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TEACHER-PERCEIVED LEARNING NEEDS ANALYSIS FOR DEVELOPING Co-DiPeL IN NATURAL AND SOCIAL SCIENCES (IPAS) AT ISLAMIC AND GENERAL ELEMENTARY SCHOOLS

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Abstract

This study examined primary school teachers' perceptions of Natural and Social Sciences (IPAS) instruction and their priorities for inclusive lesson design. Conducted within the Analysis phase of the ADDIE model, the study aimed to inform the preliminary development of Collaborative Differentiated Peer Learning (Co-DiPeL). A survey involving 73 purposively selected teachers from primary schools and Madrasah Ibtidaiyah in Surakarta and surrounding areas was administered using a 40-item questionnaire with a four-point agreement scale. Data were analyzed descriptively using frequencies, percentages, means, and standard deviations. Teachers reported using diverse instructional approaches (M = 3.22; SD = 0.69) and collaborative activities (M = 3.26; SD = 0.71). However, lower ratings were observed for the suitability of existing models for inclusive classrooms (M = 2.73; SD = 0.63), participation of students with special needs in group work (M = 2.68; SD = 0.80), and equal communication opportunities (M = 2.93; SD = 0.80). Teachers prioritized communication (M = 3.47; SD = 0.67), differentiated instruction (M = 3.41; SD = 0.66), self-regulation (M = 3.36; SD = 0.65), and social interaction (M = 3.34; SD = 0.69). These findings provide an empirical basis for refining Co-DiPeL's preliminary design and identifying priorities for subsequent development, validation, and classroom trials, without establishing its effectiveness or impact on student learning.

Keywords: IPAS; Teacher Perceptions; Inclusive Learning; Differentiated Instruction; Collaborative Learning; Peer Learning.
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INTRODUCTION

In primary education in Indonesia, the subject of Natural and Social Sciences (IPAS) integrates scientific and social inquiry into a unified framework. This approach encourages students to observe phenomena, pose questions, interpret evidence, communicate explanations, and connect their learning to daily life. These expectations are reflected in the national learning framework and curriculum policies (Educational Standards, Curriculum, and Assessment Agency, 2024; Ministry of Primary and Secondary Education, 2025). Consequently, inquiry-oriented IPAS instruction requires more than the mere delivery of factual content; it necessitates an instructional design that enables students to access information, explore ideas, and contribute to the construction of a shared understanding. Research on collaborative inquiry in school-based science education highlights the critical role of task design, student interaction, and teacher facilitation in supporting these processes (Chen & Chen, 2025; Liu et al., 2024).

These expectations are realized within classrooms that encompass students with diverse backgrounds, varying in their prior knowledge, interests, learning paces, communication styles, and support needs. Thus, inclusive education goes beyond simply placing students with different profiles in the same classroom; it requires intentional instructional design to ensure that all students can engage with meaningful learning objectives and participate actively in classroom activities. Differentiated instruction offers a pedagogical approach to addressing this diversity by making adjustments to content, processes, learning outcomes (products), the learning environment, and the support provided. Recent reviews identify differentiation as a promising approach for addressing diverse learning needs, emphasizing that its quality hinges on a teacher's ability to identify students' needs and translate available evidence into instructional decisions (Ardenlid et al., 2025; Asriadi et al., 2023; Gheyssens et al., 2023; Hu, 2024). Differentiation grounded in assessment links the interpretation of learning evidence to decision-making regarding goals, tasks, grouping, scaffolding, and feedback (Eysink & Schildkamp, 2021).

A second aspect to consider is the organization of collaborative activities. Simply grouping students does not automatically foster interdependence, equitable contributions, or meaningful dialogue. Productive collaboration requires shared goals, a clear yet flexible division of responsibilities, opportunities to provide explanations and ask questions, and routines that enable students to listen to and respond to one another. Evidence from science education at the primary school level indicates that collaborative learning is shaped by personal, behavioral, and environmental factors, including task structure and the facilitation provided (Liu et al., 2024). In the subject of Natural and Social Sciences (IPAS), these aspects are highly relevant to activities involving observation, investigation, interpretation, and explanation, processes through which students can contribute diverse observations and perspectives to a shared task.

Peer learning adds a reciprocal dimension to collaborative activities. In this context, it is understood as a structured opportunity for students to exchange explanations, questions,

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feedback, and assistance, rather than a fixed arrangement where one student consistently acts as the provider of help while another remains the recipient. Research on peer-mediated approaches for autistic students, as well as classroom-based interventions, indicates that peer interactions can be intentionally designed to support social participation. This underscores the importance of both the quality of implementation and the attitudes of classmates (Alkeraida, 2023; Birnschein et al., 2021; Morris et al., 2023; Ragaglia et al., 2026; Travers & Carter, 2022). Consequently, the element of reciprocity is crucial; it prevents a dynamic where one student becomes perpetually dependent on others, while simultaneously creating opportunities for diverse forms of contribution.

Within the proposed Co-DiPeL framework, these three elements serve complementary yet distinct purposes. Differentiation pertains to access to learning; collaboration governs the distribution of tasks and shared responsibilities; and peer learning establishes mechanisms for the reciprocal exchange of explanations and assistance. Communication and self-regulation are viewed as capacities supported by these instructional arrangements. This distinction aligns with research that conceptualizes self-regulated learning as a process encompassing cognitive, metacognitive, behavioral, motivational, and emotional aspects (Panadero, 2017). Furthermore, there is evidence that primary school students can develop self-regulation skills through explicit learning routines and structured support (Olid-Luque et al., 2025). Before an instructional model is developed, its users and designers require evidence regarding the learning conditions that must be taken into account. A needs analysis links reported instructional practices and perceived challenges to decisions about which features should be incorporated into a proposed design (Prasittichok & Klaykaew, 2022; Raza et al., 2020). It is also important to distinguish between reports on current practices, perceived needs, and preferences regarding a proposed model. These categories provide different types of information and should not be treated as interchangeable forms of evidence for instructional effectiveness.

This study focuses on development rather than the evaluation of a completed intervention. It examines current practices in the teaching of Natural and Social Sciences (IPAS) as reported by teachers, along with the support they require, in order to establish initial design requirements for "Collaborative Differentiated Peer Learning" (Co-DiPeL). The contribution of this research lies in the integration of differentiated instruction, collaboration, and peer-to-peer learning into a single pedagogical framework, with an emphasis on developing students' communication skills, social interaction, and self-regulation. The proposed framework will subsequently undergo expert review and classroom-based evaluation.

This analysis is guided by three questions: (1) How do the participating teachers describe the science and social studies (IPAS) instructional practices currently implemented in their schools? (2) What challenges or concerns do they report regarding participation,

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communication, self-regulation, and access to inclusive learning? (3) What initial design requirements can be derived from these reports for the development of Co-DiPeL?

METHODS

This study employs a descriptive questionnaire survey during the Analyze phase of a research and development (R&D) project based on the ADDIE model. The analysis aims to identify current science (IPAS) instructional practices as reported by teachers, their perceptions regarding barriers to participation and learning, and their preferences for the design of an instructional model. This study provides an empirical foundation for establishing the initial design requirements for Co-DiPeL, rather than evaluating the model's effectiveness (Eysink & Schildkamp, 2021; Raza et al., 2020).

The study participants consisted of 73 teachers selected through purposive sampling; they are science educators at the primary school (Sekolah Dasar/SD) and Islamic primary school (Madrasah Ibtidaiyah/MI) levels in Surakarta and its surrounding areas. The research instrument comprises 40 closed-ended statements, rated on a four-point Likert scale (ranging from 1 = strongly disagree to 4 = strongly agree). These statements cover five aspects: current instructional practices (6 items), participation and social interaction (9 items), communication (8 items), self-regulation and supporting conditions (9 items), and desired features for an instructional model (8 items). Three experts in statistics and research methodology reviewed the instrument to ensure its relevance, clarity, response format, and content coverage. Revisions were made based on the feedback provided by these experts (Boateng et al., 2018).

The data were analyzed descriptively using frequencies, percentages, mean scores, and standard deviations at the individual item level. The percentage of agreement was calculated based on responses with a score of 3 or 4, utilizing 73 valid responses for each item. Two negatively phrased items, pertaining to student isolation, were interpreted separately to preserve their original meaning. The research findings are organized into four analytical outcomes: (1) an overview of current learning conditions, (2) perceptions regarding gaps and barriers to participation, (3) teacher preferences for instructional design, and (4) supporting evidence for initial design decisions.

These findings were then triangulated with relevant theories and curriculum requirements, specifically those concerning inclusive education, differentiated instruction, collaborative learning, peer-mediated support, and self-regulated learning. This process served as the basis for establishing the initial design requirements for Co-DiPeL, which will guide subsequent R&D stages: validation, implementation, and evaluation of the model. Thus, the Analysis phase establishes an evidence-based foundation for the design and development of Co-DiPeL.

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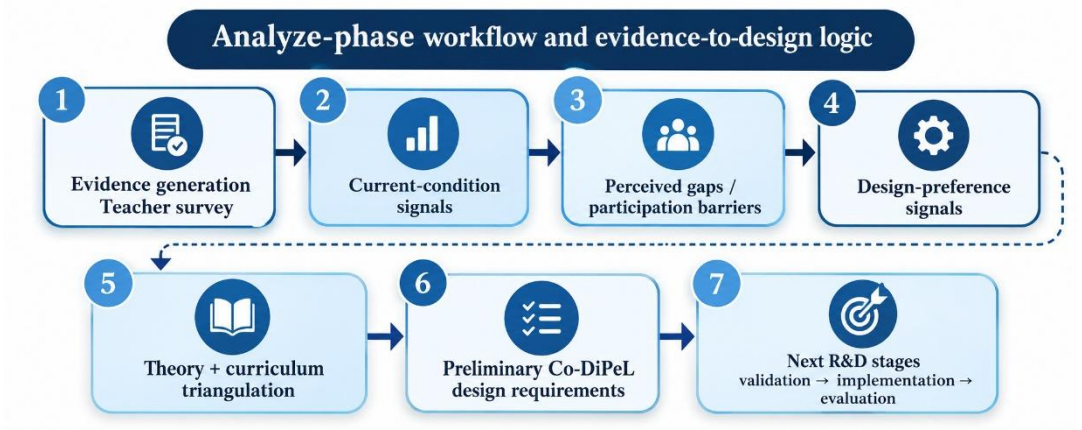


Figure 1. Research Methodology Stages

Figure 1 outlines the sequence used to transition from teacher responses to preliminary design considerations. The first step involves generating a dataset from surveys. These responses are then examined item by item to distinguish between descriptions of existing practices, concerns regarding participation, and preferences for future learning. The resulting interpretations are subsequently reviewed in conjunction with curriculum requirements and relevant theoretical literature. This process yields a set of initial design considerations for Co-DiPeL; validation and classroom-based evaluation will be conducted in a later phase.

RESULTS AND DISCUSSION

Results

A total of 73 respondents represented four school categories: private madrasah ibtidaiyah (Islamic elementary schools) (35; 47.9%), public elementary schools (19; 26.0%), private elementary schools (18; 24.7%), and public madrasah ibtidaiyah (1; 1.4%). Thus, the sample encompasses teachers from both general and Islamic elementary schools, with the largest representation coming from private madrasah ibtidaiyah. This distribution is relevant for considering the scope of the research findings and highlights the importance of including a broader range of school types in future development and evaluation efforts.

Current State of IPAS (Natural and Social Sciences) Instruction

Teacher assessments indicate that several forms of active learning are already familiar within the participating schools. The highest mean score in this group relates to the adaptation of IPAS instruction to the specific characteristics of the class (M = 3.27; SD = 0.69; 91.8% expressed agreement). Group activities and collaboration follow (M = 3.26; SD = 0.71; 90.4%), while the use of varied instructional methods recorded a mean score of 3.22 (SD = 0.69; 90.4%). Teachers also reported the presence of student-to-student interaction (M = 3.18; SD = 0.71; 87.7%) as well as attention toward diverse learning needs (M = 3.12; SD = 0.74; 86.3%).

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A different picture emerges regarding the item asking whether the currently implemented instructional models are suitable for inclusive classrooms. The mean score was 2.73 (SD = 0.63), with 68.5% of respondents indicating agreement or strong agreement. This represents the lowest mean score among the six indicators of current instructional practice. This discrepancy suggests that the use of varied methods and group tasks does not automatically mean that the overall learning environment is sufficiently responsive to the diversity of learners. These findings align with various studies indicating that inclusive education depends not only on teachers' general support for inclusion but also on practical arrangements concerning participation and instruction within the classroom (Guillemot et al., 2022; Lindner et al., 2019).

Table 1. Teacher perceptions of current IPAS learning conditions

Indicator	Mean	Agreement (3–4)
IPAS learning is implemented according to classroom characteristics	3.27	91.8%
Teachers use varied learning methods	3.22	90.4%
IPAS learning involves group activities and cooperation	3.26	90.4%
Learning considers diverse learning needs	3.12	86.3%
Learning activities encourage interaction among students	3.18	87.7%
Current learning models are appropriate for inclusive classrooms	2.73	68.5%

Participation and Social Interaction

The survey items concerning participation reveal a discrepancy between general group work practices and the reported involvement of students with special needs. Teachers provided relatively high ratings for the division of tasks and roles (M = 3.22; SD = 0.67; 91.8%) and for the practice of respecting peers' viewpoints during discussions (M = 3.25; SD = 0.68; 91.8%). Collaboration itself received a mean score of 3.16 (SD = 0.69; 86.3%). In contrast, the active involvement of students with special needs in group activities was rated at M = 2.68 (SD = 0.80; 61.6%), while positive interaction between students with special needs and their peers received a score of M = 2.77 (SD = 0.83; 68.5%). These differences highlight that the quality of participation, rather than mere placement within a group, is a critical aspect of instructional design.

Two items regarding isolation, phrased as negative statements, yielded mean scores of 2.45 (SD = 0.96) and 2.40 (SD = 0.98), respectively. These are presented separately because their phrasing differs from the positively worded items concerning participation. An additional item, which asked whether social interaction should be strengthened through instructional design, received a score of M = 3.29 (SD = 0.74; 91.8%). Overall, these responses point toward design-related questions regarding how group participation is structured, rather than simply explaining why some students might be less engaged.

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Table 2. Teachers' Perceptions of Students' Social Interaction and Participation

Indicator	Mean	Agreement (3–4)
Students actively cooperate in groups	3.16	86.3%
Students interact positively with students without disabilities and students with disabilities	2.77	68.5%
Students share tasks and roles in groups	3.22	91.8%
Students appreciate peers' opinions during discussions	3.25	91.8%
Students demonstrate empathy toward students with special educational needs	3.00	83.6%
Students with special needs actively participate in group activities	2.68	61.6%
Some students tend to be isolated during learning	2.45	53.4%
Some students tend to be isolated during learning (second item)	2.40	50.7%
Social interaction needs to be improved through a new learning model	3.29	91.8%

Communication

Responses regarding communication indicate that teachers have incorporated various activities in which students can express ideas, ask questions, present group work, and respond to their peers. The mean scores for this aspect range from 3.10 to 3.15, while the specific item concerning the provision of communication-oriented activities by teachers reached a mean (M) of 3.36 (SD = 0.65; 95.9%). While this assessment confirms the presence of such activities, it does not reveal how equitably speaking opportunities are distributed among the students.

The item concerning equal communication opportunities for students with special educational needs received a mean score of 2.93 (SD = 0.80), with an agreement rate of 80.8%. Teachers also expressed support for efforts to strengthen communication (M = 3.26; SD = 0.67; 93.2%) and for providing support, such as modeling, to encourage active communication (M = 3.29; SD = 0.70; 91.8%). The gap between the reported availability of communication activities and the lower ratings regarding equitable access warrants attention during the design phase. Research on inclusive participation emphasizes that meaningful inclusion requires careful consideration of students' opportunities to initiate interactions, respond, and contribute to classroom exchanges (Alkeraida, 2023; Morris et al., 2023).

Table 3. Teacher perceptions of student communication and communication-support conditions

Indicator	Mean	Agreement (3–4)
Students can express opinions during IPAS learning	3.12	86.3%
Students actively ask questions	3.10	86.3%
Students can present group work	3.14	87.7%
Students can listen and respond to peers' opinions	3.15	91.8%
Students with special needs receive equal opportunities to communicate	2.93	80.8%
Teachers provide activities that encourage communication	3.36	95.9%
Students' communication skills still need improvement	3.26	93.2%
A model supporting active student communication is needed	3.29	91.8%

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Self-Regulation and Support Conditions

Regarding the assessment items related to self-regulation, teachers gave the highest ratings to students' ability to follow classroom rules (M = 3.26; SD = 0.55; 97.3%). Ratings for completing tasks independently (M = 3.14; SD = 0.56; 90.4%), regulating behavior (M = 3.07; SD = 0.61; 87.7%), and managing emotions while working in groups (M = 3.08; SD = 0.62; 87.7%) were also above the scale's midpoint. The ability to sustain attention received a mean score of 3.00 (SD = 0.62; 80.8%). The item concerning behavioral or learning support for students with special educational needs had a mean score of 2.96 (SD = 0.68; 83.6%).

Two additional statements addressed perceptions regarding the need for stronger self-regulation and model-based support. The mean scores for these two statements were 3.15 (SD = 0.64; 91.8%) and 3.25 (SD = 0.66; 93.2%), respectively. These figures reflect teachers' assessments of aspects requiring attention; they should not be interpreted as scores from a validated self-regulation measurement instrument. In the proposed design, self-regulation can be supported through the provision of manageable tasks, clear routines, monitoring, reflection, and opportunities to seek assistance. Such routines align with a process-oriented approach to self-regulated learning, as highlighted in recent syntheses of interventions in primary schools (Olid-Luque et al., 2025; Panadero, 2017).

Table 4. Teacher perceptions related to self-regulation and support conditions

Indicator	Mean	Agreement (3–4)
Students can regulate their behavior during learning	3.07	87.7%
Students can follow classroom rules	3.26	97.3%
Students complete tasks independently	3.14	90.4%
Students can maintain learning focus	3.00	80.8%
Students can manage emotions during group work	3.08	87.7%
Students with special needs require behavioral-learning support	2.96	83.6%
Students' self-regulation still requires strengthening	3.15	91.8%
A model is needed to support self-regulation development	3.25	93.2%
A model is needed to support self-regulation development (second item)	3.22	93.2%

Desired Model Features

Teachers provided positive evaluations of the eight features of the proposed model. The highest mean score was obtained for the aspect of support for communication (M = 3.47; SD = 0.67; 95.9% agreement rate). This was followed by differentiated instruction (M = 3.41; SD = 0.66; 95.9%), support for self-regulation (M = 3.36; SD = 0.65; 95.9%), and support for social interaction (M = 3.34; SD = 0.69; 93.2%). Other supported features included an inclusive IPAS (Natural and Social Sciences) model (M = 3.21; SD = 0.80; 87.7%), collaboration among students with diverse support needs (M = 3.15; SD = 0.81; 84.9%), teacher guidance (M = 3.22; SD = 0.75; 89.0%), and the development of a new model (M = 3.36; SD = 0.73; 93.2%).

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These figures indicate that the respondents responded favorably to the features proposed in the questionnaire. Given that the survey items presented specific design concepts, these high ratings should be understood as expressions of preference, rather than as independent comparisons suggesting that one feature is more important or effective than another. This interpretation aligns with the distinction between stated design preferences and evidence regarding the impact of an intervention.

Table 5. Teachers' Endorsement of Model Requirements

Indicator	Mean	Agreement (3–4)
An IPAS learning model appropriate for inclusive classrooms is needed	3.21	87.7%
The new model should integrate differentiated learning	3.41	95.9%
The model should facilitate cooperation between students without disabilities and students with special educational needs	3.15	84.9%
The model should improve students' social interaction	3.34	93.2%
The model should improve students' communication	3.47	95.9%
The model should improve students' self-regulation	3.36	95.9%
Teachers need guidance for implementing an inclusive learning model	3.22	89.0%
Development of a new learning model is needed for IPAS learning	3.36	93.2%

The four preferences with the highest levels of support are communication support (M = 3.47), differentiated instruction (M = 3.41), self-regulation support (M = 3.36), and social interaction support (M = 3.34). The mean scores for these four preferences are closely clustered on a four-point scale, and three of them share the same percentage of agreement (95.9%). This pattern is best characterized as a broad range of support rather than a strict hierarchy of priorities.

Teacher guidance also received significant support (M = 3.22; 89.0%), as did the proposal to develop a new IPAS (science and social studies) model (M = 3.36; 93.2%). These responses indicate that the participants are open to further model development. This does not imply that Co-DiPeL is superior to other pedagogical approaches.

The evidence-to-design matrix in Table 5 integrates three types of information: reports on current teaching practices, statements identifying areas in need of support, and preferences regarding future models. In the proposed framework, differentiation, collaboration, and peer learning serve as organizational mechanisms, while communication and self-regulation are framed as capacities to be fostered through the model.

Implications for the Development of the Co-DiPeL Model

The survey findings provide a preliminary foundation for the design phase of Co-DiPeL, alongside curriculum requirements, relevant theories, feasibility considerations, and expert input. Several design priorities need to be addressed, including equitable access to

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learning objectives, clear distribution of group responsibilities, reciprocal peer assistance, and systematic monitoring of student participation. Differentiation should accommodate diverse learning needs through adjustments to materials, task complexity, response modes, and levels of support while maintaining shared learning objectives (Eysink & Schildkamp, 2021; Hu, 2024). Collaborative and peer-learning activities should also incorporate meaningful roles, shared decision-making, and reciprocal communication (Ragaglia et al., 2026; Zhou et al., 2024).

The model should further provide structured opportunities for communication and self-regulation through discussion, questioning, task sequencing, progress monitoring, reflection, and help-seeking (Olid-Luque et al., 2025; Panadero, 2017). Teacher guidance and professional development are also essential to support consistent implementation of inclusive learning practices (Fu et al., 2026; Wood et al., 2026). These implications remain preliminary design proposals rather than validated procedures or evidence of effectiveness. Their suitability must be examined through expert validation, practicality assessment, classroom implementation, and direct observation of student participation. This approach emphasizes the need for stronger implementation evidence and systematic evaluation of inclusive learning models (Fu et al., 2026; Zhang et al., 2024).

DISCUSSION

Current State of Science and Social Studies (IPAS) Instruction and Design Challenges

Findings indicate that teachers have implemented active learning through various instructional methods and collaborative activities. However, lower ratings regarding the suitability of current instructional models for inclusive classrooms suggest that teachers remain uncertain about their ability to accommodate students who require additional support. General indicators of group participation, such as the division of roles and showing respect for classmates' opinions, received more positive ratings than the active engagement of students with special needs. This discrepancy suggests that group membership does not automatically guarantee meaningful participation or influence over the group's final output.

A similar gap is evident in the realm of communication. Although teachers report using activities that encourage communication, the provision of equal opportunities for all students to speak received lower ratings. The survey does not clarify who initiates interactions, how students respond to one another, or whether some students participate solely as listeners. Consequently, these findings warrant further investigation through classroom observation and by incorporating the perspectives of the students themselves.

Overall, these findings suggest that the primary design challenges relate to ensuring equitable access and meaningful participation, rather than merely selecting specific teaching techniques. Differentiation can enhance task accessibility, collaboration can foster shared responsibility, and peer learning can facilitate mutual support. The integration of these elements

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into Science and Social Studies (IPAS) instruction will be explored through the ongoing development of the Co-DiPeL framework.

Participation Needs as Perceived by Teachers

The relatively low mean scores for the active participation of students with special needs in group work (M = 2.68) and for positive interactions between students with special needs and their peers (M = 2.77) highlight specific areas that require further attention. These findings offer more practical guidance for instructional design than general statements regarding the need for social interaction.

Consequently, Co-DiPeL should consider flexible role allocation, the rotation of responsibilities, individual contributions toward collective outcomes, and structured turn-taking arrangements. Research on cooperative learning and peer-based programs in inclusive schools provides a theoretical foundation for exploring such arrangements (Felső & Fehérvári, 2026; Yaşar et al., 2024). Nevertheless, these remain proposed design features rather than established, definitive solutions.

The importance of strengthening social interaction is further reflected in an average score of 3.29 and a 91.8% agreement rate. This indicates that teachers favor more structured interactions, rather than simply increasing the frequency of group activities. Within the Co-DiPeL framework, collaboration governs shared tasks and responsibilities, while peer learning facilitates mutual assistance. Both functions must be integrated to ensure that students contribute to group decision-making while simultaneously supporting one another's learning processes.

Communication Needs in Science and Social Studies (IPAS) Instruction

Findings regarding communication reveal a discrepancy between the availability of communication activities (M = 3.36) and the equality of opportunity for students with special educational needs to engage in communication (M = 2.93). Teachers also indicated that the communication aspect requires further support (M = 3.26) and expressed support for the development of a model designed to strengthen active communication (M = 3.29). These results suggest that the mere presence of communication activities does not automatically guarantee equitable participation. Future implementation of Co-DiPeL needs to carefully observe who is speaking, listening, asking questions, responding, and communicating directly with their peers. Reciprocal peer learning can facilitate such interactions through role rotation, peer explanations, guiding questions, structured turn-taking, the provision of feedback, and the collaborative creation of summaries. Consequently, communication must be an integral part of completing learning tasks, rather than being limited solely to final presentations.

Structured peer interaction offers a potential approach to supporting communication, as also discussed in research on inclusive, peer-based programs (Felső & Fehérvári, 2026). However, its contribution to the development of communication must be substantiated by

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empirical evidence gathered during implementation, including assessments of student accessibility and participation.

Self-Regulation as a Prerequisite for Learning

Teachers provided relatively positive ratings regarding adherence to rules and the completion of tasks, while aspects related to attentiveness and behavioral management received slightly lower scores. These indicators reflect various facets of classroom functioning and should not be interpreted as a validated measure of self-regulation. Nevertheless, these results suggest a need for support in managing participation throughout learning activities. Self-regulation can be integrated into Co-DiPeL through clear instructions, task planning, progress monitoring, opportunities to seek assistance, and reflection on individual contributions. Differentiated tasks can make participation more manageable, while collaborative roles and peer feedback provide additional support.

The importance of this component is underscored by a 91.8% agreement rate regarding the strengthening of self-regulation, and a 93.2% consensus that a learning model should provide such support. These responses justify the inclusion of self-regulation in the design process; however, this does not imply that students lack self-regulatory capabilities altogether. Consequently, Co-DiPeL may incorporate brief planning and reflection activities, clearly defined role expectations, and structured opportunities for seeking help. The extent to which these elements contribute to self-regulation will require further investigation through direct observation and age-appropriate assessment instruments.

Differentiated Instruction as a Design Requirement

Differentiated instruction received an average score of 3.41, with a 95.9% agreement rate, indicating strong support from teachers for its inclusion in the proposed model. These findings serve as support for a specific design component, rather than evidence that differentiation alone is more effective than other pedagogical approaches. Its implementation involves considering students' readiness, interests, and support needs when determining learning materials, task complexity, response methods, and scaffolding. Flexible grouping should avoid rigid assumptions about student ability, while ensuring meaningful participation in collaborative activities. In Co-DiPeL, differentiation is aimed at broadening access to common learning objectives in science and social studies (IPAS) by adjusting resources, instruction, time allocation, support, and response formats. The appropriateness of these adjustments will be examined during the model validation and classroom implementation phases.

Teacher Support for the Integrated Model

Teachers demonstrated a relatively high level of support for the proposed learning components. Communication received the highest mean score (M = 3.47), followed by differentiated instruction (M = 3.41), self-regulation (M = 3.36), and social interaction (M = 3.34). The approval rates for these aspects were 95.9%, 95.9%, 95.9%, and 93.2%, respectively.

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These closely clustered scores indicate broad support for the proposed design features, rather than a ranking based on their relative effectiveness.

The proposed model distinguishes between learning mechanisms and the capacities that these mechanisms are intended to support. Differentiated instruction facilitates access to learning tasks; collaboration fosters shared responsibility; and peer learning enables reciprocal assistance. Research on cooperative learning in science education highlights the importance of structured group activities, while studies of collaborative inquiry emphasize task design and teacher facilitation (Chen & Chen, 2025; Yaşar et al., 2024). Similarly, structured peer programs can provide opportunities for social participation and inclusive relationships (Felső & Fehérvári, 2026). Communication and self-regulation are expected to develop through the organization of these activities, supported by appropriate guidance from the teacher. This integration provides a conceptual direction for the development of Co-DiPeL. However, the findings of this survey reflect the preferences of teachers, rather than an improvement in student capacity or the superiority of the proposed combination over other alternative models.

Theoretical and Practical Implications

These findings offer considerations for translating teachers' perceived needs into an operational instructional model. Needs analysis provides an important basis for identifying gaps between existing learning conditions and desired instructional arrangements before determining model specifications (Prasittichok & Klaykaew, 2022; Raza et al., 2020). Accordingly, Co-DiPeL should detail teacher and student activities at each stage, including group formation, role assignment and rotation, learning materials, and assessment of participation and learning outcomes. The model should also distinguish intended learning outcomes from supporting developmental outcomes to establish clear evaluation criteria.

Future development should encompass expert assessment of the model and its supporting materials, prototype development, evaluations of usability and practicality, and classroom trials. Direct evidence from students is essential, given that the current findings reflect the perspectives of teachers. If necessary, input from families and support staff could also provide additional insights into the accessibility and meaningfulness of the proposed activities.

Position of the Findings within the Research and Development (R&D) Process

This study represents the "Analysis" phase within an ADDIE-based research and development project. The findings describe instructional practices as reported by teachers, as well as the needs they identified prior to the finalization of the Co-DiPeL model. Consequently, these findings serve as a foundation for the design phase; they do not constitute evidence regarding the validity, feasibility, implementation fidelity, or effectiveness of the model itself.

Decisions concerning the components of the model must be supported by evidence gathered during subsequent stages of development. Expert evaluations can assess conceptual coherence and alignment; feedback from practitioners can help identify implementation

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challenges; and classroom trials can determine whether the intended instructional processes actually occur. Components that prove to be unclear or impractical may require revision. The primary development task involves integrating differentiation, collaboration, and peer-to-peer learning into science and social studies (IPAS) instruction, structured through clearly defined model syntax, teacher guidelines, student roles, and assessment procedures. The practicality of this approach in primary schools and madrasah (Islamic primary schools), as well as its contribution to targeted learning outcomes, will be determined through further validation and implementation processes.

Study Limitations

This study has several limitations. First, the purposive sampling method involved 73 teachers from a limited number of schools in Surakarta and its surrounding areas; therefore, the findings cannot be statistically generalized to all primary schools and madrasah. Second, the sample distribution is uneven, with private Madrasah Ibtidaiyah (MI) constituting the largest group, while public Madrasah Ibtidaiyah are represented by only one respondent. Third, the study relies on questionnaire responses from teachers rather than direct classroom observation or assessments of students' communication, social participation, and self-regulation. Fourth, the cross-sectional descriptive design captures perceptions at only a single point in time, precluding the establishment of causal relationships or the determination of the effectiveness of Co-DiPeL. Future research should incorporate a more balanced selection of schools, combine teacher reports with classroom observations and student perspectives, and evaluate the model through an iterative process of validation and implementation.

CONCLUSION

This study reveals that the 73 participating teachers reported employing a variety of instructional approaches and collaborative activities in Natural and Social Sciences (IPAS) lessons. Simultaneously, they identified limitations regarding the suitability of existing instructional models for inclusive classrooms, the participation of students with special needs in group work, and the provision of equal opportunities for communication. The teachers also expressed strong support for instructional design features that emphasize communication, differentiated instruction, self-regulation, and social interaction. These findings highlight a gap between the diverse teaching practices reported and the teachers' perceptions of their own capacity to accommodate varied learning needs. As part of the "Analyze" phase of the ADDIE model, this study provides empirical insights into the teachers' instructional experiences and the priorities they deem essential for developing more inclusive IPAS instructional designs.

These findings have implications for the initial development of the Collaborative Differentiated Peer Learning (Co-DiPeL) model by identifying key design considerations for inclusive IPAS instruction. The proposed model should integrate differentiated learning

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activities, structured student collaboration, equitable communication opportunities, and adequate support for social interaction and self-regulation. These components are designed to accommodate diverse learning needs while facilitating meaningful participation in collaborative classroom activities. Further research is required to examine the conceptual coherence and practical application of these proposed components through expert validation, continuous refinement, and classroom-based trials. Such investigations are crucial for determining whether Co-DiPeL can effectively support inclusive participation and contribute to the learning experiences of students in primary schools and Madrasah Ibtidaiyah (Islamic primary schools).

AUTHOR CONTRIBUTION

LHA developed the study concept and research design, coordinated the research process, performed data analysis, and led the drafting of the manuscript. IM contributed to the research methodology, data collection, and interpretation of findings. KK contributed to the development of research instruments, methodological review, and critical evaluation of the research findings. FM contributed to the literature review, theoretical framework, and critical revision of the manuscript. Khoirotun Hisan KH assisted with data collection, data organization, and the interpretation of research findings. MM contributed to the literature review, validation of research findings, and manuscript editing. All authors have reviewed and approved the final version of this manuscript and take responsibility for all aspects of this research. The authors declare that there are no conflicts of interest regarding the research, authorship, or publication of this article. This research was supported by an institutional research grant from the Mambaul Ulum Islamic Institute, Surakarta, Indonesia, under a funding scheme that requires research findings to be published in a journal with a minimum accreditation of SINTA 2. The funding institution had no role in the research design, data collection, data analysis, interpretation of findings, or the preparation of the manuscript. The authors bear full responsibility for the content and publication of this article.

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