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

Alliance for Physics Excellence (APEX)

Physics Teaching Research Program (PTR)

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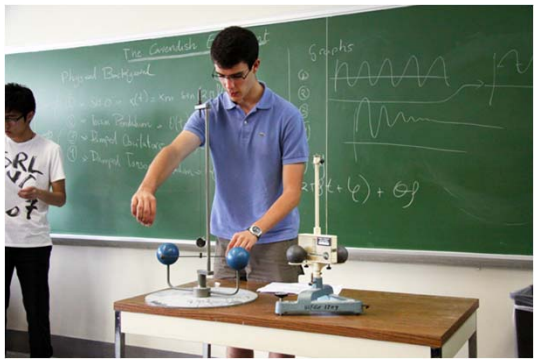
Alliance for Physics Excellence

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 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?**
- **What are the different kinds of evidence (documentation) are you using to answer your research question?** Three sources are needed to give you confidence and understand the result.

Reflections on Teaching Physics During Fall 2014

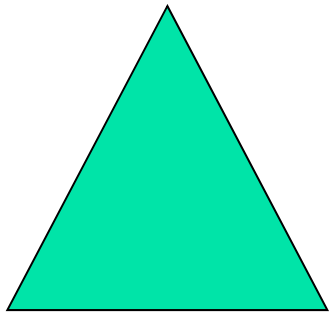
1. Christina Caldwell
2. David Hall
3. Mara Johnson
4. Mark Maddox
5. Angela McLeod
6. Angela Olguin
7. Cynthia Phillips
8. Rochelle Williams
9. Timothy Williams

APEX Cohort 1: Action Research Activity with Force and Motion Unit #2, Fall 2014

- **Description of context** of the Force and Motion unit
- **Lesson plans** or lesson outline of unit
- **Daily diary of events** that occurred
- Administer students' **pre and post revised FCI test**
- **Interview** your students
- Narrative reflective **summary** of the action research activity- **What did you learn? What was the evidence?**
- **Present**, **compare, and reflect** on your results during the 2nd APEX weekend workshop of 2014-15 school year

Different Kinds of Evidence Used?

1.



2.

3.

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

APEX Cohort 1: PTI Action Research Reflection Activity

Physics Units taught in Fall 2014

Based on your reflections on teaching physics as a result of additional intensive workshops in Summer 2014 and the Weekend Workshop in November. Report your thoughts on teaching this year so far.

Reflections on Teaching Physics at This Time

1a. Describe the Force and Motion unit you investigated during fall 2014?

1b.Has your physics teaching changed so far during APEX?

What evidence can you provide for this?

Reflections on Teaching Physics at This Time

2. What was different from what you did previously, that worked well?

What evidence can you provide for this?

3. What was different from what you did previously, that worked well?

What evidence can you provide for this?

Reflections on Teaching Physics at This Time

4. What do you want to try that you did not do?

What evidence can you provide for this?

Reflections on Teaching Physics at This Time

5. What kinds of results/products did these changes produce in your students?

What evidence can you provide for this?

In your own beliefs about teaching physics?

What evidence can you provide for this?

Reflections on Teaching Physics at This Time

- **1a. Describe the Force and Motion unit you investigated during fall 2014?**
- **1b.Has your physics teaching changed so far during APEX?**
- **2. What was different from what you did previously, that worked well?**
- **3. What was different from what you did previously, that worked well?**
- **4. What do you want to try that you did not do?**
- **5. What kinds of results did these changes produce in your students, in your own beliefs about teaching?**

Reflections on Teaching Physics at This Time

6. How can share and disseminate what you have done in your classroom as innovative teaching?

What evidence can you provide for this?

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

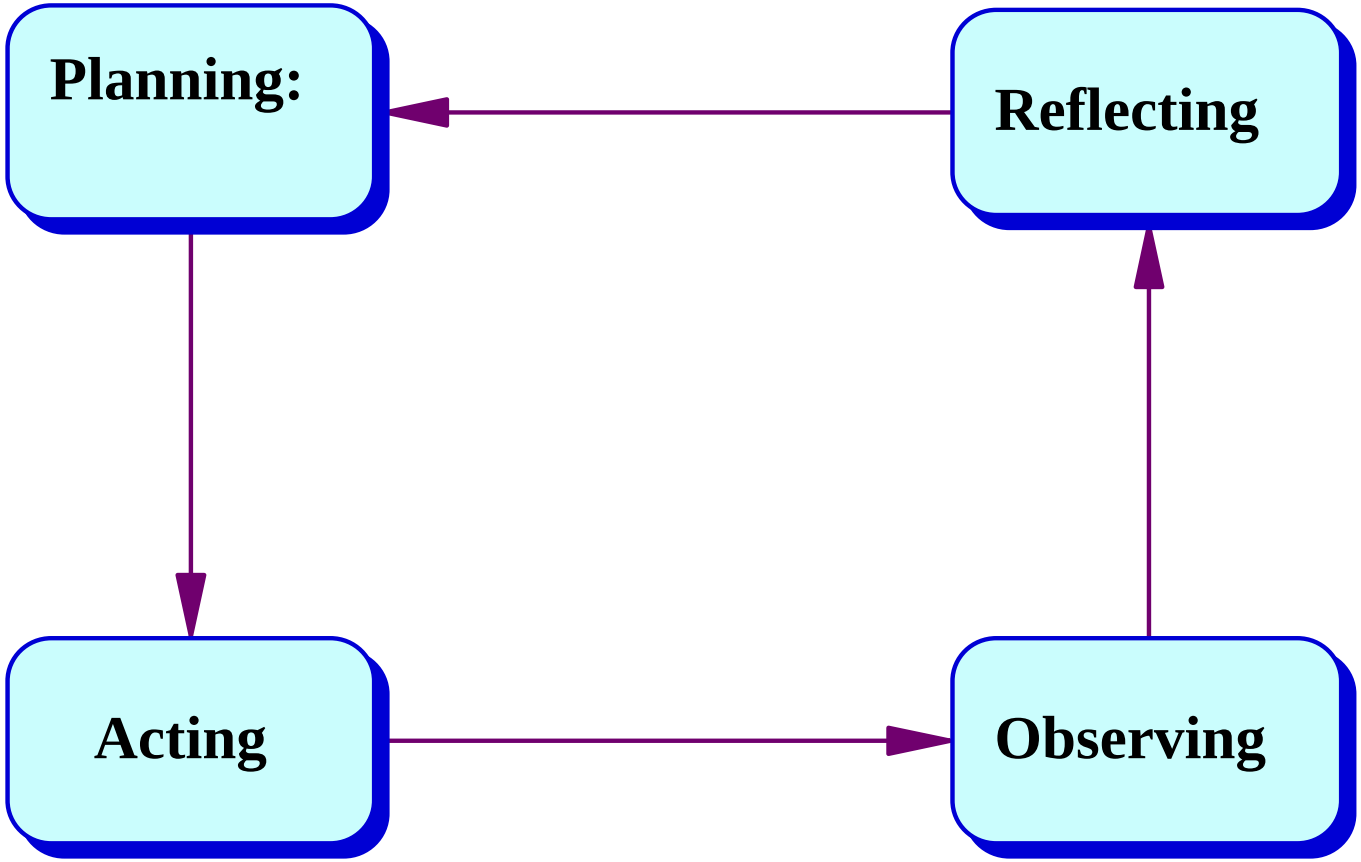
Essential Features of Inquiry	1 Full Inquiry Teaching (Can Use Learning Cycle)	2 Coupled Inquiry (Can Use Learning Cycle)	3 Guided Inquiry	4 Directed Inquiry	5 Verification	6 Expository
1. Learner engages in scientifically oriented questions	Learner poses a question	Learner selects among questions, poses 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

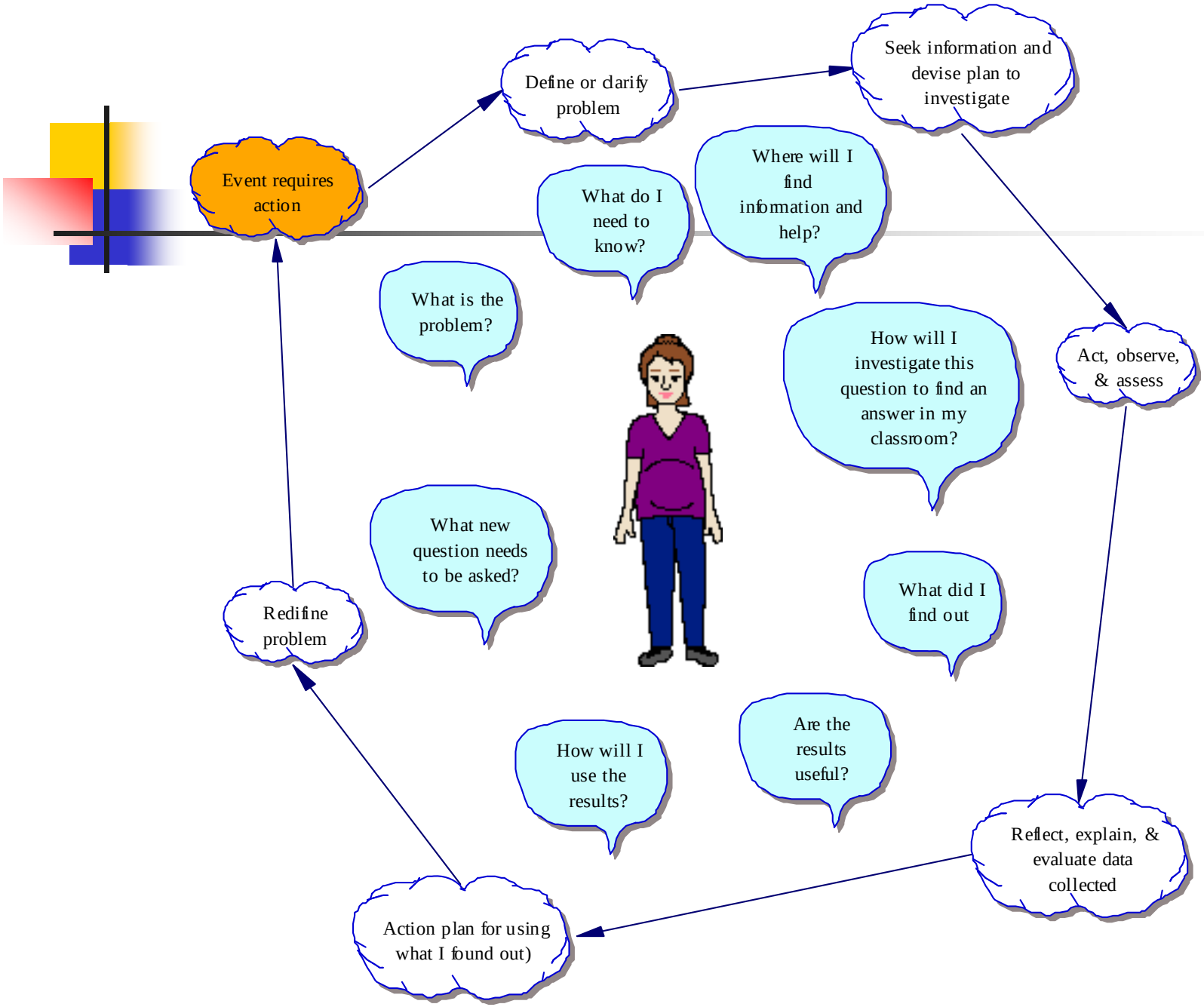
Teacher Action Research

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

Questions

- **What are “daily researches?”**
- **How do we get away from (and convince others- parents, administrators) the belief and view that teaching and learning are “a bag of tricks” we perform each class day?**
- **Not all research is of equal value. What are the characteristics of professional information on teaching and learning that teachers <u>need</u> to consider and evaluate critically.**

Questions

- **What is your REAL belief about the statement "Educators who work in … schools remain unconvinced of the efficacy of most of what gets published in scholarly [research] journals in the field of education?" Do you agree? Explain!**
- **How can research be a way of knowing for all of us? In what sense is this possible? Aren't there people who do research and the rest of us don't do research, so we have to trust what they tell us?**

Questions

- **To call yourself an "expert teacher" do you have to be proficient in *searching for*, *reading*, *planning*, *writing*, and *conducting* research in your classroom. Explain why or why not! Must all teachers be proficient? Why?**
- **What is the meaning of "Research provides us with a 'Lens' to consider our practice…"**

Question Summary

- Rate yourself on each of these rubrics in the way you deal with research:
- Lack of time 1 2 3 4 5 Have adequate time
- Impractical 1 2 3 4 5 Practical
- Not Proficient 1 2 3 4 5 Proficient
- Based on these rubrics and other factors do you avoid research in any of its forms (*searching for*, *reading*, *planning*, *writing*, and *conducting)*? Explain! .....

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.

Why Action Research?

- ✓ **Educational ideas of others are of little real use on their own**
- ✓ **Any "good idea" is a only working hypothesis, not a conclusion. It needs to be tested by you in your physics classroom to gain credibility. Then it becomes our idea that is fully meaningful to us.**
- ✓ **Successful change must use our ideas**

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

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- 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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