

NAVIGATING TO NGSS SUCCESS: ENHANCING VISUALIZATIONS

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VISUAL 

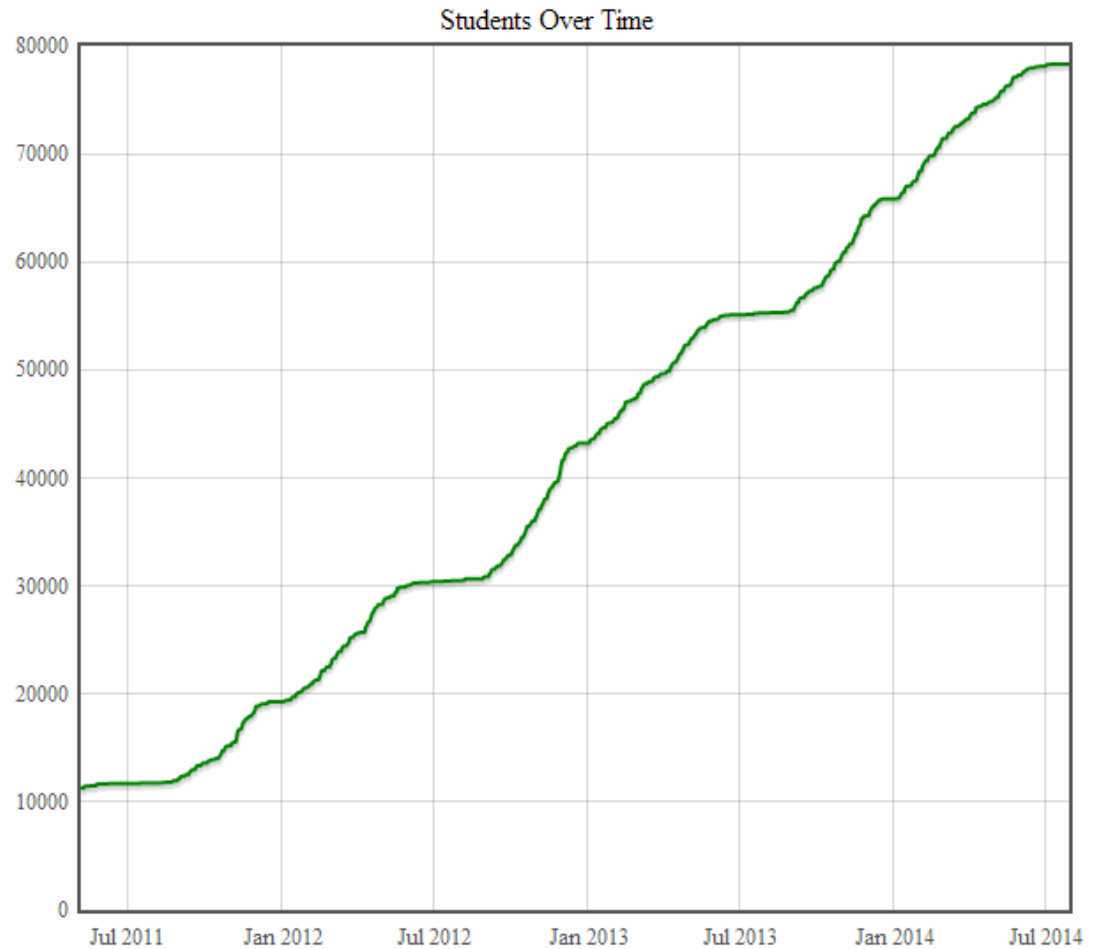


Dermot F. Donnelly; @donn00

Web-based Inquiry Science Environment (WISE) – wise.berkeley.edu



78,000 students
& 8000 teachers
(as of July 2014)



The Graph Animator: The BEAR Story

- Girls walk from lunch spot to bear
- Girls run back to lunch spot
- Girls wait
- Girls walk slowly back to bear
- Girls walk normally to meet up spot



July 6, 2009

Today Shanice and I saw a bear - it was so scary!! At 3:00 pm, we had just left our lunch spot and were walking at our normal pace. After 20 minutes, we had gone about 400 meters when we saw this gigantic black fuzzy thing on the side of the trail ahead of us. I grabbed Shanice's arm and mouthed the word "BEAR!" Fortunately, the bear was busy eating berries and didn't notice us.

We didn't waste any time getting out of there, in fact I've never run so fast in my life! We sprinted back to our lunch spot in only ten minutes and then stayed there wondering what to do for the next ten minutes.

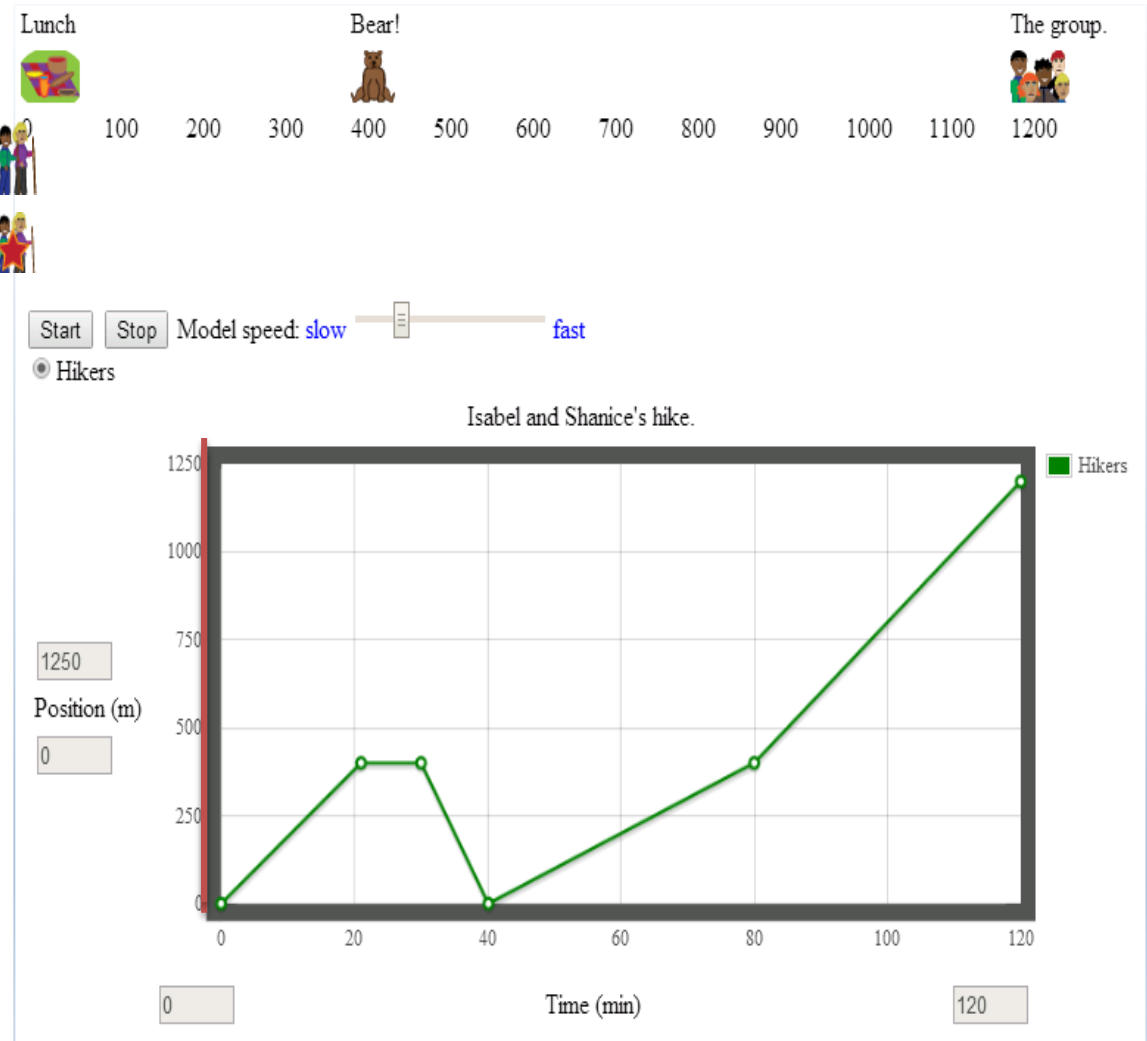
At 3:40, we decided to take our chances and keep moving forward on the trail because we knew the rest of the group would start to worry about us. So we slowly crept towards where we saw the bear. This time it took us 40 minutes to cover that 400 meter stretch. When we got there, the bear was gone (phew!), so we resumed our normal pace and caught up with the group at 5:00, 1200 meters from the lunch spot.

The WISE Graph Animator

Using real-time models to develop ability to interpret position and time graphs.

Links to NGSS practices

- using models
- obtaining, evaluating information
- analyzing and interpreting data



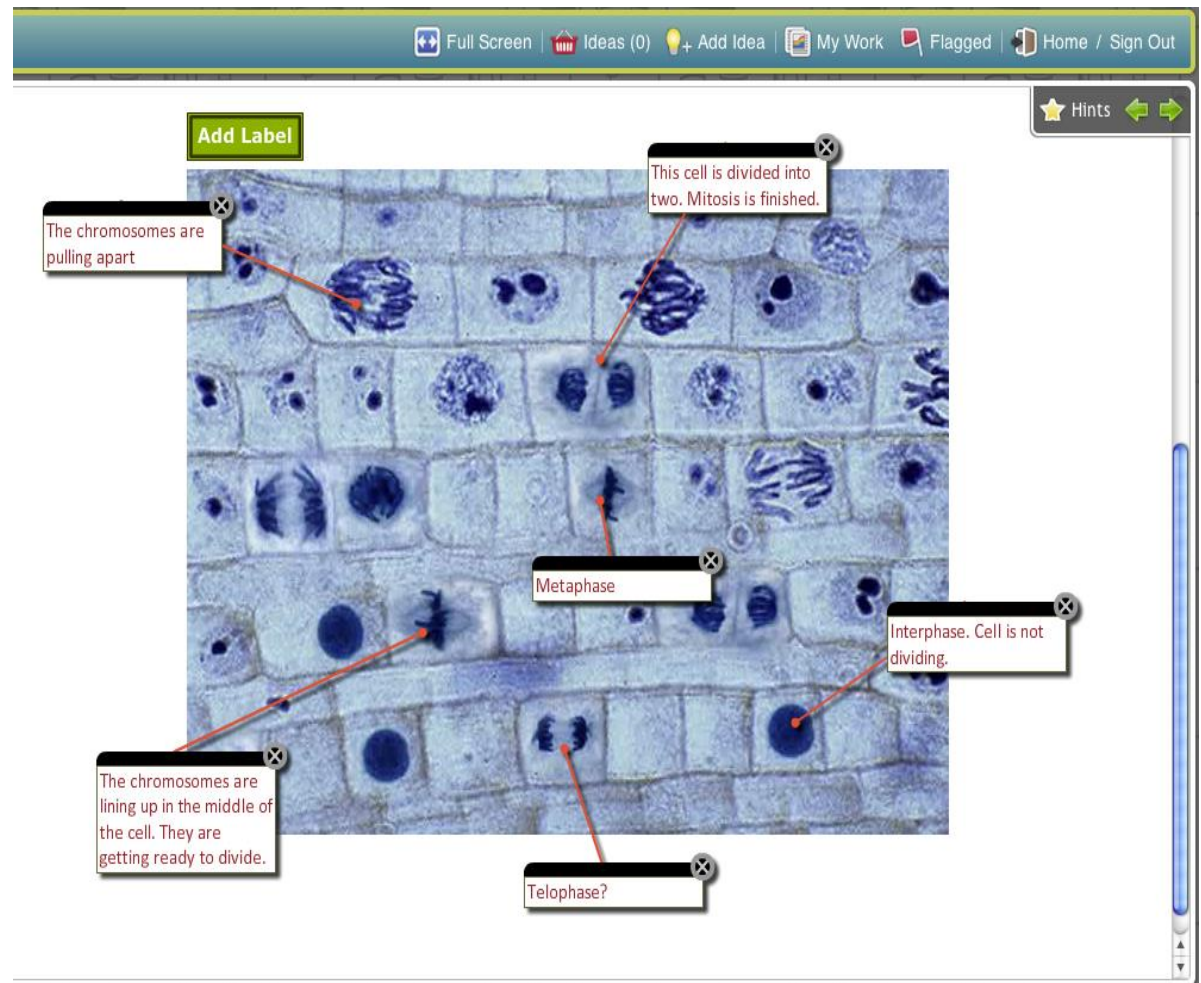
Vitale, J. M., Lai, K., & Linn, M. C. (2014). Dynamic visualization of motion for student-generated graphs. In *Proceedings of the International Conference of the Learning Sciences (ICLS)*. Boulder, CO

The WISE Image Annotator

Students use an annotator to interpret data in the Mitosis Unit.

Links to NGSS practices

- Constructing explanations
- Obtaining, evaluating & communicating information



Matuk, C. F. & Linn, M. C. (2013, April 27 - May 1). *Technology integration to scaffold and assess students use of visual evidence in science inquiry*. Paper presented at the *American Educational Research Association Meeting*. San Francisco, CA.

WISE Idea Manager

Students use the Idea Manager to develop an explanation while they are engaging in the other practices.

Links to NGSS practices

- Constructing explanations
- Obtaining, evaluating and communicating information

The screenshot displays the WISE v4 interface. On the left is a navigation pane with a list of tasks: '1: What is Cancer?', '2: The Phases of Cell Division', '3: Trade offs and side effects', '4: Investigating Three Cancer Medicines', and '5: Side effects of cancer treatments'. The '4: Investigating Three Cancer Medicines' section is expanded, showing sub-tasks 4.1 through 4.7. The main area is titled 'EXPLANATION BUILDER' and contains a prompt: 'Let's weigh the evidence! Organize your observations to show the advantages and disadvantages of each plant as a cancer medicine.' Below this is a table with columns for 'Your Ideas' and 'What is your idea about?'. The table contains several rows of observations. To the right of the table is a 'sorting space' with three columns labeled 'Plant A', 'Plant B', and 'Plant C'. Each column has a section for 'Advantages' and 'Disadvantages'. Blue boxes containing text are being dragged from the 'Your Ideas' column into these sections. A 'Ready to Explain!' button is visible in the top right corner of the explanation builder area.

Prompt to organize ideas

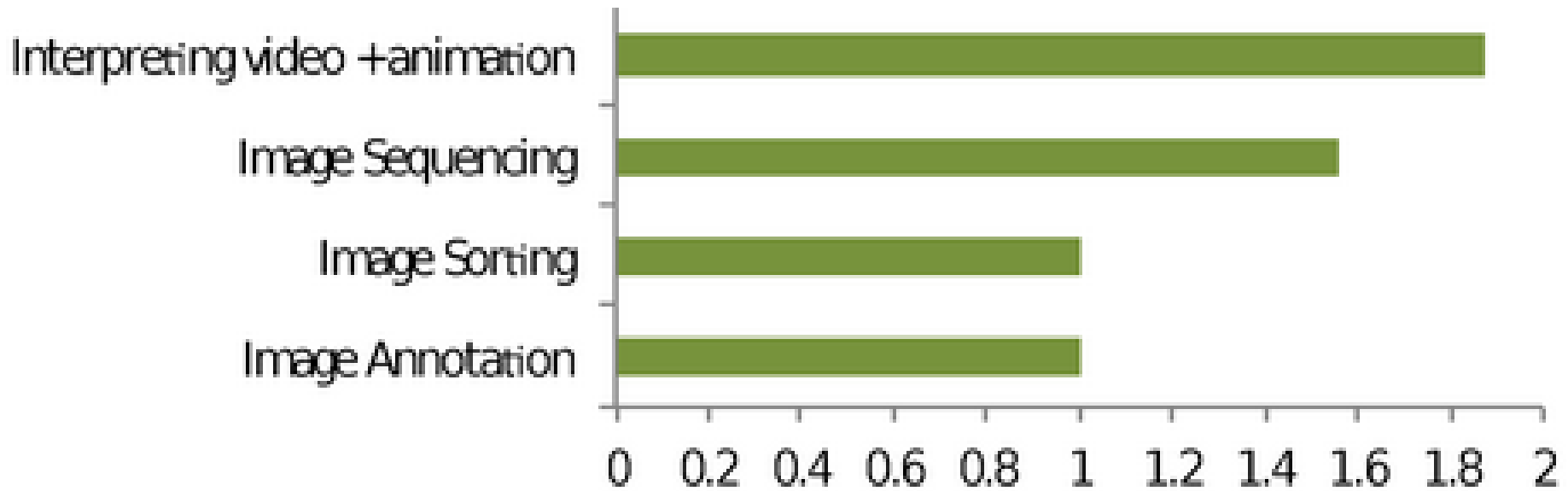
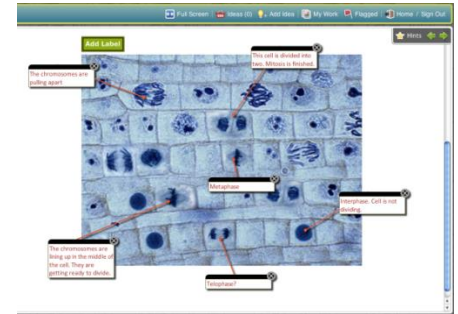
Drag ideas from the Basket onto the sorting space

Sorted ideas

Matuk, C. F. & Linn, M. C. (2013, April 27 - May 1). *Technology integration to scaffold and assess students use of visual evidence in science inquiry*. Paper presented at the American Educational Research Association Meeting. San Francisco, CA.

Scaffolding students' use of visual evidence

7th grade students (n = 67) - Mitosis Unit



Mean numbers of ideas submitted to *Baskets* during *Interpreting Data* activities.

Pretest (M = 2.38, SD = 0.48, SE = 0.05), Posttest (M = 2.92, SD = 0.79, SE = 0.08); $t(105) = -7.03$, $p < .000$, **Cohen's d = 0.72** - (Matuk & Linn, 2013)

NGSS Practices - Research Agenda?

- Modeling tools, visualization tools, and annotations and idea records are all combined in WISE to support large numbers of students engage in NGSS practices.
- How can we take advantage of these tools and others to establish a research agenda?
- What are new tools that need be created?
- How do these tools assess NGSS?

Thank you

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