

Student Perspectives on What Makes a Research Experience Worthwhile

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Project Overview

- Students complete a scientific research project including
 - Asking a question
 - Developing methods
 - Collecting data
 - Analyzing and interpreting data
 - Communicating results
- The research question begins “What do other students think about _____”
 - Students fill in the blank with a topic that interests them from the class

Project Overview

- Part of the course requirements, semester-long
- Checkpoint activities incorporated
 - Frequent, intermediate due dates
 - Students analyze examples of pieces of the project that are both good and need improvement
 - Students give feedback to each other about their projects

Themes in Best Practices Learned

- Sources: Students' thoughts
 - Feedback from students
- Source: My thoughts
 - My learned experiences with various student research projects

This Presentation Will Not Focus on the Benefits of the Project

- “This particular project teaches you to go out and collect data rather than sitting in front of a computer looking up info. It also helps you brainstorm and use your own creativity like a real scientist. When doing this, you are learning ... and using your own knowledge to put things together rather than just using info another scientist already put together.” (KL)

Summary of Themes

- 1. Importance of topic
- 2. Well-thought out
- 3. Clear directions
- 4. Frequent, structured deadlines
- 5. Timely feedback
- 6. Students share results
- 7. Explicit relationship made to the nature of science

1. Importance of topic

- Students are more invested if they are also interested
 - “I believe this was one of the reasons I enjoyed my project so much was because I really wanted to know the answer to my question.” (AT)
 - “Although I knew there would be a lot of work involved, I thought it was going to be very hard to complete. On the contrary, I found that the work was not hard because I was interested in finding out more about my topic.” (TL)

1. Importance of topic

- Make it relevant (in terms of knowledge gained)
 - “[I] created something that was actually useful and not just for the sake of learning” (AC)
 - “[It] allowed us to see what other people thought about our topics and not just what the internet and books say. This allowed us to have human insight...” (AH)

1. Importance of topic

- Make it relevant (in terms of skills and thought processes)
 - “If you just took notes every day, you would get something out of it, but you really wouldn’t care; you would ... move on, but I feel as this course taught a life lesson that gave many benefits to me personally.” (JG)

1. Importance of topic

- Make it fun
 - “I have done other research projects in the past years in school, but this one made it fun and interesting.” (AP)

2. Well-thought out

- Everything students do has a purpose
 - “Everything fit into the puzzle perfectly, which kind of surprised me.” (JG)

2. Well-thought out

- Limit the scope
 - Use your course goals to limit the extent of the project
 - How much data do they need to collect?
 - Do you want research-quality results?
 - “Just picking a topic would be too broad and the whole class wouldn’t learn much about geology.” (LR)

2. Well-thought out

- Structure time for flexibility, feedback, and reflection
 - “Before doing this project I thought that in order to do good quality scientific research we must follow the scientific process like a map but in reality doing good scientific research involves more of working around problems we might encounter along the way.” (AP)
 - “There is a lot of collecting data and going back to do it again when it fails the first time.” (KL)

3. Clear directions

- Remember that scientific research is new and difficult for many students
 - “There was quite a bit of a learning curve when it came to actually doing scientific research. I thought that the project as a whole would be more clean cut but it turned out to be far more complicated than I initially assumed.” (JH)
 - “The research project introduced me to the idea of discussion of data. This is the most enjoyable and useful part of the scientific process, yet I was unaware of this step in the past.” (AC)

3. Clear directions

- Try to give students an understanding of the time commitment
 - “My geology project showed me how time consuming science can be.” (JS)
 - “I assumed scientist follow the steps of the scientific method but I didn’t expect it to be so much more work than it really is.” (KL)

3. Clear directions

- Detailed description of the steps involved
 - What to include in each section
 - “All the information was given in the packet.” (JG)
 - For example, options of how to approach methods and analysis
 - “The instructions to follow were organized in a way that enabled us to conduct scientific research.” (LM)
 - If necessary, how to create graphs and tables

4. Frequent, structured deadlines

- “The date deadlines ... made the project a lot easier to complete. I feel having deadlines always kept the project fresh in my mind instead of putting it off until the last minute.”
(JS)
- “It was helpful in small pieces because it allowed me to focus on certain tasks each week and not overwhelm myself. When I normally do a project I tend to tackle everything at once and I end up stressing myself out.” (AT)

5. Timely feedback

- Students need to be able to make modifications while it's still fresh in their minds
- Feedback can come from other students
 - “Real scientists look [to] others for educated opinions and that can always open a new idea or a new hypothesis.” (LR)
 - “I have learned that people’s perspectives on certain subjects can change how they look at the facts presented.” (TL)

6. Students share results

- Improve students' communication skills and confidence
 - “[It] made me realize that presenting in front of people really isn’t so bad when you know what you’re talking about. I used to have a lot of anxiety.” (TL)
 - “Even though my presentations weren’t the best, I still learned and experienced standing in front of the class.” (JG)
 - “I have written many papers before but writing a scientific research paper is a totally different style of writing that takes some getting use to!” (NP)

6. Students share results

- Students are accountable to each other for their project
- Students have a sense of completion
 - “I was pleased with end product.” (IB)
- Gives a purpose to project
 - “The geology research project still was ... interesting and the class got to learn.” (LR)

6. Students share results

- Short can be as useful as long
 - “I learned the important of time restraints ... when presenting information to an audience but also in life in general. When it comes to the presentation part, if you are too long people will think it is boring but if it too short, people will not feel as if they got enough information on the topic.” (TL)

7. Explicit relationship made to the nature of science

- Students don't learn the nature of science through osmosis – make it clear and include student reflections
 - “I do not think that simply picking a topic and presenting that topic to the class would be nearly as useful. We would be missing the whole idea of science and its process. Simply collecting facts and understanding them does not go a long way in the science field.” (AC)

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