



STEM Programs at Local Libraries: Encouraging Elementary Student's Interest in the Sciences

Senior Project

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By

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### **Abstract**

The goal of this project was to create an hour long STEM program aimed at elementary age students in order to encourage interest in the sciences at a young age. This program was implemented at two local libraries, Robeson County Public Library and Scotland County Memorial Library. This program incorporated reading, experimentation, activities, and knowledge testing. When working with a library, the age range that you will be working with is quite unpredictable. However, the program was successfully received by its target audience, elementary students, in addition to being well received by the older middle school students who were in attendance. The programs successfully encouraged scientific exposure and thinking. Programs like this inside and outside of normal school curriculum are key in helping students gain healthy attitudes towards learning about the sciences now and in higher education.

## **STEM Programs at Local Libraries: Encouraging Elementary Student's Interest in the Sciences**

When choosing a type and topic for my senior project, I knew I wanted to do something that was related to chemistry, since that is my area of study, as well as something that would relate to my future career in the medical field. Service is a big part of having a career in medicine, so I decided to do a service-learning project. Another aspect of being a medical provider is constantly educating your patients. These factors led me to choose a project in which the subject was science and the goal was education.

I have always had a passion for science. In my personal experience, I attribute that to early and frequent exposure to science topics during my elementary school years. For some, the idea of majoring in a science or even taking science courses required in general education, can be intimidating. I believe more exposure, earlier on in a student's education is extremely important in developing a positive attitude towards studying and succeeding in science. Studies show early exposure to project-based scientific inquiry improves a student's ability to think in a scientific manner later on in their education, and elementary education is the perfect time for that exposure to begin (Can 395). "Children are insatiably curious, because it's by asking questions that they learn (Sufang 37)." This makes elementary school age is the perfect time to encourage interest in science." The goal of this project is not to encourage more people to major in or pursue a career in the sciences. However, it is intended to create a comfortability with them at a young age, preparing them to be confident in their ability to complete science courses in high

school and college, regardless of their chosen majors. My hope is that with programs such as these, no student will begin college with a fear of a subject created simply because of lack of experience with it.

### **Establishing the Programs**

The first step in completing my project was identifying and contacting local libraries who would be interested in partnering with us. I contacted Lisa Bowden, the Youth Services Librarian of the Robeson County Public Library and inquired about partnering with them. I discovered that they have a STEM program that they advertise and host once a month. We partnered with them for their October STEM club and they allowed us to put on our program during their advertised time slot. Dr. Storms had already previously worked with the Scotland County Memorial Library in trying to establish a monthly STEM program partnered with UNCP. She contacted Lynette Butler, the Youth Services Librarian, who was also interested in hosting our STEM program. The advertising for the program was done by the libraries in each case. These advertisements can be found in the appendix.

### **Curriculum Development**

Once we knew we were going to be able to partner with these libraries, I began to design the curriculum. This program was structured to fit into an hour long timeslot and held during late afternoon at public libraries. The target participants were students looking for after-school activities either individually or through an after-school group. The libraries both advertise to elementary and middle school students, however the curriculum was designed more for the elementary school age participants. The first step in designing the curriculum was choosing a theme. Since

I am a chemistry major, I looked for a theme which would allow me to incorporate some chemistry aspects. The theme I chose, astronomy, coincided perfectly with this year's theme for the American Chemistry Society's (ACS) National Chemistry week, which was "*Chemistry is out of this World.*" When planning the curriculum, I wanted to incorporate these key parts: reading, experimentation, crafts and activities, and knowledge testing.

I decided to start the program with a reading for several reasons. Since the programs were in partnership with libraries, it seemed appropriate to incorporate literacy and connect its importance to STEM education. It also served as an attention-getting device which quickly and interestingly gave the students an overview of the information that was being taught through this program. The book that I chose to read was Tish Rabe's "*There's No Place like Space! All About Our Solar System.*" This book is aimed at elementary school age students and follows Dr. Seuss' characters Cat in the Hat and Thing One and Thing Two as they travel throughout the solar system learning all about the planets, the moon, and the stars.

The experiment I chose to demonstrate was from the ACS National Chemistry week and was called "*Creating Oxygen to Breathe in the Space Station* (Silva 9)." I chose this particular experiment because it combined my personal area of study with the theme of the program. In this experiment electrolysis of water is used to convert water to oxygen and hydrogen gasses. The goal of using this experiment was to help the students to learn that we need air (specifically oxygen) to breathe, that there is a lack of it in space, and that chemistry can be used to solve that problem for astronauts (Silva 9).

The majority of the time in the program was focused on completing crafts and activities. The first activity was building constellations. The students were given black or blue construction paper, small paper stars, chalk, and pictures of constellations. They were instructed to glue the stars to the construction paper in the pattern of the constellation and then connect them with the chalk (“Stars Inspire Imagination”). The constellations we used were the Big Dipper, the Little Dipper, Orion, and Ursa Major (“Constellations Pin Punching Cards”). After the students followed one or two of the constellation patterns, they were allowed to create their own constellations. The second craft was simply coloring the planets. They were each given a set of planets which were attached to labeled craft sticks (“Space”). As they colored the planets, we looked back through the pictures of the planets in the book we read. We discussed the properties of the planets, including their appearance, their temperature, and what makes up their surfaces. This was also used as an opportunity to discuss the order of the planets. The next activity was a worksheet where they created mnemonic devices to help them remember the planet order (Trapp). This worksheet consisted of a front page with tabs where the students wrote one word of the mnemonic on each tab. Those tabs could then be lifted up to reveal the planet name that corresponds with that letter.

Lastly, we played a question and answer game in order to test and solidify their knowledge of the information they learned. I asked them a series of planet fact questions (“DIY Planets Board Game”). The questions were phrased in such a way that the students could answer by holding up one of the planets they previously colored. For example, I asked which planet is the closest planet to the sun, and they

were each able to answer by holding up one of their colored planets. After they answered the question, I would identify what the correct answer was and why that was the correct answer.

### **Curriculum Implementation**

The program was first implemented at Robeson County Public Library. Seventeen students were in attendance. This consisted of an after-school group and several individual attendees. There was a mixture of student ages, with both elementary school and middle school students. I read the book, completed the demonstration, had them complete the constellation activity, and then held the question and answer session. For the first program, I had the students raise their hands and verbally answer the questions. However, I realized that it would be more effective if every student could answer the question, which prompted me to alter the plan for the next program. The program held the students' attention and student response was good as well. The planned activities were well suited for the varied ages, incorporating something for everyone. The only downfall, was that the program did not take the entire hour to complete. Upon reflection I decided to add more activities for the second program.

At Scotland County Memorial Library, the group was slightly smaller. There were ten participants and all of these were individuals, with no groups in attendance. This group was also a much younger group which consisted of almost exclusively elementary age students. This program also began with the reading of the book. The demonstration of the experiment was skipped on this day due to some defects with the materials and due to the very young age of the participants. The

students did complete all of the activities listed in the curriculum section. Adding the other activities improved the curriculum by making it a better-rounded program and by adding more time necessary to complete all of the components of the program. The last part of the program was the question and answer session in which the students were all able to answer each question using their planet hand-outs.

### **Reflections**

The program was successful both times it was implemented. Having a more uniform age-group during the second program allowed it to be more effective. Each time, students were engaged and they participated well in the activities. Not only did they learn about astronomy, but they had a positive experience learning about a scientific topic, which will only improve their attitudes towards science upon their next encounter. The implementation of programs such as these within elementary school curriculum and during extra-curricular activities will prepare these students to be open-minded about STEM subjects moving forward into higher education.

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## Appendix

### Program 1: Robeson County Public Library

**SCI-FRI S.T.E.M. TIME**

**JOIN US:  
EVERY  
FIRST  
FRIDAY  
OF THE  
MONTH**

**TIME: 4-5 P.M.  
AGES: 5-12**

**LET'S BUILD  
SOMETHING  
TOGETHER!**

Science Technology Engineering Mathematics



## Program 2: Scotland County Memorial Library



Join us at  
Scotland County Memorial Library  
on Thursday, November 8  
at 4 p.m.  
for STEM Club

We will conduct hands-on activities including the hydrolysis of water and a constellation activity while learning more about the solar system. The activities are best suited for ages 6-10, but all ages are welcome!



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