

Mathematics professors' goals through an integrated lens of guided reinvention and creation

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Guided reinvention or the guidance principle (Realistic Mathematics Education) examines how teachers can provide opportunities for students through “realistic” contexts to facilitate them to reinvent “higher” level formal concepts. (Gravemeijer, 2008; Van den Heuvel-Panhuizen, & Drijvers, 2020). Guided reinvention acknowledges collaborative students' work like whole group discussions. We assume that students can show or develop multiple understandings and even non-traditional knowledge in such discussions. Therefore, we consider the creation dimension (Rehumanizing Mathematics) which acknowledges students' conceptions and diverse forms of expressing mathematics (Gutiérrez, 2018) as a way of expanding guided reinvention. Being able to stray from traditional knowledge forms/representations can feel humanizing for students and help transform their relationship with mathematics as authors/creators of mathematics. By way of illustration of diverse forms, there can be sense-making alternative axiomatic models of a concept, which are different from the traditional ones. Moreover, students might show “proofs” that are non-deductive, non-symbolic, or visual. Creation privileges Nepantla moments of tensions within multiple perspectives (Gutiérrez, 2012); however, Gravemeijer's mathematization in guided reinvention process focuses on developing standard procedures, “limiting interpretations,” and validations (Gravemeijer, 2000). This encourages us to identify how guided reinvention and creation can interact with and expand each other's use.

To obtain empirical evidence, we recruited five mathematics professors in India for our ongoing qualitative case study to explore how their views of their teaching roles might influence their interest/propensity to use guided reinvention and creation. One out of three interviews for each participant centers guided reinvention, another interview centers creation, and the final interview centers both concepts. “Member checking” is conducted in the last interviews by summarizing interpretations of the first two interviews to the participants. With a lens of guided reinvention and creation, we seek responses to our research questions on mathematics professors' perceptions of their role in facilitating students for abstract concepts, students' alternative conceptions (Fujii, 2020), students making conjectures, and students' participation. The findings can potentially exemplify and guide us on how guided reinvention and creation can be developed as an integrated framework, which can be used in later studies and support a more humanizing experience for students studying mathematics.

The poster presents the study's preliminary results, participants' quotes, future steps, and a Venn diagram depicting how guided reinvention and creation potentially interact. Among other results, we focused on one professor and noticed he finds it essential to provide realistic scenarios but thinks it becomes difficult to find such scenarios at “higher” abstraction levels. We identified that, for this professor, he finds it important to alert his students about informal writing so that they can avoid “errors,” which might prevent guided reinvention or creation. We look forward to discussions with conference attendees about more results mentioned in the poster.

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