Activity: An Absolute Value Discovery

Course: College Algebra/Algebra for STEM

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Activity Abstract:

In An Absolute Value Discovery, Algebra for STEM instructors are provided with problems that introduce students to the concept of absolute value as a distance. The discovery will lead students to further understand absolute value as a distance measured from zero, and that both positive and negative values can have the same absolute value. Students can model these concept on number lines leading to formal equations which they can solve realizing the possibility of more than one solution or no solutions. This Activity can be used as a whole class discovery, in smaller groups or individually by students.

Instructional Plan:

Rationale for selecting/designing this problem/task sequence:

This problem/task focuses on introducing the concepts of absolute value to Algebra for STEM / College Algebra students and providing them with a scaffolded approach to understanding how to solve and visually represent various absolute value equations. Students will be able to discover through guided questioning the concept of absolute value as a distance and visualize absolute values on a number line. They will further be able to transition from the visual representation of a number line graph to an abstract representation as an equation which they will work on solving in various forms. Students will also be asked to verbally explain their understanding of absolute value and the meaning of various absolute value equations.

Prerequisite Knowledge:

- Students should have a general understanding of solving one and two step equations
- Students should have general knowledge of absolute value however the instructor may need to dispel common misconceptions about absolute value i.e., " just use the opposite sign of the number."

Learning objective(s) and alignment with Student Learning Outcomes (SLOs From CEP Matrix):

- Interpret functions and convert between their representations, including symbols, tables, graphs, and words.
- Algebraically solve equations including linear, quadratic, polynomial, rational, radical, absolute value, exponential, and logarithmic.

MIP Components of Inquiry:

This section outlines how our activity will meet the Mathematical Inquiry Project (MIP) criteria for active learning, meaningful applications, and academic success skills.

Active Learning: Students learn through engaging in deep problems requiring them to select, perform, and evaluate actions whose structures are equivalent to the structures of the concepts to be learned.

- Students will engage in active learning by having the students physically measure a distance with a measurable attribute, the tape on the floor, and a measurement unit, their foot.
- Students can engage in mathematical discussion to determine their definition and explanations of absolute value and the problems presented in the ARC.
- Students will be able to actively determine what additional steps are needed to solve problems where they have $|x \pm a|$ rather than just $|x|$ and see what changes in the solving process by using a number line to represent the difference in their steps for solving.

Meaningful Applications: Applications are incorporated in mathematics classes to support students in identifying mathematical relationships, making and justifying claims, and generalizing across contexts to extract common mathematical structure.

- Students will engage in meaning applications by relating what they learned using foot measurements to number line measurements.
- Students will justify the definition of absolute value from their measurement forwards and backwards on the floor tape and from the number line.
- Students will be able to see in a real-life situation how absolute value is related to being a certain distance from a number using the jelly bean activity and graphing the results.
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Academic Success Skills: Students construct an identity as learners in ways that enable productive engagement in their education and the associated academic community.

- Students will engage in Academic Success Skills by working in groups to collaborate on specific terminology to create clear and concise definitions.
- Students will be able persevere as math learners as they develop their own definitions and explanations of their solving process with absolute value problems.
- Students will be able to discover their mathematical understanding of absolute value and show that they can examine, identify, and evaluate problems involving absolute value which promotes their mathematical success as active mathematical thinkers and learners.