Task Analysis Framework

Lindsay Reiten
reiten@wisc.edu

This framework is intended to help you better critique and develop tasks aimed at promoting students' development of conceptual understanding of mathematics through reflection and communication (Hiebert et al., 1997), as well as through using and connecting mathematical representations (NCTM, 2014). Descriptions below are not necessarily in a hierarchical ordering nor are they mutually exclusive.

Portions of the table below are adapted from Trocki (2014) and Sinclair (2003).

Affordances	Descriptions
N/A	Task primarily requires a technology task with no focus on mathematics.
N/A	Virtual manipulative does not have mathematical fidelity required to respond to the prompts.
A	Task prompts students to recall a mathematical fact, rule, formula, or definition.
B	Task prompts students to report information from the virtual manipulative or consider mathematical concepts, processes, or relationships in the current display. The student is not expected to provide an explanation.
C	Task prompts students to explain the mathematical concepts, processes, or relationships in the current display.
D	Task provides opportunities for students to make predictions and then test their predictions using the virtual manipulative.
E	Task provides opportunities for students to connect multiple representations of a mathematical concept (e.g., graphical, algebraic, and tabular representations of a relation).
F	Task provides opportunities to check students' understanding of mathematical concepts, processes, or relationships. Task may provide minimal feedback to the student based on specific errors.
G	Task prompts students to go beyond the current display by considering multiple examples to generalize mathematical concepts, processes, or relationships.
H	Task supports students' exploration through manipulation of the display that may surprise one exploring the relationships represented or cause one to refine thinking based on themes within the surprise (e.g., addressing a common student misconception).

Hiebert, J., Carpenter, T. P., Fennema, E., Fuson, K. C., Murray, H., …Human, P. (1997). Making sense: Teaching and learning mathematics with understanding. Portsmouth, NH: Heinemann.

National Council of Teachers of Mathematics. (2014). Principles to actions: Ensuring mathematics success for all (Executive Summary). Reston, VA: Author.

Sinclair, M. P. (2003). Some implications of the results of a case study for the design of pre-constructed, dynamic geometry sketches and accompanying materials. *Educational Studies in Mathematics, 52*, 289-317.

Trocki, A. (2014). Evaluating and writing dynamic geometry tasks. *Mathematics Teachers, 107*(9), 701-705.

Using Virtual Manipulatives to Enhance Student Learning and Engagement

Lindsay Reiten
reiten@wisc.edu
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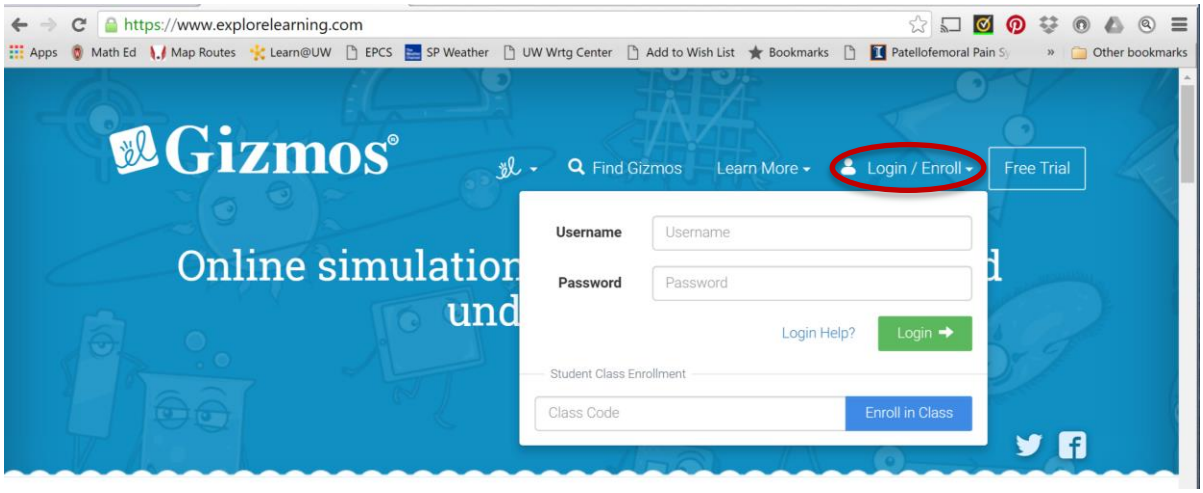
My website: https://lindsayreiten.wordpress.com/

Virtual Manipulative Resources: http://tinyurl.com/virtmanips

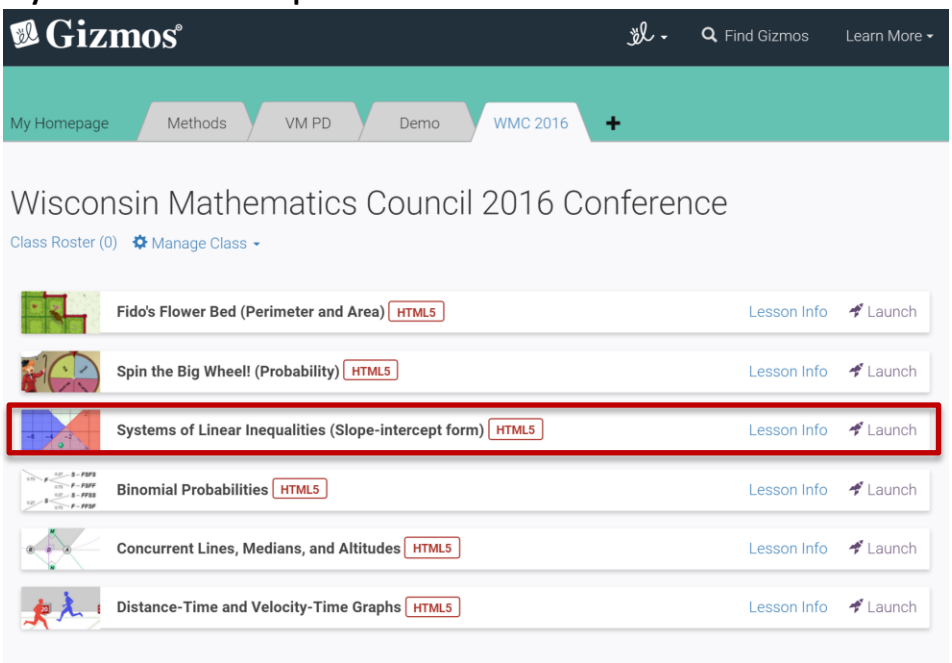
- If you would like access to activities sorted by content topics, please email me.

Activity 1

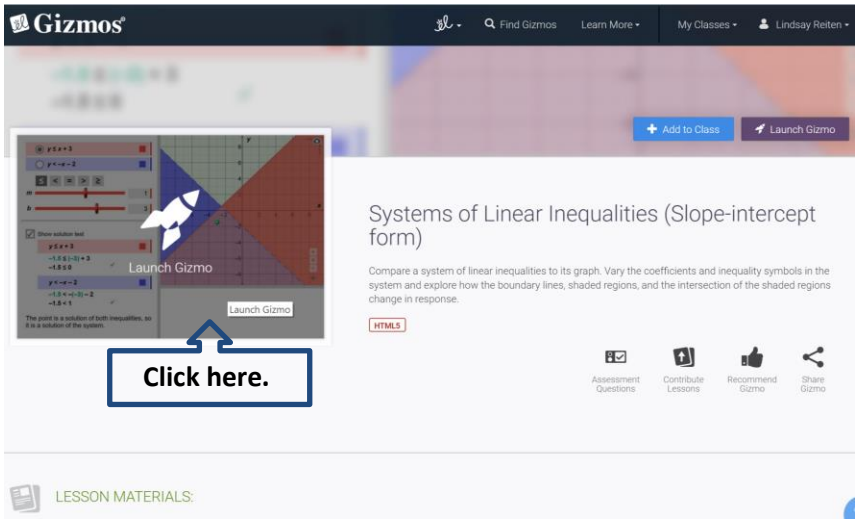
1. Go to https://www.explorelearning.com/
2. Click on Login/Enroll and enter the username and password that you were given as you entered.



3. Select **Systems of Linear Inequalities** from the list.



4. Launch the activity by clicking on the “picture.”



5. Complete Activities A and B (C if time allows) **as a student**. Feel free to talk with those whom are around you or ask me questions.
6. **Think about the following questions….**
    a. What is an essential question you would use this activity to explore?
    b. Where do you think your students would struggle in this activity?
    c. How would your students benefit from engaging in this exploration?
    d. Thinking about the essential question, what is one modification you would make so that the exploration better fit the needs of your students?
        i. Why would this modification help your students engage in the essential question?
7. Use the **Task Analysis Framework** (handout) to critique the activity.
    a. What “affordances” apply to your activity?
    b. What from the activity supports your claim?
8. Use the Task Analysis Framework to help you modify your activity
    a. Look at the affordances that did not apply.
    b. Change prompts/portions of the activity so that the affordances do apply.

Additional Suggested Activities to Explore (Note: Not all of them have an exploration guide.)

- Related Rates (AP Calculus) https://tube.geogebra.org/student/m45775
- Binomial Probabilities Gizmo (AP Stats)
- Fraction Scale (Remedial) (http://www.mathplayground.com/Scale_Fractions.html)
- Ski Slope (Early Algebra) http://smartgraphs-activities.concord.org/activities/189-ski-slope/student_preview