

A case study of collaboration between mathematicians and mathematics educators under the perspective of assemblage theory

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Introduction

Over the last decade, within the field of undergraduate mathematics education research, the collaboration between mathematicians and mathematics educators has increasingly become a topic of study. Most research related to collaborative efforts between the two communities has focused on the products, and only few on the process of collaboration (Bleiler, 2015). Research on the collaboration between members of the two communities has taken different forms, addressing issues at the micro or macro level from different theoretical perspectives. However, what is lacking is a perspective that considers issues beyond such micro-macro binaries (de Freitas & Curinga, 2015), while focusing on the emergent relations within a network of interactions among the constituent parts. Thus, the purpose of this case study is to explore the development and function of emergent relations within a collaborative group of mathematicians and mathematics educators as they negotiate the teaching and learning of mathematics at the undergraduate level to address students' needs.

Theoretical Background

Drawing on Deleuze and Guattari (1987; in de Freitas & Curinga, 2015) I use the concept of assemblage, as method and unit of analysis to define the ontological status of the collaborative group-entity. An assemblage is made up of components and the interaction of these components determines what the assemblage is. A different perspective of the function of language leads to a shift in relation to the unit of analysis. “Language is not a code for discerning the meaning of an act, nor is speech the communication of information. Instead, language is a material act or effectuation”. (de Freitas, 2015, p. 255) Thus, material expressions are developed within a field of action and influence and stem from social, material, and cultural sources. The focus of analysis is on the field of (emergent) relations that function through material expressions which (re)configure, materially and discursively, the assemblage of the group. This means that the analytical unit is the assemblage of the group, with the aim of studying its function concerning the teaching and learning of mathematics in higher education. The interactions of the assemblage’s components (semiotic/discursive and material) are shaped by language which forms the material expressions that enable the emergence of certain relations which function to produce – discursively and materially – a new collective individual. Thus, the assemblage is also a method of analysis as a “process of individuation” through which language is effectuated through the interaction of different forces involved. Methodologically, we can break down this process into three stages. Stage 1, which is about identifying the components of assemblage and mapping the network of their interaction as material expressions. Stage 2, which is about mapping the network of interactions of the material expressions that enable the emergence of certain relations. Stage 3, which is about exploring the function of the emergent relations as coordinate movements of the interactions between material expressions that form the assemblage.

Example of analysis - Results

Data for this study come from a three-year collaboration between two mathematics educators, myself, and five mathematicians, involving several recorded discussions, interviews with students and university personnel, university evaluation reports, mathematical texts, and curriculum materials. The data used to illustrate the analytical process are drawn from our second meeting in 2020, which took place at the beginning of the COVID-19 pandemic when remote teaching became necessary. Following a discussion I had with students, I informed the group about their feedback. This led to a discussion about workshops that could complement lectures, considering the available digital tools, institutional constraints, and teaching practices. In the analysis, the identified semiotic components encompass the cultural practices of students' learning and studying, the social context of the pandemic, and the cultural practices of teaching among researchers and mathematicians. The material components comprise digital technology, university infrastructure and funding status, and the physical aspects of mathematicians, educators, and students embodying these practices.

Educator A: Through distant learning, someone can organize a workshop and assign individual exercises for the participants as homework and dedicate some time for a student to discuss how she solved it or what she did when she couldn't solve it. You can't do that for everyone, but you can bring this as an example that may feedback others.

Mathematician A: I Can! Yes! ... Alright, it looks good, I agree with what you're saying. During our discussion, this idea came to me, that it could be an opportunity now, perhaps in this situation, to try out these new methods... if it's something that works it could be used under normal circumstances, necessarily this will work with a small group.

The interactions among the components shape the material expressions, which encompass (1) the tutoring workshop, (2) the modes of student interaction and engagement with mathematical tasks, (3) technology-mediated communication and feedback, as well as (4) resource constraints. Material expressions are the generative force that produces the emergent relations. For example, the relation regarding “the importance of feedback and validation in learning practice” is an emergent property of the assemblage, reflecting the interplay between material expressions 1, 2, and 3. This relation emerges from the negotiation of students' needs for feedback and validation of their solutions to exercises by the group, as well as the emphasis on conducting workshops where they can actively participate in solving exercises and receive feedback on their approaches. As a movement, an emergent relation draws a line in some direction of an actual or potential formation concerning teaching and/or learning perspective. Thus, the aforementioned emergent relation is a movement towards an inclusive teaching practice that seeks and acknowledges students' desires in order to enhance their understanding and mathematical competence. Through feedback and validation students can potentially deepen their understanding and gain confidence in their competence.

References

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