SUMMARY AGENDA

9:00 - 9:15 a.m.  WELCOME REMARKS, INTRODUCTIONS

9:15 - 10:00 a.m.  PKAL LEADERSHIP ACTIVITIES

10:00 - 11:30 a.m.  ACTIVITY  
Reformed Teaching Observational Protocol

11:30 a.m. - 12:30 p.m.  INFORMAL POSTER SESSION & LUNCH

12:30 - 1:00 p.m.  PRESENTATION  
Measuring the Dynamics of Student Learning

1:00 - 2:00 p.m.  WORKSHOP ACTIVITY  
Rapid Assessment & Web Reports

2:00 - 3:00 p.m.  ACTION ITEMS & PLANS FOR NEXT MEETING

3:00 - 4:00 p.m.  REPORT OUT TO FULL GROUP AND DISCUSSION OF NEXT STEPS

4:00 - 5:00 p.m.  RECEPTION
Welcome Remarks, Introductions

Time: 9:00 - 9:15 A.M.

Welcome
❖ Scott Franklin
   *Professor of Physics*
   Rochester Institute of Technology
❖ Anne Houtman
   *Head and Professor*
   Rochester Institute of Technology

PKAL 2.0 Strategic Plan

Mission
PKAL's mission is to be a national leader in catalyzing the efforts of people, institutions, organizations and networks to move from analysis to action in significantly improving undergraduate student learning and achievement in STEM (science, technology, engineering and mathematics) in preparation for careers and participation in this increasingly complex, globally-interdependent and technologically-driven world.

Vision
PKAL's vision is to significantly enhance the capacity of America’s colleges and universities to graduate more highly-qualified and liberally-educated STEM professionals and K-12 teachers, and to promote a higher level of among scientific literacy and reasoning all college graduates, with particular attention to broadening participation of underrepresented groups in STEM.

Goal
Regionally and nationally, PKAL will serve as the nexus of an interconnected and multidisciplinary community - bringing ideas, people, evidence, strategies and resources together – to more systemically lead change in undergraduate education to achieve PKAL’s mission and vision.
PKAL Leadership Activities

Time: 9:15 - 10:00 a.m.

Facilitators:

- Geoff Bowers
  Assistant Professor of Chemistry
  Alfred University
- Elizabeth Hane
  Associate Professor
  Rochester Institute of Technology
- Anne Houtman
  Head and Professor
  Rochester Institute of Technology

Since the first Summer Leadership Institute in 1996, PKAL has used Experiential Learning Exercises (ELE) as a means of teaching leadership and team building skills. During these exercises, we use the Experiential Learning Model based on Kolb’s Experiential Learning Cycle. See page 10 for more information.

Best Idea:

The authentic leader brings people together around a shared purpose and empowers them to step up and lead authentically in order to create value for all stakeholders. The dimensions of an authentic leader are: Pursuing purpose with passion, Practicing solid values, Leading with heart, Establishing enduring relationships, and Demonstrating self-discipline.

— Bill George, True North: Discover Your Authentic Leadership. 2007.
Activity

REFORMED TEACHING OBSERVATIONAL PROTOCOL (RTOP)

Time: 10:00 - 11:30 a.m.

Facilitators:
- Kathy Falconer
  Lecturer, Elementary Education & Reading
  SUNY - Buffalo State College
- Scott Franklin
  Professor of Physics
  Rochester Institute of Technology

- RTOP consisting of short videos of classroom activities, discussion with table about what they see in the videos, group summaries, as well as the application of consensus ideas to other videos to reinforce key ideas
- Website: http://physicsed.buffalostate.edu/AZTEC/RTOP/RTOP_full/index.htm
- See page 11 for RTOP materials

Best Idea:
In informal poster session & lunch

Notes:

Creativity is a lot like looking at the world through a kaleidoscope. You look at a set of elements, the same ones everyone else sees, but then reassemble those floating bits and pieces into an enticing new possibility. Innovators shake up their thinking as though their brains are kaleidoscopes, permitting an array of different patterns out of the same bits of reality. Change masters challenge prevailing wisdom. They start from the premise that there are many solutions to a problem and that by changing the angle on the kaleidoscope, new possibilities will emerge. Where other people would say, ‘That’s impossible. We’ve always done it this way,’ they see another approach. Where others see only problems, they see possibilities.

Kaleidoscope thinking is a way of constructing new patterns from the fragments of data available—patterns that no one else has yet imagined because they challenge conventional assumptions about how pieces of the organization, the marketplace, or the community fit together.

Keynote Presentation

MEASURING THE DYNAMICS OF STUDENT LEARNING

Time: 12:30 - 1:00 P.M.

Presenter:

Eleanor C. Sayre
Assistant Professor of Physics
Kansas State University

When do students learn science? How much, and in what way? How quickly do they forget? Physics Education Research (PER) is the field of physics that studies how people learn physics and how to teach them better. A classic method in PER is to pre-test students before instruction, teach them, then post-test afterwards to see how much they have gained. However, this method cannot capture the dynamics of student learning which are common to all disciplines. By testing students more frequently, we can observe rapid learning and forgetting, as well as destructive interference patterns. In this talk, I present data showing three kinds of “response curves” -- flat, step, and peak-and-decay -- and suggestions for how to measure the same kinds of behavior in your classes, whether they are in physics or other STEM disciplines.

Best Idea:
Workshop Activity

RAPID ASSESSMENT & WEB REPORTS (RAWR)
TIME: 1:00 - 2:00 p.m.

Facilitators:
- Eleanor C. Sayre
  Assistant Professor of Physics
  Kansas State University

See page 29 for activity sheet.

Best Idea:

I’d like my students to learn how to learn, to be involved in the process of teaching themselves. And to make commitments—not to be in love with the position, but to be in love with the search, so that if they find themselves not able to hold a position, if it turns out to be untenable, then they should have enough courage to say, “you know what I said last week? I no longer believe that.”

— Maya Angelou, 1993.
Action Items & Plans for Next Meeting

**TIME:** 2:00 - 3:00 P.M.

- Facilitators: TBD

Seating by institution type, work on action items and plans for next meeting. Attendees will discuss and share:

1. What challenges are facing your institutions?

2. How can a network of cross-disciplinary, cross-institutional faculty and leaders help?

3. What do we want to do? What will success look like?

Best Idea:
Report Out & Discussion of Next Steps

Time: 3:00 - 4:00 P.M.

Facilitators:
- Holly Lawson
  Associate Professor of Chemistry
  Director Science Education Partnership
  SUNY Fredonia

Best Idea:

Rules for Brainstorming

- No criticism. This is the premier rule of brainstorming. During the brainstorm itself, criticism is out. Whatever’s said goes on the list.


- Piggyback. Besides just making up ideas out of the air, take ideas already mentioned as a point of departure, extend them, and add a twist.

- Diversify. Try for different kinds of ideas—ideas in contrasting categories, ideas that come from different points of view.

Experiential Leadership Exercises

Experience - This cycle begins with an experience - an event or exercise in which the learner actively participates.

Reflection - Next the learner reflects on the experience, focusing on what happened, how he/she feels about it, etc.

Expansion - After reflecting, the learner expands on the original experience by identifying the abstract ideas, theories, and principles behind the exercise.

Application - The learner completes the cycle by transferring his/her newly acquired skills to situations in the "real world." This stage involves application of the experience to other situations and experiences with which the learner is engaged or will be engaged.

Real world application creates a New Experience and the cycle begins again.

After you have participated in a PKAL Experiential Learning Experience, you will be asked to reflect upon it, share your thoughts and feelings with others, contemplate and identify leadership and or teambuilding principles, and consider how you can apply these principles in your institutional transformation efforts. This is called “processing” or “debriefing”.

All PKAL Leadership Learning Experiences are presented as “challenge by choice.” This means that if you feel threatened in any way, physically or psychologically, by the challenge or problem you are asked to complete, you have the right to opt out of the activity and become a process observer. We do encourage you to participate even if this makes you a little uncomfortable because one aspect of leadership is risk taking and leaders needs to be willing and able to work outside of their comfort zones.

The Experiential Learning Exercises you will experience and the process we will use to debrief them are derived from work done during the past two decades by Sylvia Nadler (nadlers@william.jewell.edu) and Judy Dilts (diltsja@jmu.edu). Their activities and process are based on the Kolb learning cycle and from literature about how people learn.
Reformed Teaching Observation Protocol (RTOP)

Daiyo Sawada
External Evaluator

Michael Piburn
Internal Evaluator

and

Kathleen Falconer, Jeff Turley, Russell Benford and Irene Bloom
Evaluation Facilitation Group (EFG)

Technical Report No. IN00-1
Arizona Collaborative for Excellence in the Preparation of Teachers
Arizona State University

I. BACKGROUND INFORMATION

Name of teacher __________________________  Announced Observation?
(yes, no, or explain)

Location of class __________________________
(district, school, room)

Years of Teaching __________________________ Teaching Certification
(K-8 or 7-12)

Subject observed __________________________ Grade level __________________________

Observer __________________________ Date of observation __________________________

Start time __________________________ End time __________________________

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1) The instructional strategies and activities respected students’ prior knowledge and the preconceptions inherent therein. 0 1 2 3 4
2) The lesson was designed to engage students as members of a learning community. 0 1 2 3 4
3) In this lesson, student exploration preceded formal presentation. 0 1 2 3 4
4) This lesson encouraged students to seek and value alternative modes of investigation or of problem solving. 0 1 2 3 4
5) The focus and direction of the lesson was often determined by ideas originating with students. 0 1 2 3 4

IV. CONTENT

Propositional knowledge

6) The lesson involved fundamental concepts of the subject. 0 1 2 3 4
7) The lesson promoted strongly coherent conceptual understanding. 0 1 2 3 4
8) The teacher had a solid grasp of the subject matter content inherent in the lesson. 0 1 2 3 4
9) Elements of abstraction (i.e., symbolic representations, theory building) were encouraged when it was important to do so. 0 1 2 3 4
10) Connections with other content disciplines and/or real world phenomena were explored and valued. 0 1 2 3 4

Procedural Knowledge

11) Students used a variety of means (models, drawings, graphs, concrete materials, manipulatives, etc.) to represent phenomena. 0 1 2 3 4
12) Students made predictions, estimations and/or hypotheses and devised means for testing them. 0 1 2 3 4
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Rapid Assessment and Web Reports

R·I·T

K·STATE.

7/28/12
1 Instructor Pages

Below is a diagram of how an instructor can navigate the RAWR web site.

**Login**

**Report Problem**

**Reset Password**

**Home**: Displays the classes the instructors teaches or has taught in the past. For each class, displays links for the Autostats and Group Autostats for that task.

**Task Completion**: Displays which students completed their assigned tasks.

**Autostats**: Graphs that display average performance over time for each task.

**Group Autostats**: Displays performance for each task for a single week.

**My Account**: Displays account information.

**Account Settings**: Allows the user to change his contact email and password.
2 Student Pages

Below is a diagram of how a student can navigate the RAWR web site.

**Login**
- Report Problem
- Reset Password

**Home:** Displays the tasks available for the student to take along with the due date for the tasks. In addition, if a student has started a task, but not yet completed it, the time left to complete the task is shown.

**Task History:** Displays the tasks the student has already completed along with the dates they were completed.

**Task:** Displays questions for the student to answer.

**My Account:** Displays account information.

**Account Settings:** Allows the user to change his contact email and password.
3 Student Timeline

Below is a timeline showing how a student interacts with RAWR in a typical task period (usually occurs once a week). Each tick on the timeline represents four hours.

Midnight, morning of starting date for a task.

4 a.m., morning of the due date for a task, student receives an email instructing him to take the task.

4 a.m., morning of the due date for a task, student receives an email reminding him to take the task if he hasn’t already.

11:59 PM, due date of the task, if the student has not completed the task by this point, it is entered into the database that the student did not complete the task.
4 Instructor Timeline

Below is a timeline showing how an instructor interacts with RAWR in a typical semester. Each tick on the timeline represents a week.

- Two weeks before the start of classes, instructor emails Dr. Franklin (svfps@rit.edu) stating intent to participate in RAWR.
- A few days before the start of classes, instructor emails Dr. Franklin (svfps@rit.edu) with class list.
- End of add/drop period, instructor emails Dr. Franklin (svfps@rit.edu) with revised class list.
- Students participate in online tasks on a weekly basis, instructors can view statistics after each task period is finished.
For the next five questions, refer to the picture below. Vector \( \mathbf{W} \) has length 3, and is directed along the vertical axis as shown. Vector \( \mathbf{Q} \) has length 5, and is directed at an angle 127° from the vertical axis. You may use a calculator.

1. What is the dot product of \( \mathbf{W} \) and \( \mathbf{Q} \)?
   -4
   4
   -7.2
   7.2
   -9
   9
   -12
   12
   -15
   15

2. Does the sign of the dot product depend on the coordinate system?
   yes
   no

3. Is the magnitude of the cross product of \( \mathbf{W} \) and \( \mathbf{Q} \) equal to the magnitude of \( \mathbf{W} \)?
   yes
   no
don't know

4. Does the sign of the cross product depend on the coordinate system?
   yes
   no
don't know

5. Compare \( \mathbf{W} \) to \( \mathbf{Q} \).
   a. Are they the same magnitude as each other?
      yes
      no
      don't know
   b. Are they the same direction as each other?
      yes
      no
      don't know

For each pair of vectors, are their dot products positive, negative, or zero?

+  -  0
  +  -  0
  +  -  0
  +  -  0
  +  -  0

Below are the initial velocity (\( \mathbf{v}_i \)) and final velocity (\( \mathbf{v}_f \)) for a cart. In the space provided, please draw the change in velocity vector, \( \Delta \mathbf{v} \).

4.1 Concept Tasks
4.1.1 Vectors
Simple vector operations and arithmetic. Includes dot and cross products.
4.1.2 CLASS-Phys

Colorado Learning Attitudes about Science Survey – Physics version.

Here are a number of statements that may or may not describe your beliefs about learning physics. You are asked to rate each statement on a scale where 1 = Strongly Disagree and 5 = Strongly Agree.

Choose one of the above five choices that best expresses your feeling about the statement. If you don’t understand a statement, leave it blank. If you have no strong opinion, choose 3.

A significant problem in learning physics is being able to remember all the information I need to know.


I think the physics I experience in everyday life is relevant to my future career.


I find that reading the text in detail is a good way for me to learn physics.


I cannot learn physics if the teacher does not explain things well in class.


I study physics to learn knowledge that will be useful in my life outside of school.


I do not expect physics equations to help my understanding of the ideas; they are just for doing calculations.


When studying physics, I relate the important information to what I already know about the world.


Understanding physics basically means being able to recall something you’ve read or been shown.


Nearly everyone is capable of understanding physics if they work at it.


I don’t remember a particular equation needed to solve a problem as an adult, there’s nothing much I can do (legally!) to come up with it.


If you find physics a subject you dislike, I usually try to figure out a different route.


I view studying physics as a useful life skill.


Nearly everyone is capable of understanding physics if they work at it.


There could be two different correct values for the answer to a physics problem if I saw two different approaches.


I do not spend more time than necessary on a physics problem before giving up or seeking help from someone else.


To understand physics, I discuss it with friends and other students.


I am not satisfied until I understand why something works the way it does.


Reasoning skills used to understand physics can be helpful to me in my everyday life.


If a problem has more than one solution, I often try them all until one works.


It is possible for physicists to carefully perform the same experiment and get two very different results that are both correct.


When studying physics, I relate the important information to what I already know about the world.


Nearly everyone is capable of understanding physics if they work at it.

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