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Individual Project Topic

For my individual project, I will investigate education and common knowledge in the field of astrophysics. For most people, when they hear the term "astrophysics" they think of a complex field that only scientists can understand. From personal experience, whenever I tell someone that I am an astrophysics major, they often say something along the lines of, "Wow, that must be hard." In reality, astrophysics is just another scientific field that works towards understanding the world that we live in. Outer space is seen as this far away thing that is removed from our life on Earth. However, all of us are a part of outer space... we live in it. Various aspects of our daily lives depend on satellites that orbit the Earth in outer space, such as GPS, cell phone, and weather satellites. The humanities strive to gain an understanding of the human condition, and part of that human condition is how we interact with and understand the universe that we live in. Studying outer space allows us to think of the world in a larger context, not only in physical size but also in very long time scales. The universe is so old and large that you can't even wrap your head around the concept. My goal is to help people understand at least a small part of how interconnected we are with our expansive universe.

My research project will address the question: how accessible is astrophysics education to the public and is interactive education more effective? This question is not simply asking if people have access to astrophysics information, but if that information is communicated in a way that can be easily understood by the common person, rather than the scientific community. It is important for society to understand the universe we live in because being exposed to larger scales of information can encourage people to think in new ways, bringing innovation to all sectors of society. There are various tools online for astrophysics education geared towards people who have no experience in the topic. For example, NASA's website has a page titled "Ask an Astrophysicist" where people can ask questions about outer space to be explained by an expert. On Github, I found a game which teaches about interstellar phenomenon titled "Astrophysics for Gamers in a Hurry." I also came across an astronomy education bot on Github. These tools utilize interactive designs in order to attract people to learning about astrophysics. I think that this sort of education is important so that people will want to learn. I plan on analyzing how an interactive education method can change people's views on astrophysics. Alexander Rudolph conducted a study on teaching and learning of introductory astronomy which found that "interactive learning strategies are capable of increasing student conceptual understanding."(Rudolph) This study was conducted over a long period of time, but my approach will focus on how students respond to a short session of interactive learning.

I will collect data on the geared audience for astrophysics books on the internet. I will use the Google Books API through the requests library in python. With this data, I will count word frequencies in the books to identify the most common words. To clean the data and come up with

an accurate list of most common words, I will remove punctuation, capitalization, and stop words before I count word frequencies. I will then determine if the most common words are in layperson's terms or scientific terms. This will give a summary of the landscape of online astrophysics books. During my presentation, I will show my peers a visualization of the solar system which I have found on the internet. Then, they will take a short poll after interacting with the visualization. With the data from the poll, I will create a graph of the results, to quantify and show how effective interactive astrophysics education can be.

I expect for there to be a good amount of books from both a scientific perspective and an educational perspective. I am interested to see which types of books show up first in the search. I expect for introductory books to come up first and books on more specific topics of astrophysics to come up later in the search. To categorize the books, I will have to make some assumptions about which words are considered layperson's terms and which are considered scientific terms. However, I will base these assumptions on my background in astrophysics. For the poll, I expect that people will think that they know all that they need to about outer space, but they will be interested in the visualization that I show them. Hopefully, everyone will learn something new after interacting with the visualization.

From this project, I hope to gain an understanding of what is out there for people who want to learn more about astrophysics. I am also interested in learning how people respond to astronomical visualizations. Although it is known that most interactive education is more effective than non-interactive education, my goal is to further understand how interactivity has an effect on astrophysics education.