

# ORIENTATION & PROFESSIONAL DEVELOPMENT WORKSHOP



## FIRST II PROJECT GOALS

1. **Maintain and expand coalitions of faculty** who will implement and sustain reform in undergraduate biology education;
2. **Enable faculty to gain experience in active, inquiry-based science teaching** that increases student learning;

## *FIRST II* PROJECT GOALS

3. **Enable faculty to learn and use multiple assessment strategies;**
4. **Facilitate collaboration among faculty** about their reforms and about the emerging criteria and strategies for scholarship of teaching; and
5. **Support a national dissemination network** to sustain improvement in teaching.

## WHAT IS INQUIRY-BASED LEARNING?

1. What did you learn?
2. How did you learn?
3. What was the role of the students?  
teacher?

## DESIGNING ACTIVITIES

1. GOAL(S)
2. PROBLEM SPACE
3. QUESTION
4. METHODS
5. CONCLUSION

← 100% student 100% teacher →

## ASSESSMENT OF LEARNING

- How do you know you have met your teaching goals?
- How do you know that students have learned?

## “Consensogram” Directions

1. Take one color-coded post-it for each question, write the question # in the corner.
2. Write a number between 0-100 on each post-it in increments of 10.
3. Do not share responses

## “Consensogram” Questions

Please respond on a scale of 0 -100 in increments of 10:

1. To what degree is the assessment of your students aligned with the learning goals in your course?
2. To what degree is your course and curriculum based on active, inquiry-based learning?
3. How important is it to use multiple kinds of data to assess your students?
4. How often do I use data to make instructional decisions?
5. In my department, teaching is as important as research and is rewarded accordingly. (100 agree - 0 disagree)

## True or False?

- Faculty really are very interested in assessing their students' learning better, but just don't know how to?

## True or False?

- Lack of meaningful assessment in undergraduate education occurs because faculty/faculty peers/administrators are satisfied to be less accountable in their teaching than they are in their research.

## True or False?

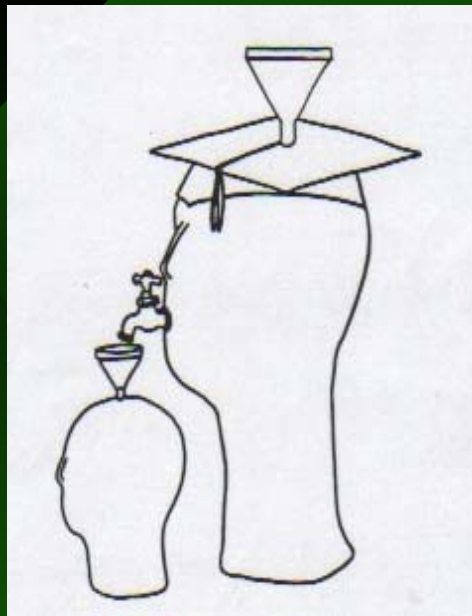
- Assessing student learning in science is more closely related to what scientists actually do as researchers than they realize.

## Assessment in 'Teaching' Parallels Assessment in 'Research'

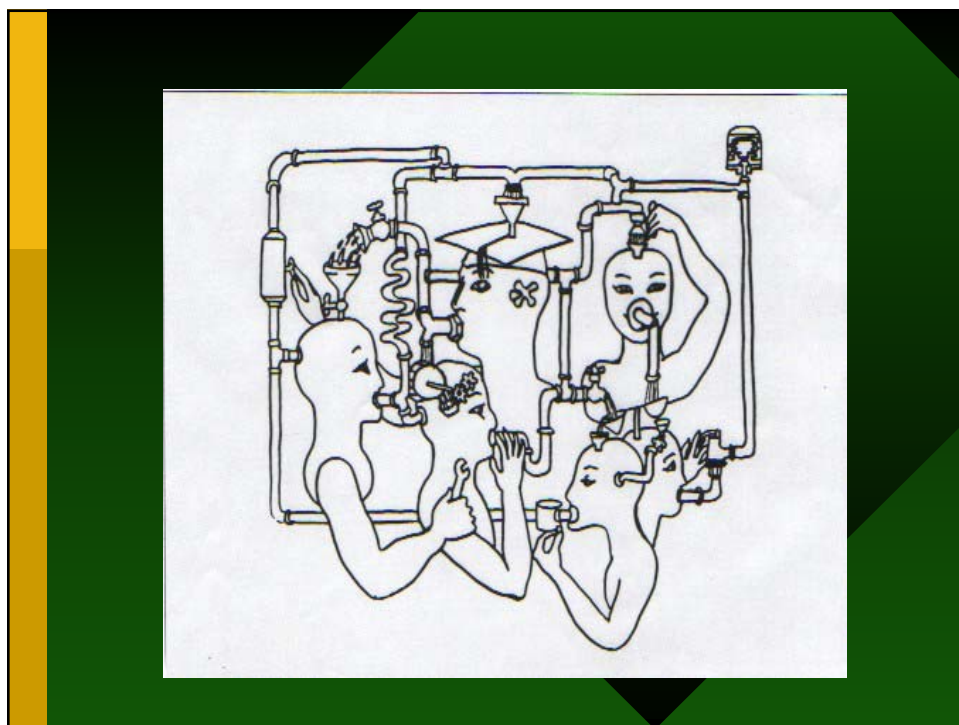
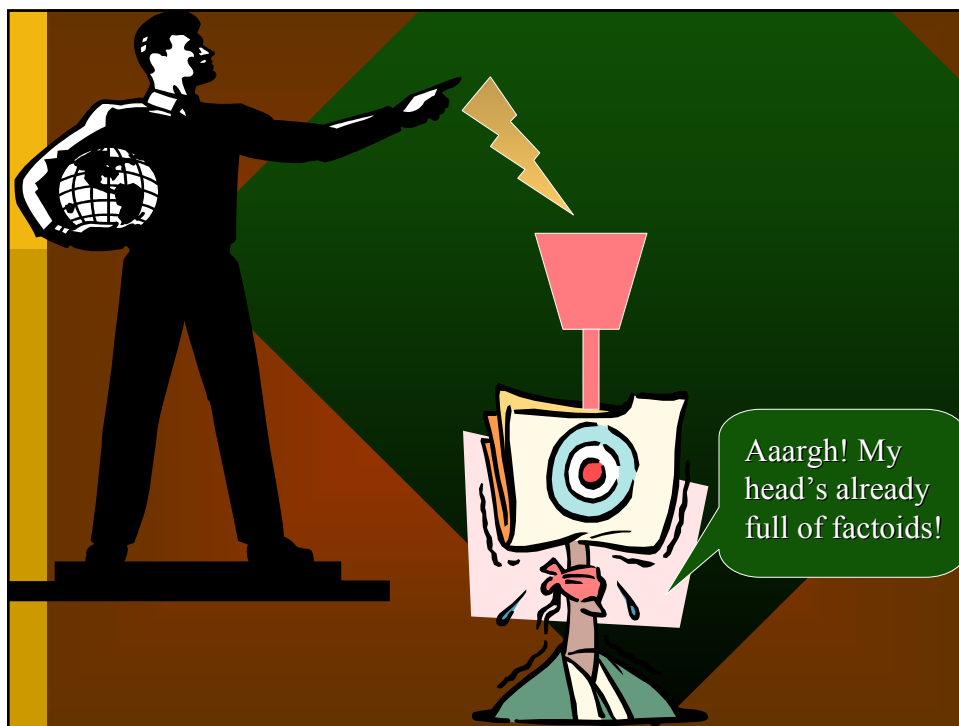
- ↓ We make observations, assumptions, assertions.
- ↓ Questions we ask are meaningful, interesting, fundable.
- ↓ Data we collect are aligned with questions about a problem.
- ↓ Research methods and designs appropriate for question.
- ↓ Instruments/techniques we use are calibrated, repeatable.
- ↓ We explain results in the context of our questions.
- ↓ Results drive our next questions.
- ↓ Our ideas are peer reviewed for publication/funding.

## What are 3 central questions about learning?

1. What do we want our students to *know* and be able to *do*?
- 1.5. What *evidence* will we accept that students know and can do?
2. How will we *help* students get there?



Karl Smith



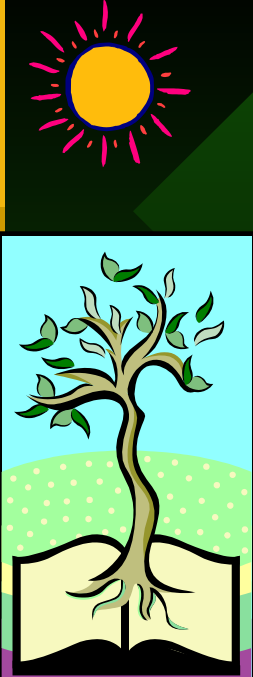


## Cognitive Theory

- “Learners are not simply passive recipients of information; they actively construct their own understanding.”
- Svinicki 1991

## Ultimate goal of teaching:

1. ***Improved*** student learning.
2. Improved ***student*** learning.
3. Improved student ***learning***.



The illustration shows a bright yellow sun with pink rays in the top left corner. Below it, a tree with green leaves and a brown trunk grows out of an open book. The background of the illustration is a light blue sky and a green field with yellow polka dots. The entire slide has a dark green background with a yellow vertical bar on the left.

- Even students from prestigious universities have misconceptions about scientific concepts.
- Inquiry is a way to help students confront their misconceptions, build mental frameworks so they can better understand content/concepts.
- Students are not learning what we think they are learning!

## What Type of Learning?

- Bloom (1956)
- Major categories in the Cognitive Domain of Educational Objectives

## Convergent Thinking

- *Knowledge* - remember material
  - *Comprehension* - grasp the meaning of material
  - *Application* - use learned material in new concrete situations
- Adapted from Grolund (1970)

## Divergent Thinking

- *Analysis* - break down material to understand organizational structure
  - *Synthesis* - put parts together to form a new whole
  - *Evaluation* - judge value of material for a purpose
- Adapted from Grolund (1970)

## Classroom Environment

- Teacher inspires students to struggle with the discipline - both within and outside the classroom.
- Teacher needs evidence from students about their progress in learning

## What is assessment?

- Data collection with a purpose
- Courses: gather data about our students' learning.

## What type of data do we gather?

- Depends on the evidence we will accept that students have learned what we want them to learn.
- Data must be aligned with the course goals.
- Measures of knowledge, attitudes, and skills.
  - tests, extended responses, concept maps,
  - research papers, teamwork, communication



"THEN, AS YOU CAN SEE, WE GIVE THEM SOME MULTIPLE CHOICE TESTS."

## Functions of Assessment Data

- **Formative:** diagnostic feedback to students/instructor
- **Summative:** description of students' level of attainment
- **Evaluative:** curricular feedback to instructor
  - (e.g., effectiveness of field trip, lab investigation)
- **Educative:** students engaged in interesting, challenging experiences to develop further insight and understanding (Hodson 1992)

## In effect...

- Assessment **IS** a form of learning.

## Change in Focus for All Teachers (K - Grad School)

- From: teaching/instruction
  - To: learning
  - (i.e., What is actually learned by students?)
- From: linear, single discipline approach dealing with only theoretical problems
  - To: application through an integrated approach in dealing with real-life problems

### Biology Professor: (Kansas State University, 2002)

“The Director of the Science Education Center has introduced us to two cutting edge philosophies in teaching today, the 5E’s philosophy and cooperative learning. The five E’s are engage, explore, explain, elaborate, and evaluate and replace the usual teacher standing in front of the classroom lecturing.”

## Change in Focus for Students

Learners actively construct knowledge by

- Engaging in scientifically oriented questions;
- Giving priority to evidence;
- Formulating explanations from evidence;
- Evaluating explanations; and
- Communicating and justifying explanations.

– (NRC 2000)

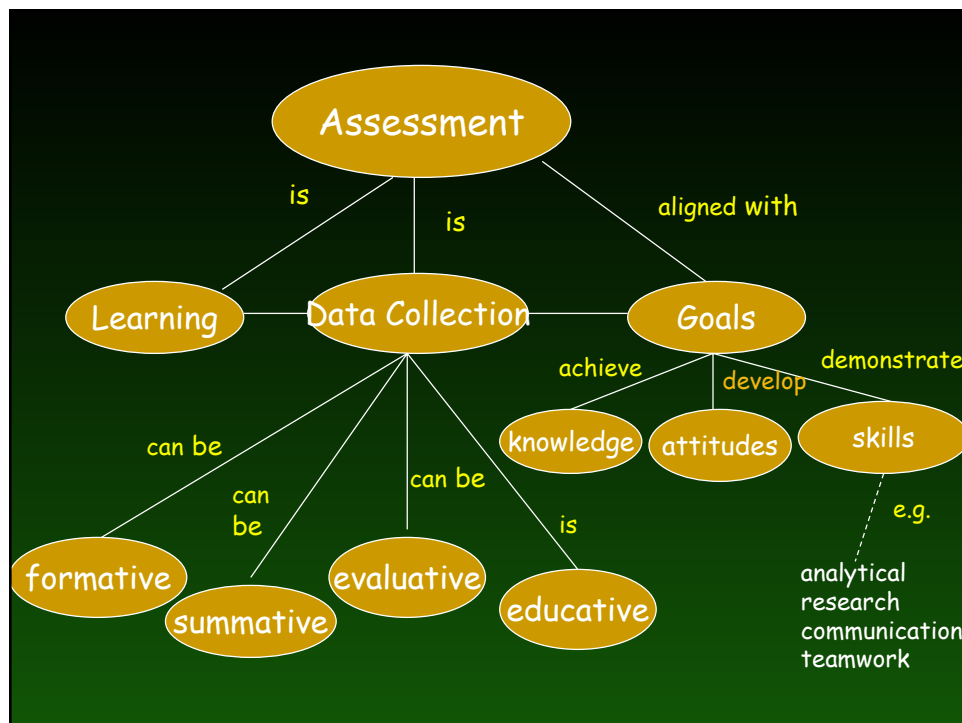
### FIRST-YEAR STUDENT: St. Lawrence University, NY

“ Bio is interesting, it’s 80 people in a lecture hall with a 3 hour lab and recitation. The lecture is weird, the prof has a weird teaching style I don’t really like, it’s a lot of figuring stuff out for yourself. But I may not like it because I don’t like the material, its scientific method stuff, which I never liked, and its not clear cut. Oh well.”



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## Assessments Linked to Goals

- Goals articulated with outcomes that are measurable or observable (actions)

So as you think about today,  
remember.....

- The greatest reform will come when faculty view themselves as reformers in their immediate spheres of influence, especially in their classrooms.
  - Karl Smith, University of Minnesota
- Success requires the courage to fail
  - Jeanne Narum, Office of Independent Colleges

## WHAT IS EFFECTIVE TEACHING/LEARNING?

- What is the role of the teacher?
- What is the role of the student?
- What kinds of evidence will you accept that your students have learned?

## TEAM GOALS

- Where do you want to be by Sunday in the context of the *FIRST II* project and your own team?
- Where do you want to be by the end of the 4-year *FIRST II* project?

## POINTS TO CONSIDER

- What constrains your teaching now?
- What will induce you to do more?
- What barriers exist to implementation of curriculum/course changes?

## Assessment of Reasoning - Engagement Problem:

E. O Wilson states that insects and other land-dwelling arthropods are so important that if all were to disappear, humanity probably could not last more than a few months. Based upon what you know today, do you believe that this statement is true? Write an essay and explain your reasoning as logically and thoroughly as you can. Do not use any outside resources for your essay.

## How do I develop a rubric?

- Describe the goals for the course or assignment
- Select the assessment tasks aligned with the goals
- Develop performance standards
- Differentiate levels of responses based on clearly described criteria
- Rate (assign value) the categories

## Advantages of Scoring Rubrics

- Improve the reliability of scoring written assignments, oral presentations, and other forms of student learning
- Convey goals and performance expectations of students in an unambiguous way
- Convey “grading standards” or “point values” and relate them to performance goals

## Advantages of Scoring Rubrics

- Engage students in critical evaluation of their own performance
- Save time but spend it well

## Limitations of Scoring Rubrics

- Problem of criteria
- Problem of practice and regular use
- Scoring Rubric website:

>> <http://www.wcer.wisc.edu/nise/cl1/flag>

## DIFFICULT TOPICS TO TEACH IN SCIENCE

- What topics have you found difficult to teach?
- How have you tried to enhance student learning about that difficult topic?
- Why did you choose those approaches?
- What are your students doing when you teach that difficult topic? What is their role?
- What is your role as the teacher?

## MAINTAINING COMMUNICATION

- How will you maintain communication and community with your team?
- How will we maintain communication and further build community among the 5 institutional teams?

## NEEDS ASSESSMENT

1. As a team write a one-paragraph description of your institution and its educational mission
2. Identify and post your institutional needs
3. Develop 1-year, 2-year, etc. goals for your team activities.
4. Develop 1-year, 2-year, etc. goals for your individual course activities.



## FUTURE PLANS

### **Emphases of the next workshop:**

1. Further experience with inquiry-based learning and teaching,
2. Exposure to teaching tools and methods,
3. Assessment, and
4. Team progress reports, feedback, and further action plans.