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INTERPRETATION OF DIAGRAMS IN DYNAMIC GEOMETRY ENVIRONMENTS

Kotaro Komatsu[1] & Keith Jones[2]
[1]Shinshu University, Japan, [2]University of Southampton, UK

The use of dynamic geometry environments (DGEs) is known to influence students' proof-related activity (Laborde, 1993). Our study addresses DGE use in mathematical activity related to proofs and refutations (Lakatos, 1976), conceptualised in terms of conjecturing, proving, and refuting (Komatsu & Jones, 2017). Our study focuses on the refuting phase, and analyses the ways that students discover and treat counterexamples to their conjecture when using a DGE to transform diagrams.

As a framework, we apply the research of Steenpaß and Steinbring (2014) on student interpretation of diagrams, and distinguish two types of diagram interpretation, namely *perception- and relation-oriented interpretations* (a framework that is subtly distinct from the notions of 'drawing' and 'figure' employed by Laborde, 1993). The *perception-oriented interpretation* of a diagram refers to considering its visible elements (e.g. points, lines, circles, etc.), whereas the *relation-oriented interpretation* of a diagram refers to considering the relations amongst these visible elements.

Using this framework, we analysed a task-based interview where a triad of Japanese secondary school students (16–17 years old) tackled tasks related to conjecturing, proving, and refuting using a DGE (Komatsu & Jones, 2017). The video records and transcriptions of the interview, the worksheets the students completed, and the DGE file they made, were used as data for the analysis.

Our analysis shows that when students engaged in proofs and refutations by interpreting diagrams in a relation-oriented manner, this helped them discover new diagrams, including one that was a counterexample to their conjecture. It also enabled the students to address efficiently another counterexample by unifying it into a previous counterexample. Our study suggests that the distinction between perception- and relation-oriented interpretations, as well between 'drawing' and 'figure', can help in deepening understanding of student behaviour when they are using DGEs.

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