Session III

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Action Research in the Science Classroom

Session III Overview

- Brief discussion of progress so far
- Qualitative Data Analysis
- Writing up findings
- The final paper, presentations
- Q & A on your studies

Credit: NASA

Poll: Who has begun to analyze their data?

Let's Share…

- Have you begun your analysis?
- What are your data sources?
- What challenges have you experienced or what challenges to you foresee?
- What has been your favorite part so far in the action research process?

Qualitative Research, Revisited

- Inductive
- Strong attention to details
- Interpretive, interested in meanings
- Small sample size
- Contextual
- In-depth
- Naturalistic
- Not meant to be generalized

http://www.socialresearchmethods.net/

Where should you be in your study?

- Data collection
- Analysis
- Writing

- Moving forward: How can you ensure that your research findings are of high quality?

Rigor, Revisited

- Triangulation of Data Sources
- Member Checking
- Peer debriefing
- Rigor in Analysis Techniques

Credits: Library of Congress & GLOBE program

Steps for Analyzing Qualitative Data . . .

1. Determine the sources to be used.

2. Study each source individually
   a. Examine line-by-line, item by item and make notes (“memoing”)
   b. Categorize and sort – consider using a visual representation (colors, numbers, letters, chart, table, etc.)
   c. Chunk pieces of data together that fit into categories (find themes across all data sets)

Student Work

Standard 1—Analysis, Inquiry, and Design

Elementary

Mathematical Analysis

Student Work Sample

Context

Math 4/5 Pilot test Spring 1995

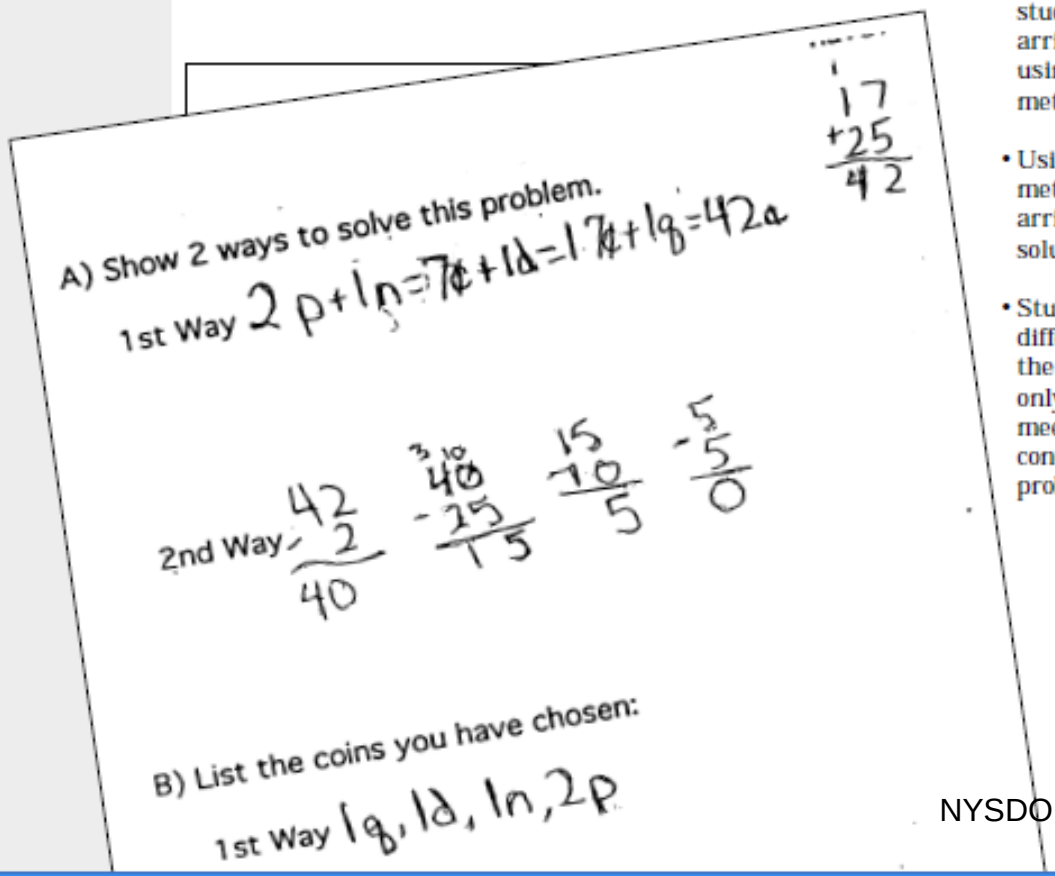
Performance Indicators

Students can:

. . . explore and solve problems generated from school, home, and community situations using concrete objects or manipulative materials when possible.

Task

I have 6 coins worth 42 cents. What coins could I possibly have? Draw a picture of the 6 coins which total 42 cents.



Commentary

The Sample:

- The symbolic equation clearly illustrates the thinking of the student as he/she arrives at a solution using an addition method.
- Using a subtraction method the student arrives at a second solution.
- Student shows two different solutions to the 42 cent sum, but only the 2nd way meets both conditions of the problem.

NYSDOE, 2009

Interview Transcripts

	uncomfortable w/ other stuff	
42.	And science to me is not creative is not flexible it's not what we talk about in class, what we read about, so – it's refreshing. It really is.	
43.	*So how do you put that like into what you think? Like what is being presented in class, as it being a more of like a creative thing?*	
44.	I guess more or less, it's - I feel like more or less I am a product of science being all about your results and not about it being a process (*right*) and I feel like we talk about finding a balance between you know teaching students about the process of science while at the same time complementing that with the actual material they need to learn. I feel like in the earlier stages – I might be totally wrong and off on this, but based on what I learned so far – I feel like the early years of elementary is more not about actual content but about just teaching what science is and making it really fun but relevant at the same time. Cause, talk about science, they already have, you know, knowledge, a knowledge base, they have to make sense of everything in their environment (*right*) so we're working off of that and possibly rectifying incorrect, you know -	Nature of science teaching: - Science "not creative" / "all about results" vs. "process" Teaching to dev. needs - e.g. age relevance: "not about content but what science is" Teaching to dev. needs: - e.g. build on kids' environmental sense making / "rectifying (what is) incorrect"
45.	*Right, addressing misconceptions*	
46.	Right – exactly. Addressing misconceptions and then like the latter years of elementary, is where I would think you start introducing like photosynthesis and you know – but I don't know. But when I went to River East and those FOSS kits and I don't really like them.	Teaching to dev. needs: - "addressing misconceptions" [also last sentence #44, #45] Source of ideas / Thinking like science teacher: FOSS kits don't work (even though not sure why / how to fix)

#8: Ey um so…
A: So, you took bio in college any other…?
#8: Bio, physics…
A: Oh, you did take physics?
#8: Um yeah I really enjoyed physics too. It was just like um it was just like all these different phenomenas sort of started to make sense on a deeper level.
A: Oh, that's great.
#8: I mean it was sort of I guess right…
A: Mmhmm.
#8: Yeah it was interesting. Yeah, it was kind of cool. I never took chemistry. I actually speaking of like changing careers and stuff I thought I might want I really was pretty serious about um going back to school to um go into natural medicine.
A: Mmhmmm.
#8: Um natural pathic medicine and stuff so I was actually at the city college and started a chemistry class, but then it it I just it wasn't I don't know there's I was just trying to figure out what I really wanted to do. For some reason I always wanted to kind of be in teaching but I didn't know I don't know, it was hard for me to take that plunge and being like okay I'm going to I want to be a math teacher or ya know go into the school system or blah blah blah so…
A: Yeah.
#8: So that yeah I haven't taken too much chemistry but…
A: Yeah, okay.
#8: That's what it is.
A: Well, how do you uh since you enjoyed the physics stuff end of it like how do you feel about doing a physical science like physical science is like a chemistry earth science um physics how do you feel about teaching physical science with your perspective students?
#8: Um I feel, generally speaking…?
A: Mmhmm.
#8: Like good but as far as um I feel like I'd need to brush up on a lot of stuff ya know…
A: Mmhmm.

attitudes sci~
imp of PS
phys sci exp as student~
prior sci experience as a student~
want to be a teacher~
phys sci exp as student~
prep to teach science~
OE~
attitudes sci~
confidence~

. . . Steps for Analyzing Qualitative Data . . .

3. Note ideas that emerge across data sets – what are major themes?

    Are all themes relevant?

4. Note what doesn't fit– why not?

    Are outliers significant?

5. Review your research questions– do they still fit?

Steps for Analyzing Qualitative Data

6. Time for member-checking and peer debriefing!

7. Go through your data multiple times

8. Return to your themes and choose ‘exemplars’ that support your themes to begin writing (These are examples from your raw data that best illustrate the phenomena you are trying to show). Do not include all data in the body of your paper!

A Great Overview:

http://oldweb.madison.k12.wi.us/sod/car/caranalyzingdata.html

Madison Metropolitan School District

CLASSROOM ACTION RESEARCH

Guidelines for Analyzing Your Data

- Design a systematic approach to analyze your data. This may develop as you become more comfortable with what you are learning.
- Do not be afraid to let the data influence what you are learning as you go deeper with your analysis.
- Look for themes and patterns to emerge. Look for those unique ideas that you had not considered which may influence your thinking.
- Make sure that you are organizing your data based on what you are actually learning from the data, not on the assumptions you bring with you to your analysis.
- Don't censor the data, even if you don't like what you are learning. Include data that doesn't necessarily reflect change or growth. All of this is part of the learning experience and can still inform our practice.
- Go through your data several times. New ideas will occur to you with a fresh perspective.
- Think about creating visual images of what you are learning. A grid, an idea map, a chart, or some visual metaphor are all possibilities to help make sense of the data and display a powerful presentation of your ideas.
- Write lots of notes to yourself (post-its work well) as you are sorting. This kind of reflection will help you as you step back and try to look at the big picture.
- Share your findings with a colleague. Do new questions emerge from this discussion?
- Let the data influence you. Jot down ideas for actions you will take as a result of what you are learning.

Writing Up Your Analysis - Methods

The Methods Section of your Action Research Report will eventually contain:

- Setting and participants
- Data Sources
  - Describe each type
  - Include a description of any instruments (copies in appendix)
    - Questionnaires
    - Assessment probes
    - Interview protocols
- Data Analysis Techniques
  - Specifically what YOU DID
- Elements of rigor

Methods

Case Study

This qualitative study draws a general picture of how group and individual change occurred over time using a case study approach. The methodological approach to this study is based on "description, interpretation" and "identif[ication] of recurrent patterns in the form of themes" (Merriam, 1998, p. 12). The case being studied was of one individual participant within the context of a whole class. Several methods of data collection were employed to draw the case, which was constructed using multiple data sources and artifacts that were also used for triangulation. The purpose for collecting these sources of the data collection was to ascertain experiences, practices and attitudes of the participants through their own lens and through the observations of the researchers.

Setting and Participants

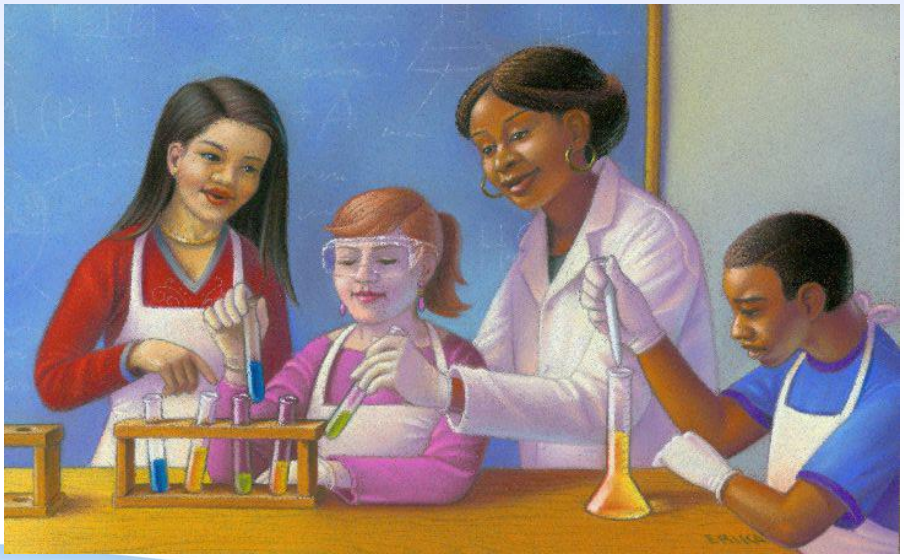
This study took place in an elementary science methods course—Science in Childhood Education, over 16 weeks during fall 2007 semester, which enrolled 23 preservice teachers (and 3 doctoral candidates as participant observers). For some of the participants, this was one of their first graduate education courses. Many of the participants had no formal teaching experience or background in science teaching. The environment engendered by the professor (second author) was constructivist with an emphasis on science teaching through inquiry, multiculturalism, social justice, and the relevance of science to everyday life in the city and to urban school students.

Data Collection & Analysis

Data was collected through open-ended surveys at the beginning of the semester, field notes taken by the first researcher acting as a participant-observer throughout the semester, a reflective journal of the second researcher, and interviews with one participant, Kasey. This participant was chosen based on her interest in science and in participating in this study through sharing her experiences. The first author conducted the first interview with Kasey at the mid-point of the

Writing Up Your Research - Findings

1. Tell the story of what your data shows
   - be very descriptive
2. Use exemplars to support your findings
   - these are examples from data that support your themes
   - Create appendices to support exemplar findings.



Sample Findings –

Whole Class

For the class as a whole (N=23), the preliminary surveys asked a general question about their science teacher identity: "Do you see yourself as a science teacher?" They results indicated a reoccurring reason for participants who did not self-identify as a science teacher—their lack of

experience with science, whether it was a lack of content experience or science teaching experience. In-class observations also indicated that participants' lack of experience was a factor in their expressions of negative self-efficacy and expectancy outcome for science teaching. Below are some examples:

Yvette: My impression of someone who teaches science full time is they love science and science was not something I gravitated towards in school ... I am not a 'science person'... Hopefully by the end of the course I will feel more confident about teaching something that I am not naturally good at.

Anna: My lack of exposure makes me wary.

It is therefore not surprising that participants expressed an increase in self-efficacy and

Sample Findings –

Table 6.2: Participant Statements of Science Self-efficacy, End of Semester

Participant	Science self-efficacy at the end of the semester
Kim	"I think that science is really fun with elementary schools in terms of like the kids get so excited when you could totally play up like: 'You're the scientists!' …just be interactive and not just sit there and listen, so I think that that's the fun part of science and that's the part that I would try and draw out."
Ben	"I don't know a lot about the nuts and bolts as far as planning lessons . . . but I feel like if it's planned appropriately it's like you know there's no science material I can't understand. It's just a matter of like really trying to plan fun things that are really interactive for the kids. It's not really intimidating I guess anymore."
Rachel	"If I had my own class I would see myself teaching science. . . . I definitely didn't feel confident about teaching it - um it I was very nervous about it - but I, I did feel like it was an important um topic for um to incorporate into the classroom but yeah this [class] has definitely helped me feel more confident in it and have a better understanding of kind of doing the research in order to prepare to teach science."
Laura	"I think I'll be more likely now to sort of look science into my regular topics, you know, into studying other units. You know um, which I dc class I don't, you know, I don't think I would r
Jocelyn	"I still I kind of still feel that I don't know how
Bernard	"I don't know how you're going to teach peop

Table 6.3 Science Activities

Opportunities to Gain science Content Knowledge
▪ Researcher as guest instructor for two class meetings: demonstrating six inquiry-based lessons, introducing physical science concepts to grades K-3
▪ Science in the City Photo Album: connection of science content standards to images of science in the city
▪ Bridging Art and Science Project
▪ Microteaching: planning and teaching a science content lesson in an elementary classroom
▪ Expectations and Reflections papers: reflections on planning and teaching a science lesson

Data Analysis

- Refer to the rubric.
- Suggestion- Speak to the findings from each source independently.
- Discuss how you analyzed your data
- Include direct quotes, specific results.
- DUE: March 17

Writing Up Your Research - Discussion

- This is where you explain what your findings mean
- Use the context of your literature review to make connections to existing body of knowledge
- Be sure to revisit your research question in light of your findings

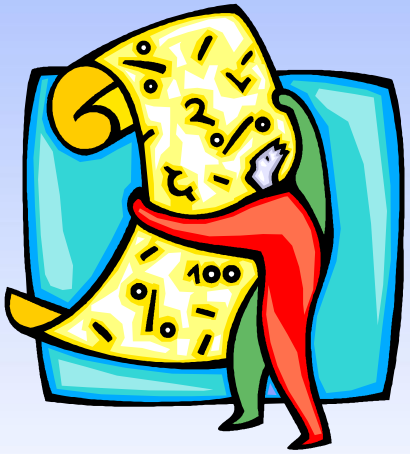
Writing Up Your Research - Conclusion

- Briefly summarize what you found and what it means (one-two paragraphs)
- Discuss the implications for your study in your class, school and the field of education in general
- Make the connection between research questions→ methods→ results

Presentation – Due March 24
Presentations March 26

- Three slides:
  - Research questions, purpose of your study, why are you interested in this study? MAJOR lit review points
  - BRIEF outline of data collection and analysis
  - Major findings & Personal Reflections on action research and what you've gained
- Please be BRIEF!! MAX 4 Minutes!
- Please submit to the dropbox by 12 noon on the 25th – Thank you!

Final Paper – Helpful Hints



- Sections:
  - Introduction
  - Literature Review
  - Methods
    - (include: Setting and Participants, Data Collection and Data Analysis explanations here)
  - Findings
  - Discussion
  - Conclusion

- Address comments on previous section drafts

- Use the rubric to guide your work

- Due **March 31**

Deadlines and Follow up

- 2nd Conferences are not necessary- only by request
- March 17- Data Analysis
- March 24- PPT in Dropbox
- March 26- Presentations
- March 31- Final Papers

Questions on your research process?