CEAR
Centre for Education Action Research

التعليمية الفطيم Al-Futtaim Education Foundation

CAN PEER COLLABORATION IMPROVE MATHEMATICAL ENGAGEMENT AND ATTAINMENT IN YEAR 4?

YVONNE WARD

Hartland International School
yward@hartlandinternational.com

Hartland International School
مدرسة هارتلاند انترناشيونال

Introduction

This article explores how structured peer collaboration can improve engagement and attainment in a mixed-ability mathematics class in Year 4. This year, our school moved away from grouping students into ability sets, prompting the need for more adaptive strategies that support and challenge all learners. Early in Term 1, I observed that student engagement was inconsistent, especially among lower and middle attainers. Mathematical discussions lacked depth and students often relied on teacher input to progress. The problem, therefore, was twofold: limited mathematical discourse and disengagement, particularly during independent and problem-solving activities. Research suggests that peer collaboration, when scaffolded effectively can foster deeper understanding, shared accountability and inclusive learning environments (Siller & Ahmad, 2024; Alegre et al., 2020). This approach offered a practical, efficient strategy. When students are explicitly taught how to collaborate through structured roles, sentence stems and feedback routines they become more reflective, independent and motivated. Over the three terms I introduced structured collaboration across three terms to investigate whether this approach could raise engagement, confidence and attainment in mathematics for all learners in my class.

Background to the problem
This academic year, the decision was made to move to mixed-ability groups for mathematics classes. This new approach presented some challenges. Lower and middle attainers were often not progressing to challenge tasks and required a lot of teacher input and support. High attainers were missing out on opportunities to extend their thinking as teacher input was being prioritised for those who required support. Mathematical dialogue was dominated by high-attainers with little input from middle or lower attainers. This limited the progress of less confident students. Equally, there were missed opportunities for high attainers to develop their reasoning and explanation skills. Student surveys confirmed also the student lack of confidence, particularly during problem-solving activities. I was left with the question of how I could empower all pupils to participate actively and learn from one another.

By implementing peer collaboration strategies, I hoped to create a classroom culture in which every student voice could be heard and encouraged, creating opportunities for students to take risks and engage more confidently in mathematical dialogue in a safe space. At the same time, the introduction of the 'Clarifier' role challenged high attainers to developing their ability to ask questions and break down problems for others. As a High-Performance-Learning school, this approach also supported the development of empathy, communication and self-regulation.

Literature Review

Research strongly supports the idea that structured peer collaboration can improve outcomes in mathematics. Alegre et al. (2020) found that peer tutoring was especially effective in primary settings when clearly defined roles were introduced.

Similarly, Siller and Ahmad (2024) found that scaffolded peer interactions, when supported with teacher modelling, led to increased confidence, engagement and performance in mathematics. Their study highlighted that structured peer dialogue not only improved problem-solving outcomes but also enhanced learner's willingness to take risks.

This sentiment was echoed by Gallagher et al. (2020) who found flexible grouping, peer support and differentiated strategies allowed all students to access learning while maintaining high standards.

From these studies, I decided to review my use of peer support and look at ways to introduce more structure to collaborative routines. My study sought to examine if these strategies would lead to improved academic outcomes but also engagement and learner agency.

Methodology

Action research was chosen as the methodology for this study because it is practitioner-led, classroom-based and focuses on improving specific aspects of practice in real time. It allows for reflection and responsive adjustment. As both the researcher and class teacher, I could closely monitor pupil responses, evaluate strategies and make informed changes as the year progressed.

The overall research objective was to investigate the effectiveness of structured peer collaboration as an adaptive teaching strategy in a mixed-ability mathematics setting.
The following two research questions were developed:

1. How does peer collaboration influence the use of mathematical language and problem-solving skills?
2. What impact does peer collaboration have on mathematical understanding, engagement and attainment?

Research Action
The research was conducted over three terms and involved three action cycles.

Cycle 1 (Term 1):
- Peer assessment introduced at the end of every mathematics lesson.
- Student survey on Mathematics

Cycle 2 (Term 2)
- Lesson on constructive feedback.
- Modelling good and bad feedback.
- Use of rubrics to reflect on feedback.
- Student survey on Mathematics
- Focus group with 3 children identified through results

Cycle 3 (Term 3)
- Introduction of sentence stems bookmarks
- Introduction of clarifier role
- Mini-lesson on role of clarifier
- Student survey on Mathematics

Participants
The study took place in a Year 4 classroom at Hartland International School, comprising 22 students. The participants represented a range of attainment levels:
- Working towards expectations - 2
- Meeting expectations - 8
- Working above expectations - 12

Data Collection
A mixed-methods approach was used to gather quantitative and qualitative data. The following tools and strategies were used:
- Pupil surveys: Administered at the end of each term to gauge student attitudes towards collaboration and mathematics (Likert scale and open-response format).

- Observations & Photographs: Student interactions and the quality of mathematical dialogue.
- Work samples: Annotated student work was analysed to track evidence of mathematical reasoning and vocabulary development.
- Attainment data: End of unit White Rose assessment scores were compared to measure progress in problem-solving and arithmetic strands.
- Reflection rubrics: Students completed self-assessments using simplified HPL collaboration rubrics. (see **Figure 1**)

Figure 1
Reflection Rubric

Creativity Empathy 	Stage 1 I'm feeling it! 	Stage 2 I'm doing it! 	Stage 3 I'm smashing it! 
Collaboration	I have shared my feedback with my partner.	I have listened to my partners feedback and made changes based upon it.	I have listened to constructive feedback, applied changes to my work and have shared why I made these changes with another classmate.

Data Analysis

This study employed a mixed-methods approach to analyse both quantitative and qualitative data collected through pupil surveys, attainment data, and classroom observations. The aim was to identify trends in student engagement, collaborative behaviours and mathematical attainment resulting from structured peer collaboration.

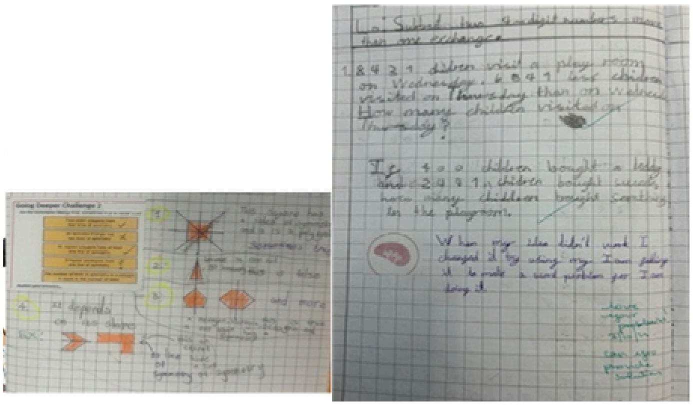
Quantitative Analysis

1. White Rose & Attainment Data: Mathematics attainment scores from Term 1 and Term 3 were compared using percentage performance in arithmetic and problem-solving strands. Students' results were grouped into three broad attainment bands: Lower (below 60%), Middle (60–79%), and Higher (80% and above).
2. Survey Data (Likert Scales): Pre and post intervention surveys included Likert scale questions such as "I enjoy solving maths problems with a partner" and "I feel confident explaining my maths thinking to a peer." The number of students agreeing or strongly agreeing was tallied and compared across the two points.
3. Visual Observational Evidence: Teacher observations confirmed a marked increase in risk-taking and mathematical dialogue from these students. Their participation in group work became more consistent, and their responses during lessons grew in length and depth. They were more willing to attempt challenge tasks and increasingly used sentence stems to articulate their thinking. (see **Figure 2**)

Triangulation of Findings

By integrating trends across assessment scores, pupil voice and classroom behaviours, the study ensured triangulation and reduced researcher bias.

Figure 2
Students using sentence starters and question prompts to scaffold peer feedback during a problem-solving task



Results

Attainment
Table 1 shows the problem-solving percentage scores for five students across Term 1 and Term 3, highlighting improvements made during the intervention period, showing measurable improvement in student performance.

Table 1
Problem Solving Percentage Scores

Student	Term 1 Problem Solving (%)	Term 3 Problem Solving (%)	Change in Score (%)
Cielo	26	78	52
Jacob	57	93	36
Megat	40	44	4
Dariya	40	60	20
Leanna	33	63	30

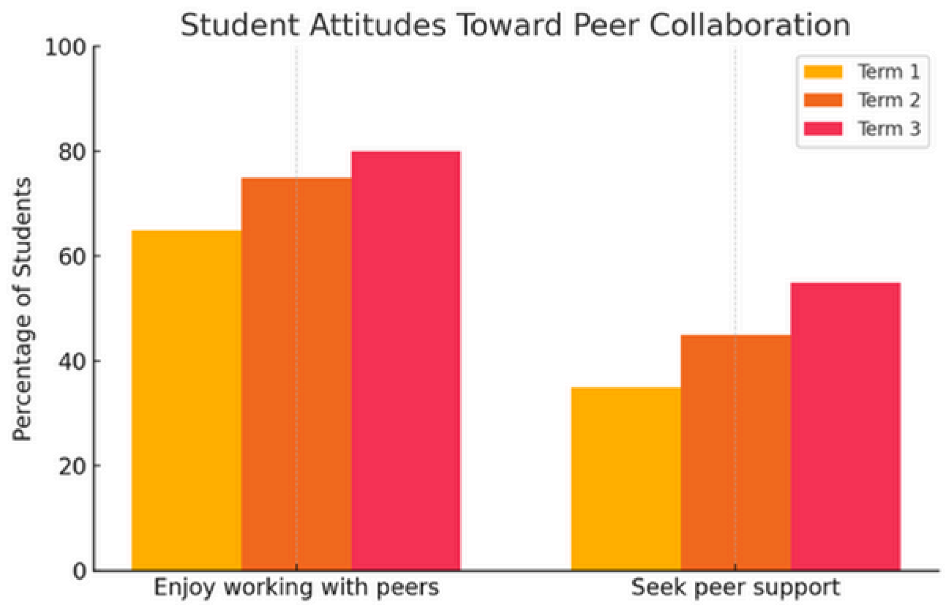
Confidence in problem-solving
Whole-class survey data revealed a rise in the number of students reporting that collaboration made them feel more confident in problem-solving (see **Figure 3**). Student reflections also echoed an increased confidence: *"Sometimes I don't get it, but when my partner shows me their way, I feel like I can try it too."*
Another student shared: *"I feel better when someone helps me instead of just the teacher, because they talk like me."* While another added: *"I like talking about the answers now, not just writing them."*

The introduction of the Clarifier role encouraged deeper questioning, improved listening and prompted high attainers to explain their methods clearly. This not only supported their peers but also strengthened their own understanding.

Attitudes to Peer Collaboration
Survey results indicated that collaborative work was their most valued support strategy in mathematics. Visual data collected in **Figure 4** further illustrate this shift in mindset, showing a notable increase in student preference for peer-led support.

Figure 3 Confidence levels in problem-solving

Figure 4 Student Attitudes to Peer Collaboration



Discussion

The most significant shift was in pupil mindset. Students moved from working in isolation to viewing mistakes as part of the learning process. Peer dialogue became more purposeful, and feedback was received more constructively.

The three students tracked most closely began the year hesitant and disengaged but finished as more confident, active contributors in mathematics lessons. Structured routines and peer roles provided clarity and confidence. The use of sentence stems and purple-pen feedback reinforced key mathematical vocabulary and encouraged thoughtful responses.

As a teacher I became more deliberate in planning time for talk, not just task completion. My role evolved from instructor to facilitator, observing and supporting dialogue rather than directing learning. This allowed me to offer more targeted intervention, particularly for small groups needing support.

The Clarifier role helped challenge high attainers, developing their communication and leadership skills. This promoted greater equity and helped build a culture of shared success.

Overall, the project showed that peer collaboration, when explicitly taught and consistently embedded, can transform classroom culture, support inclusive progress and improve mathematical engagement for all learners.

Conclusion

This action research project demonstrated that structured peer collaboration has the potential to significantly enhance engagement, confidence and attainment in primary mathematics. By embedding routines, modelling roles and valuing student voice, the classroom became a more inclusive, language-rich environment where all learners could thrive.

References

Alegre, F., Moliner, L., Maroto, A., & Lorenzo-Valentín, G. (2020). Academic achievement and peer tutoring in mathematics: A comparison between primary and secondary education. *SAGE Open, 10*(2), 1–9. https://doi.org/10.1177/2158244020929295

Gallagher, S., Hume, D., & Du Preez, J. (2020). Adaptive teaching in mixed-ability classrooms. *Education Today, 15*(3), 45–58.

Siller, L., & Ahmad, R. (2024). Structuring peer talk for success in primary mathematics. *Journal of Learning and Teaching, 31*(1), 22–37.