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Module 3 Culminating Assignment

Part 1:

Looking back at my diagnosis of student understanding, it is clear to me that my students still need quite a bit of support when it comes to their progress towards my vision of science understanding. The part of my vision for "science understanding" that I was eliciting involved asking questions and finding answers. It also included identifying skills that they need to answer their questions or prove/disprove their predictions or explanations. Although my students were able to identify the inquiry skills needed to answer questions, they still need refinement when it comes to asking questions and supporting their predictions and explanations with evidence. My students had difficulty with revising their explanations if their predictions were not supported by data. Essentially, my students were able to list the inquiry skills, but they were unable to perform the skills themselves.

To further development my students' science understanding, I believe that they need to start practicing asking questions about the world around them. When asking questions, I expect my students to be able to not just ask a question about the world, but ask a question that they can form a plan to answer. A student who is successful at asking questions would be able to ask a question about the world around them that could be tested. They goal of learning how to ask questions is so that when my students come across problems throughout their lives they know how to go about solving those problems. In order to help all my students become successful, I could present them with a scenario. For example, I have a plant in my house that is dying: what questions can you ask about my plant? Then after asking their questions (at first I would practice with the students on how to create testable questions), I would have my students predict the answer to their question. These are skills that are more complex and challenging to learn and in order to aid my students' progress, a lot of scaffolding would need to be done.

Also to develop their science understanding, my students need further assistance when it comes to explaining their predictions and revising their explanations if their prediction was incorrect. During my Toy Car experiment in Module 2, my students were able to tell me what they believed would happen. However, when I asked them why they believe this, they could not say. A student who is successful at explaining their predictions is able to say why they believe their prediction is what will happen. It does not need to be correct or include scientific vocabulary as long as it matches their prediction and is clear to the reader. A student who is successful at revising their prediction is able to say why their prediction was not correct and explain what really happened using evidence. Explaining answers is a skill that my class and I have been working on all year in Math and Language Arts. However, it is not something that we have worked on in Science. I feel as if my students had a difficult time with their explanations because they did not have the scientific content knowledge to support their ideas. They were able to say what they thought would happen, but were missing the 'why' piece.

In order to develop this aspect of my vision, I think it would be wise to teach my students to tap into their productive resources. Many of my students lack confidence in science content and if we tap into the knowledge that they already have, they may gain

the confidence needed to explain their ideas. Since it is difficult to say what each of my students productive resources might be, I can make a few educated guesses based on some of my students' experiences. For example, in Part 3 of this assignment I have my students predicting why my plant has died. I expect that many of my students may have had similar experiences with plants because we live in the desert where there is a lot of sun and a little rain. Many students have quite a few experiences that deal with making sure they themselves stay hydrated. Not only can my students pull from their own personal experience, they can also pull from what they have learned in previous grades. In third grade, students in Arizona discuss solar energy and why we need the sun. In fourth grade, students in Arizona learn about the life cycle of both plants and animals. Keeping all of this in mind, I will be able to help my students brainstorm ideas of why my plant may be dying.

Even though my students struggled with both asking questions and explaining ideas/predictions, I plan focusing just on developing my student's explanations. This is something that my students and I have been working on all year in ELA and Math and I feel as if using the same skills we have been using in other content areas will make the transition smoother.

Part 2:

Each year at my school, teachers are to create an Individual Growth Plan (IGP). This year for my IGP I decided to focus on thinking and problem solving, with a concentration in explaining our ideas and answers. A strategy that I found that is extremely helpful with this focus is the R.I.C.E strategy. We have been using this strategy all year in ELA and Math and I feel as if it can also apply to science. The R.I.C.E strategy helps students solve problems by restating (R), finding information (I), calculating (C) and explaining (E). My school district uses the "TAP" system for teacher evaluations, included with this is a portal of strategies for teachers to use. According to TAP (National Institute for Excellence in Teaching), the R.I.C.E strategy (from "The Problem Solver" Judy Goodnow) teaches students how to identify critical information to solve and explain problems.

To implement the R.I.C.E strategy for science, I had to make some subtle changes. First, the "R" piece is the restatement. I am going to give my students a science question and ask them to restate what is being asked for them using the guidelines we have been using (what is the key information that I need to figure this out and what is really being asked of me). To do this we create a T-chart with key information on one side and the question on the other. Then we write a statement started with "I need to figure out _____if _____." An example math restatement might be, "I need to figure out how many apples Johnny had if he started with 5 apples and gave 2 to Sally. However, I am also going to have my students predict here what they believe the answer of that question is (hypothesis). So, the new restatement will be "I need to figure out _____ if_____. I believe that _____." For example, "I need to figure out why the length of the days is shorter in winter than in summer if the Earth is the same distance from the sun all year long. I believe that the days are shorter in the winter than summer because the Earth is spinning faster." The "I" is next and has a few changes as well.

Instead of illustrating (usually students draw an illustration that will help them solve the problem) I will have the students plan how to solve the problem, basically getting ready for the experiment (what will the set up look like, what are the variables, etc.), drawings will be included.

The "C" is the most challenging because we are not "calculating". In math, this is where students calculate the problem. For science, I will have the students "Conduct" the experiment, so the "C" stays the same and causes less confusion. This is where they will gather data and make observations related to the question. Lastly, the "E" the students will create science explanations. Their explanations will include whether or not their predication/hypothesis was correct and explain why.

I also decided to deepen my understanding of scientific explanations since I have not had many opportunities with explaining science phenomena. I read in *Ready, Set, Science* that when students are constructing and defending their explanations they must include three things: claim, evidence and reasoning. This framework allows students to make sense of the science they are learning through claims. Claim is an opportunity for students to tell others what they are thinking about the particular science. Then students must use evidence to support their claim (research, observations, data). This evidence articulates the understanding that they have. Lastly, reasonsing is the student's opportunity to defend their claims and evidence. When using this strategy with my students I will use a sentence frame like this: "Before conducting my experiment I believed _____. After conducting my experiment, I believe _____ because _____. I know this because in my experiment, I observed _____. This evidence supports _(my claim)_ because _____." An example for my lesson plan in Part 3 might be, "Before conducting my experiment, I believed that Ms. Kole's plant is dying because it did not have enough sunlight. After conducting my experiment, I believe that Ms. Kole's plant is dying because it was not getting enough water(claim). I know this because in my experiment, I observed that when the plant did not have enough sunlight the soil stayed moist and the leaves started to become less green. In the plants that did not have enough water, the soil was dry and the leaves were dry too. Some o the leaves even fell off the plant (evidence). This evidence supports that Ms. Kole's plant was dying because it did not have enough water because plants get water from soil. If the soil is dry, then there is no water in the soil for the plant to absorb causing it to dry up (reasoning). If we give the plant some water, Ms. Kole's plant will come back to life."

Michaels, S., Shouse, A.W, & Schweingruber, H.A. (2008) *Ready, Set, Science! Putting Research to Work in K-8 Science Classrooms*. Washington, D.C.: The National Academies Press.

National Institute for Excellence in Teaching. (2010) *The R.I.C.E Math Method*. Retrieved from http://www.tapsystem.org, April 17, 2014.

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Part 3:

**This lesson plan would be conducted AFTER I do a modeling experiment the day before where the class and I complete the steps listed in this lesson plan together. The following lesson plan is my students using the strategy on their own/in small groups. It will also take several days to complete (about 5 one hour lessons- done during different times to collect data on plant growth)

FIVE-STEP LESSON PLAN

PRE-PLANNING: KNOW, SO, SHOW

OBJECTIVE.	CONNECTION TO THE COMMON CORE
• I will be able to restate a scientific question and predict the answer to that question. • IWBAT design a science experiment to answer the question. • IWBAT conduct my designed experiment, make observations and gather data. • IWBAT analyze my data by discussing what happened with my group and creating charts. • IWBAT claim if my predication was right or wrong, use evidence to support my "new" claim and defend my reasoning.	5W9 Draw evidence to support analysis, reflection and research. 5W2 Write informative explanatory texts to examine a topic and convey ideas and information clearly. **Lesson connected to our novel student of *The Secret Garden***

ASSESSMENT.

- I will know my students have made progress toward the objective by looking at their explanations. As a way to determine how my students thinking had changed, I will look at my student's original predictions and explanations. I will look at this explanation to compare to the final one for this lesson. I am looking to see a change in explanations after evidence is collected.
- At the end of the lesson, I will collect all student explanations and grade based on understanding. I will not be grading for right or wrong, just looking to see that the student made a prediction, determined if it was correct or incorrect, made a new claim if their prediction was incorrect, supported their claim with evidence and gave clear reasoning.

KEY POINTS. (What? Why? How?)

- Key ideas represented:
  - Constructing and Defending Explanations
  - This part is mostly represented in the "Independent Practice" part of the lesson, where they will be revising and adding evidence to their explanations. It is also mentioned in the "Guided Practice" where the students will first be writing their predictions and explanations.
- This lesson plan does more than construct and explain. It gives students the opportunity to really research and gather data on their own (although not part of my science understanding that I am eliciting, but I believe if the students are experiencing this for themselves it will be less challenging to explain "why."

OPENING. (2 min.)	MATERIALS.
• Tell students they are going to apply what we learned the past couple days (the R.I.C.E process for science) on their own! • We will be conducting our own experiment related to a question that I have for you then, you are going to explain to me why this is happening • Get students excited by letting them know it is their turn to shine and be real scientists!	• Objectives
INTRODUCTION TO NEW MATERIAL. (10min.)	**MATERIALS**

• Show students dead plant say, "This is my problem! We are reading *The Secret Garden* and I decided to grow my own plant, but look what happened to it! My question for you is "Why is my plant dying? I've kept him in my living room and would check on it every few days. I just don't understand!"
  ○ I do not want to give my students any information as to why my plant really died, but my plant is dry- I will give my students time to observe my plant.
• As a class, brainstorm ideas of why a plant could die (create a bubble map)
  ○ Lack of sunlight or water, nutrients in soil, etc
• It is your job to help me save my plant! We don't want Neville to die! (Naming things always makes my students laugh and peaks their interest ☺)
• Student roles:
  ○ Students have roles for their science groups (selected by teacher):
  ▪ Field Manager (Responsible for the group)
  ▪ Umpire (Responsible for safety and conducting the investigation)
  ▪ Equipment Manager (Responsible for materials and equipment)
  ▪ Statistician (Responsible for ensuring everyone records data in group)
  ○ Divide students into groups and discuss roles (we've previously used these roles with a gummy bear experiment)
  ○
	• Dead Plant ☹
	• How could my plant be dead bubble map (teacher)
	• Student role cards

GUIDED PRACTICE. (Day 1: 35-40 min Observation days (approx 5): 10 min)	**MATERIALS**

	• Teacher will say the question again "Why is my plant dying?"
	• In science journals students will restate the question:
	  o Sentence frame: "I need to figure out_____ if _____. I believe that _____."
	  o Ex w/ sentence frame: I need to figure out why Ms. Kole's plant is dying if she keeps it in her living room and checks on it every few days. I believe that Ms. Kole's plant is dying because it is not getting enough sunlight.
	  o Give students about 5 minutes to complete this
	  o Remind students that this must be related to one of the brainstorm ideas that we had (this way I have everything the students need to conduct their experiments)
	• Now individual groups will illustrate their experiment, what do you need to conduct your experiment, what are the variables, how will you collect data?
	  o This should take the remainder of this first day's lesson, we will begin the experiment the next day
	• Conduct the experiment:
	  o Students will set up their experiments and begin collecting data
	  o The first day will be set up, the rest of the days will be 10 min a day to collect the data
	  o On the last day, students will create a poster displaying their data
		• Plants for students
		• Water
		• Soil
		• Lamps
		• Science journals
		• Large construction paper

	INDEPENDENT PRACTICE. After all observations are completed (30 min.)	MATERIALS

	• Writing our explanations
	  o First, ask the students if their original prediction was correct or incorrect by comparing my plant to their plants (my plant will be kept at home without water still-I don't want to give any hints to my students)
	  o Using the data that they collected from their experiments students will write their explanations using the following sentence frame:
	  ▪ "Before conducting my experiment, I believed that Ms. Kole's plant is dying because _____. After conducting my experiment, I believe that Ms. Kole's plant is dying because _____(claim). I know this because _____ (evidence). This proves _____ because _____(reasoning). If we _____, Ms. Kole's plant will come back to life."
		• Science journals
		
		• Data from experiment

	CLOSING. (__ min.) How will students summarize what they learned? How will students be asked to state the significance of what they learned? How will you provide all students with opportunities to demonstrate mastery of (or progress toward) the objective?	MATERIALS

	• Have each group share their findings and poster with the rest of the class • Bring Neville the plant back to school and bring him back to life based on student findings!	• Group posters