



Argument-Based Mathematical Inquiry: Teacher Strategies for Supporting Young Students' Collective Argumentation

Jill Fielding

School of Education
University of New England
<jill.fielding@une.edu.au>

Penelope Baker

School of Education
University of New England
<pbaker31@une.edu.au>

Nadya Rizk

School of Education
University of New England
<nrizk3@une.edu.au>

Research shows that engaging in argumentation enhances conceptual understanding, critical thinking, and long-term retention of knowledge. However, young learners often struggle with argumentation because they are unfamiliar with its social and discursive demands, frequently defaulting to egocentric or persuasive modes of reasoning. We investigated a learning environment in which a teacher sought to develop collective argumentation to identify and examine effective instructional strategies.

The design-based research drew on 10 hours of classroom video recordings with 22 students (aged 9–10). The inquiry centred on a geometry problem—whether pyramids can have scalene faces. Data were transcribed and analysed to identify teacher strategies that fostered collective argumentation, with attention to the five principles outlined by Brown and Renshaw (2000): consistency, objectivity, consensus, generalisability, and recontextualisation.

The study highlights several teacher practices that supported students in developing collective argumentation. First, the teacher explicitly introduced the Claim-Evidence-Reasoning framework (Zemal-Saul et al., 2013). This supported the *consistency principle* by enabling students to resolve contradictions through reasoned discussion. Second, through scaffolding and probing questions, the teacher emphasised what counts as quality evidence, prompting students to evaluate sufficiency, validity, and reliability—fulfilling the *objectivity principle*. Third, student ownership was fostered by allowing groups to choose approaches, creating authentic engagement and supporting the *consensus principle*. The teacher also encouraged multiple representations—nets, models, diagrams—to help students articulate their thinking, addressing the *generalisability principle*. Finally, structured peer critique enabled groups to refine arguments and improve the quality of evidence, exemplifying the *recontextualisation principle*. Beyond these, the researchers propose a new *Discursive Knowledge Principle*, whereby explicit attention to mathematical and argumentation language enabled students to bridge everyday and disciplinary discourse, thereby deepening communicative competence.

The study demonstrates that when carefully scaffolded, collective argumentation can foster both epistemic agency and mathematical understanding in primary classrooms. Importantly, the findings underscore that argumentation is not merely a cognitive exercise but a socially situated, language-mediated practice.

References

- Brown, R. A. J., & Renshaw, P. D. (2000). *Collective argumentation: A sociocultural approach to reframing classroom teaching and learning*. Pergamon.
- Zemal-Saul, C., McNeill, K. L., & Hershberger, K. (2013). *What's your evidence?* Pearson.

For more information, please refer to the following paper presented at the 47th Annual Conference of MERGA in July 2025.

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