

# Action-Consequence-Reflection Activities:

Using Technology to Make Math Stick!

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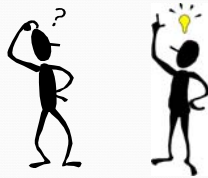
## Action-Consequence-Reflection

- Students perform a mathematical action  
On a graph, geometric figure, symbolic expression, list of numbers, or physical model.
- Observe a mathematical consequence  
What changes?  
What stays the same?
- Reflect on result and reason about underlying mathematical concepts  
Record results, answer questions, discuss implications, make predictions, communicate thinking, develop proofs, construct arguments.

Campe, 2011; Dick & Burrill, 2009

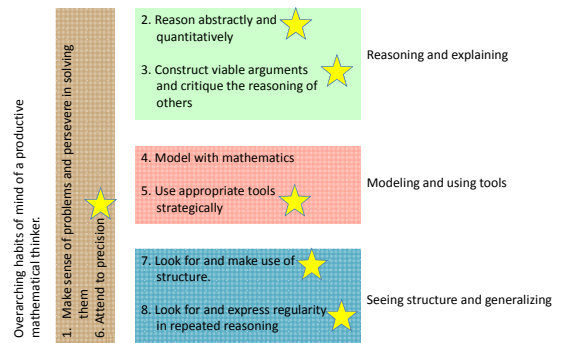
## Ask Good Questions!

- What will happen if...?
- What must I change to make ... happen?
- How is ... affected by ...?
- What changes, what stays the same?
- When will ... be true?
- Why does this happen?



Campe, 2011; Dick & Hollebrands, 2011

## Standards for Mathematical Practice



William McCallum—The University of Arizona

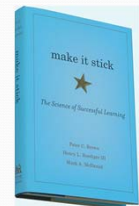
## Eight High-Leverage Instructional Practices

- Establish mathematics goals to focus learning
- ★ Implement tasks that promote reasoning and problem solving
- ★ Use and connect mathematical representations
- ★ Facilitate meaningful mathematical discourse
- ★ Pose purposeful questions
  - Build procedural fluency from conceptual understanding
- ★ Support productive struggle in learning mathematics
- ★ Elicit and use evidence of student thinking



## Make It Stick!

- Retrieval Practice
- Space out Practice
- Interleave different practice
- Elaboration
- Generation
- Reflection
- Calibration



Brown, Roediger, McDaniel, 2014

## Activities with technology:

- Use Geogebra
- Use TI-Nspire or TI-Nspire CAS
- Use Cabri Jr. on TI-84+ and TI-84+Color
- Use Transformation Graphing App on TI-84+



Sliders & dynamic elements engage students in the action-consequence environment.



A pre-made file allows students to focus on implications rather than on the construction details.

## Some Resources

Focus in High School Mathematics: Technology to Support Reasoning and Sense Making

Thomas P. Dick & Karen F. Hollebrands, NCTM, 2011.

Do It Right: Strategies For Implementing Technology

Karen D. Campe, Mathematics Teacher, April 2011.

Tough to Teach/Tough To Learn: Research Basis, Framework, and Principles for a Practical Application of TI-Nspire™

Thomas Dick & Gail Burrill, 2009.

Five Practices for Orchestrating Productive Mathematics Discussions

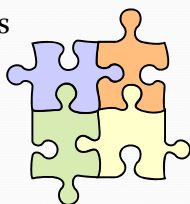
Margaret S. Smith & Mary Kay Stein, NCTM, 2011.

Organizing a Curriculum around Mathematical Habits of Mind

Cuoco, Goldenberg & Mark, Mathematics Teacher, May 2010.

## Themes – Habits of Mind

- Connecting Multiple Representations
- Understanding Invariants
- Visualizing Concepts



Cuoco, Goldenberg & Mark, 2010

## ACTIVITIES:

Math Nspired [education.ti.com>Activities](http://education.ti.com>Activities)

- Domain and Range
- Linear Inequalities in Two Variables
- Families of Functions
- Reflections & Rotations
- Trig Ratios



TI-84 Activity Central

- Interior/Exterior Angles
- Stretching Quads
- Asymptotes & Zeros
- Parallel Lines (and Not)

Geogebra [geogebra.org/kdcampe](http://geogebra.org/kdcampe)

- Power Functions
- Equations of Lines
- Graph transformations
- Geometric transformations

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