

Learning Through Action Research While Teaching Undergraduate Science

Penny J. Gilmer
Florida State University

+ Action Research to Improve Science Interest and Learning

- Most undergraduate teaching reform so far is at lower division
 - Taylor, Gilmer & Tobin (2002)
 - Sunal, Wright & Day (2004)
 - Glaser et al (2006)

- Fewer reform efforts at upper division
 - White (2001, 2002)
 - Gilmer (2010)

- Action research
 - Kemmis & McTaggart (1988, 1990)
 - McDonald & Gilmer (1997)
 - Wright & Sunal (2004)

- Fourth Generation Evaluation (Guba & Lincoln, 1989)

+ Key features of action research

- 1) reflexive critique
- 2) dialectical critique
- 3) collaborative resources
- 4) risk
- 5) plural structure, and
- 6) theory, practice, transformation

Winter, 1989
Hunter, 2007

+ Context

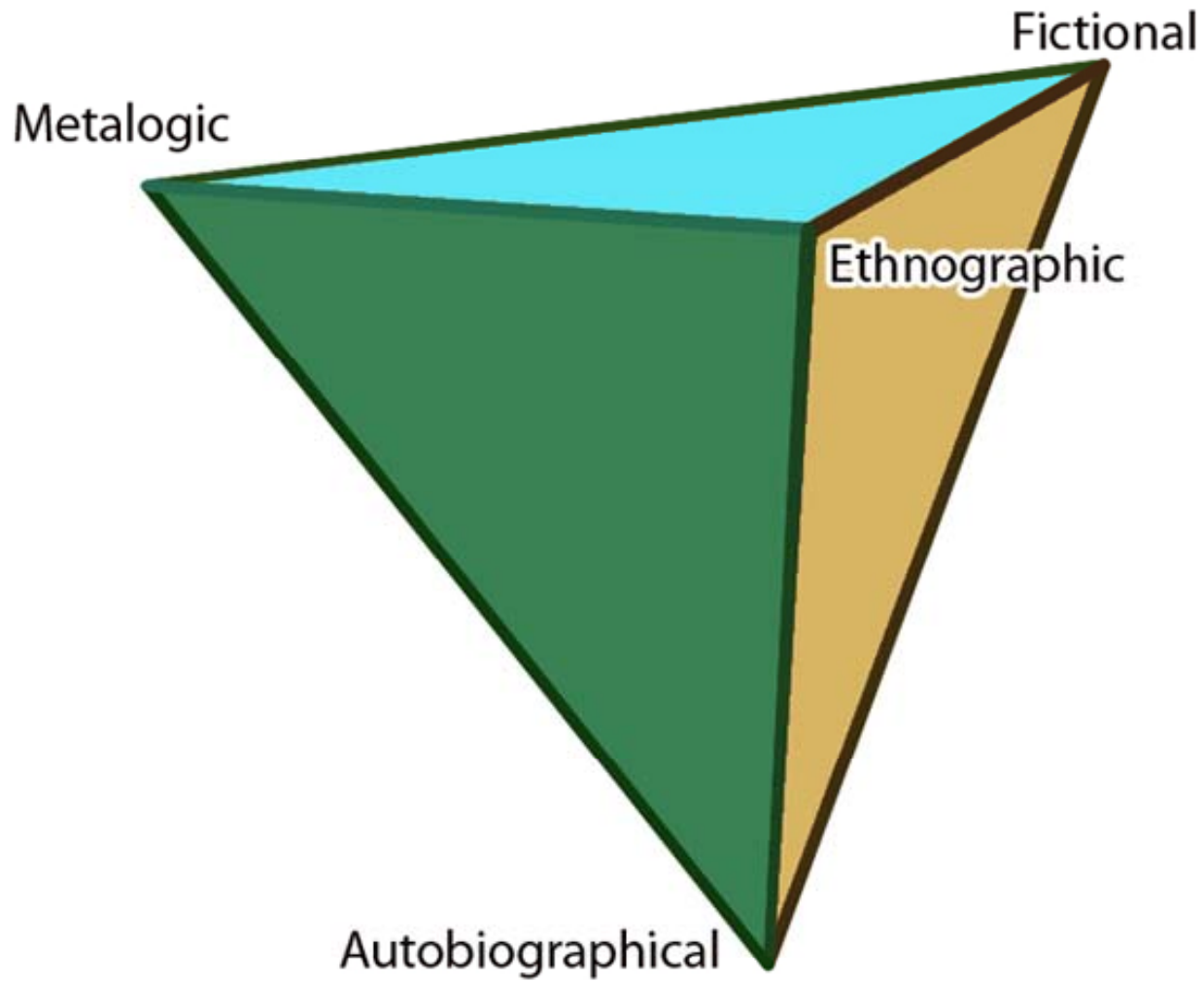
- Biochemistry capstone course for science majors
- 34 students, mainly undergraduates, 4 graduate students
- Features to enhance students' interest and learning
 - Technology
 - Collaboration
 - Peer review
- Ethnographic data
 - Higher Education Constructivist Learning Environment Survey
 - Collaborative Learning Survey (CLS)
 - Optional Final Question
 - Interviews

+ Theoretical perspective

Communities

CHAT diagram with **Rules, Communities, Division of Labor** and **Tools** interacting and influencing the **subject's object** and **outcomes**

+ Four genres utilized



+ Some data...

- Ethnographic
 - CLS – each group responded on learning environment on days web site was due
 - Final optional question
- Fictional
 - Students responding to fictional story I wrote one year later – and they told me more about the class
- Autobiographical
 - Reading Brufee's book on *Collaborative Learning* challenged my ideas on truth
- Metalogue
 - Discussion on epistemology and nature of truth in science

+ Students' ideas on collaborative groups

- 1. Coordinate and communicate within the group.
- 2. Try to be punctual to all meetings.
- 3. Listen to each other's thoughts and feelings.
- 4. Get more organized and start making meetings more efficient.
- 5. Assign in advance the tasks needed to complete on time.
- 6. Communicate and share (Web) sites/info that is helpful to each particular aspect.
- 7. Talk one on one.
- 8. Do (biochemistry) chapter problems together.
- 9. Meet outside of class more.
- 10. Keep in mind all of the information we have learned for future collaborative work.
- 11. Continue working closely and accept ideas from one another (Gilmer, 2010, p.127).

+ CHAT diagram as related to self as

Rules

Positivist view of science and epistemology

Communities

Science educators, students, and science colleagues

Division of Labor

Effective roles for students and teacher

Similar CHAT diagrams for individual students and for metalogue professor

+ Action research is cyclic

- In later courses, I applied my learning from one action research cycle into next course with Group learning projects (GLP) with more structure.

- Submitting the proposal for the GLP
 - Choose your topic and question
 - Find resources
 - Prepare your project proposal

- Submitting the GLP and the critiques
 - After approval, work on the project
 - Prepare a reference section
 - Critique your own project
 - Post your project on the group Web page on Blackboard
 - Critique one other group's project (i.e., peer review)

+ Book is published by Springer (2010)

- Focus in the book was more on the learning of the students
- Today's focus in presentation was more on the learning of the teacher

