

# **Lesson 6: Testing and Iterating the Math Experience**

by Vivian Shell

## **Grade Level(s)**

12<sup>th</sup> grade students enrolled in “Mathematical Decision Making for Life”

## **Lesson Overview**

Students will test their initial prototype, then reflect on its effectiveness with their users. After this reflection, they will iterate their solution to include the feedback they received from their users. This iteration will be tested later.

## **Learning Objectives**

Students will receive feedback about the solutions they have designed. Students will gain more insight into the complexity of mathematical understanding and deepen their own understanding of the concepts they are trying to help the younger kids understand.

## **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:
  - o 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

Be sure your host classrooms are expecting you.

## Materials and Resources

- Inspirational song of the day
- Prototyping materials
- New Supplies for Interviews

### Activity 1: Return to Elementary Classroom and Test Prototype (*one short day or part of a long day*)

- Play inspirational song and instruct students to gather their supplies for their solution:
- Walk to the elementary school and test the prototype.

### Activity 2: Reflection on Inferences and Mathematical Insights (*5-10 minutes*)

Once you have returned to your school, debrief the experience of solution testing. Ask teams to discuss in small groups if their solution seemed to fit with their user as a human and as a mathematician. Share out these reflections as a whole class, so teams can hear about the experiences and reflection of other groups.

## Activity 3: Iteration of Prototype (a day or two)

Allow time for teams to improve upon their prototype based on feedback from the user. These prototypes will be taken back to the elementary school to be tested again.

### Troubleshooting

The solutions that your students have produced may not work. Depending on the mindset of your students, this may be merely good feedback or frustrating. It would be wise to know the solutions well from a teaching point of view, so that you can offer a spectrum of support for your students. Monitor the interactions between your students and the younger students to gain insight into how to best support them. This design challenge is intended to help your students become very invested in the outcome for their users in a playful and heartfelt way. Your own attitude will guide them. Be positive, playful, and solution-focused, and they will most likely respond that way as well. (Your students are essentially becoming teachers. Consider the challenges you face as a teacher and the help from others that has guided you!)

### Assessment

Success of this stage is measured by the impact on your students and the younger students. Look for smiles and connection. You may also wish to create a questionnaire for the younger kids to complete at a later date to give tangible feedback to the high school students about their impact. During the share out activity, listen for your students to show deeper empathy and mathematical insight based on these experiences. You know they have developed these things when you hear sentences beginning with phrases such as these: “We tried... and this worked/didn’t work for our user because s/he ...” “Did you see her/his face when we ...?!” “I didn’t realize \_\_\_\_\_ was such a tricky topic in math. When s/he said... I wasn’t sure what to say! Now, I wonder...” To have tangible feedback about the impact these activities have had on your high school students, ask them to create thank you cards for their user which states specific things they (the high school students) learned from designing for him/her.