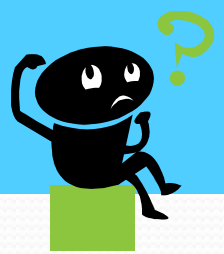
Mobile Science Camps

Nora Wilson & Jessica Castaneda TN MEP

Why Mobile Science Camps? What Were We Thinking?

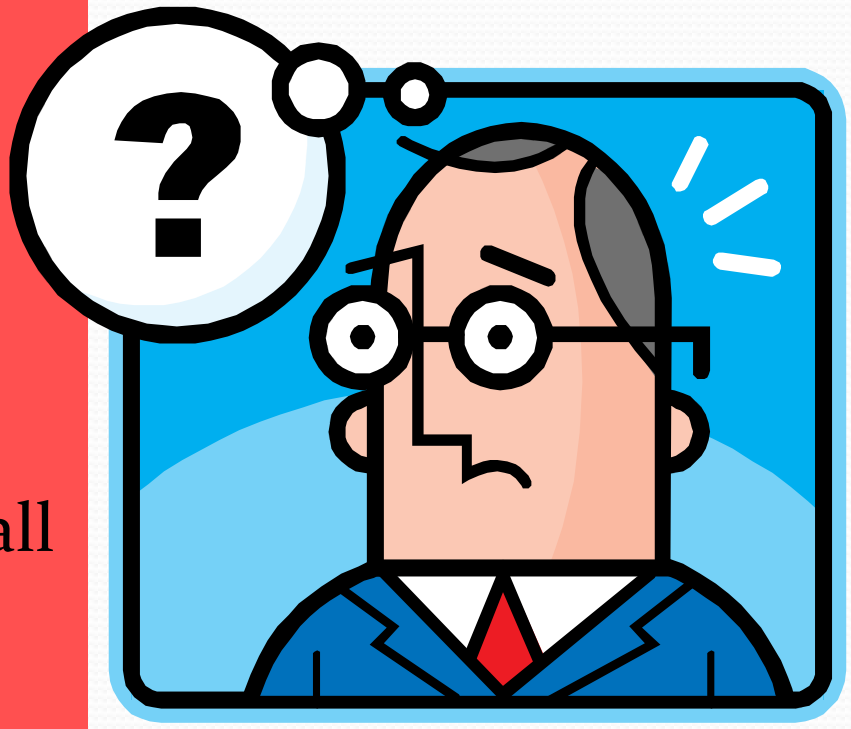
- We have limited funding
- We have kids all over the state that need programming.
- We don't have money for curriculum or a lot of supplies.

- We wanted quality programming.
- We don't always have staff all over the state that are excellent.
- We thought we could work with kids for just a week but we wanted it to be good.



Tennessee MEP- Science Camp Model

- KEY ELEMENTS
- Good curriculum
- Quality Training
- Limited Funding $$$
- Need Excellent Staff
- We need to work with all grade levels K-12



Ah- hah! SCIENCE CAMP!!!!!

- Decided to hold various camps across the state- June & July
- We found a site in each area. (Head Starts, Schools, in conjunction with Boys and Girls Clubs)
- Had mobile staff- they worked at multiple camps

We traveled all over the state and implemented the camps

Staffing

- Absolutely necessary for us to pick our very best staff.
- Flexible
- Willing to give a week
- Pay was high since we estimated out the hours they would work would be 12-14 a day and we planned stipend accordingly

- Pay ranged between $1000-$1500 a week
- Hotel & Per diem
- Hours of program were 8-4 but staff hours were usually 7 a.m. to 10:00 p.m.

Site Location

- Needed enough classrooms for teachers and staff- 1 to 10 ratio
- Access to play area outside
- Accessible by bus easily
- FREE
- Close to where students live to save on transportation costs

Budget

- Staff-$5,000-$7,000
- Supplies (including foods)- $ $1,800-3,000
- Transportation- Vans- $600 a week
- Bussing- $800- 2,500 for student transportation for a week
- Janitor

Basic Daily Schedule

- 7-8 Prep for Experiments and Prepare Breakfast
- 8-8:30Breakfast
- 8:30-9:30 Experiment 1
- 9:30-10:30 Experiment 2
- 10:30-11:30 Experiment 3
- 11-11:30 older students prepare lunch with teachers
- 11:30—12:15 Lunch
- 12:15-12:30 Recess
- 12:30—1:30 Experiment 4
- 1:30—2:30 Experiment 5
- 2:30-2:45 Snack/Bathroom Break
- 2:45—3:50 Experiment 6
- 3:50—4:00 Clean up and Dismissal
- 4:00 . . . Share successes and ideas, set up for following day, **plan next day's experiments** and study materials, (watch videos, etc) go to get needed supplies, food . . .

Experiment Means

- Not just doing the experiment.
- Experiment means: Evaluate prior knowledge, capture student interest, design and then do the experiment, provide instruction, have students also come up with variables, test variables, evaluation piece…

Just to name a few….

1. Bouncing Bubbles
2. Double Dip Chip Challenge
3. Flying Film Canisters
4. Growing Bacteria
5. Growing Creatures
6. Mentos Geyser
7. Oil Absorbing Polymers
8. The Science of Cleaning Products
9. Catapult
10. The Incredible Hoop Glider
11. Ice cream in a bag
12. Solar S'mores
13. Cardboard Boomerang
14. Bernoulli's Bag
15. Egg Drop Experiment
16. Folding Eggs
17. Magic Milk
18. Marshmallow Masher
19. Naked Egg Experiment
20. Practical Polymers and helpful hydrogels
21. Soil Soakers
22. Taco Sauce Penny Cleaner
23. High and Dry: Spinning Bucket
24. Magic Color Changing Flower
25. Red Cabbage Magic
26. Air Burst Rocket
27.

1. Goldenrod Color-Changing Paper
2. Gummy Bear Density
3. Prescription Protection
4. Solar bag
5. Solar Power! Solar Powered Robots, Bugs, Racing Cars
6. UV Beads
7. H-Racer Hydrogen Car
8. Seven Layer Density Column
9. Straw Stack of Color
10. Colorful Convection Currents
11. Giant Bubble
12. Walk on Water Cornstarch Goo
13. Experiments
14. Strong Sand
15. Bounce No Bounce Ball
16. Whirly—the Twirling Sound Hose
17. Bubbling Density Concoction
18. Floating Rice Bottles
19. Recycling Paper
20. Screaming Cup
21. Cloud in a Bottle
22. Fuel Cell Science Car Kit

Just to name a few….

- Antworks
- Frog Habitat
- Sun Print Paper
- Solar Bag
- Shrink Wrap that Kid
- Kid Friendly Elephants Toothpaste
- Dry Ice Crystal Ball Bubble
- Burping, Bubbling, Smoking Water
- Oooh Ahhh Awesome Bubbles
- Floating Bubble
- Floating Balls & Flying Toilet Paper
- Walking On Water
- Skewer Through a Balloon
- Practical Polymers and helpful Hydrogels
- Soil Soakers
- Slime - The Real Recipe vs. White Glue Putty
- White Glue Putty - Yes, It's Silly
- Oil Absorbing Polymer
- Moon Blob: A Self-Siphoning Gel
- Vanishing Jelly Marbles
- Instant Snow - The Erupting Snow
- School Spear-It!
- Screaming Balloons
- Singing Glasses
- Pop Bottle Sounds
- Whirly - The Twirling Sound Hose

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- Singing Rod
- Musical Straws
- Bouncing Bubble Solution
- Boo Bubbles
- Giant Bubbles
- Chilly Bubbles
- Balloon in a Bottle
- Do Not Open Bottle - Soda Prank
- The Unpoppable Balloon
- Seven Layer Density Column
- Liquid Layers - Straw Stack of Color
- Smoke Rings (the Modern William Tell)
- Color Changing Milk
- Supersaturated Solution
- Vanishing Styrofoam
- Color Changing Milk of Magnesia: How Antacids Work in Your Stomach
- Spinning Tray of Glasses and Hoop
- Incredible Growing Marshmallows
- Lemon Suds
- Think Ink! - The Clock Reaction
- Make Your Own Bubbling Lava Lamp
- Making Lemonade Fizzy Drink
- Brew Your Own Flavored Soda or Root Beer (Kit)
- Brew Soda without a Kit
- Sinking Soda Surprise
- Experiment-Instant Freeze - Soda Ice
- Soda Can Shake-up
- Mentos Geyser - Diet Coke Eruption
- Glowing Tonic Geyser
- Tornado in a Bottle
- Floating Water
- Anti-Gravity Water
- Fire Water: Coolest Conductor of Heat
- Strong Sand
- The Brazil Nut Effect
- Floating Bowling Balls
- Floating Lemons and Sinking Limes
- Amazing Egg Experiments
- Dancing Raisins - The Bubble Lifter
- Ivory Soap Science - Floats and Grows
- Diving Ketchup
- Fun Fly Stick
- Static Electricity Zingers
- Squeeze Bottle Rocket

Evaluation…

- Our focus was on quality instruction
- Focusing on finding out student background knowledge on a subject first through an activity
- Then conducting experiment
- Then checking for mastery
- Documenting progress

MEP Science Camp Pre and Post Student Mastery Checklist

Day_____

Write the appropriate number for pre and post mastery of key concepts and vocabulary in the appropriate column for each student

1- Student is able to explain key concepts orally to peers or teacher and/or is able to clearly write or draw an explanation.

2- Student shows some mastery of key elements, but stuggles to explain completely needed concepts either verbally or through writing

3- Student has minimal understanding of key concepts

4- Student has no understanding of key concepts

Write the name of experiment in the appropriate column		Name of Experiment		Name of Experiment		Name of Experiment		Name of Experiment		Name of Experiment		Name of Experiment		Name of Experiment		Name of Experiment		Name of Experiment	
Student Name	**Grade**	**Pre #**	**Post #**	**Pre #**	**Post #**	**Pre #**	**Post #**	**Pre #**	**Post #**	**Pre #**	**Post #**	**Pre #**	**Post #**	**Pre #**	**Post #**	**Pre #**	**Post #**	**Pre #**	**Post #**

Comments

- “I enjoyed the work, and, as a teacher with 30 years experience, I feel these camps are very beneficial to the students. I was so impressed by the dedication of the TOPs employees and the other teachers who participated in the program. They all worked so hard and did whatever it took to make sure the camps were a success. During these two weeks, they were totally focused on the students and the camps and had no personal agenda to meet.”- CAMP staff

Comments from CAMP staff

- "The camps were such a positive experience for the students. The TOPs employees worked so hard to prepare a program that was organized and easy to execute. The needed materials and supplies were always available which made the program run smoothly. The activities and experiments were planned around the Tennessee science standards. This was a very important element of the camps because the students can take the knowledge garnered during the camps into the classroom in the fall and experience a greater level of success in their science classes. As an ESL teacher, I appreciate these camps because it gives these students a chance to be totally involved in all aspects of the learning process. Many times, migrant and ELL students do not participate in classroom discussions or volunteer to answer questions very often. During the camps, they were very vocal and attempted to answer questions without reservation. The opportunity to participate at such a level builds confidence, and students who are confident in their abilities do better in school."

- “The camp was an incredible experience for both the tutors (us) and the kids! It was a great time to get them to open up and be able to express themselves creatively and start to make them wonder how things work and question the world around them. It even did this for ME in a way I NEVER imagined possible. At 24 years, I am starting to ask myself why things work the way they do, and think of variables in everything I see. :) I love that they can come to our camp, and see that it's different - it's not the "science class" they're used to. It's hands on, messy, and not all about textbook reading and worksheets.”

More than just a good idea…

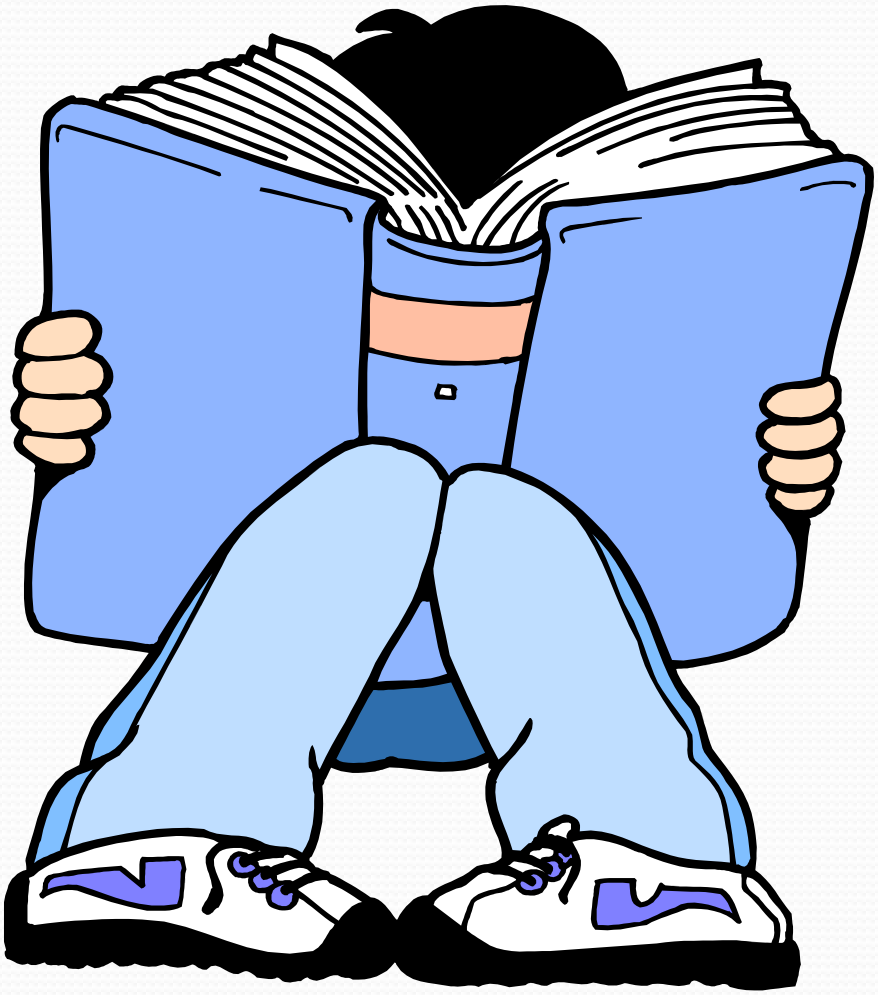
- Our Migrant Students in TN are behind in science related subjects.
- Our needs assessment has shown this.
- We needed a way to target science instruction, keep the kids coming and train our teachers to really work effectively.
- So….. we needed to build a curriculum & training program.
- Resources from Steve Spangler's site were invaluable

Prior to the start of the camp

- Met with staff
- Provided a training on expectations and program set up
- Provided curriculum- Had them read over the curriculum and review videos on how to do the experiments
- Training on state standards
- Gave listing of experiments per day
- Gave study time to prep to be ready

How to Be Prepared

- Be familiar with the curriculum
- Know the information
- Study and send notes of what you learned as you studied to noramiged@blomand.net along with standards that apply to the various experiments for the grade levels you are to work with.



Expectations

- Be enthusiastic
- Care about the kids
- Become a magician of science!
- Bring it to life
- No, “Hold on, let me read this.”

Hands on vs. Minds-on

Science is already fun, but it also has to be relevant to the curriculum and to the real world.

We have all been taught that a hands-on approach is better than the more traditional sit-and-listen lecture style, but is that true?

Just because kids are doing a hands-on activity doesn't mean they're learning.

We must not only use a hands-on approach, it must also be a minds-on approach to our teaching that inspires students to think differently and approach problems with a creative mind set.

Why Not More Recess?

You'll be going, doing, experimenting all day.

It should be interesting, hands on, and fun. It will be thinking and learning play all day. They shouldn't need a break for fun time.

I'm going to go…

No planning period during the day.

No going out to grab…

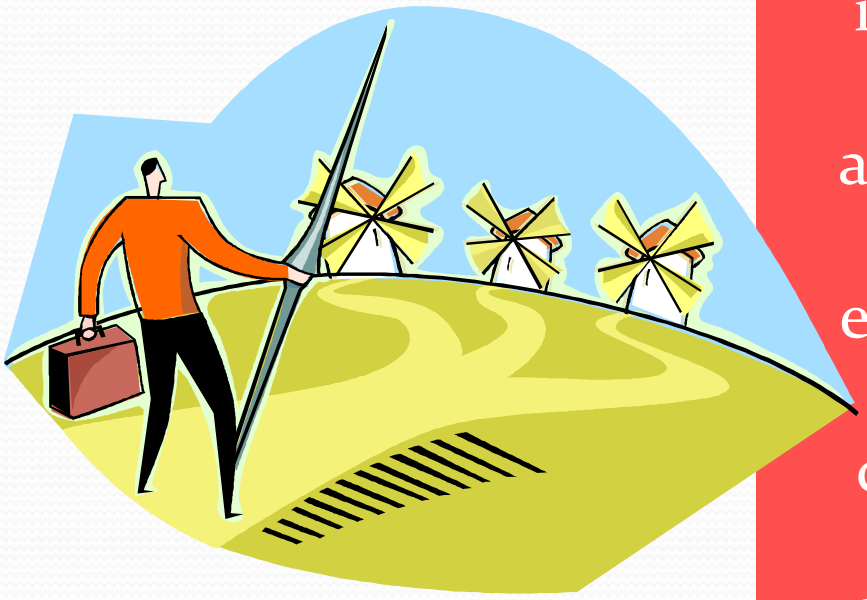
No lunch break.

Stay with your students all day, every day.

Teachers Expectations Affect Students

Asa Hilliard III (1991) after researching the effect that teacher expectations have on students says "our current ceiling for students is really much closer to where the floor ought to be.“

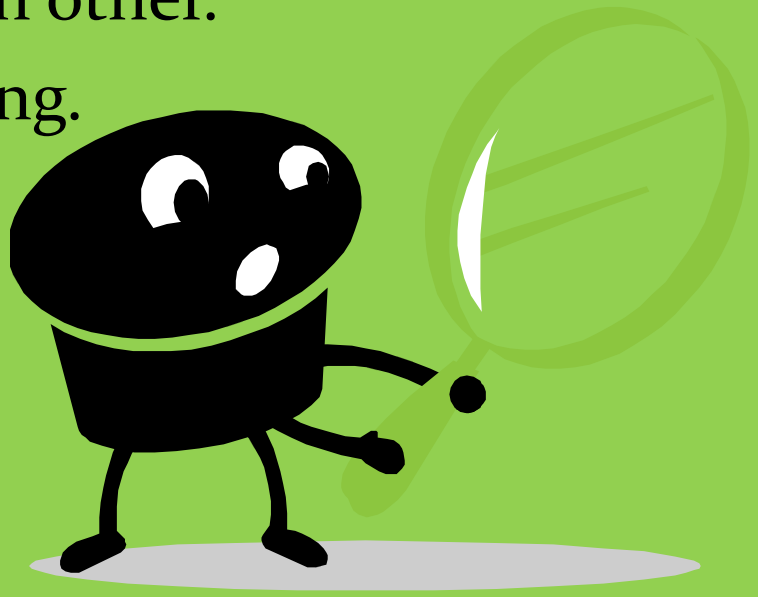
This is too hard for these kids...



In addition, instructional content is sometimes "dumbed-down" for students considered to be low in ability. Students in low groups and tracks are usually offered "less exciting instruction, less emphasis on meaning and conceptualization, and more rote drill and practice activities" than those thought to be in high groups and classes (Cotton).

What the Program Looks Like

- Multi-Grade/Multi-Level Classrooms
- Intensive Learning and Doing
- No “down time.”
- Siblings work to take care of each other.
- Students nervous at the beginning.



Teach the Concepts

What are we trying to do?

What do they need to learn?

It's really important to use each of the activities to help teach kids how to think like a scientist. It's so important for students to use the scientific method.

What about the Standards?

Questions?

How can I teach multiple grade levels and still meet students academic needs?

How do I teach concepts to a multi-level classroom?

Tornado in a Bottle

Students fill one 2-liter bottle mostly full with water and add food coloring, sequins, and glitter. They turn it over and swirl it in order to create a tornado.

- **What state standards would go well with this simple experiment?**
- **What academic vocabulary?**

Pick out 2 specific standards that would go with each of these grade levels.

Pick out several academic vocabulary words that align with the activity.

- K –
- 3rd
- 7th
- 9th

Tornado in a Bottle

Students fill one 2-liter bottle mostly full with water and add food coloring, sequins, and glitter. They turn it over and swirl it in order to create a tornado.

- Use a variety of objects to demonstrate different types of movement. (K, 11.1: Science)
  - Demonstrate different types of movement (e.g. backwards/forward, side to side, in circles) and make observations about the best way to create a tornado and describe its movement.
- Identify how the direction of a moving object is changed by an applied force. (3rd, 11.1: Science)
  - Explain what happens to the rotation of the tornado when force is and is not applied and record their observations and explanation in a notebook.
- Investigate how Newton's laws of motion explain an object's movement. (7th, 11.4: Science)
  - Discuss Newton's laws of motion. Explain how they relate to the creation of the tornado in the bottle.
- Recognize the limitations of scientific investigations. (9th – 12th, 2.3: Scientific Research)
  - Analyze how the tornado in a bottle is reflective of real tornadoes and how it differs from them.

Your Turn to Talk!

Each one of you will be assigned a different lesson…

- Sum up concepts of your lesson.
- Summarize what they need to learn
- How would you evaluate it?

Your Turn to Talk!

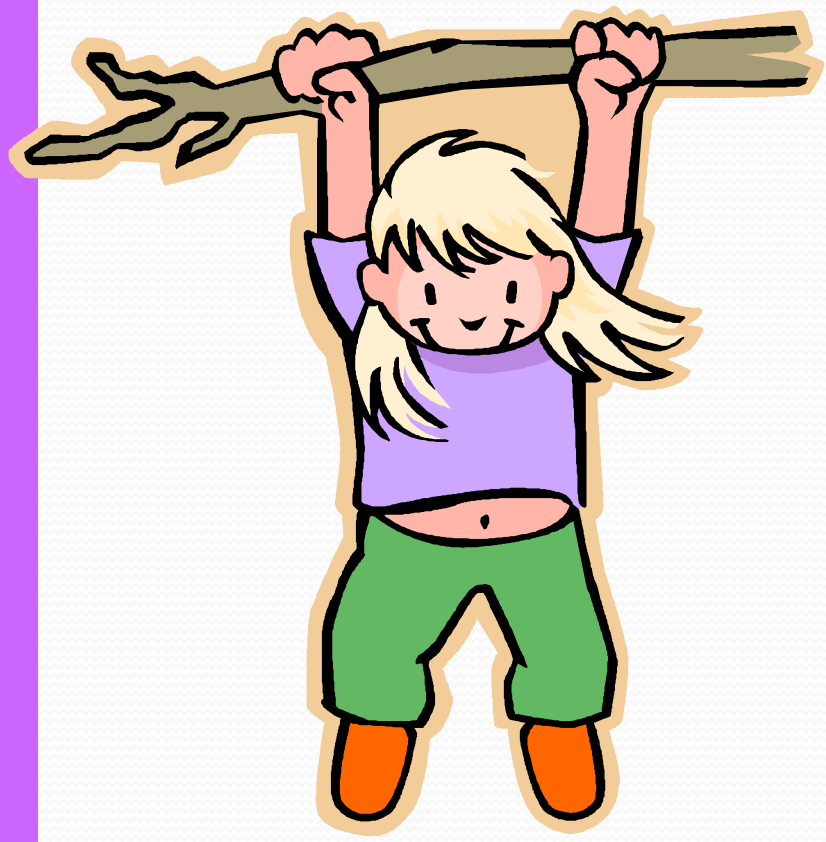
Now take the lesson you just talked about and :

- Find multi-grade level standards that apply.
- Find similar standards across the grade levels and standards that can build on each other or be used in tandem.

Branch out from the Experiments

Use the experiments to make connections to the world that your students know and the world around them.

You can bring things in to the lesson and expand, but your instruction is based on and designed around the experiments themselves.



Your Turn to Talk!

Now take the lesson you :

- Make a list of what other concepts could you expand on that relate to that lesson.
- Get ready to present them.

The Scientific Method

Learning about the scientific method is almost like saying that you are learning how to learn.

You see, the **scientific method** is the way scientists learn and study the world around them. It can be used to study anything from a leaf to a dog to the entire Universe.

Extend, Expand, Apply

Perhaps the most overlooked step is that of applying the information gained from the experiment to a larger field of experience.

This is the time for great open-ended questions and new activities that can inspire your students to think creatively!

Your Turn to Talk!

Now think about an experiment we've done today…

- Make a list of variables that could be tested.
- Get ready to present them.

Question Everything!

Teach students the following ideas:

If you assume you know the answer, then you don't really have a question.

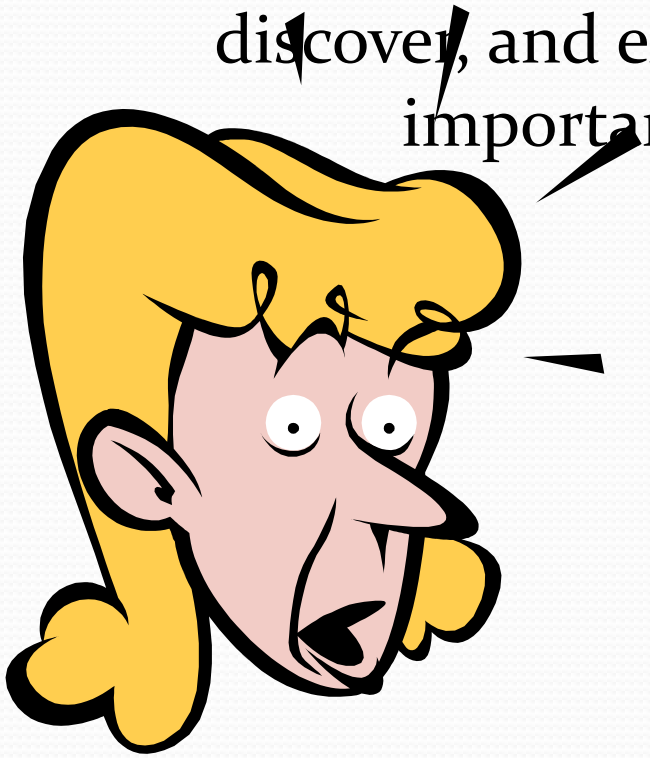
Egg Experiment Results

What Happened?

Be willing to allow for an unexpected variable and accept the possibility that the answer you discover might lead to more questions!

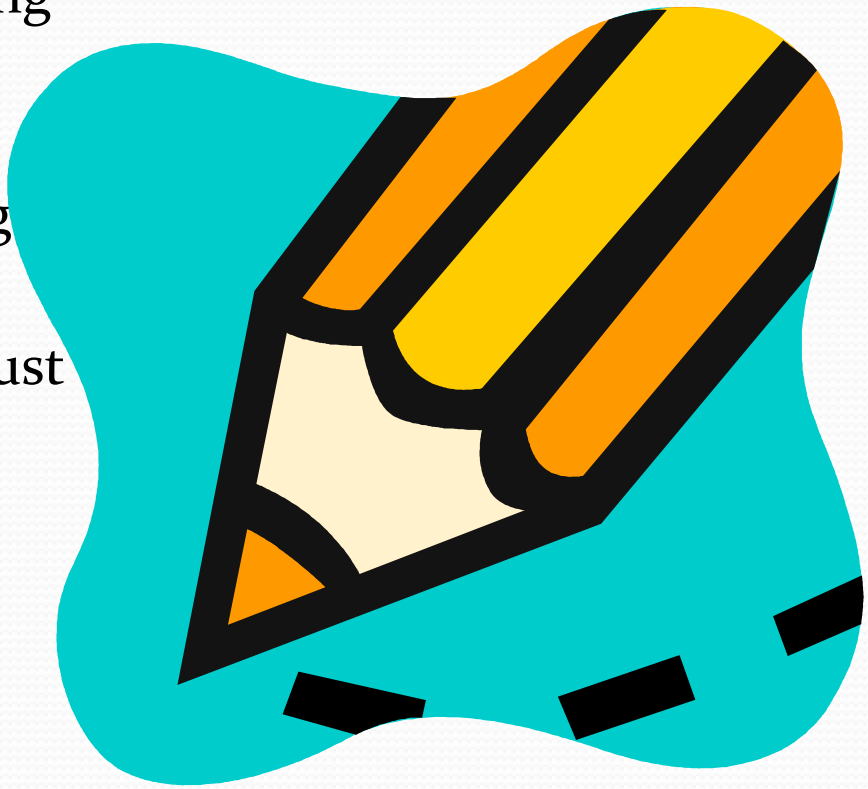
It Wasn't Supposed to Do That!

It's completely OK to conduct an experiment and arrive at an discovery that is a complete surprise to you. Remember, it's the job of a scientist to wonder, discover, and explore, and unexpected results are an important part of the road to discovery.



Science Journals

- Science journals should be something the students can be proud of.
- Make them an important part of science camp, not simply something that should or must be done.
- Don't let them become something just thrown together.
- They should be full of diagrams, pictures, interesting information, steps on how to do various experiments.
- The youngest students draw pictures of the steps and experiment results.

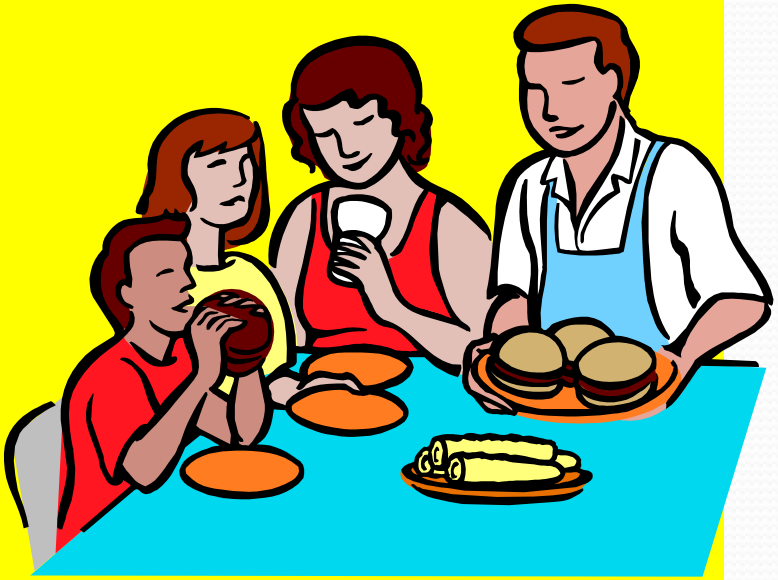


Techniques

One of the secrets to achieving this goal is to make certain that our students are given the opportunity to the activities themselves

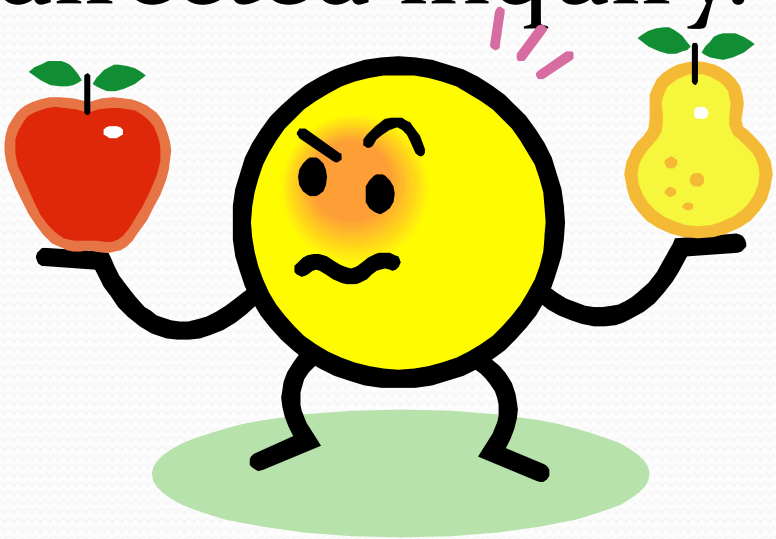
Reaching for "the Table"

When a child is so excited about what he has learned that day, that he can't wait to get home and share it with everyone around, that's genuine education that that child is going to remember.



Making a Difference

There is a difference between guided inquiry and self-directed inquiry.



Area of Inquiry

- To develop competence in the area of inquiry, students must have a deep foundation of factual knowledge, understand facts and ideas in the context of the conceptual framework and organize knowledge in ways that facilitate retrieval and application.

Area of Inquiry

- To have bona fide inquiry experiences, students must formulate their own questions, create hypotheses, and design investigations that test the hypotheses and answer the questions proposed.

Area of Inquiry

- According to the standards, "inquiry into authentic questions generated from student experiences is the central strategy for teaching science." The standards encourage teachers to focus on inquiry as it relates to the real-life experiences of students and to guide students to fashion their own investigations. Students formulate their own questions and devise ways to answer them. They also collect data, decide how to represent them, and test the reliability of the knowledge they have generated. They learn to justify their work to themselves and one another. This process involves reacting to challenges regarding their conclusions, explaining limitations of their work, making presentations to others, and being willing to receive constructive criticism (NRC, 1996).

What do you think? Inquiry Instruction?

- **Students complete a Moon phase calendar by cutting out photographs of the Moon in different phases, mounting them on a monthly calendar on the proper date, and labeling each of the eight major Moon phases.**

- The National Science Education Standards characterize inquiry instruction as involving students in a form of active learning that emphasizes questioning, data analysis, and critical thinking.

Inquiry Instruction?

- After completing a pre-assessment activity on students' knowledge of Moon phases, a student asks about the correct order of Moon phases. The teacher challenges students to determine the sequence of phases by observing the Moon and recording their observations for one month.

Inquiry Instruction?

- The teacher begins with the question “Does the Moon rise and set at the same time every night?” Following a brief discussion of the question, the teacher demonstrates the rising and setting of the Moon for several sequential evenings using a computer simulation. The teacher then facilitates a class discussion in which the class concludes that the Moon rises and sets about 50 minutes later each evening.

Levels of Inquiry

- **1 Confirmation—Students confirm a principle through an activity in which the *results are known in advance*.**
- **2 Structured inquiry—Students investigate a teacher-presented question through *a prescribed procedure*.**
- **3 Guided inquiry—Students investigate a teacher-presented question using *student designed/selected procedures*.**
- **"4 Open inquiry—Students investigate topic-related questions that are *student formulated through student***

Even for the youngest students...

The days of just setting out science materials at a discovery table are over. Today it's all about **doing.** Doing science experiments with the children and creating experiences

They want to be just like their big brothers and sisters!

Your Turn to Talk!

Activity:

- Using your lesson describe how you would structure the lesson to incorporate both guided and self-guided inquiry.
- Be prepared to share.

Break It Down

Remember, the attention span of most kids is 15 minutes. Did you get that? This is not the attention span of ADHD or ADD kids. This is the attention span for the typical child, and probably of many adults, if we're really honest!

So the easiest thing to do is to break our lessons into 15 minute chunks. But, you say, I simply cannot teach a lesson in just 15 minutes! No, of course you can't. But you can break the lesson up into chunks.

How?

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