

Student-Centered Inquiry in Secondary Mathematics Instruction

Ryan Pero

Hobart and William Smith Colleges

Research Question:

How can student-centered inquiry be incorporated into secondary mathematics classrooms to promote problem-solving skills while engaging students with the content?

Background

- “You watch, we do, you do” is the most common approach to secondary math instruction. Essentially, the teacher directly shows students how to solve a problem, and students replicate the teacher’s process.
 - This approach does not promote problem-solving skills, and students do not have agency in their own learning.
- Alternatively, student-centered inquiry is an approach where students use the art of conjecture to discover mathematical theorems in small groups.

Literature Review

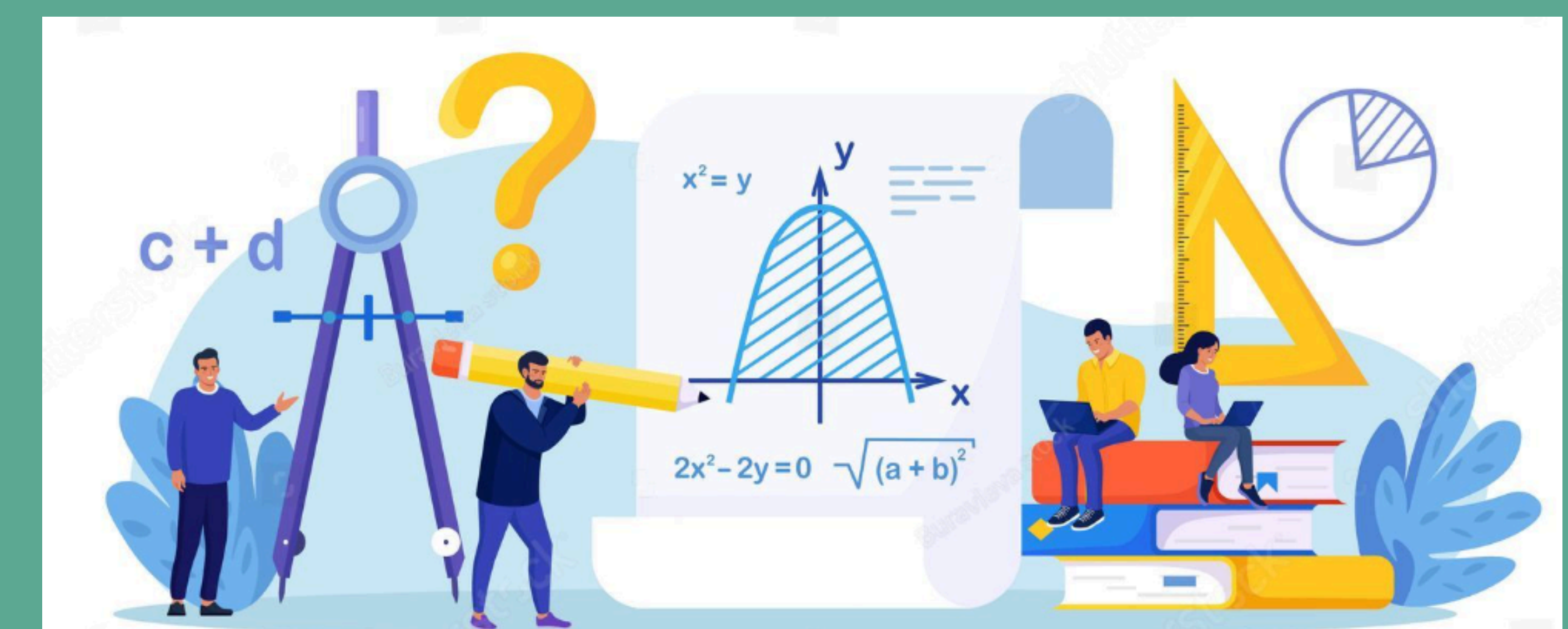
- Math Action Technologies, such as Desmos and GeoGebra, allow students to explore patterns and relationships by manipulating mathematical objects.¹
- Math Action Technologies promote the cycles of proof as students test and revise their own conjectures.²
- Students take control of their learning which fosters equality as all students have a voice in conversations about mathematics.²

Methods

- The primary data source will be an artifact analysis of student exit tickets.
- The exit tickets of 5 randomly selected ninth grade students will be obtained and analyzed following the completion of each of approximately five lessons within one unit of study. All lessons within this unit will include student-centered inquiry and will be taught by the researcher.
- The researcher will look for key words and phrases that help to understand the effect that student-centered inquiry has on secondary mathematics students.
- A conventional content analysis will be used to analyze student statements in the exit tickets.³
- After the responses are read, the researcher will develop themes and generate a codebook that correlates to each theme, and the frequency of each code will be recorded. The codebook will generate the analysis of the effects that student-centered inquiry has on secondary mathematics students, specifically, of their mastery of material and of their enjoyment of the course.⁴

Anticipated Results

- The goal is to increase student engagement in secondary mathematics courses while simultaneously teaching problem-solving skills and collaboration.
- The researcher predicts that students will prefer the student-centered inquiry approach, which will be expressed in the exit tickets.



References

1. McCulloch, A. W., Lovett, J. N., Dick, L. K., & Cayton, C. (2021). Positioning Students to Explore Math with Technology. *Mathematics Teacher: Learning and Teaching PK-12*, 114(10), 738-749. <https://doi.org/10.5951/MTLT.2021.0059>
2. Niank, S., Muroveko, J. M., & Edgar, S. J. (2023). It's Off the Screen: Unearthing Megagons Through Technology. *Mathematics Teacher: Learning and Teaching PK-12*, 116(5), 358-365. <https://doi.org/10.5951/MTLT.2023.00092>
3. Hsieh, H. F., & Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis. *Qualitative Health Research*, 15(9), 1277-1288. <https://doi.org/10.1177/1049731505276687>
4. Kurth, J. A., McQueston, J. A., Rupp, A. L., Toews, S. G., Johnston, R., & McCabe, K. M. (2019). A Description of Parent Input in IEP Development Through Analysis IEP Documents. *Intellectual and Developmental Disabilities*, 57(6), 485-498. <https://doi.org/10.1111/1532-1934.9556-57.6.485>