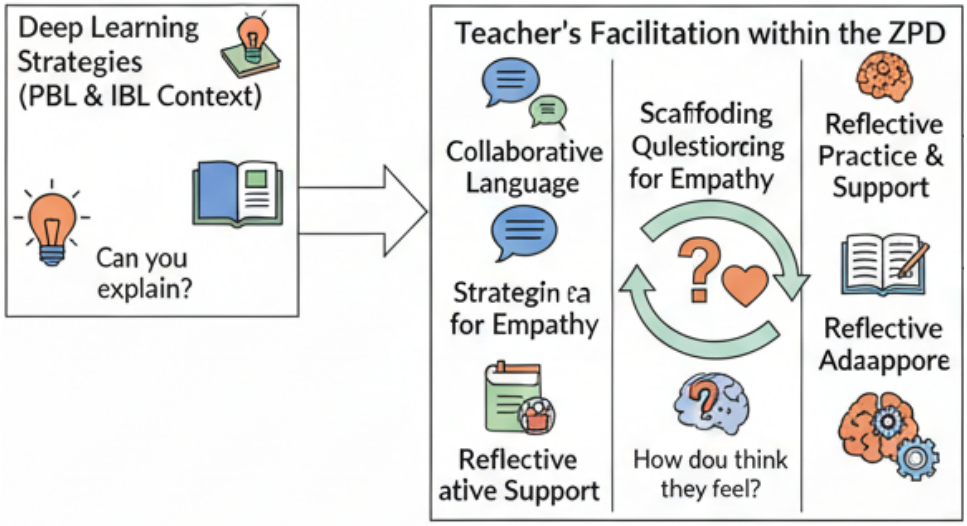

Figure 2. Model of the Teacher's Role in Mediating Students' Social-Emotional Growth within the Zone of Proximal Development (ZPD)

d. Student Perceptions and Experiences of Empathy and Collaboration in Group Work

Analysis of student focus group data reveals that initial perceptions of group work were fraught with challenges centered on resource allocation and individual control. In early sessions, students frequently expressed frustration, with comments such as, "He wouldn't share the green marker," or "I wanted to draw it my way." These statements corroborate initial observational data and

highlight an egocentric perspective common at this developmental stage. This baseline indicates that the concept of a shared goal was initially subordinate to individual desires and a lack of established collaborative norms.

As the intervention progressed, student focus groups captured a significant shift in perception, with children beginning to articulate the cognitive benefits of collaboration (Rachmawati et al., 2024). Post-module discussions included statements like, "It was better with four people because we had more ideas for the mural." This emerging awareness that collective effort could yield a superior outcome aligns with Vygotsky's theory of co-construction. Students started to value the group not just as a social arrangement but as a more powerful problem-solving unit, demonstrating a developing appreciation for shared intelligence (Xuanyi, 2024).

Students' reflections provided direct evidence of developing empathy and social awareness. In focus groups, children began to verbalize their understanding of their peers' emotional states. One student explained, "I let her have a turn because she looked sad when she couldn't help." This shift from focusing on personal wants to recognizing and responding to a peer's feelings is a clear indicator of growth in the social awareness competency of the SEL framework, suggesting the activities successfully created contexts for genuine perspective-taking.

The concept of fairness and shared responsibility became a prominent theme in student discussions about their collaborative process. In later focus groups, students described their group's self-devised systems for ensuring equity, such as, "We made a rule that everyone gets to add one animal to the web." This articulation of procedural fairness demonstrates the internalization of relationship skills. It signifies a move beyond teacher-imposed rules to a student-led negotiation of social contracts, which is fundamental for effective and sustainable teamwork.

Finally, student perceptions evolved to reflect a positive affective experience and a sense of collective ownership. By the end of the semester, focus group comments were characterized by enthusiasm and pride, such as, "Our web of life was the best because we all made it together," and "It was more fun to work with my friends." This positive sentiment indicates the development of a supportive learning community where collaboration was not just a task requirement but a valued and enjoyable social experience.

Students initially viewed group work as a struggle for control and materials, showing limited understanding of shared goals. Over time, they recognized the cognitive and social advantages of collaboration, valuing diverse ideas and collective problem-solving. Reflections revealed growing empathy students noticed peers' emotions and adjusted their behavior accordingly. They also developed fairness norms and shared responsibility, leading to increased enjoyment and pride in group achievements. This progression demonstrates strengthened social awareness and positive perceptions of collaborative learning.

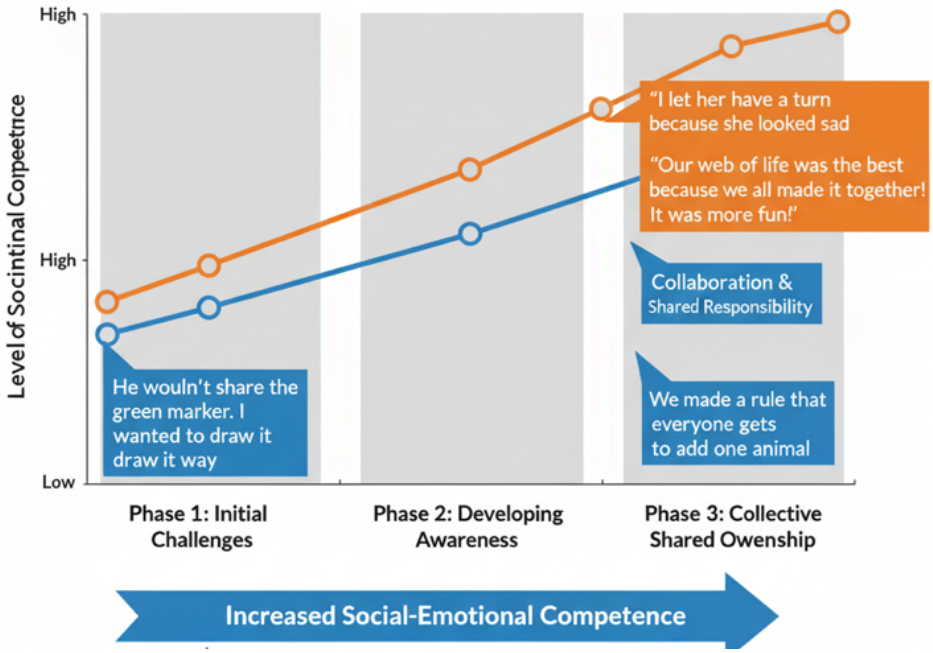

Figure 3. Evolution of Student Social-Emotional Perceptions in Group Work: From Egocentric to Collaborative

e. Evidence of Integrated Learning and Shared Understanding in Student-Created Artifacts

Qualitative content analysis of student-created artifacts provides tangible corroboration for the observational and interview data. The "Community Helpers" murals and "Web of Life" diagrams serve as summative representations of each group's collaborative journey. These products are not merely academic outputs but are physical manifestations of co-constructed knowledge, as theorized by Vygotsky. Their final form offers concrete evidence of the group's ability to synthesize individual ideas and negotiate a shared vision, moving beyond simple cooperation to achieve integrated learning.

The "Community Helpers" murals demonstrated a high degree of visual integration, reflecting successful collaboration. Unlike disjointed collections of individual drawings, the final products exhibited a unified compositional structure, with consistent scaling and narrative elements connecting different parts. For instance, shared background elements and pathways between figures indicated that students engaged in significant negotiation and planning. This visual synthesis serves as direct evidence of developed relationship skills, as groups successfully managed creative differences to produce a single, coherent artistic statement.

Similarly, the "Web of Life" diagrams from the inquiry-based module illustrated a shared conceptual understanding. The artifacts were not simple lists of organisms but complex networks showing interdependent relationships, captured through connecting lines and symbols. This structure signifies that students successfully integrated disparate individual observations into a unified ecosystem model. The process of creating such a diagram required students to practice social awareness by valuing and logically connecting their peers' unique findings into a coherent whole, demonstrating a collective cognitive achievement.

Both sets of artifacts provide compelling evidence of applied perspective-taking, a

cornerstone of empathy. The murals required students to first understand and then visually represent the role of a specific community helper, integrating it into a larger societal context. The ecosystem diagrams demanded a more abstract form of empathy, as students had to consider the needs and functions of various organisms to map their interdependencies accurately. This act of representing another's perspective is a tangible outcome of the social awareness competency fostered by the learning activities.

The integration of deep learning strategies, particularly through reflective dialogue sessions, further reinforced the development of empathy and collaboration. Students frequently referenced their peers' insights during reflection, indicating an awareness of multiple viewpoints and the capacity to reinterpret their own ideas in light of others' experiences (Andriyani et al., 2025). This metacognitive engagement thinking about how they learned and interacted allowed them to recognize emotional cues, appreciate diverse opinions, and develop a sense of shared responsibility. Such reflective cycles are central to transformative learning, where knowledge construction is intertwined with personal and interpersonal growth (Santosa et al., 2025).

Moreover, observational notes revealed that leadership and role distribution within groups evolved dynamically throughout the project. Initially, dominant voices tended to steer the discussions; however, by the later stages, facilitative leadership emerged, characterized by turn-taking, active listening, and equitable contribution. This transition underscores the success of the deep learning framework in fostering authentic collaboration rather than compliance-based teamwork. Students learned not only to divide tasks but also to co-create meaning through continuous dialogue an indicator of social-emotional maturity that extends beyond academic contexts.

Ultimately, the completed artifacts stand as evidence of successful learning within the Zone of Proximal Development. Their complexity and coherence would have been unattainable by individual students, showcasing the power of peer scaffolding. These products embody the fusion of the study's theoretical frameworks, representing the culmination of a social learning process where students practiced and honed SEL competencies. The murals and diagrams are therefore not just evidence of learning about a topic, but of learning how to collaborate and understand others.

Student-created murals and ecosystem diagrams provided concrete evidence of integrated learning and shared understanding. Unlike early fragmented work, final artifacts showed cohesive composition and logically connected ideas, reflecting negotiation, cooperation, and perspective-taking. These products demonstrated both conceptual synthesis and strengthened SEL competencies such as empathy, equitable participation, and facilitative teamwork. The complexity of the outcomes indicates learning within the Zone of Proximal Development, achieved through peer scaffolding and reflective dialogue.

Table 2. Indicators of Collaboration and Emotional Perspective in Student Products

Student Product	Collaboration Integration Indicator	Emotional Perspective Indicator
Mural "Community Helpers"	Integrated visual narrative, proportional scale	Drawings reflect interview insights on roles
Diagram "Web of Life"	Depiction of interrelationships among living things	Peers' language respected in group decision-making

4. Conclusion

This study concludes that the structured implementation of project-based and inquiry-based learning is a highly effective pedagogical approach for developing empathy and collaboration in early elementary students. These strategies successfully moved students beyond individualistic behaviors by creating authentic problem-solving scenarios that required shared decision-making and perspective-taking. The transition from parallel work to integrated teamwork, as evidenced by classroom interactions and final artifacts, validates Vygotsky's theory that complex skills originate in social activity. The research demonstrates that these deep learning methods provide the necessary context for students to actively practice and internalize foundational social-emotional competencies.

A pivotal finding is that the success of these deep learning strategies was critically mediated by the teacher's role as a facilitator (Martinez-Yarza et al., 2024). The pedagogical shift from a director of tasks to a scaffolder of social processes was indispensable. By modeling negotiation language and employing strategic questioning to prompt perspective-taking, the teacher actively guided students through their social-emotional Zone of Proximal Development. This intervention confirms that while project-based and inquiry-based learning create the opportunity for growth, it is the educator's targeted facilitation that transforms these collaborative contexts into powerful learning experiences for empathy and relationship skills.

Structured PBL and IBL, supported by intentional teacher scaffolding, effectively build empathy and collaboration by guiding students from individual work toward shared problem-solving within the ZPD. Evidence shows improved perspective-taking and teamwork, confirming that deep learning designs can successfully cultivate SEL skills in early elementary classrooms.

The research provides compelling evidence of student development, triangulated through observations, participant reflections, and artifact analysis. Students' perceptions evolved from frustration to an appreciation for collective problem-solving, while their collaborative products demonstrated a tangible integration of diverse perspectives. This study effectively illustrates the synergy between Vygotsky's Sociocultural Theory and the Social-Emotional Learning framework. The social interactions essential for cognitive development served as the direct mechanism for practicing and honing SEL competencies. Ultimately, this case study affirms that intentional pedagogical design, centered on deep learning strategies, can successfully cultivate a classroom culture where empathy and collaboration are learned skills.

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