Teaching Physics in Alabama
Cohort 1 January 16-17, 2015
WW2 Year 2 EM Action Research

Alliance for Physics Excellence (APEX)

Physics Teaching Research Program (PTR)

Dennis Sunal, JW Harrell, John Dantzler, Cynthia Sunal, Marsha Simon, Donna Turner, Tara Ray, Michele Wooten, and Marilyn Stephens (PTR Team)

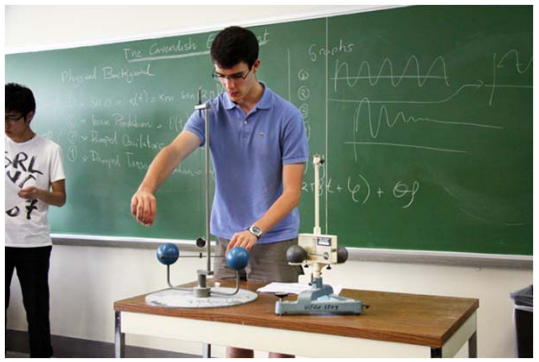
University of Alabama

Alliance for Physics Excellence

The goal of the *Alliance for Physics Excellence* (APEX) program is to integrate research-based teaching practices into Alabama physics classrooms via in-service teacher education, and evaluate the impact on physics teachers and their students in the state's school systems.

Teacher Action Research

Action Research is a strategy for extending APEX professional development and facilitating change in your electricity and magnetism unit physics teaching



Action Research Facilitates Change in Beliefs

- Over the last two summers we said……
  - ***All teachers have beliefs which guide their teaching.***
  - ***Beliefs are constructions of reality.***
  - ***Can you determine which of your beliefs are "truthful" or "misconceptions"?***
  - ***The process of changing is the process of changing beliefs.***
  - ***<u>How do you change beliefs?</u>***
  - ***How can you change your beliefs about physics teaching?***

Professional Development through Teacher Action Research

What is the Action Research process that will help you monitor your progress in using the APEX PTI information and understandings from the past 1½ years?

- **How will your study add to your understanding of the problem and question (teaching your E&M Unit)?**
- **What different kinds of evidence (documentation) are you using to answer your question?** Three sources are needed to give you confidence and understand the result.

Reflections on Teaching Physics During Spring 2015

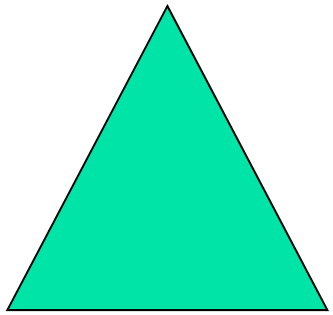
1. Christina Caldwell
2. David Hall
3. Mara Johnson
4. Mark Maddox
5. Angela McLeod
6. Angela Olguin
7. Cynthia Phillips
8. Rochelle Williams
9. Timothy Williams

APEX Cohort 1: Action Research Activity with Electricity and Magnetism Unit #1, Spring 2015

- **Description of context** of the Electricity and Magnetism unit
- **Lesson plans** or lesson outline of E&M unit
- **Daily diary of events** that occurred
- Administer students' **pre and post revised EMCI test**
- **Interview** your students
- Narrative reflective **summary** of the action research activity- **What did you learn? What was the evidence?**
- **Report the results of this activity with parts 1-7 in a written narrative report,** including the students' pre and post test scores and attach it in an email to dwsunal@bama.ua.edu by ***May 15, 2015***

Different Kinds of Evidence Used?

1.



2.

3.

How do these three sources work together to answer your question?

Inquiry Teacher's Actions and Students' Responses

Essential Features of Classroom Inquiry and Their Variations

Essential Features of Inquiry	1 Full Inquiry Teaching (Can Use Learning Cycle)	2 Coupled Inquiry (Can Use Learning Cycle)	3 Guided Inquiry	4 Directed Inquiry	5 Verification	6 Expository

More <_____ Amount of Learner Self-Direction _____ Less

Less <_____Amount of Direction from Teacher or Material _____More

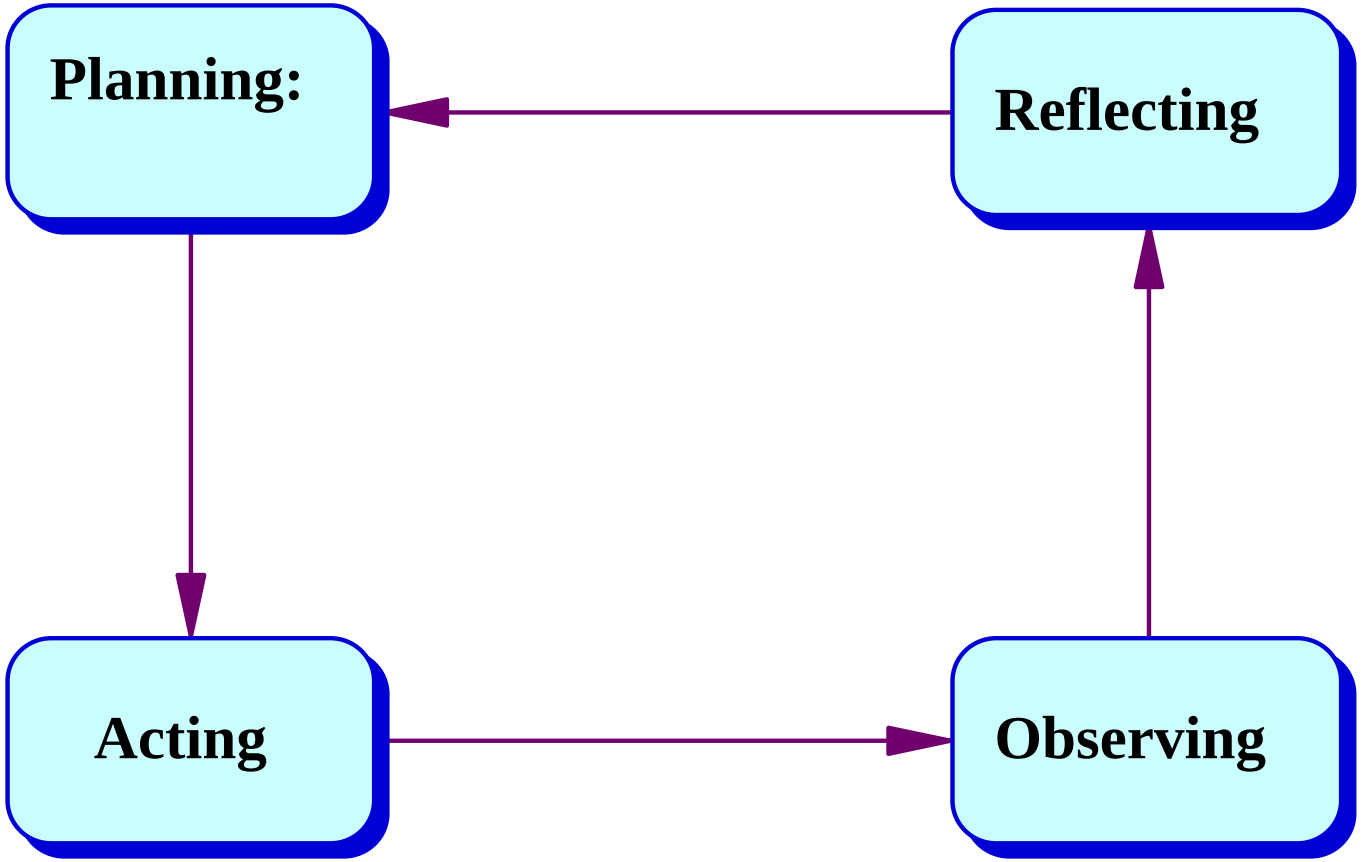
Essential Features of Inquiry	1 Full Inquiry Teaching (Can Use Learning Cycle)	2 Coupled Inquiry (Can Use Learning Cycle)	3 Guided Inquiry	4 Directed Inquiry	5 Verification	6 Expository
1. Learner engages in scientifically oriented questions	Learner poses a question	Learner selects among questions, poses new questions	Learner sharpens or clarifies question provided by teacher, materials, or other source	Learner engages in question provided by teacher, materials, or other source	Learner engages in question that replicates one provided by teacher, materials, or other source	Learner engages in no question to investigate
2. Learner gives priority to evidence in responding to questions	Learner determines what constitutes evidence and collects it	Learner directed to collect certain data	Learner given data and asked to analyze	Learner given data and told how to analyze	Learner given data and told how to analyze that replicates one provided	Learner given no data just conclusions
3. Learner formulates explanations from evidence	Learner formulates explanation after summarizing evidence	Learner guided in process of formulating explanations from evidence	Learner given possible ways to use evidence to formulate explanation	Learner provided with evidence	Learner provided with evidence that replicates conclusions already given	Learner provided with no evidence, only conclusions
4. Learner connects explanations to scientific knowledge	Learner independently examines other resources and forms the links to explanations	Learner directed toward areas and sources of scientific knowledge	Learner given possible connections	Learner provided with connections	Learner provided with connections that replicates one provided	Teacher reports connections
5. Learner communicates and justifies explanations	Learner forms reasonable and logical argument to communicate explanations	Learner coached in development of communication	Learner provided broad guidelines to sharpen communication	Learner given steps and procedures for communication	Learner reports how close to the textbook the conclusions were	Learner reports no conclusions

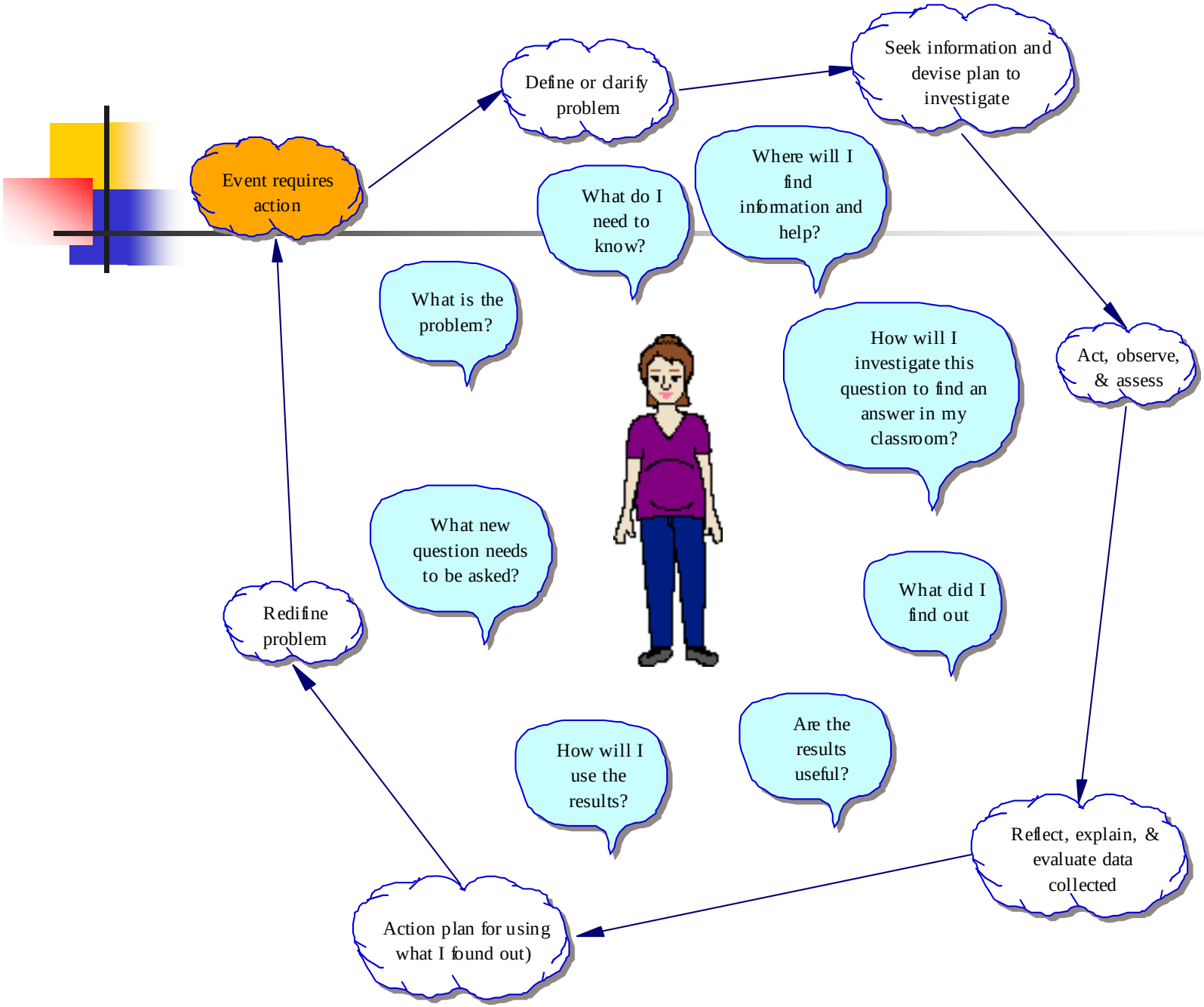
Teacher Action Research

Action Research as a strategy for facilitating change in your physics teaching

the Physics Classroom

Basic Processes of Action Research




Event requires action
Define or clarify problem
Seek information and devise plan to investigate
What do I need to know?
Where will I find information and help?
What is the problem?
How will I investigate this question to find an answer in my classroom?
Act, observe, & assess
What new question needs to be asked?
What did I find out
Redifine problem
How will I use the results?
Are the results useful?
Reflect, explain, & evaluate data collected
Action plan for using what I found out)

Ongoing Action Research Model
(perhaps several cycles for a complex innovation)

A Spiraling Process:

- revise focus (**redefine problem**)
- modify or use new hypotheses (**plan**)
- leading to new actions and new data analysis (**act, observe & assess**)
- revise previous conclusions (**reflect, explain & evaluate**)
- redevelop grounded theory (**understand**)
- etc.... in a continuous spiral leading to self-professional development and change

Action Research: Summary

- Note that the question is not, “What should the teacher do next Monday?”, but rather “How can you select, adapt, use, or re-conceptualize PTI materials to make learning more productive for students?”
- Action research, also, involves physics teachers in the process of defining, making decisions about, and solving problems leading to their own professional change and growth.

Action Research

- **Not a deficit model**
- **Experience is not enough**
- **Creates a climate of search for knowledge. This is more likely to produce change than finding answers.**
- **Not traditional formal research**
- **Self-reflective inquiry to improve teaching**

References

- Albern, S. (2011). A toolkit for action research. Lanhan MD: The Rowman & Littlefield Publishing Group, Inc.
- Angelo, T. & Cross, P. (1993). *Classroom assessment techniques*. San Francisco: Jossey-Bass
- Lawson, A. (1995). *Science teaching and the development of reasoning*. Belmont, CA: Wadsworth
- Sagor, R. (2005). *The action research guidebook: A four-step process for educators and school teams. Thousand Oaks CA: Corwin Press.*
- Schmuck, R. (2006). *Practical action research for change.* Thousand Oaks CA: Corwin Press.
- White, R. & Gunstone, R. (1992). *Probing understanding*. New York: Falmer Press.

Action Research Related Web Sites

Developing an Action Research Plan with Examples

http://www.bamaed.ua.edu/sciteach

Web-based Action Research Activities:

http://archon.educ.kent.edu/Oasis/Pubs/0200-08.ht

An Introduction to Action Research

http://www.phy.nau.edu/~danmac/actionrsch.html

Action Research-Linked Sites

http://carbon.cudenver.edu/~myder/itc/act_res.html

Virtual Fly Lab:

http://vcourseware3.calstatela.edu/VirtualFlylab/IntroVflyLab.html

Physics Teaching Resource:

Pathway: Physics Teaching Web Advisory. Ask an expert a question.

- ***http://www.physicspathway.org/***
- ***Digital video library for physics teaching at secondary school level***
- ***Four expert physics teachers provide expert advice in short scenes through synthetic interviews - Roberta Lang, Paul Hewitt, Chuck Lang, & Leroy Salary***
- ***Related Videos are also available***

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