ENGAGING WITH A GEOMETRIC TRANSLATIONS TASK USING CODING

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Portnoy et al. (2006) suggested students need to use patterns, generalizations and spatial reasoning as they learn geometric transformations. Computation tasks are an excellent medium for identifying patterns and exploring the results of manipulations (Schanzer et al., 2015). This study explores how 9th grade students engage with a computation task focused on rigid geometric translations and their teacher's insights on how the task could support their students' understanding of geometric translations. Geometric translations can be interpreted as motion and mapping (Hollebrands, 2003; Yanık, 2011). Motion refers to "the mental or physical manipulation of geometric figures to new positions or orientations" (Boulter & Kirby, 1994, p. 298). In mapping, "translations are considered special functions that map all points in the plane to other points in the plane based on a specific direction and magnitude" (Yanık, 2013, p.273).

This poster presents ongoing research on synergies between computational and mathematical thinking. We observed a one-hour class in which 14 ninth grade students concurrently enrolled in Algebra I engaged with a coding activity where students created a translation of a bird silhouette. Students were given prewritten code that translates the bird to the top of the output panel and were asked to simplify the code, by creating a function. At the end, we debriefed with the teacher on how she used this bird task in supporting her students' understanding and use of geometric translations and how computation tasks could be helpful in her future teaching. Researchers used the Framework for Engagement with Mathematics (Attard, 2012) to create questions for the debrief. Also, students' codes were stored in our platform (Alegre, 2020). Field notes of the observation, debrief with the teacher, and students' codes were used in the data analysis.

Initial analysis showed the majority of the students interpreted translations as motion. They described the translation as "it is like sliding". One student stated "You can move x and y. We can move the shape 5 units or 3 units left and right with coordinates". The teacher commented on whether the translation should be applied to all points on the plane. But, there was no check for understanding on mapping interpretation of translations in the lesson. But the analysis of the codes showed that students defined a function in their codes that applies translation on all points.

Preliminary results suggest that computation activities let students externalize and manipulate their thought process, making mathematical thinking explicit while engaging with the task. Also, it allowed students to observe the motion interpretation of the translation through manipulation. Students had a chance to understand the mapping interpretation of translation by defining a function, and they used important mathematical concepts, such as functions and congruence, during the task. Future research will explore rotations, dilations, and composite transformations.

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