

Group #1: Natalie Elliott, Matthew Gardiner, Cindy Moore, Erin Rausch, Michelle Turner, & Patrick Zuniga

Instructions: After viewing the presentation by Dr. Eva Horn: *Understanding Evidenced-Based Practices and Consuming Research*, work together in your group to identify 2 articles and analyze each one using the process outlined below. Finally, as a group, complete the last section highlighting the group's overall evaluation.

1. Source

Authors

Are the researchers affiliated with a professional organization, university or research institute?

Does the person or the organization appear to promote a political or "profit" agenda?

Does the publication mention using a peer-reviewed process?

The research topic/question

Was the research topic(s) defined?

Is it based on theory, previous research or other evidence? Is relevant research literature reported? Analyzed critically?

Was a research question clearly stated? Are the related hypotheses testable?

Do the definition of key terms and variables used make common sense?

Is a justification given - i.e. why research is important?

Is there evidence of bias in the investigator's language?

2. Type of Research

What framework is used?

- Experimental employs two identical groups of participants that are randomly assigned to treatment and control groups.
- Quasi-Experimental employs treatment and comparison groups that are not randomly assigned but appear to be identical, though they may have unseen differences
- Correlational with statistical controls employs treatment and comparison groups that are not identical but researchers use statistics to control for differences that may be important
- Correlational without statistical controls employs treatment and comparison groups that are different, but researchers assume that the difference may not be important; sample is usually large.
- Case studies may employ only a treatment group and assumes differences among participants are not important or are obvious; sample is usually small.

Does the research design seem to fit the research question/hypothesis?

3. Methods and Procedures

How are the variables of interest **operationalized** (measured)? Are validity and reliability discussed?

What research methods/procedures are used?

How well do they fit the research question?

4. Sampling

What population does the sample represent? Is it appropriate for the study?

How was the sample selected?

Is the size sufficient?

5. Statistical Significance

Is significance explained?

Is an effect size reported?

6. Implications

Are limitations discussed?

What are implications for practice?

What are implications for future research?

Gormally, C., Brickman, P., Hallar, B., & Armstrong, N. (2011). Lessons learned about implementing an inquiry-based curriculum in a college biology classroom. *Journal of College Science Teaching*, 40(3), 45-51.

Study #1 APA-Style Citation:	
	Gormally, C., Brickman, P., Hallar, B., & Armstrong, N. (2011). Lessons learned about implementing an inquiry-based curriculum in a college biology classroom. <i>Journal of College Science Teaching</i> , 40(3), 45-51.
Quality Indicator	Evaluation
1. Source	<p>Affiliations: All of the contributing others are either from Universities or are from companies affiliated with institutions of higher-learning in the sciences (pg. 51). Two of the authors are professors at the University of Georgia in Athens, one is a professor at the Georgia Institute of Technology in Atlanta, and one author is affiliated with a science and research commission in Charleston, West Virginia. The researchers' claim is to "offer insights to educators in the process of adopting inquiry-based curricula," as well as to inform "the focus of future studies of inquiry-based instruction" (Gormally, Brickman, Hallar and Armstrong 2011).</p> <p>Agenda Promotion: It does not seem that the authors are doing anything more than describing how inquiry-based instruction contradicts traditional instruction in the sciences.</p> <p>Peer Review: This is not outright stated; however, it is from a scholarly Journal. So, it may be inferred that it is a peer reviewed article.</p>

2.Type of Research	<p>This study is a case study. The research was conducted as a case study with a small sample size—10 students from each section of the “inquiry lab” program in the introductory biology course. They were volunteers who participated in a one-hour focus group at the end of a semester. Although it appears that if one allows for a comparison between then and now it could be argued that it was experimental in contrasting traditional modes of instruction versus experimental (inquiry-based) modes of instruction. As it is, the overall lack of data and reliance on qualitative data only somewhat weakens the anecdotes.</p> <p>The research topic refers to their course objective of helping “students understand how science is carried out by giving them opportunities to perform scientific research” (Gormally, Brickman, Hallar and Armstrong 2011). Essentially, researchers shifted the format of their biology labs to student-centered, inquiry-based instruction, and wanted to interview students and TA’s to investigate their responses to this major shift in instruction. In addition, the topic of this study is to help students understand science and how it’s carried out. As well as giving them different opportunities to perform scientific research.</p>
3. Methods and Procedures	<p>The students were interviewed in a focus group, and their attendant TA’s were interviewed in the focus, also. The sample size was small and entirely volunteer-based, which does not necessarily allow for validity.</p> <p>The methods raise eyebrows. One must be cognizant that they may be reading into a self-fulfilling prophecy in that they only interview people in regards to their reflections and along the lines of their observations. Sure, inquiry-based teaching is great, if all you’re looking for is affirming data. With that said, based on my experience, I find a lot of their observations to be similar to mine in the struggles and successes in this type of teaching.</p>
4. Sampling	<p>It seems that there could have been a larger sample group—considering the researchers admit early on in the abstract that “~1,300” students take this biology lab each year. To have such a small sample size of volunteers seems to provide some insight, but hardly any insight of significance, especially after the authors later reveal that this focus group was held, more or less, to counteract quantitative data revealed in standard university course evaluations (Gormally, Brickman, Hallar and Armstrong 2011).</p> <p>Again the sampling is speculative. It seems that they attain a very large sample, but as explained, only conduct thorough interviews with TAs and their experiences in inquiry-based teaching and learning. The article clearly promotes inquiry-based instruction as the “way of the future” but, lack of a reasonable sample puts their conclusions into question.</p>

5. Statistical Significance	None – since this analysis and synthesis is predicated on qualitative data mostly, any statistics can be easily put into question in regards to their relevance. This article is not designed to argue that experimentation proves that inquiry-based teaching is the best teaching, rather to show that inquiry-based teaching is a new and innovative way of teaching. Interestingly, at the very end of the article, the authors more or less admit that they conducted this interview case study to bolster findings from student evaluations of the course, which tended to track more negatively than hoped (Gormally, Brickman, Hallar and Armstrong 2011). It's curious that this fact receives very little mention until the end of the discussion of findings, as it would both inform the research question and reveal the intention behind the research methods, as well.
6. Implications	The implications might be the strongest part of the journal article in that it describes the shifts in roles and responsibilities between the teacher and the student in this type of classroom. The student is expected to design their own learning experience through asking good questions, conducting thorough research, measuring hypotheses, and reflecting on experiences. It's also good to see that the authors struggle in coming up with a jingoism for the role of the teacher, because I think, as of right now, this role cannot be metaphorically assigned.

The Group's Overall Evaluation

- 1) If this study's findings are different than past research, did the researchers explain why it is different?

No, the researchers did not say if the findings were different from past research. In fact they commented on the lack of research to show the effectiveness of inquiry-based learning in the science classroom.

- 2) Has there been enough high quality research so that we can say we know a lot about what works in this topic area? Or, has there been only a little research so we should only consider the research as suggestive of what might be going on, rather than more definitive?

No, there has not been enough research in this area to make the findings definitive. More research should be conducted that include studies that follow the gold standard and that include empirical data.

Zeger-Jan, K., Ruurd, T., Sanneke, B., and Gravemeijer, K. (2011). "Instructional practices that aim at the understanding of simple electric circuits." *Research in Scientific Education*, Vo. 43. Pgs. 579-597.

Study #2 APA-Style Citation:	Zeger-Jan, K., Ruurd, T., Sanneke, B., and Gravemeijer, K. (2011). "Instructional practices that aim at the understanding of simple electric circuits." <i>Research in Scientific Education</i> , Vo. 43. Pgs. 579-597.
Quality Indicator	Evaluation
1. Source	<p>Affiliations: The researchers are affiliated with Eindhoven School of Education, Eindhoven University of Technology in the Netherlands.</p> <p>Agenda Promotion: The researchers do not seem to have any political or "profit" agenda. Instead, they seem to advocate for the inquiry-based model as a more authentic means of delivering science instruction.</p> <p>Peer Review: This is not outright stated; however, it is from a scholarly Journal. So, it may be inferred that it is a peer reviewed article.</p> <p>The investigation was based not only around previous data that touted the effectiveness of inquiry-based instruction, but the particular difficulty in this instruction unit on electric circuits, that managed to continuously be a stumbling block for students (Kock, Taconis, Bolhuis, and Gravemeijer 2011). The researchers hoped that by creating inquiry-based lessons that students would have a stronger conceptual understanding of the material.</p> <p>In terms of physics content the aims of the local instruction theory were to address students' preconceptions and help students build a scientifically acceptable understanding of electric circuits, which would enable them to predict the relative brightness of light bulbs as well as currents and voltages in simple serial and parallel circuits. (p. 584)</p>
2.Type of Research	<p>This is a case study investigating a single series of lessons in 9th grade physics curriculum as it pertains to electricity and circuits. The study is of a single Dutch classroom as they work through this series of lessons. The lessons were designed in collaboration with a physics teacher who implemented the series of lessons while the researchers observed and evaluated student data collected through realia and workbooks.</p>

3. Methods and Procedures	There is no question of validity, as there is no statistical relevance to the case study. However, the methods of data collection (observation, collaboration, student interviews, and student work assessment) does seem appropriate considering the nature of the research question.
4. Sampling	<p>Considering this was a one-shot case study, the population sample was extremely small (26 boys and girls) and only consisted of one class. That class, however, was identified as the “difficult” group, presumably meaning the students experienced the most behavior issues or variety of learning styles (Kock, Taconis, Bolhuis, and Gravemeijer 2011).</p> <p>Furthermore, these were 9th grade students, and they were all between the ages of 14 and 15 years old. This was a required class. None of the students had studied electricity prior to taking this class.</p>
5. Statistical Significance	None – there is no statistical evidence involved in this method of study.
6. Implications	<p>The researchers realized the limitations of the study when outcomes did not go as projected. Responsively, researchers developed seven conjectures that may have explained why lessons did not proceed according to plan. The last few of these conjectures attempted to find causality behind students’ lack of engagement or learning when presented in the inquiry model.</p> <p>Based on the fact that outcomes of the study were unexpected the authors believe that research should be conducted in the following areas: 1) Open student investigations have to be sufficiently structured to enable students to find experimental results, which they can productively build upon; 2) Students have to be offered an initial theoretical starting point for constructing scientifically sound theories from empirical data; and 3) Teachers have to offer the students considerable support to help them shift from school-oriented motives to scientifically oriented motives.</p>

The Group's Overall Evaluation

- 1) If this study's findings are different than past research, did the researchers explain why it is different?

No, the researchers did not identify why the findings were different than past research.

- 2) Has there been enough high quality research so that we can say we know a lot about what works in this topic area? Or, has there been only a little research so we should only consider the research as suggestive of what might be going on, rather than more definitive?

Based on the fact that this was a small case study we should only consider the research as suggestive of what might be going on rather than as definitive. In order to produce research that is more definitive in nature, future research will want to create research designs based on the gold standards of research which include random sampling and statistical analysis of data.