Grant Deliverables

- Develop a “Flipped Science Unit” in which there are
  - Assessments
  - Inquiry opportunities for students (guided)
Agenda

- June
  - Beginning with the End in Mind
  - Unit Big Ideas/Essential Questions/Knows/Do
  - Introduction to Flipping

- July
  - Developing assessments for learning

- August
  - Developing the story of your unit!
Agenda for Today

- Big Ideas!
- Essential Questions
Icebreaker!

Part 1: Pick a card and find your matches

Part 2: If you were to write your autobiography, what would the title be and why? Share with your group.

Part 3: The most interesting title from our group was...
What’s the big idea??
What would you say?

“If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed on to the next generations of creatures, what statement would contain the most information in the fewest words?” (Feynman, 1963)
Your answer?

- Take one minute to answer, individually, Feynman’s question.
- If only one sentence of Biology, Chemistry, Earth Science information was passed to the next generation of creatures, what should that sentence be?
- We’ll share in a minute, and then sharpen our definition of Big Ideas and then reframe the question to address science.
Share...
The Big Idea

What will the students remember for:

40 seconds?
40 minutes?
40 years?

The 40 years are the BIG IDEAS!
You’ve got to go below the surface...
to uncover the really ‘big ideas.’
Science summed up...
Establishing Priorities

Knowledge and skills that are important to know and do

- Mendel’s laws of heredity are based on his mathematical analysis of observations of patterns of inherited traits.
- Geneticists apply mathematical principles of probability to Mendel’s laws of heredity in order to predict results of simple genetic crosses.
- Use a Punnett square to show all possible combinations of gametes and likelihood that particular combination will occur in monohybrid and dihybrid crosses.

Scientific Inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.

Nature is constantly changing, but there are many repeating patterns.
Establishing Priorities

**Knowledge that is worth being familiar with**
- Inheritance patterns of multiple allele traits
- Human genetic abnormalities

**Knowledge and skills that are important to know and do**
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Scientific Inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.

**Enduring Understanding:**
- Nature is constantly changing, but there are many repeating patterns.
Activity 1: Aligning SOL’s to Big Ideas

In your envelope, you have 5 Big Idea Statements that come from the National Science Next Generation Standards.

Your task is to work with your team to align the set of knows and do (what you want students to learn by the end of the unit) to one or as many of the statements as you can.

You will post your final work on chart paper in order to share out with the team.
Overarching vs. Topical Understandings

- Enduring understandings vary according to their scope and level of generalization.

- An *overarching understanding* can apply to multiple points during a student’s education; the most overarching can also apply to multiple content areas.

- A *topical understanding* is unit or time-specific and generally applies to a specific unit within the student’s course of study.
To What Extent Do Your Desired Results Address Understanding?

- **Big Ideas:** interdependence, heroism, patterns and systems, investigation

- **Enduring Understandings:** All great writing is rewriting. Science can help us reveal the structural patterns and processes that shape and define our physical universe.

- **Essential Questions:** Is war inevitable? How can we determine what an author means? To what extent is mathematics a language?—How can we learn to “speak” it with fluency and mastery?
Conclusions

In terms of curriculum...

- We tend to try to do too much. Less is often better.
- Organizing a coherent and articulated conceptual framework around a small set of key ideas holds promise.
- Well crafted questions can drive instruction and enmesh assessment into its practice.
Break!

When you return, find your content area table.
From Big Ideas to Essential Questions
Text Protocol

3-2-1
- 3 Important Facts
- 2 Questions
- 1 Main Idea

Debrief
- Round robin
- Reporting Out
What makes a question essential?
Why use essential questions?
How do we design essential questions?
How do we use essential questions?
Identifying Essential Questions from Enduring Understandings

- Identify a big idea and/or essential understanding(s)
- Draft essential questions for your table
- Your table should have 3 to 5 essential questions

- How many questions do I need per unit?
- Overarching vs topical questions
## Editing your Essential Questions

<table>
<thead>
<tr>
<th>Original Draft Question</th>
<th>Commentary on Draft</th>
<th>Revised Questions</th>
<th>Commentary on the Revisions</th>
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</thead>
<tbody>
<tr>
<td>Are there any benefits from the deforestation of rain forests?</td>
<td><em>The question calls for some research/info gathering and analysis, but ends in a list.</em></td>
<td>To what extent do the costs outweigh the benefits of deforestation of the rain forests?</td>
<td><em>The revised question broadens the inquiry and calls for a more sophisticated analysis; more likely to spark debate and deeper inquiry into any list of pros/cons.</em></td>
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Wiggins and McTighe (2010)
Essential Questions revised

- Use the rubric to revise the draft essential questions
- Write the revised questions on the chart paper and post it
- By 12:30, take a break and do a gallery walk and provide specific feedback on the posted questions
Break!
Share out
Homework

- Go to http://bit.ly/UEhdtn to watch Katie Gimbar’s work with Flipping the classroom.

- Go to https://www.teachingchannel.org/videos/structure-learning-essential-questions to watch the video on essential questions

- Using your cornell notes, take notes from the presentation. Be sure to bring them tomorrow, we will be using them in our work!
Agenda for Today

- Flipping with Dr. Bob!
- Setting up Our Technology
Stand up
Hand up
Pair up
Partner up
Let’s Define Flipping!

With your shoulder partner, sort the cards in your envelope into two categories:

<table>
<thead>
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<th>Flipping is...</th>
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Dr. Bob Stewart

- Chair Natural Sciences and Mathematics Department
- Experience as a researcher, professor, and an AP Biology Scorer
Flipping in the Sciences

Robert Stewart, Ph.D.
Professor and Chair, Dept of Natural Science and Mathematics
Regent University
Traditional (re: Old) Model

Data
News Articles
Textbook
Reports
Research
References
Publications

Information Preparation Presentation Learning Retention & Application
Traditional (re: Old) Model

Data
News Articles
Textbook
Reports
Research
References
Publications

Information
Preparation
Presentation
Learning
Retention & Application
New (re: Engaging) Model

- Data
- News Articles
- Textbook
- Reports
- Research
- References
- Publications

Information  Learning  Preparation  Presentation  Retention & Application
Source of Pedagogy

- Tradition methods
  - Adjunct courses 18 years
  - Full-time courses (16 different) 18 years
  - Simply mimicked best instructors
  - Successful: high student rankings, teaching award

- SFASU QEP: High Impact Practices
  - First cohort of eight training summer 2010
  - Presented as hybrid course
  - Over 100 papers read, discussed
Flipping Experiences (1)

- Fall 2010 Freshman Seminar blended practices
  - Collaborative learning
  - Peer-to-peer instruction
  - Flipping
  - Outcomes reported as poster December 2010

- Spring 2011 Freshman Biology (non-majors)
  - Flipping only with graded responses (clickers)
  - Converted back to traditional mode mid-semester at student requests
  - Review: lack of student buy-in (bimodal grades)
Flipping Experiences (2)

- AY 2011-2012 Experiences
  - Increased student classroom access to technology
    - iPhones, iPads, notebook computers
    - Use of clickers for ungraded assessment
  - Very clear delineation of expectations at onset
    - Eliminated on-line lectures
    - Heavy reliance on reading, learning textbook sections
    - Graded reading quiz online due midnight before class
  - “Unleash the hounds” required personal rewiring
    - Sometimes like herding cats
    - Enforce expected decorum, rate of progress
    - Student engagement improved
Comparison of Methods: Old

What is Life?
Scientific Method
Old Method Summary

- Required preparatory readings (rarely done)
- Frequent presentation of relevant news report
- Standard classroom lectures:
  - PowerPoint outlines cover all required components
  - Response to questions can lead to discussions
- Assessments:
  - Daily clicker quiz over previous day’s material
  - Quarterly exams – 80% multiple choice, 20% short answer
  - Cumulative final exam same format
Characteristics of Life

Composed of cells
Growth and development
Metabolism (energy for):
  Growth
  Repair
  Reproduction.
Characteristics of Life

Homeostasis
Movement
Response to stimuli
Genes of DNA
Ability to adapt.
The Scientific Method

Current methodology:
Ask a question
Develop hypothesis
Make a prediction
Test the prediction (try to destroy it)
Modify the hypothesis
Repeat.
The Scientific Method

Hierarchy of confidence:
- Hypothesis
- Theory
- Principle
- Law.
Curiosity isn't dangerous...

I wonder if those flowers have thorns?
... But research is!

I think I'll taste them and see.
Comparison of Methods: New

What is Life?
Scientific Method
New Method Summary

- **Flipping: Preparation Before Class**
  - Required reading from textbook or other sources
  - Online graded quiz covering readings:
    - Two relatively hard free response questions
    - Final question each time: “What concept was most difficult to understand?”
    - Due by midnight day before class

- **Assessments:**
  - Online reading quiz graded with 10% course weight
  - Quarterly and final exams address higher order thinking – 50% multiple choice, 50% free response
  - Students pick up exam during quarterly personal review
New Method Summary

- Peer Instruction: Activities During Class
  - Question posted, 90 second silent contemplation
  - Two basic formats:
    - Clicker poll taken, results posted, or
    - Students verbally present options or suggestions
  - Students paired, have 3-5 minutes to convince the other
  - Question posted again and results compared
  - I provide supplemental instruction to fill in gaps or to summarize
  - Progress at 5-6 questions per hour
Peer Instruction Questions (1)

- The second manned Mars expedition discovered a green substance on a rock outcropping that increased in size when exposed to sunlight. Is it alive? (Choose yes, probably, maybe, no)

- In order to determine if the substance is alive what 5 observations or measurements would you want to start with? (Open ended; lists posted on board and some identified as key)
Peer Instruction Questions (2)

• What would you do next (how would you experiment) to help determine if it is alive? (Open ended with next step based on previous list, leads to use of scientific method and experimental design)

• Given the following data (based on previous list) which is the strongest and the weakest evidence supporting the claim that it is alive? (Choose A, B, C or D based on characteristics selected from board above)
Peer Instruction Questions (3)

- What test would you propose that might make you surer of your answer? (Open ended, list posted to board).

- Do you think that life exists on other planets in our galaxy? (Choose yes, probably, maybe, no)

- How do you justify your answer to the above question? (Open ended, allows scriptural integration)
Issues

- Most common student complaint: “The teacher never taught; I had to learn everything myself.” (Drives many pre-professional to distraction)
- But:
  - That’s how everyone learns
  - Reduction of bimodal results
  - Most common student assessment: “Best class I’ve ever had.”
- Mentoring embedded, large time commitment
Review Card Sort

- Review your card sort about what flipping is and is not.
- Make any necessary changes to your sort.
- Turn to your shoulder partner and discuss the following questions:
  - What excites you most about flipping?
  - What surprises you most about flipping?
  - What concerns you most about flipping?
- Share out
Break!
Technology Set-Up

- Complete your technology check-list.
- When you are finished, start on your homework in Edmodo.
Final Thoughts

1) In your team, take turns sharing your “big ideas” about essential questions.

2) Each team member has 1 minute to share and 30 seconds for comments or follow-up questions.
Homework

- Choose 1 article from Inquiry folder
- Complete Compass Points assignment in Edmodo
June 27, 2013
**Let’s Define Flipping!**

Resort your flipping defined cards. Discuss with your group and reach a consensus.

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Our Definition of Flipping
Connect the Dots!

- Big Ideas
- Essential Questions
- Flipping
- Inquiry Science

Non-linguistic representation
Graffiti walk
Let’s Talk Strategy

- Gallery walk
- Graffiti walk
- Stand up, hand up, pair up, partner up
- Round robin
- Think, pair, share
- Non-linguistic representation
- Varied grouping
- Debate and consensus
- Peer feedback
Final Re-write

- Let’s fine-tune our essential questions using kid-friendly words
- Incorporate peer feedback
Break!
NearPod in Action
Choosing Your Unit

- Timeframe – must be a unit taught before spring break
- Maximum group size: 2 content teachers plus 1 collaborating teacher
# Instructional Planning Framework

<table>
<thead>
<tr>
<th>Unit Topic:</th>
<th>Big Idea(s):</th>
<th>Time Frame:</th>
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<tr>
<th>Essential Questions</th>
<th>What students should <em>know</em> (Essential Understandings)</th>
<th>What students should <em>be able to do</em> (Essential Skills)</th>
<th>Types of Assessments</th>
<th>Types of Learning Activities</th>
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Feedback Protocol

II. Group Presentation 5 Min.
Teacher-presenter describes the elements below to be used in this unit.

- Big Ideas
- Objectives
- Essential Questions
- Activities
- Instructional Strategies
- Assessments

III. Clarifying Questions 2 Min. Max
Participants ask clarifying questions.

VI. Warm and Cool Feedback 8 Min.
Participants share first the warm feedback and then the cool feedback while the teacher-presenter is silent.
July Course Expectations
August Deliverables

- Complete unit plan
  - Unit Plan Templates available on Edmodo
- Updated Unit Planning Framework (if needed)
Exit Ticket

Post the answers to the following questions on Edmodo:

- Where am I? (what part of the process are you in, where will you go next?)
- What have I learned so far?