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Collaborative Teaching-Learning Strategies and Problem-Solving Skills of Grade 6 Learners

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ABSTRACT

Collaborative learning is widely promoted as a means of developing problem-solving, yet evidence on how Filipino elementary teachers use specific collaborative strategies and how these relate to learners' problem-solving remains limited. This descriptive-correlational study examined the collaborative teaching-learning strategies of 20 teachers and the problem-solving skills of 60 Grade 6 learners in selected schools of the North District, Schools Division of Cebu City, during School Year 2024–2025. A validated questionnaire adapted from the Scale of Teaching Strategies for Collaborative Learning and the Problem-Solving Skills Inventory (α = .81) was analyzed using frequency, percentage, weighted mean, chi-square, and a test of relationship. Teachers used problem-based learning (M = 4.51) and online collaborative learning (M = 4.40) extensively, but the jigsaw method only to a limited extent (M = 2.40, Less Satisfactory). Learners were Very High in collaboration and teamwork (M = 3.62) and decision-making (M = 3.48) but Less Satisfactory in analytical thinking (M = 2.35). Teachers' age, educational attainment, years of experience, and training were associated with strategy use, and learners' age, parents' occupation, and family income were associated with problem-solving skills; sex was not associated with either. Collaborative strategies were significantly related to learners' problem-solving skills (t = 3.214, p = .002). Collaboration appears to have strengthened the social and procedural aspects of problem-solving more than analytical reasoning. Teaching-learning activities that strengthen the jigsaw method, embed analytical routines in problem-based learning, and widen access to online collaboration are proposed.

Introduction

Education systems around the world now treat collaboration as a core competency rather than an optional classroom technique. International assessments measure collaborative problem-solving alongside reading and mathematics (OECD, 2017), and studies across levels show that well-structured group work improves achievement, communication, and attitudes toward learning (Alzubi et al., 2023; Siller & Ahmad, 2024). Problem-solving is the competency most often linked to collaboration. When learners analyze problems together, weigh alternatives, and test solutions, they develop the analytical and decision-making abilities that independent seatwork seldom builds (Garrison et al., 2021; Hsu et al., 2021; Cahyadi et al., 2023).

In the Philippines, the Enhanced Basic Education Act of 2013 calls for a learner-centered, inquiry-based, and collaborative curriculum (Republic Act No. 10533, 2013; Department of Education, 2013), and the K to 12 curriculum guide identifies problem-solving as a central

learning goal (Department of Education, 2016). National development planning likewise stresses 21st-century skills (National Economic and Development Authority, 2023). Yet translating these aims into classroom practice remains difficult. Filipino learners respond well to cooperative structures that fit cultural values of mutual help (Dizon, 2020; Zhang & Liang, 2020), but teachers report limited time, large classes, uneven participation, and little training in facilitation. Learners' return to classrooms after the pandemic years has added further strain, since many experienced isolation and disrupted routines, as documented among Filipino students (Panela, 2025b).

At the local level, schools in the North District of the Schools Division of Cebu City use collaborative methods, but there is little evidence on which strategies are used most, how well Grade 6 learners solve problems, and whether the two are related. This study examined the collaborative teaching-learning strategies and problem-solving skills of Grade 6 learners in selected North District schools during School Year 2024–2025. It described the profiles of teachers and learners; the extent to which teachers used the jigsaw method, problem-based learning, and online collaborative learning; the learners' problem-solving skills in analytical thinking, decision making, and collaboration and teamwork; the associations of teacher and learner profiles with these variables; and the relationship between the strategies and the learners' problem-solving skills. The results served as the basis for proposed teaching-learning activities.

Literature Review

Collaborative Learning as a Pedagogical Framework

Collaborative learning engages learners in shared tasks that require dialogue, joint reasoning, and mutual responsibility. Its roots lie in a long tradition of cooperative and collaborative approaches (Li & Kim, 2022), and in STEM it is recommended for building conceptual understanding through structured peer interaction (Felder & Brent, 2020). Collaborative structures improve both performance and social interaction (Alzubi et al., 2023), and when combined with problem-based and inquiry-based instruction, they strengthen learners' cognitive and problem-solving abilities (Zohar & Dori, 2020; Shengqiang et al., 2025). Collaboration also supports metacognition, as learners articulate and evaluate their reasoning in front of peers (McLeod & Velayudhan, 2021).

Three strategies are central to this study. In the jigsaw method, each member masters part of a lesson and teaches it to the group, so the group depends on every member's contribution. Problem-based learning organizes group work around a real-world problem that learners research, analyze, and solve (Zohar & Dori, 2020). Online collaborative learning extends group work into digital spaces where learners communicate, share resources, and build products together (Dooly & O'Dowd, 2020; Voogt et al., 2020). Online formats can strengthen problem-solving and metacognitive awareness when they are well structured (Hsu et al., 2021), but they depend on access and on teachers' capacity to design and moderate them (Joksimović et al., 2020; Stoet & Geary, 2020).

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The Teacher's Role

The success of collaboration depends heavily on the teacher. Teacher guidance, including structuring tasks, monitoring groups, and intervening at the right moments, is consistently associated with better collaborative outcomes (Van Leeuwen & Janssen, 2019). Teachers who model openness and cooperation build psychological safety and engagement (Johnson et al., 2022), and teacher scaffolding helps elementary learners solve ill-structured problems (Kim & Lee, 2020). Continuous assessment and feedback sustain motivation and learning in collaborative settings (Kuo et al., 2020). Teachers' preparation for these roles therefore matters, and professional development is frequently identified as the condition on which collaborative learning depends (Voogt et al., 2020).

Problem-Solving Skills

Problem-solving involves cognitive, metacognitive, and affective dimensions. Analytical thinking, including the ability to break problems into parts, identify patterns, and evaluate evidence, is a core predictor of proficiency (Lavigne et al., 2020). Decision making involves weighing options and consequences, and it is influenced by learners' emotional intelligence (Eisenman & Komives, 2021). Collaboration and teamwork add a social dimension in which learners divide tasks, communicate, and give feedback (Van der Meijden et al., 2020; Zhou & Brown, 2023). Elementary learners differ in their flexibility in problem-solving (Hiemstra & Gardner, 2020), many lack effective strategies (Al-khati, 2022), and problem-solving skills are closely linked to academic achievement (Irawati, 2023; Sari & Prasetyo, 2022).

Collaboration and Problem-Solving

Research consistently links collaboration to problem-solving. Structured collaborative tasks improve elementary learners' problem-solving and motivation (Kuo et al., 2020), collaborative approaches raise sixth graders' mathematics achievement and attitudes (Siller & Ahmad, 2024), collaborative problem-solving strategies interact with cognitive style to improve outcomes (Setiawan et al., 2020), and collaborative inquiry builds learners' ability to design investigations and explain results (Brown & Lee, 2021). In Philippine elementary classrooms, cooperative and collaborative learning have improved problem-solving, mathematics performance, and academic achievement (Zhang & Liang, 2020; De la Victoria, 2024; Cagatan & Quirap, 2024; Lozada & Antiquina, 2022). Contextual factors also shape these effects. Socio-economic status affects learners' resources and readiness (Education Policy Institute, 2020), and gender norms can influence problem-solving confidence (Ghorai & Mohakud, 2024; Obunge, 2021).

Theoretical and Legal Framework

Vygotsky's sociocultural theory holds that learners develop higher mental functions through social interaction within their zone of proximal development (Vygotsky, 1978). Piaget's constructivism holds that learners build knowledge actively through experience and the resolution of cognitive conflict (Piaget, 1950). Johnson and Johnson's cooperative learning theory specifies the conditions, including positive interdependence, individual accountability, and promotive interaction, under which group work succeeds (Johnson & Johnson, 2009).

Together, these theories explain why structured collaboration can develop problem-solving. Legally, the study is anchored on the Governance of Basic Education Act of 2001, which empowers schools to adopt responsive instructional approaches (Republic Act No. 9155, 2001), the Enhanced Basic Education Act of 2013, and the Inclusive Education Act of 2022 (RA 11650), which promotes participation of all learners.

Methodology

Research Design

The study used a quantitative descriptive-correlational design. The descriptive component portrayed the current characteristics of the respondents, their use of collaborative strategies, and the learners' problem-solving skills (Best & Kahn, 2007), and the correlational component tested associations among these variables.

Respondents

The respondents were 20 teachers and 60 Grade 6 learners from selected schools of the North District, Schools Division of Cebu City, during School Year 2024–2025, selected through simple random and quota sampling. Only those who met the selection criteria and consented participated.

Instruments

The questionnaire was adapted from the Scale of Teaching Strategies for Collaborative Learning (Cárdenas Rodríguez et al., 2019) and the Problem-Solving Skills Inventory (Yaman, 2003). Part I recorded the teachers' age, sex, educational attainment, years of teaching, and trainings attended, and the learners' age, sex, parents' occupation, and family income. Part II measured teachers' extent of use of the jigsaw method, problem-based learning, and online collaborative learning on a five-point scale interpreted as Excellent (4.21–5.00), Good (3.41–4.20), Fair (2.61–3.40), Less Satisfactory (1.81–2.60), or Least Satisfactory (1.00–1.80). Part III measured learners' analytical thinking, decision making, and collaboration and teamwork on a four-point scale interpreted as Very High (3.26–4.00), High (2.51–3.25), Lesser (1.76–2.50), or Least (1.00–1.75). The instrument was validated by a panel of practitioners and pilot tested, yielding a Cronbach's alpha of .81.

Procedure and Analysis

After approval from the Schools Division of Cebu City and the principals of the selected schools, the researchers distributed the questionnaires, explained the purpose of the study, and retrieved the completed forms. Teachers' workloads made scheduling difficult, and some respondents returned their questionnaires late; follow-up communication and close coordination with the schools resolved these problems. Data were analyzed using frequency, percentage, and weighted mean. Chi-square tests examined the associations of teacher and learner profiles with the main variables, and a test of relationship examined the link between the strategies and problem-solving skills, at $\alpha = .05$.

Ethical Considerations

The study followed the standards of the Northwest Samar State University Ethics Review Committee. Participation was voluntary, and learners below 18 gave assent with parental or

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guardian consent. No personal identifiers appeared in the instruments or report, data were stored securely and used only for academic purposes, and the researchers declared no conflict of interest.

Results and Discussion

Profile of the Respondents

Table 1

Profile of the Teacher and Learner Respondents

Variable	Distribution, f (%)
Teachers (n = 20)	
Age	31–40: 6 (30); 21–30: 5 (25); 41–50: 4 (20); 51–60: 3 (15); 61 and above: 2 (10)
Sex	Female: 11 (55); male: 8 (40); others: 1 (5)
Educational attainment	Bachelor's: 6 (30); master's: 6 (30); master's units: 5 (25); doctoral units: 2 (10); doctorate: 1 (5)
Years of teaching	6–10: 5 (25); 1–5: 4 (20); 11–15: 3 (15); 16–25: 4 (20); 26 and above: 4 (20)
Trainings attended	4–6: 8 (40); 1–3: 5 (25); 7–9: 4 (20); 10 and above: 3 (15)
Learners (n = 60)	
Age	11: 20 (33.33); 12: 18 (30.00); 13: 10 (16.67); 10: 8 (13.33); above 13: 4 (6.67)
Sex	Female: 30 (50.00); male: 28 (46.67); others: 2 (3.33)
Parents' occupation	Farmer: 12 (20.0); laborer: 10 (16.7); fisherman: 8 (13.3); vendor: 7 (11.7); driver: 6 (10.0); others: 17 (28.3)
Monthly family income	Below ₱10,000: 20 (33.33); ₱10,000–19,999: 14 (23.33); ₱20,000–29,999: 12 (20.00); ₱30,000 and above: 14 (23.33)

The teachers were relatively young to middle-aged, with 55% aged 40 or below, and most were women (Table 1). Seventy percent had graduate units or degrees, and 30% held only a bachelor's degree. Experience ranged widely, from 20% with five years or less to 20% with more than 25 years, and most teachers had attended between one and six trainings (65%). This is a diverse faculty with moderate professional development exposure, which suggests that facilitation skills for collaborative learning are likely to be uneven (Van Leeuwen & Janssen, 2019). A recent mapping of basic education teachers' skills and competencies on Samar Island likewise found that formal qualifications do not always translate into specific instructional competencies, and that targeted needs assessment should precede training (Panela, 2025d).

Most learners were 11 or 12 years old (63.33%) and evenly divided by sex. Their families depended mainly on farming, fishing, labor, driving, and small vending, and more than half (56.66%) earned less than ₱20,000 a month. Learners from such households often have limited academic support and materials at home (Education Policy Institute, 2020), which makes classroom collaboration an important source of support for learning (Dizon, 2020).

Extent of Utilization of Collaborative Teaching Strategies

Table 2

Extent of Utilization of Collaborative Teaching Strategies per Indicator

Strategy and Indicator	Mean	Interpretation
Jigsaw method	**2.40**	**Less Satisfactory**
The group collaborates to understand all parts of the lesson	2.45	Less Satisfactory
Each member is responsible for understanding and teaching their section	2.42	Less Satisfactory
Specific topics are assigned to different group members	2.40	Less Satisfactory
Information is shared and discussed after individual study sessions	2.38	Less Satisfactory
Each group member teaches their assigned topic to others	2.35	Less Satisfactory
Problem-based learning	**4.51**	**Excellent**
A real-world problem is identified for the group to solve	4.56	Excellent
Information is gathered from various sources to understand the issue	4.52	Excellent
Group discussions are used to explore possible solutions	4.50	Excellent
The group collaborates to research and analyze the problem	4.48	Excellent
The group presents their findings and proposed solutions	4.47	Excellent
Online collaborative learning	**4.40**	**Excellent**
Online discussions help the group explore different ideas	4.45	Excellent
Group members communicate and collaborate through online platforms	4.42	Excellent
Resources are collaboratively gathered and shared via digital tools	4.40	Excellent
Tasks are shared and divided among group members online	4.38	Excellent
The group presents their work through online platforms or meetings	4.36	Excellent

Note. 4.21–5.00 = Excellent; 3.41–4.20 = Good; 2.61–3.40 = Fair; 1.81–2.60 = Less Satisfactory; 1.00–1.80 = Least Satisfactory.

Use of the three strategies differed sharply (Table 2). Problem-based learning was used most extensively (M = 4.51, Excellent), with all five indicators in the Excellent range; identifying a real-world problem for the group (4.56) and gathering information from various sources (4.52) were the highest. Online collaborative learning was also used extensively (M = 4.40), with online discussions (4.45) and communication through online platforms (4.42) leading. The jigsaw method was used least (M = 2.40, Less Satisfactory), with peer teaching of assigned topics (2.35) the weakest indicator.

The contrast suggests that teachers favor whole-group, task-centered collaboration over structures that depend on individual expertise and peer teaching. Problem-based learning fits the K to 12 emphasis on real-world, inquiry-based learning and gives the teacher a clear task to manage (Department of Education, 2016; Zohar & Dori, 2020). The jigsaw method, by contrast, requires every learner to master and teach a portion of the lesson and requires the teacher to design interdependent subtasks and hold each member accountable. These are the elements of positive interdependence and individual accountability that cooperative learning theory identifies as essential and that are difficult to establish without training (Johnson & Johnson, 2009; Van Leeuwen & Janssen, 2019). The extensive use of online collaboration reflects the digital practices that schools expanded during and after the pandemic (Dooly & O'Dowd, 2020; Voogt et al., 2020), although its effectiveness depends on learners' access to devices and connectivity (Stoet & Geary, 2020).

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Level of Problem-Solving Skills

Table 3

Level of Problem-Solving Skills of Grade 6 Learners per Indicator

Dimension and Indicator	Mean	Interpretation
Analytical thinking	**2.35**	**Lesser**
Logical reasoning is applied to solve problems effectively	2.45	Lesser
Information is broken down into smaller components for analysis	2.40	Lesser
Patterns and connections are identified from complex data	2.35	Lesser
Different perspectives are considered to analyze issues thoroughly	2.30	Lesser
Evidence is evaluated critically to make informed conclusions	2.25	Lesser
Decision making	**3.48**	**Very High**
Decisions are based on clear goals and available information	3.55	Very High
The consequences of each choice are carefully considered	3.52	Very High
The decision-making process involves careful thought and analysis	3.50	Very High
Multiple options are evaluated before making a final decision	3.45	Very High
Group input is gathered to make well-informed decisions	3.40	Very High
Collaboration and teamwork	**3.62**	**Very High**
Open communication is encouraged to support teamwork	3.72	Very High
Group members actively contribute to achieving shared goals	3.65	Very High
Team members support each other in completing assigned tasks	3.60	Very High
Tasks are divided and completed collaboratively within the group	3.58	Very High
Feedback is shared respectfully to improve group work and outcomes	3.55	Very High

Note. 3.26–4.00 = Very High; 2.51–3.25 = High; 1.76–2.50 = Lesser; 1.00–1.75 = Least.

Learners' problem-solving skills were uneven (Table 3). Collaboration and teamwork was strongest (M = 3.62, Very High), led by open communication (3.72) and active contribution to shared goals (3.65). Decision making was also strong (M = 3.48), with decisions based on clear goals (3.55) and consideration of consequences (3.52) highest. Analytical thinking, however, was weak (M = 2.35, Lesser): learners rarely evaluated evidence critically (2.25), considered different perspectives (2.30), or identified patterns in complex information (2.35).

These results suggest that collaboration has developed learners' social and procedural problem-solving more than their analytical reasoning. Learners communicate, share tasks, and reach decisions as groups, but they are less able to break problems down, find patterns, and judge evidence. Analytical thinking is a core predictor of problem-solving proficiency (Lavigne et al., 2020) and depends on metacognitive skills that must be taught explicitly (McLeod & Velayudhan, 2021). Group work alone does not guarantee deeper reasoning; scaffolding and explicit problem-solving frameworks are needed (Kim & Lee, 2020; Al-khati, 2022). The weakness in analytical thinking is consistent with the limited use of the jigsaw method, which requires each learner to analyze and explain a portion of the content independently.

Profile Variables and the Main Variables

Table 4

Chi-Square Tests of Association Between Respondents' Profiles and the Main Variables

Profile Variable	χ^2	p	Decision	Interpretation
Teachers × extent of strategy use				
Age	12.45	.031	Reject H_0	Significant
Sex	3.28	.193	Accept H_0	Not significant
Highest educational attainment	15.82	.008	Reject H_0	Significant
Years of teaching experience	18.63	.004	Reject H_0	Significant
Relevant trainings and seminars	14.29	.012	Reject H_0	Significant
Learners × problem-solving skills				
Age	12.45	.031	Reject H_0	Significant
Sex	3.28	.193	Accept H_0	Not significant
Parents' occupation	15.82	.008	Reject H_0	Significant
Combined monthly family income	18.63	.004	Reject H_0	Significant

Note. The learner chi-square values are identical to the first four teacher values in the source manuscript and should be verified.

For teachers, years of teaching experience ($\chi^2 = 18.63$, $p = .004$), educational attainment ($\chi^2 = 15.82$, $p = .008$), trainings attended ($\chi^2 = 14.29$, $p = .012$), and age ($\chi^2 = 12.45$, $p = .031$) were significantly associated with the extent of strategy use, while sex was not ($\chi^2 = 3.28$, $p = .193$) (Table 4). For learners, family income ($\chi^2 = 18.63$, $p = .004$), parents' occupation ($\chi^2 = 15.82$, $p = .008$), and age ($\chi^2 = 12.45$, $p = .031$) were significantly associated with problem-solving skills, while sex was not.

The teacher results indicate that professional background, rather than sex, is linked to how teachers use collaborative strategies. Experience, graduate study, and training build the facilitation skills collaboration requires (Van Leeuwen & Janssen, 2019; Johnson et al., 2022). Teachers' capacity to adopt new practices also depends on support; teachers on Samar Island who undertook action research during the pandemic needed mentoring, time, and institutional backing to sustain changes in their practice (Panela, 2025e). The learner results indicate that family economic circumstances are associated with problem-solving, which agrees with evidence that socio-economic status shapes learners' resources, readiness, and opportunities to practice problem-solving (Education Policy Institute, 2020; Stoet & Geary, 2020). The lack of sex differences among learners contrasts with studies that report gender gaps in problem-solving (Ghorai & Mohakud, 2024; Obunge, 2021). Gender comparisons are more reliable when the instrument has been shown to work equivalently for boys and girls, as demonstrated in a gender-based Rasch analysis of a Philippine teacher scale (Panela, 2025a). Because the learner and teacher chi-square values in the source are identical for four variables, these results should be rechecked before they are relied upon.

Relationship Between Collaborative Strategies and Problem-Solving Skills

The test of relationship between the collaborative teaching strategies used by teachers and the problem-solving skills of learners was significant ($t = 3.214$, $p = .002$), and the null hypothesis

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was rejected. Teachers' use of collaborative strategies is therefore associated with learners' problem-solving skills.

This result agrees with a large body of evidence. Collaborative problem-solving tasks improve elementary learners' performance and motivation (Kuo et al., 2020), collaborative approaches raise sixth graders' mathematics achievement (Siller & Ahmad, 2024), and cooperative learning improves Filipino elementary learners' problem-solving (Zhang & Liang, 2020; Cagatan & Quirap, 2024). The pattern of the descriptive results suggests how this relationship works in the present schools. The extensively used strategies, problem-based and online collaboration, correspond to learners' strong teamwork and decision making, while the weakly used jigsaw method corresponds to their weak analytical thinking. In sociocultural terms, learners have had many opportunities to reason together but fewer to construct and explain knowledge individually for their peers (Vygotsky, 1978; Johnson & Johnson, 2009). The result should be interpreted with care. The methodology specified Pearson correlation, whereas a *t* value was reported without a correlation coefficient, so the strength and direction of the relationship cannot be stated. The analysis also links ratings from 20 teachers to those of 60 learners, and the method of matching them was not described.

Proposed Teaching-Learning Activities

The findings suggest four directions for teaching-learning activities. First, the jigsaw method should be strengthened through clearer task division, expert-group preparation, and individual accountability checks, so that each learner analyzes and teaches content (Johnson & Johnson, 2009). Second, problem-based learning should be retained and extended with explicit analytical routines, such as breaking problems into parts, identifying patterns, and evaluating evidence (Lavigne et al., 2020; Zohar & Dori, 2020). Third, online collaboration should use accessible tools and in-school access so that learners from low-income families can participate fully (Voogt et al., 2020). Fourth, teachers should receive continuing training in collaborative facilitation and scaffolding (Van Leeuwen & Janssen, 2019; Kim & Lee, 2020). These activities should also attend to teachers' well-being, since facilitating active group work adds to their workload; a recent study reported that university teachers found an AI companion tool helpful in managing workplace stress (Panela, 2026).

Conclusion

Teachers in selected North District schools of the Schools Division of Cebu City are diverse in age, education, and experience and have moderate exposure to training, and their Grade 6 learners come mostly from low-income families. Teachers use problem-based learning and online collaborative learning extensively but use the jigsaw method to a limited extent. Learners are strong in collaboration and teamwork and in decision making but weak in analytical thinking. Teachers' age, education, experience, and training are associated with their use of collaborative strategies, and learners' age, parents' occupation, and family income are associated with their problem-solving skills. Collaborative teaching strategies are significantly related to learners' problem-solving skills.

Teachers should strengthen the jigsaw method, keep problem-based learning at the center of instruction while adding explicit analytical routines, and make online collaboration accessible to all learners. Administrators should provide continuing training on collaborative facilitation and monitor how collaborative practices affect learners' problem-solving. Teachers should design differentiated activities for learners of varying ages and backgrounds, adopt inclusive practices, and respond to learners' socio-economic circumstances. Because the cohort spent part of its schooling under pandemic conditions, teachers should also attend to learners' social and emotional readiness for group work (Panela, 2025c). Future studies should report correlation coefficients for each strategy and each problem-solving dimension and verify the learner-level associations.

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