

Lesson 5: Prototyping the Math Experience

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Grade Level(s)

12th grade students enrolled in “Mathematical Decision Making for Life”

Lesson Overview

Students will build a prototype of a math experience that will address the need they have identified in their user.

Learning Objectives

Students will deepen their own understanding of mathematics by designing a learning experience for a younger student.

Standards

- How to construct viable arguments and construct the reasoning of others. In particular, how to:
 - o Use stated assumptions, definitions, and previously established results to construct an argument. (MDMFL IV.1a)
 - o Recognize and use counterexamples. (MDMFL IV.1c)
 - o Justify and communicate conclusions, and respond to the arguments of others. (MDMFL IV.1.d)
- How to construct, analyze, and interpret flow charts. In particular, how to:
 - o Construct flow charts to describe processes or problem-solving procedures. (MDMFL IV.3a)
 - o Analyze flowcharts and follow procedures to solve problems. (MDMFL IV.3b)
 - o List requirements and restrictions needed for a suggested algorithm. (MDMFL IV.3d)
- How to initiate and participate effectively in a range of collaborative discussion with diverse partners on *grades 11-12 topics, texts, and issues*, building on others' ideas and expressing their own clearly and persuasively. In particular, how to:

- Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. (SL 11-12.1b)
- How to evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. (SL 11-12.3)
- How to present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. (SL 11-12.4)
- How to adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.

Preparation

For the activities over the next day or two, be prepared to demonstrate models for understanding the math that your students have uncovered from their interviews with their younger user.

Materials and Resources

- Each team's Empathy map and POV statement.
- Materials for prototyping. Suggested list: cards, cardstock, computers, printers, Base-10 blocks, rulers, shoeboxes, random office supplies, glue guns, baggies, elementary math textbooks, jump ropes, poster paper, dice, interlocking cubes, iPads, iPhones, etc.
- Copies of the elementary math core.

Activity 1: Title (*a day or two*)

Teams will work on designing a math experience to meet the need they identified in their user. Walk around and help teams understand the mathematics involved, select good examples for the insights they are trying to unveil, and design an experience that is age appropriate.

Troubleshooting

Designing learning activities is extremely complex. Students may not know how to break down concepts into smaller pieces and sequence these pieces appropriately. Asking students to create flow charts to model mathematical lines of thinking or mathematical algorithms will help make this complexity more concrete. Also, be prepared to help them select good examples of the topics they are addressing. Poorly selected numbers or figures

can undermine a good lesson. Furthermore, your students may be limited by their own experiences of learning mathematics. They may not be familiar with the use of manipulatives, games, Multiple Intelligence theory, or other models of elementary concepts. Look for places where your knowledge of these things may help and use them under the premise that you want to help them understand the concept better. Do not insist that they use the method you think they should. Simply increase the critical mass of understanding in the room by introducing these models.

Assessment

This activity is successful when students have created a prototype.