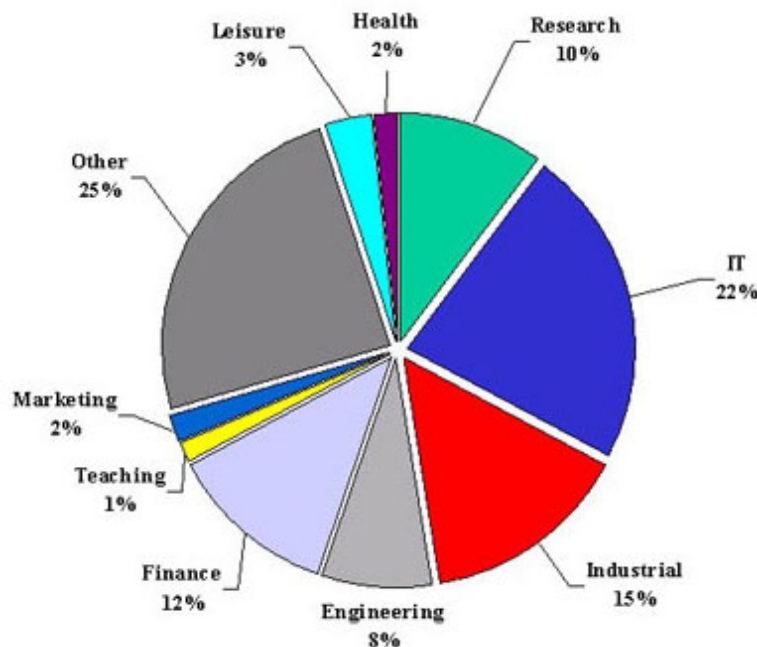


## Introduction

I teach junior Physics and love it! I have always been extremely energetic about the subject and I try to make my enthusiasm as contagious as possible so that my students no longer hear the word physics and cringe, or hear science and squirm. Instead, I love nothing more than when they smile and become engaged and strive to explore further. Due to my efforts to make physics exciting and fun, I have noticed several students becoming involved and really enjoying their studies in my class, however, at the end of June, that seems to be where it ends.

I want to encourage my students to not only explore and understand physics in the classroom during their junior year, but to also see all that physics has to offer them when they leave my class. As a culminating project, I would have them complete a web quest to research possible careers and applications of physics in the real world that they could possibly look into after high school and college. Through this web quest, they would not only learn about the career they research, they would learn about all of the careers their classmates looked into as well. Students will use the pre-selected websites to develop an understanding of careers in physics. They will then present their findings to the class in the form of either a brochure, PowerPoint, or video taped commercial. Their aim should be to entice others to consider this career option and to explain fully the physics involved with the career, the degree requirements, as well as the impact this career has on society.



This pie chart shows a breakdown of the basic categories physics careers fall under. It is obvious that physics can be found in a large variety of types of occupations. Because of this, there is a good range of careers for students to choose to research further. It is important that students choose different careers to present on to portray the many options that are out there and available.

<http://www.physics.org/article-careers.asp?contentid=423&pid=404&hsub=1>).

Being implemented in an Honors Physics classroom, it is important that this interactive website addresses various content standards. The following New Jersey Core Curriculum Standards are addressed.

**STANDARD 5.2 Science and Society**

ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF HOW PEOPLE OF VARIOUS CULTURES HAVE CONTRIBUTED TO THE ADVANCEMENT OF SCIENCE AND TECHNOLOGY, AND HOW MAJOR DISCOVERIES AND EVENTS HAVE ADVANCED SCIENCE AND TECHNOLOGY.

**5.2.12 A. Cultural Contributions**

1. Recognize the role of the scientific community in responding to changing social and political conditions and how scientific and technological achievement effect historical events.

**5.2.12 B. Historical Perspectives**

2. Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.

**STANDARD 5.3 Mathematical Applications**

ALL STUDENTS WILL INTEGRATE MATHEMATICS AS A TOOL FOR PROBLEM-SOLVING IN SCIENCE, AND AS A MEANS OF EXPRESSING AND/OR MODELING SCIENTIFIC THEORIES.

**5.1.12 C. Patterns and Algebra**

1. Apply mathematical models that describe physical phenomena to predict real world events.

**STANDARD 5.4 Nature and Process of Technology**

ALL STUDENTS WILL UNDERSTAND THE INTERRELATIONSHIPS BETWEEN SCIENCE AND TECHNOLOGY AND DEVELOP A CONCEPTUAL UNDERSTANDING OF THE NATURE AND PROCESS OF TECHNOLOGY.

**5.4.12 A. Science and Technology**

1. Know that scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans, while technology is driven by the need to meet human needs and solve human problems.

**5.4.12 B. Nature of Technology**

1. Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact.

**STANDARD 5.7 Physics**

ALL STUDENTS WILL GAIN AN UNDERSTANDING OF NATURAL LAWS AS THEY APPLY TO MOTION, FORCES, AND ENERGY TRANSFORMATIONS.

**STANDARD 8.1 Computer and Information Literacy**

ALL STUDENTS WILL USE COMPUTER APPLICATIONS TO GATHER AND ORGANIZE INFORMATION AND TO SOLVE PROBLEMS.

**8.1.12 A. Basic Computer Skills and Tools**

5. Produce a multimedia project using text, graphics, moving images, and sound.

**8.1.12 B. Application of Productivity Tools**

**Social Aspects**

1. Describe the potential and implications of contemporary and emerging computer applications for personal, social, lifelong learning, and workplace needs.

**Information Access and Research**

5. Select and use specialized databases for advanced research to solve real world problems.

6. Identify new technologies and other organizational tools to use in personal, home, and/or work environments for information retrieval, entry, and presentation.

7. Evaluate information sources for accuracy, relevance, and appropriateness.

**Problem-Solving and Decision Making**

9. Create and manipulate information, independently and/or collaboratively, to solve problems and design and develop products.

12. Integrate new information into an existing knowledge base and communicate the results in a project or presentation.

**STANDARD 8.2 Technology Education**

ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE NATURE AND IMPACT OF TECHNOLOGY, ENGINEERING, TECHNOLOGICAL DESIGN, AND THE DESIGNED WORLD AS THEY RELATE TO THE INDIVIDUAL, SOCIETY, AND THE ENVIRONMENT.

**8.2.12 A. Nature and Impact of Technology**

1. Use appropriate data to discuss the full costs, benefits and trade-offs, and risks related to the use of technologies.

3. Provide various examples of how technological developments have shaped human history.

**8.2.12 C. Systems in the Designed World**

**Standard 9.1: Career and Technical Education**

ALL STUDENTS WILL DEVELOP CAREER AWARENESS AND PLANNING, EMPLOYABILITY SKILLS, AND FOUNDATIONAL KNOWLEDGE NECESSARY FOR SUCCESS IN THE WORKPLACE.

**9.1.12 A. Career Awareness and Preparation**

1. Re-evaluate personal interests, abilities, and skills through various measures including self-assessments.

2. Evaluate academic and career skills needed in various career clusters.

3. Analyze factors that can impact an individual's career.

4. Review and update their career plan and include the plan in a portfolio.

5. Research current advances in technology that apply to a selected occupational career cluster.

**9.1.12 B. Employability Skills**

1. Assess personal qualities that are needed to obtain and retain a job related to career clusters.

2. Communicate and comprehend written and verbal thoughts, ideas, directions, and information relative to educational and occupational settings.

3. Select and utilize appropriate technology in the design and implementation of teacher-approved projects relevant to occupations and/or higher educational settings.

5. Demonstrate teamwork and leadership skills that include student participation in real world applications of career and technical education skills.

**STANDARD 3.3 (SPEAKING)**

ALL STUDENTS WILL SPEAK IN CLEAR, CONCISE, ORGANIZED LANGUAGE THAT VARIES IN CONTENT AND FORM FOR DIFFERENT AUDIENCES AND PURPOSES.

**A. Discussion**

3 Assume leadership roles in student-directed discussions, projects, and forums.

4 Summarize and evaluate tentative conclusions and take the initiative in moving discussions to the next stage.

**D. Oral Presentation**

1 Speak for a variety of purposes (e.g., persuasion, information, entertainment, literary interpretation, dramatization, and personal expression).

2 Use a variety of organizational strategies (e.g., focusing idea, attention getters, clinchers, repetition, and transition words).

3 Demonstrate effective delivery strategies (e.g., eye contact, body language, volume, intonation, and articulation) when speaking.

5 Modify oral communications through sensing audience confusion, and make impromptu revisions in oral presentation (e.g., summarizing, restating, adding illustrations/details).

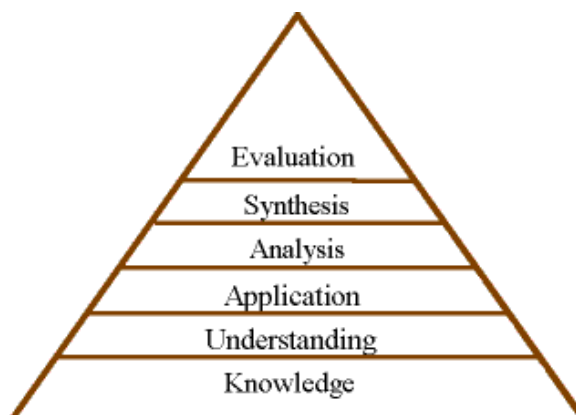
6 Use a rubric to self-assess and improve oral presentations.

(<http://www.state.nj.us/education/cccs/>)

Additionally, this project is designed to stimulate all types of learners and address many areas of the curriculum. According to studies of Henry Gardner, people with different excel in an environment with enhanced differentiation because of what he terms 'Multiple Intelligences'. This interactive website provides opportunities for various strengths to succeed. The color scheme, graphics, animations, and use of the computer are going to engage **visual and spatial** learners. The structured rubric, applications of physics, and collection of data will make the **mathematical/logical** learners comfortable. Oral presentation in any of the acceptable forms, (brochure, PowerPoint, or commercial) is ideal for the **verbal/linguistic** learner. Collecting data, using the computer for research, creating something as a product are important for the **bodily/kinesthetic** learner. Having the option to work with a partner is perfect for **interpersonal** learners. Allowing students to work independently, providing them with a detailed rubric to self-assess, and letting them choose their means of presentation are all helpful elements of this project for **intrapersonal** learners.

Anthony Gregorc also studied the differences between mind styles as to how certain learners were more apt to succeed under specific conditions. He defined four mind styles which help to describe ideal learning environments for these students. This website will help to address all four mind styles and thus enhance student learning and interest. **Concrete sequential** learners will enjoy collecting and analyzing their research, applying physics concepts to the real world job they are researching, and utilizing a rubric to evaluate their progress. **Concrete random** learners will appreciate the opportunity to work independently to understand the physics behind the career of their choice. **Abstract sequential** learners will thrive on the order of project and the independence they have with their choice of presentation. Finally, **abstract random** learners will enjoy the option of working with a partner, bringing harmony to their partnership, as well as the creative output options for their final presentation.

To ensure a higher level of learning, this project will also ensure that students complete all levels of Bloom's Taxonomy. Developed by Benjamin Bloom, this is a guide to the skills learners should have to demonstrate their true higher level understanding of a subject.



The base of this pyramid, (<http://www.officeport.com/edu/blooms.htm>) represents the lowest form of learning which is rote memorization and recall. By recalling concepts they have learned through the year in terms of physics they will be demonstrating **knowledge**. Explaining the science behind these topics and recognizing the physics in certain careers demonstrates

their **understanding** or **comprehension** of the topic. Choosing a career, interpreting the career's affect on society, and demonstrating the physics behind it shows their **application**. Analyzing the importance of the career and examining the major components of the field is a sign of **analysis**. Organizing their findings, planning a project, and creating a presentation in one of the acceptable formats is **synthesis**. Assessing themselves throughout the project using the provided rubric shows true **evaluation**.

### **Goal & Objectives**

The goal of the proposal is to improve student understanding of the real world applications of physics. This will be accomplished through research into careers in physics.

My goal for my students is that they will complete this web quest and learn how to successfully research a career involving physics as well as present their findings to the class in an enticing way. I want them to see how many professions utilize the concepts of physics we have discussed this year and ideally, I would love them to continue their studies of Physics at a higher level.

Student Objectives are as follows:

- Utilize website and work individually or in groups of two to complete the assignment.
- Develop research skills using the internet and previously selected websites to ensure accurate information.
- Organize findings and data into meaningful groupings to explain the physics behind their chosen career.
- Relate the information and requirements of this career to specific topics we have studied in physics.
- Present their final project in their chosen media to the class.
- Observe classmates' presentations on various fields of physics.

### **Procedure & Methods**

I predict this project will take approximately 9-10 weeks to complete. I plan to utilize notes on both Brainy Bits and Pedagogy from the Brains Course including but not limited to Gardener's Multiple Intelligences, Bloom's Taxonomy, Retention, Sense and Meaning for students, etc. I also will utilize the Internet for sources and resources for the students as well as the DreamWeaver software to create my final web quest.

Student Outline:

1. Go through the interactive website either individually or with a partner. (20 minutes)
2. Using the resource links provided, determine the field or career they want to research. (1 class period –complete for homework)
3. Begin Research- Utilize worksheet/graphic organizer to sort through the information you find including the following categories: (3-4 class periods)
  - a. What is the career? What does it entail? Who can do it (education requirements, age/ability requirements, locations, etc.)?
  - b. How does this career involve any/all concept(s) of physics we discussed and studied throughout this year? Must be explained in complete detail.
  - c. Why is this career enticing? Why should students look into it?
  - d. How does this career affect society? What technology does it use? Where would we be if this career didn't exist?
4. Plan a presentation- Brochure, PowerPoint, or Video Commercial. (1 class period)
5. Create Presentation- (1-2 class periods/about 1 week outside of school)
6. Present to Class (about a 10 minute presentation)

**Potential Impact & Significance**

Throughout my past few years teaching physics, I often hear my students say things like, “This is the best science,” or, “Physics is so interesting,” and they leave in June and probably never think much about physics again. This project will hopefully open their eyes to the fact that careers in physics are out there all around us and are great opportunities to continue to use and learn more about this field that they seem to enjoy so much during their junior year.

As junior year comes to an end, my students are certainly beginning to look at their lives and evaluate their future. They are taking SAT's and thinking about what colleges to apply to and in doing so, they are beginning to look into specific programs that colleges have to offer. By completing this project prior to deciding upon a college, it will give students insight into possible paths of study they might be interested in. It is a way of preparing them to look not just at the names of schools but to look into what that school has to offer them in terms of their future which is not that far off. By encouraging students to research job opportunities at the high school level, they will gain some idea of how to find jobs that involve not just what

they're good at, but also their interests. Obviously, I do not think every one of my students will end up using physics in their careers but I do hope that through this web quest, they achieve the skills to do research into the job market in a specific field that interests them. This is extremely important and most college students don't even know how to find what they're looking for when it comes to deciding on a career.

By having the students choose a career that they are interested in, they will automatically have sense and meaning, causing them to *want* to complete this project. By allowing them to choose their type of presentation, many learning styles and mind styles are addressed, furthering their comfort level and creativity. I don't want this project to be something they rush through to complete; I want the students to enjoy the process and take not only the information out of it, but to also retain the life skills. By analyzing different careers and synthesizing a final product for their peers to view, they will enhance their own retention of the information they gain.

Below is a graphic portrayal of detailed job opportunities utilizing physics (<http://www.aip.org/careersvc/pify/indigo.html>). I plan to use this on my process page so that students can first see the huge variety of careers and secondly, they can begin to pick a career to research.



## Sources

Sousa, D. (2001). *How the Brain Learns*. Thousand Oaks: Corwin Press Inc.

Cristini, A. (Fall, 2007) Class notes. "Brainy Bits."

Bernice, Nick. (Fall, 2007) Class notes. Pedagogy notes.

## Useful Sites for Webquest:

<http://www.spsnational.org/cup/>

Search for local internships, possible jobs, prepare for teaching

<http://www.aps.org/careers/>

<http://www.physics.org/careers.asp?contentid=381>

<http://www.physics.org/article-careers.asp?contentid=423&pid=404&hsub=1>

(pie chart of types of physics careers)

<http://www.aip.org/careersvc/pify/indigo.html>

Complete description Circular Chart of various fields

<http://www.aip.org/careersvc/pify/violet.html>

other resources

<http://www.physicstoday.org/jobs/>

(list of current jobs)

<http://www.aps.org/careers/student/>

(self-assessment/preparation)