Making Connections: Bridging the Learning from the Lab to the Classroom

Afreena Miller & Serena Alderson
Manager of School Partnerships
Carnegie Learning, Inc.
Session Objectives:

- Discuss & Identify similarities/differences between classroom & lab

- Experience Sample activities that assist with making connections between classroom & lab.

- Leave with ideas to take back to school & teachers.
Making Connections: Bridging the Learning from the Lab to the Classroom

Driving Questions for this session:

- Identify similar math concepts in class/lab. How do you ensure that students recognize similarities in the class?

- Identify different approaches to math concepts in class/lab. How would you support or connect those differences while teaching a lesson? How do you highlight them in the lab?

- Utilize Report Data to drive instruction. How would you adjust or design intervention strategies to address skills alerts?
Identify similar math concepts in class/lab.

How do you ensure that students recognize similarities in the class?

<table>
<thead>
<tr>
<th>What are the similarities?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starts with a Scenario</td>
</tr>
<tr>
<td>Multiple Representations</td>
</tr>
<tr>
<td>Question</td>
</tr>
<tr>
<td>Tables</td>
</tr>
<tr>
<td>Graphs</td>
</tr>
<tr>
<td>Provides Feedback</td>
</tr>
<tr>
<td>Peer Tutoring</td>
</tr>
<tr>
<td>Teacher Facilitation</td>
</tr>
<tr>
<td>through Probing Questions</td>
</tr>
<tr>
<td>Both are student centered</td>
</tr>
<tr>
<td>Teachers must plan in lab and Classroom</td>
</tr>
<tr>
<td>Using virtual (lab) or graphing (classroom) calculator helps students make connections between classroom and lab.</td>
</tr>
</tbody>
</table>
Similarities

Text: Course 1 3.9 Yours is the Reason
Why-Parts in a part

“If I can turn the divisor of $\frac{3}{4}$ into one, then the problem can be solved. I can multiply both fractions by the reciprocal of $\frac{3}{4}$, which is $\frac{4}{3}$, to create 1.”

9. Analyze Karen’s method for dividing fractions. Describe the steps in the dashed circles.

$\frac{5}{8} \div \frac{3}{4} = \frac{5}{8} \times \frac{4}{3}$

Division is rewritten as a fraction.

![Diagram of fractions and division steps]

I see a shortcut! I can change $\div$ to $\times$ if I invert and multiply the divisor.

Lab: MATHia Module 2, Unit 6, Sec 2

As part of your exercise program, your goal is to be able to run 1 mile. Every day, you run along a trail that is $\frac{3}{4}$ mile. How many laps must you complete to reach your goal?

Use the model to represent the problem.

Enter the number of laps you must complete to reach your goal of 1 mile.

4 laps

Write a number sentence that describes the model using division.

$1 \div \frac{1}{4} = 4$

With the same numbers, write another number sentence that describes the model using multiplication.

$4 \times \frac{1}{4} = 1$

Click to place a $\frac{1}{4}$ mile part on the bar.
Similarities

Text: Course 3 A park Ranger’s Work is never done Solving Problems Using Equations

Problem 3 Solving Two-Step Equations

In Problems 1 and 2, you were solving two-step equations. To solve two-step equations you need to perform inverse operations. Inverse operations are operations that “undo” each other. For example, adding 3 and subtracting 3 are inverse operations. Two-step equations are equations that require two inverse operations to solve. A solution to an equation is any value for a variable that makes the equation true.

Let’s consider the equation:

\[ 2m - 6 = 22 \]

The left side of this equation has two terms separated by the subtraction operation. The 2 in the first term of the left side of the equation is called the coefficient. A coefficient is the number that is multiplied by a variable. The terms 6 and 22 are called constants. A constant is a term that does not change in value.

Lab: MATHia Solver Tool- Solving 2 Step Equations

When solving any equation, you want to get the variable by itself on one side of the equals sign.
Identify different approaches to math concepts in class/lab.

How would you support or connect those differences while teaching lesson? How do you highlight in the lab?

<table>
<thead>
<tr>
<th>What are the differences?</th>
<th>Lab</th>
<th>Classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use of extra instructional tools, i.e., graphing calculators, algebra tiles/blocks, etc.</td>
<td>Classroom has more cognitive, conceptual extensions</td>
</tr>
<tr>
<td></td>
<td>Lab has ‘instant’ glossary and personalized tutor</td>
<td>Classroom emphasizes sharing out of processes and ideas</td>
</tr>
<tr>
<td></td>
<td>Graphing is more interactive and dynamic</td>
<td>Classroom emphasizes communication (written and oral) and reflection</td>
</tr>
<tr>
<td></td>
<td>Lab has faster feedback</td>
<td>Textbook is Distributed Practice</td>
</tr>
<tr>
<td></td>
<td>Lab has more skills practice</td>
<td>where the Software is Mass Practice</td>
</tr>
</tbody>
</table>
Differences

- Lab has ‘instant’ glossary and personalized tutor
  Vocabulary mobile
  Word Walls – groups assigned to chapters/modules (units)
- Graphing is more interactive and dynamic
  Interactive White boards
  “Cling Sheets”
- Lab has faster feedback
  TI Navigator
  Clickers
  Jeopardy Game
## Differences

<table>
<thead>
<tr>
<th></th>
<th>Lab</th>
<th>Classroom</th>
</tr>
</thead>
</table>
| **Describe student experiences** | Working Individually  
Individually Paced  
Immediate Feedback  
Multiple Representations  
Technology | Cooperative Work  
Communication is both Oral & Written  
Sharing of Process/Solution (Presentations)  
Feedback to and from Peers & Teacher |
Similarities /Differences

Presentations:

- Choose corresponding unit/section/problem for students to present to class. (Content Browser or Review Mode)

- “Jig Saw” textbook problem for informal presentations.

- Students review chapter by designing presentation around textbook concepts & vocabulary.
Differences

Alternative approaches to textbook lessons:

Have you ever made a model of an airplane or a doll house or a car? Well, did you know that there are some people whose job it is to create models? It's true! These professional model builders create scale models of all sorts of buildings, bridges, parks, cars—well almost anything you can think of.

Many times, designers and architects employ model builders to create scale models from their blueprints for presentations. Why do you think scale models are helpful for presentations?
Problem 1  A Typical Day in a Small Town

1. There are two main sections in a small town called the Hill Section and the Lake Section. The town has a population of 3496 people. The number of people who live in the Hill Section is 205 more than twice the number of people who live in the Lake Section. How many people live in each section of town?

One method to solve this type of problem is to draw a “picture” that models the situation. In the “picture,” you can draw a rectangle or box to represent an unknown quantity.

a. In the situation given, one unknown quantity is the number of people living in the Lake Section. Draw a box to represent this quantity and label it with a $p$.

Lake Section:

Hill Section:

b. Next, draw three boxes to represent the people who live in the Hill Section. Label these boxes, $p$, $p$, and 295. Why do you think these boxes are labeled this way?
You can represent the picture you drew as a mathematical sentence using operations and an equals sign. An **equation** is a mathematical sentence you create by placing an equals sign, $=$, between two expressions.

One way to write an equation is to think about writing it with words.

One equation you can write for the population in a small town situation is:

$$\text{Number of people in the Lake Section} + \text{Number of people in the Hill Section} = 3496$$

Now that you have written the situation in words, let’s think about how to write an equation.

**d.** First, write an expression to represent the number of people in the Lake Section.

Let $p$ represent the number of people in the Lake Section.

**e.** Next, write an expression to represent the number of people in the Hill Section.
2. One of the farms outside of town uses a water tank for irrigation. The water tank holds a total of 5600 gallons, and the tank has three pipes through which water drains to irrigate three different areas of the field. When water is drained from the tank, Pipe B drains twice as much water as Pipe A. Pipe C drains 65 gallons more than Pipe B. Assume that the tank is drained completely before it is refilled. How many gallons of water does each pipe drain?

a. Draw a picture to represent the water tank situation. Label the unknown parts with variables and the known parts with their values.

Pipe A:

Pipe B:

Pipe C:

b. Use your picture to determine the number of gallons of water each pipe drains. Explain your reasoning.

Gallons drained by Pipe A:

Gallons drained by Pipe B:

Gallons drained by Pipe C:

c. Write an expression for each part. Let $a$ represent the number of gallons drained by Pipe A.

The number of gallons drained by Pipe A:

The number of gallons drained by Pipe B:

The number of gallons drained by Pipe C:

d. Write an equation to represent the water tank situation.
Course 2:

Students can bring in their favorite recipe and scale it to accommodate the class.

Do you like smoothies? Perhaps one of the best things about smoothies is that you can make one with just about any ingredients. Just throw them in the blender and turn it on!

Smoothies can be very healthy too. Try this healthy smoothie recipe sometime.

- 1 banana
- 1 cup of vanilla yogurt
- 1 cup of grapes
- \( \frac{1}{2} \) of an apple
- 2 cups of spinach leaves

If this recipe serves 3 people, how much of each ingredient would you need to make smoothies your whole class?
Course 2:

Problem 1  May the Best Recipe Win

Each year, your class presents its mathematics portfolio to parents and community members. This year, your homeroom is in charge of the refreshments for the reception that follows the presentations. Four students in the class give their recipes for punch. The class wants to analyze the recipes to determine which will make the punch with the strongest grapefruit flavor, and which will make the strongest lemon-lime soda flavor. The recipes are shown.

<table>
<thead>
<tr>
<th>Recipe</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adam’s Recipe</td>
<td>4 parts lemon-lime soda, 8 parts grapefruit juice</td>
</tr>
<tr>
<td>Bobbi’s Recipe</td>
<td>3 parts lemon-lime soda, 5 parts grapefruit juice</td>
</tr>
<tr>
<td>Carlos’s Recipe</td>
<td>2 parts lemon-lime soda, 3 parts grapefruit juice</td>
</tr>
<tr>
<td>Zeb’s Recipe</td>
<td>1 part lemon-lime soda, 4 parts grapefruit juice</td>
</tr>
</tbody>
</table>

Students can recreate each recipe using Arnold Palmers and determine which recipe has the most lemonade taste by voting and then compare results to mathematical calculations.
In addition to finding the perimeter of the composite figure, the lesson could be expanded beyond the text.

**Problem 2: Is France Hexagonal?**

1. Draw a hexagon to approximate the shape of France. Use the hexagon for Questions 2 and 3.

2. Which of the following statements is true?
   - The coastline of France is greater than 5000 kilometers.
   - The coastline of France is less than 5000 kilometers.
   - The coastline of France is approximately 5000 kilometers.

3. Which of the following statements is true?
   - The area of France is greater than 1,000,000 square kilometers.
   - The area of France is less than 1,000,000 square kilometers.
   - The area of France is approximately 1,000,000 square kilometers.

4. If the population of France is approximately 118.4 people per square mile, how many people live in the country of France?
Utilize Report Data to drive instruction

| Describe Assessments | Lab is Self Assessing (green) Based on Student Needs Differentiated Software Reports | Individual or Group Formal Assessments, different format – combine assessments Capture Software problems and change the values (Paper Carnegie) |
Accessing Reports:

Choose the kind of report you'd like to generate.

- **Skills Alert**
  - Class skill mastery within a unit.

- **Class Progress**
  - Completed units by student.

- **Fluency Challenges**
  - Totals and best performance.

- **Class Check for Understanding**
  - State of each CFU set by student.

- **Student Detail**
  - Student progress at the section level.

- **Assessment by Problem**
  - Results and statistics by problem.

- **Assessment by Unit**
  - Evaluation of each unit covered by the test.
How would you adjust or design intervention strategies to address skills alerts?
Suggestions for making connections and supporting students based on report data

### Student Skills Alert

**Student:** McPatrick, Ciara  
**Report Date:** 02/29/12 11:44  
**Module:** Course 2.2 - Rational Numbers  
**Instructor:** Booze, Susan  
**Class:** 8th Grade - morning  
**Reporting Period:** 11/01/2011 to 11/15/2011

<table>
<thead>
<tr>
<th>Unit/Section</th>
<th>Unmastered Skill</th>
<th>Skill Level</th>
</tr>
</thead>
</table>
| Unit 2 - Fraction, Decimal, and Percent Conversions  
Sect 1 - Converting Common Percents | Calculate fraction from given percent. | 87          |
| Sect 1 - Converting Common Percents | Enter decimal from given model. | 60          |

**Current Place In Module**

- Unit 8 - PostTest
- Section 1 - PostTest
**Overview of Reports:**

**REPORTING FOR FLEXIBLE USE**

Each time students log into MATHia or Cognitive Tutor Software, it constantly records and assesses each student’s skills while adapting programmatically to the mastery level of each individual student. You can use our reporting system to continually assess this progress and use the results to create individualized, data-driven learning plans.

The following table describes how you can use the reports with individuals or groups of students.

<table>
<thead>
<tr>
<th>IF YOU WOULD LIKE TO …</th>
<th>THEN, RUN THIS REPORT:</th>
<th>REPORT TYPE (Class, Student, or Administrator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify current student placement in a class</td>
<td>Class Progress Report</td>
<td>Class Report (Teacher’s Toolkit)</td>
</tr>
<tr>
<td>Prepare for parent conferences or IEP meetings</td>
<td>Skills Alert or Student Detail Report</td>
<td>Student Report (Teacher’s Toolkit)</td>
</tr>
<tr>
<td>Locate class-level summary data helpful for grading</td>
<td>Student Detail Report - Class Summary</td>
<td>Student Report (Teacher’s Toolkit)</td>
</tr>
<tr>
<td>Group students according to skill level or needs</td>
<td>Skills Alert</td>
<td>Class Report (Teacher’s Toolkit)</td>
</tr>
<tr>
<td>Summarize class progress in the curriculum</td>
<td>Class Progress Report</td>
<td>Class Report (Teacher’s Toolkit)</td>
</tr>
<tr>
<td>Compare multiple schools’ usage over time</td>
<td>Participation Report</td>
<td>Administrator Report (Resource Center)</td>
</tr>
<tr>
<td>Gauge how often the software is being used</td>
<td>Trend Report</td>
<td>Administrator Report (Resource Center)</td>
</tr>
<tr>
<td>Post an anonymous report in the lab for students to view their progress</td>
<td>Class Progress Report</td>
<td>Class Report (Teacher’s Toolkit)</td>
</tr>
<tr>
<td>View a summary of how a student is progressing in the software</td>
<td>Student Detail Report</td>
<td>Student Report (Teacher’s Toolkit)</td>
</tr>
</tbody>
</table>
### Closure:

<table>
<thead>
<tr>
<th>Questions to ask to promote connections</th>
<th>While in the lab...</th>
<th>While in the classroom...</th>
</tr>
</thead>
<tbody>
<tr>
<td>How does interval/boundary relate to domain/range?</td>
<td>How does interval/boundary relate to domain/range?</td>
<td>Use screenshot of similar lab problem to promote questions regarding scenarios in the classroom.</td>
</tr>
<tr>
<td>What steps/Commands did you give the computer to solve</td>
<td>What steps/Commands did you give the computer to solve</td>
<td>Ask the student to revisit steps given in the lab on similar problem to help understand how to solve on paper.</td>
</tr>
<tr>
<td>What activities in the classroom are similar to this problem in the lab</td>
<td>What activities in the classroom are similar to this problem in the lab</td>
<td></td>
</tr>
<tr>
<td>What changed in this problem, what stayed the same?</td>
<td>What changed in this problem, what stayed the same?</td>
<td></td>
</tr>
<tr>
<td>Questioning Techniques: Describe, Explain, Know, See...</td>
<td>Questioning Techniques: Describe, Explain, Know, See...</td>
<td></td>
</tr>
</tbody>
</table>
Suggestions: Ways to Help Teachers Apply Ideas from today

- Set expectations and accountability for taking follow-up actions
- Choose textbook chapter/lesson and software unit to implement activities and keep the planning time focused and productive
- Provide opportunities for collaborative planning and for reflecting on strategies tried
- Provide in-class support
- Incorporate a focus on making classroom & lab connections into observations
Wrap Up:

What is one idea that you will take away from today’s session?