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Engaging Students in Science through Effective Teaching

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Alexis Nader
Honors Project Proposal, Annotated Bibliography, and Timeline for HNRS 4990
Dr. Eric Myers, Primary Advisor
Fall 2018

Research Questions

- What are the most common teaching styles?
- What are the components of an effective teaching style?
- What are factors that can cause students to lose focus?
- How can I, as a future educator, teach effectively in a high school science classroom?
- What aspects of my lesson plan/activity demonstrate effective teaching?
- What makes a PowerPoint effective?

Literature Review

Upon gathering the different sources for this project, I knew finding diverse information and studies were important in the formation of the Annotated Bibliography. There are surface level sources, studies in other countries, and even a source that was completed right here in Ohio that is extremely relevant to this project. Many sources overlap in terms of the two interdisciplinary subjects. This made for easy research and does not include a separation of sources. All of the sources also range in older and current scholarly work. One older form of scholarly work is an encyclopedia about the history of education. An example of a current scholarly work is the study completed at Miami University in 2016. The sources also vary in origin. Although the focus of this project is in Ohio, it is important to have sources and studies from other countries to better eliminate any bias from occurring.

Although there are a supple amount of resources listed and annotated, I have strong intentions on continuing to add to the list of sources. This is not because I feel as though I do not have enough or that my sources will not be of strong quality. I know how I am as a writer so while I am in the process of writing the final honors project paper, I may want a source that is not on my list. I feel as though this is a good thing. Although I am taking the spring semester off from my final honors project, I will still be thinking about this project. I may think of ideas I had not thought of before and will want to add and expand to my current honors project. By adding new ideas and source, it shows I have dedication to this project and that I am willing to grow and expand my ideas.

Proposed Activity

My passion for teaching was not apparent to me immediately when I came to college. I even went as far as telling myself I never wanted to become a teacher. I realized I have a strong passion for teaching people new things. The look on their face when they understand a new topic or are able to better interpret information on their own is what drives me to teach. By not realizing exactly what I wanted to do in life, I knew my idea for my final honors project would change and evolve along with me. Ultimately, I decided I will implement the ideas I learn in my research about effective teaching methods, educational theory, and practicing education by demonstrating them through a lesson plan and PowerPoint activity. The content will include one or two science standards with intentions to choose standards that are my favorite to teach. This lesson plan will be constructed using a template that will be learned in a future class to be taken at Bowling Green State University. When I will be completing this project, I will be in the first half of my professional year of my senior year. This first half of the professional year is called Methods. I will be learning the methods of being a high school science teacher between a mixture of course work and a high school field placement. This mixture ensures I am able to learn the course work and apply the ideas in practice. The idea of Methods is a strong framework for this project. My lesson plan and PowerPoint activity will display the theories and

ideas discussed in my paper to give an example of utilizing educational theory in an educational environment.

Methodology

Upon extensive and continual research about education theory and education practice, I will attempt to demonstrate those ideas in the form of a lesson plan. This lesson plan will include an interactive PowerPoint students are able to use and learn from in order to better grasp the science standard being taught. In my paper, I will be doing research and defending the ideas being used in my lesson plan. The paper will discuss how I executed the educational theories in my lesson. These projects were chosen because of my will to be a high school chemistry and biology teacher. Students will be able to focus and enjoy the content being taught. Coming to college not wanting to be a teacher is an advantage for me in this project. I understand what separates the good from the great teachers and can use that knowledge to know what my students want and ultimately need in an educator.

Expected Results

Based on my research and the plan for this final honors project, I would expect to determine if those partaking in my activity would be able to focus, enjoy, and learn the material being presented. High school science has a negative reputation of being boring and not interesting. As a future chemistry and biology teacher, I am here to change that. By conducting research about the studies and sources I have gathered, I will attempt to prove my lesson plan will demonstrate the ability to better engage students and ultimately, allow them to better learn the material being taught. My goal is to make the content relatable to my students so that the material goes beyond just the classroom. Chemistry and biology are all around us and I want to show that to my future students.

Appendix (optional)

As far as the proposal, I do not have anything to include here. The final paper and PowerPoint will be created and written when I take HNRS 4990 in the Fall of 2020.

Annotated Bibliography

Ashbrook, P. (2017). Using the 5Es to Teach Seasonal Changes. *Science & Children*, 55(4), 15. Retrieved from <http://ezproxy.bgsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eft&AN=126367646&site=ehost-live&scope=site>

Peggy Ashbrook is a science teacher who has taught for many years. This article is owned by the National Science Teachers Association (NSTA) so this article is credible. The intended audience is for science teachers for grades PreK to 2nd grade. Although this is the intended audience, she makes statements that are suitable for science teacher for any grade. I have a good amount of sources that are owned by NSTA but this source has a focus on education rather than the actual science being taught. This will be helpful when writing my final paper and constructing my lesson plan.

Cunningham, G. (2009). *The New Teacher's Companion: Practical Wisdom for Succeeding in the Classroom*. 1st ed. Alexandria: Association for Supervision & Curriculum Development.

Gini Cunningham was a teacher for 28 years in the United States and wrote this book to provide wisdom to upcoming and current teachers. She has a lot of experience ranging from kindergarten to high school. Her vast experience allows this source to be credible and is intended for teachers to use as a resource. This source is a book whereas many of my other sources are websites so this will provide some diversity on where I have gathered my research. (d) explain how this work illuminates your bibliography topic ("How to Prepare")

Davies, M. I., & Seimears, C. M. (2008). Water: A Topic for All Sciences. *Science Activities: Classroom Projects and Curriculum Ideas*, 45(3), 27–36. Retrieved from <http://ezproxy.bgsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ809615&site=ehost-live&scope=site>

This source is a scholarly journal which includes ideas for high school science teachers to use for their classroom. Although a little dated, this source is credible. The intended audience is for future and current high school science teachers. The particular source is geared toward multiple sciences because it gives the idea of collaborating with other teachers in order to better convey the big idea being taught. This source includes chemistry ideas along with other science subjects taught in a high school so it is different than my other sources, but it still has a focus on secondary education. This source will help the final paper to talk about misconceptions students easily develop through their science classes and how to combat them for the future.

Education, History of. (2017). *Funk & Wagnalls New World Encyclopedia*, 1p. 1. Retrieved from <http://ezproxy.bgsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=funk&AN=ED014400&site=ehost-live&scope=site>

This source is an online encyclopedia so this is a credible source. The intended audience is for anyone wanting to learn more about the history of education in the United States. This is the only source that is an encyclopedia reference so it is a bit different compared to the rest of the sources listed. This source will help with the final paper and the proposal to this project.

Espinosa, A. A., Datukan, J. T., Butron, B. R., & Tameta, A. D. C. (2018). Perceptions of Pre-Service Chemistry Teachers on the Utilization of Productive Lesson Study as a Framework for Teaching and Learning. *International Journal for the Scholarship of Teaching and Learning*, 12(1). Retrieved from <http://ezproxy.bgsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1172224&site=ehost-live&scope=site>

This source is a study from the *International Journal for the Scholarship of Teaching and Learning* which means that it is credible. They may be slight cultural differences as the study was completed in Manila, Philippines. The intended audience is for future and current high school chemistry teachers, along with anyone directly involved with creating the curriculum for a high school chemistry class. This source contains a study, which my annotated bibliography has a low amount of studies so this will help diversify my sources. This source in particular will be really helpful due to the focus on high school chemistry teachers in the study. This will be utilized in my final paper along with my proposal.

Guseva, L. G., & Solomonovich, M. (2017). Implementing the Zone of Proximal Development: From the Pedagogical Experiment to the Developmental Education System of Leonid Zankov. *International Electronic Journal of Elementary Education*, 9(4), 775–785. Retrieved from <http://ezproxy.bgsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ehh&AN=124009378&site=ehost-live&scope=site>

This source is a study in Russia about Vygotsky's theory of Zone Proximal Development (ZPD). Although the study was completed in another country, the ideas of ZPD are universal around the world so this source is credible and can be used to provide information about ZPD. The intended audience are teachers who want to better understand how their actions can impact their students. This source is fairly similar to the other sources listed, but this source has a large emphasis on the educational psychology of teaching. This source will be most utilized on the paper in order to describe the effect teachers have on students' performance.

Kimberlin, S., & Yeziarski, E. (2016). Effectiveness of Inquiry-Based Lessons Using Particulate Level Models to Develop High School Students' Understanding of Conceptual Stoichiometry. *Journal of Chemical Education*, 93(6), 1002–1009. Retrieved from <http://ezproxy.bgsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1104116&site=ehost-live&scope=site>

This source comes from an academic journal called the *Journal of Chemical Education* so this is a great and creditable source. The intended audience is future and current high school chemistry teachers. This is possibly the most relevant source I have found due to the fact the study was completed right here in Ohio at Miami University. Due to this source being directly strongly toward my project, I intend to use it for the final paper.

Ohio Department of Education. (2018, February). Ohio's Learning Standards and Model Curriculum for Science. Retrieved from <http://education.ohio.gov/Topics/Learning-in-Ohio/Science/Ohios-Learning-Standards-and-MC>

The information used from this source is directly from the Ohio Department of Education (ODE) website. Since I plan on teaching in Ohio post-graduation, this makes the most sense to base this project on. This source is extremely creditable. It's audience is geared toward science teachers in Ohio, but other school personnel can use this information. This piece will be a strong staple in my honors project due to the fact that my lesson will be built upon the science standards ODE has instilled statewide.

Pollock, J. E. (2007). *Improving student learning one teacher at a time*. Alexandria, VA: ASCD.

Jane Pollock has experience teaching in a classroom for several years. Her book contains research on ideas to enhance teaching for classroom teachers. The projected audience is for teachers looking to better the performance of themselves as teachers in order for their students to better succeed in their classroom. Pollock's book can add depth to my research on experience in the classroom. She has experience giving pedagogical feedback to teachers and has earned her doctorate at the University of Colorado. In her book, she gives methods and ideas on how to better student performance by changing what is done by the teacher. This will help my proposal and final paper bring light to methods a teacher can bring in order for students to be successful in the classroom.

Prokop, P., Prokop, M., & Tunnicliffe, S. D. (2007). Is biology boring? Student attitudes toward biology. *Journal of Biological Education (Society of Biology)*, 42(1), 36–39. Retrieved from <http://ezproxy.bgsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=tfh&AN=27894923&site=ehost-live&scope=site>

This study is found in the *Journal of Biological Education* and is the property of Institute of Biology so this source is deemed creditable. It's intended audience is anyone curious if age or gender influence the attitude of students toward biology. This can be extremely relevant for school teachers planning to teach the subject of biology, such as myself. I do not have many sources that are a study so this will add some numerical data to my proposal and final paper. This source also mentions the difference between biological and physical sciences so that can help relate back to my PowerPoint used for my lesson plan.

Stinson, M. (2006). Fired up about science. *Science Scope*, 29(4), 40–41. Retrieved from <http://ezproxy.bgsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ehh&AN=19677395&site=ehost-live&scope=site>

This lab comes from an academic journal called *Science Scope* which is owned by the National Science Teachers Association. The journal is intended for junior or middle level science teachers. This source is a bit different compared to the other sources listed. This is a lab procedure designed to teach students the difference between observations and inferences. This source would be used in my proposal and final paper due to the lab providing details about the excitement students had which helps ignite curiosity in them.

Teaching Methods. (n.d.). Retrieved October 7, 2018, Retrieved from <https://teach.com/what/teachers-know/teaching-methods/>

Although this article doesn't include author's name, the website is a great resource. It includes helpful information for future and current teachers on how they can better themselves through a teaching career. The intended audience is for future and current teachers to help them with key terms used in the profession and hosts a collection a resources needed for the teaching profession. This resource is fairly surface level information. This source was used to help direct where other sources could be found. It will also help with the development of the final paper. In order to maximize the diversity of my sources used, having a source with surface level information will help develop into the more detailed sources.

Tro, N. J. (2013). *Chemistry A Molecular Approach With Masteringchemistry* (3rd ed.). Pearson College Div.

This source is a textbook used in my general chemistry class here at BGSU. Tro is a professor at Westmont College in Santa Barbara, California and has been a chemistry professor for over 25 years. He received his Ph.D. in chemistry from Stanford University. This source is most certainly creditable. The intended audience is anyone trying to learn the basics of chemistry. It can be used in a general college class or even an Advance Placement class in high school. This source is unlike the other sources due to the fact it's a textbook. This textbook will be used for the

creation of the PowerPoint used in my lesson plan. It will provide chemistry knowledge for the chemistry standards being used in the lesson plan.

Uzun, A. M., & Eđmir, E. (2018). How do instructors use PowerPoint as a part of their instruction? A cognitive theory perspective. *Proceedings of the Multidisciplinary Academic Conference*, 68–77. Retrieved from <http://ezproxy.bgsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=132304197&site=ehost-live&scope=site>

The two authors are faculty at a university in Turkey. Although their research partakes in a different country, PowerPoint is a resource used around the world. This makes the research valid and the two authors creditable. The intended audience is university students who have been exposed to a PowerPoint lecture. This is a heavy research based resource being used. This resource gives diversity to the type of resources being used. This source will be used in my final paper to describe the different teaching styles to convey information to students. This will help give statistics about using PowerPoint as a teacher.

WikiHow. (2018, September 03). How to Make a Jeopardy Game on PowerPoint. Retrieved from <https://www.wikihow.com/Make-a-Jeopardy-Game-on-PowerPoint>

WikiHow would not normally be a typical source used in any type of research, however, I am using this website to help further my skills in PowerPoint in order to create part of my final honors project. For the use of this source, it is creditable enough. It explains steps for both a Mac computer and a Windows computer, which is extremely helpful. The intended audience is anyone who wants to know how to make their own Jeopardy PowerPoint. Although I'm not making a Jeopardy PowerPoint, I am using a lot of the same techniques found in a typical Jeopardy PowerPoint. This type of source will be used sparingly as it is not a typical source for research based information. It is mostly to expand my knowledge base rather than be utilized as a source to quote information from.

Timeline for HNRS 4990:

December 2018 through August 2019:

- Continue researching and finding sources
- Find a secondary advisor
- Discuss project to friends and family for potential input
- Enroll in HNRS 4990 for Fall 2020

August/September 2019:

- Return to school
- Email advisors about any new developments
- Select lesson plan template
- Begin research/final paper
- Select science standard(s) being used
- Begin writing lesson plan
- Begin creating PowerPoint (and other supplemental activities for lesson)

October 2019:

- Continue research/final paper
- Continue writing lesson plan
- Continue creating PowerPoint (and other supplemental activities for lesson)

November/December 2019:

- Finish lesson plan and supplemental activities
- Finish paper
- Orally defend project

Updated Timeline Due to COVID-19

April 27th, 2020

- Send necessary emails
- Pick standard(s)/topic for project
- Gather resources

April 28th – May 2nd

- Begin writing lesson plan
- Create lesson plan supplement materials
- Begin writing paper
- Email ideas to advisors

May 3rd – May 8th

- Finish paper
- Send everything completed to advisors for corrections
- Make corrections

May 9th – May 15th

- Any final details needed to be completed
 - Prepare for defense
- Procedure to defend project (possibly a Zoom call? I'll ask the Honors College what they're doing for this step)
- Cheers to graduation!