

Suggestions for Using the Career Pamphlet

Posted by teachers actively using RI-ITEST materials and activities.

Choose one of your favorite SAM activities and try to relate the model(s) in the activity to a possible career. (Students might select a gas law model that shows how gases expand when heated and relate that to the career of meteorologist or protein structure and how it relates to drug production.)

In addition to the field of science, what other types of professions are needed to produce computer modeling programs? (ie, video games, animation, marketing, etc.)

Who wants to be a?

An Activity designed to provide motivation for them to consider pursuing a STEM-related career

1. Hand out pamphlet for students to peruse.
 2. Have each student chose one STEM career that they find interesting (no two students can pick the same career)
 3. Allow students approximately 15 minutes to research their career of choice:
 - a. Colleges/Universities that have this major available
 - b. Typical work day in this field / Stress level
 - c. Work environment
 - d. Job availability (after completion of required coursework)
 - e. Opportunities for advancement within field
 4. Have students break into groups of 4-5 to “play the game”.
 5. The Game:
 - a. Objective of game: persuade other students that your career is THE BEST (using the information obtained during research)
 - b. Each group MUST ultimately agree upon ONE career that their group feels is the best and one that is the worst.
 - c. Groups then break up and “jigsaw” with other groups (until students have completely circulated room)
 - d. All “best” and “worst” careers are listed on the board – students must justify why these careers are placed in each category
 - e. In the end, the class must agree upon the best and worst career.
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Each student will receive the Exciting Careers in Computer Modeling pamphlet. After reading through the pamphlet and reviewing the careers, student will visit the Science Daily web site related to Computer Modeling:

http://www.sciencedaily.com/news/computers_math/computer_modeling/

They will browse for an article that peaks their interest. They will analyze the information in the article and write a brief summary to answer the following questions:

1. How were computer models were involved in this article?
2. What type of "job title" would you give to someone working in the field involved in the article?
- 3, What type of preparation or skills would someone need to work in that field?

The students will present this information in an informal oral presentation.

Have students review pamphlet as a starting point, and then take a career of interest and research how computer modeling is implemented in that career. Students can do oral presentations, posters, design their own pamphlets, or conduct a "career panel" to explain their career to other students.

Students could produce a power point presentation about their career, incorporating video, sound files that would approach the topic from a model perspective.

Used any time in any science class to motivate students and to increase awareness of everyday applications of computer models and potential careers which utilize modeling in science.

Students will be allowed to engage in play with a digital game system such as the Wii and the fitness programs associated. The games will be projected on the Smartboard. After everyone has had a turn, the students will break into small groups to discuss how they think the games work. They will complete a guided worksheet to encourage solid thinking about the operations of the computer programs, the modeling of real-life skills and the actual functioning of the human body. The groups will convene in a whole class discussion centering on how effective computer modeling is and how easily it is to work with a model of something when it is easily understood. They will then be asked to do some research about how modeling activities are used in other ways particularly in science and technology. They will complete a guided worksheet for homework, in which they are required to visit several websites in a scavenger hunt manner (modified webquest). They will find several examples of computer modeling at work. The next class will begin with the introduction of the career pamphlets and a short video presentation that highlights some of the careers which were included in the homework.

Activity:

- Students will create a scale drawing of a bridge and construct it using balsa wood and glue.
- Students will research engineering careers with a focus on bridge building and decide if computer modeling might be a viable tool in bridge design.
- SAM activities that reinforce concepts related to the project will include: Newton's Laws (force, mass, etc.) and Phase Change (thermal variation and its effects on materials), Intermolecular Attractions (material selection).

Extension:

Students will be asked to research schools of engineering (ex: URI) and summarize a course sequence, admission requirements, and evaluate their own readiness for college.

After completing a module brainstorm/research ideas with classmates on potential careers (example: phase change and meteorology) that would incorporate computer modeling.

On the front of your brochure is a picture that asks "How were computer models involved in making this scene possible?" (Answers on back cover.)

Find a picture from a magazine/newspaper or on-line and explain how computer models are involved in making the scene possible.

Ask students if they have connections with anyone in the community who has a career in which computer modeling is used. Invite guest-speakers into the classroom.

Students hold a poster session-- each child is required to produce a poster on a particular career. Research for their poster includes face to face or phone interviews with people who use computer modeling in their work.

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1. Students can brainstorm in small groups of 2-4 students, various careers they think are related to the fields of science and technology.
 2. Groups of 2-4 should research pamphlets and compare brainstormed lists to those found in the pamphlets. Discuss educational requirements and possible institutions to attend.
 3. Groups could generate a skit to present to class to illustrate career opportunities shown in the pamphlet. Discussion could center on possible job descriptions and places of employment. Education and salary data should be noted.
 4. Students can create visual collages to depict these career choices and post them throughout the school to promote these options. Include some non-scientific, entry-level careers to show students that their current options might be limited in advancement

opportunities. Students should have a choice to design a musical rap, poem, or other artistic media to deliver their messages.

This lesson should be presented early in the year to hook students and encourage them to learn more.

Extended assignment: Students can research local employers and area post-secondary programs to determine pathways to gain employment or internships in these careers.

Look at the Computer Modeling Pamphlet. Which one of the scientific fields that are listed would you most enjoy?

How would you use computer models in this field to solve problems and make predictions?

Can you find any real life computer models on the internet that someone in this field might use to solve this problem?

Make a poster which shows the: Profession, Pose a problems to solve and identify any models that you found on the internet. You will be sharing your poster with the class.

Students will hang their posters around the classroom. All students will leave post it comments on each others work. (Be sure to teach students what type of feedback to give as well as rules about respecting others work.)

Intro/focus:

- Choose a model from Physics, Chemistry, and Biology that best illustrates **main concepts** from that field and illustrates **different applications** of computer modeling (i.e. 3D shape of a molecular model, molecules/ions passing through a semi-permeable membrane, manipulation of particles regarding velocity or creation of an electrical current and voltage.)
 - Model/discuss key slides from each, highlighting how the computer models enhances the students understanding of each concept.
 - Anticipatory set: As a class, brainstorm possible applications of this computer modeling in various real-world scenarios/occupations.

Activity:

- Divide the class into 5 groups:
 - Group1:What is Computer Modeling & How Does it Word/What can you do with computer models
 - Groups2-5: Physics, Chemistry, Biology, Human Behavior pages
- Groups read their respective pages
- Each group is responsible for, and will consequently present to the class:
 - 3 Main Points from their reading

- A summary (for subject pages, this summary must include career names, BRIEF description, schooling required, and salary)
- Groups create a visual for presentation to the class, and may choose their format: chalkboard, overhead, poster board, portable whiteboard, PowerPoint, etc.)
- Each member of the group will participate in a portion of the oral presentation
- Student groups share out their presentations

Share:

- Class discussion about presentations, interesting points and further questions
- Illustrate connections to careers and the various computer models done already in class (or most recently completed)

Extension:

- Students can research further those careers introduced in the pamphlet (or others! ☺) that they were most interested in and provide a brief written report on things such as: what the job entails, schooling required, local schools that offer that major, salary, job outlook, working conditions, etc etc)

Warm Up:

On overhead:

Computer Modeling

Questions from the front of the pamphlet:

What is it?

Who uses it?

Where do I learn it?

How does it work?

What can I do with it?

1.) Careers that use computer modeling. After using the portion from the pamphlet “What is computer modeling?”.

2.) List and discuss the occupations within groups. Entire class then puts the ideas on the board. The students will need to realize that although the careers may be science driven they use interdisciplinary skills, such as, writing, mathematics, reading, etc...

3.) Open the sample career section of the pamphlet. Find three careers that interest your group from the pamphlet of the list provided. Research on the computer Identify the education required, description of duties, hours, salary, hours, benefits, use of computer modeling, and future employment opportunities.

4.) A poster board with all of the career information will be presented to the class.

1. Create a bulletin board/Research project about one of the careers in the pamphlet. Each student would be responsible for a different career and explaining specific ways in which the career professionals use computer models. They could also do an oral presentation to the class about the career they researched. Students should be encouraged to incorporate technology into their product.
2. Use "The Four Levels of Protein Structure" SAM activity in conjunction with a discussion of a computational chemist's career and how they use models to design medications.
3. Have students research how computer models are used in windmill technology, as this is becoming a more relevant topic in areas near the water. They may tie this into their own community or into neighboring communities. Students should determine how engineers select locations for windmill structures and how effective this type of energy source can be.
4. Host a "Career Day" at the school, where professionals that use computer models come in to talk to students about their significance in a round table type of discussion. This can be incorporated or organized within the department or through a career & college planning program if the school has this type of resource.

Lesson Plan - The use of the career pamphlet in studying how to deal with environmental concerns without sacrificing your financial future.

Objective:

SWBAT (Students will be able to)

- 1) determine how computer models can be used to solve real world problems.
- 2) determine what particular career would allow you to solve the Chesapeake Bay problem we've studied in class.
- 3) determine what particular career would bring you the most satisfaction for a job well done.

Discussion:

Have the students review the article by Peter Whoriskey, "Bay Pollution Progress Overstated"; July 18,2004 (<http://www.washingtonpost.com/wp-dyn/articles/A57380-2004Jul17.html>)

Students,

We have discussed in class the presence of bias in Science, in particular the Chesapeake Bay problem as posted in the Washington Post(Online version) by Peter Whoriskey, July 18,2004. We've noted in this article that the monies allotted for the cleanup of the Bay were not used because politicians using a factitious computer model claimed that the Bay was making tremendous improvement in the ongoing clean up. It was however noted that in the mid 1980's to 2003, the nitrogen and phosphorous (two targeted pollutants) showed no change in concentration during the so called "clean up".

It was found by the Washington Post and you that "an institutional bias to show progress" existed.

Problem: If you were living next to the Bay, you would have a vested interest in the good health of the Bay. Let's say you had a unique opportunity to investigate the conditions of the Bay, what career in the pamphlet would you choose to monitor. and correct the adverse conditions in the Bay? Now, remember you want to get to the problem as fast as possible, but money for education is limited. What would you do and why?

Note to Instructor: The students will be motivated to read the entire pamphlet knowing that computer modeling allows them to do research remotely, and more comprehensively without the necessity of many research expeditions into the Bay itself. They will also need to know how much time is needed for a bachelor and Master's degree to be achieved and the cost at a good school. Let them estimate the "incidentals of study" in small groups then decide on the correct career to solve their problem. The students will be "tickled" and very motivated when discussing the financial impacts with their particular choices on the whole class in presentation.

Have students read the pamphlet in class and discuss some of the positives and negatives of the careers listed. Have them brainstorm other careers and uses for computer modeling. FOR HOMEWORK - as a project, the students will create a poster board or a "tri-fold" about the olympics and how computer modeling could or is used for them. ie: helping skaters land their jumps. Helping ski flyers understand the wind velocity and how it helps them get more distance. Or perhaps imaging luge runs on different tracks and surfaces to help drivers accommodate for changes. Analyze the calorie intake required for the exertion of a bi-athalon skier versus short track speed skaters, etc.... AND attach a "career" to whichever model they chose. (meaning.... what type of career would they have to have in order to understand the calorie intake vs exertion, or to determine the wind velocity, or to develop the angles figure skaters or snowboarders need to create to land their jumps.)

In class after the assignments are submitted, we will discuss the algebra behind the model.... it's there for almost any of the olympic connections they might have chosen.

With the recent outbreaks of the H1N1 flu virus you would be able to link a few careers in computer modeling. The careers that would assist in studying this virus using computer modeling are sociologist, epidemiologist, lab technicians, computational chemist (drug designer), environmental engineer, and material scientist.

Students will be broken down into six groups. Each group will be assigned one of the fore mentioned careers. The task of each group will be to research/investigate:

- Research the fore mentioned career/field including: educational requirements (major/ course work), salary, hours worked and major companies.

- How their career uses computer modeling to help understand and treat the H1N1 virus outbreak.
- Create a plan for future outbreaks.

Students will present their findings in a powerpoint presentation to the class.

Once all presentations are presented the students will have to create a concept map stating how each career path plays a role in the H1N1 outbreak.

Student could run the SAM activity – Protein Partnering and Function – to show how the intermolecular attraction of the Igg molecule helps the body fight off infection.

Have students match the model activity that they have completed to one of the careers in the pamphlet.

- Possible connection between the model and the career
- Explain the reasoning behind the connection
- Example: The Molecular Recognition Modeling Activity can be linked to a drug designer because a drug designer creates molecules that specifically bind together to perform a function.

Pre-Activity:

Students will read Computer Modeling pamphlet.

Time: 55 min class period

Activity: individual

Use <https://secure.waytogori.org>

Pick a stem career that is interesting (not in the pamphlet)- Students will list the following information:

Job title-

Description

Education required- courses required and degree required

Salary (annual)

Activity- whole class:

Correlate the salary and education required by:

Students put salary on sticky note and place it on a graph of # year education required.

1. The class is divided into 5 groups of 4-5 students each depending on the size of the class. Within each group the following roles are assigned.

Principal investigator: Develops research questions and facilitates team discussion; oversees research of the team; presents findings

Research Assistant: Researches questions developed by the team; assists in presentation of findings

Word Wizard: Responsible for defining new vocabulary; assists in research and data development as needed; assists in presentation of findings

Technical Illustrator: Responsible for the development of technical illustrations that sum up findings; assists in research and data development as needed; assists in presentation of findings

Personnel Officer: Researches and reports on two careers associated with the assigned section and article

(If class is small Word Wizard and Technical Illustrator can be combined.)

2. Each group is assigned a section of the pamphlet to read

Group 1 What is computer modeling and how does it work

Group 2: Physics

Group 3: Chemistry

Group 4 Biology

Group 5 Human Behavior

3. Each group reports on their findings using the roles assigned. Reports must include:

Summary

Research questions answered

Illustration

Vocabulary

Related Careers (describe at least 2)

(Reports can take any format but must include oral component.)

4. In addition to reading and reporting on what is in the pamphlet each group must also accomplish the following

A. Each group finds an article online or in one of the available journals in the classroom that directly relates to their section of the pamphlet.

Ex. Scientific American, Popular Science, Journal of Wildlife Management, Psychology Today, etc

Sample websites

http://www.sciencedaily.com/news/computers_math/computer_modeling great links to all disciplines

<http://memagazine.asme.org> mechanical engineering

<http://www.biomedical-engineering-online.com> biomedical engineering

[http://www.me.utexas.edu/~neptune/Papers/pmrc11\(2\).pdf](http://www.me.utexas.edu/~neptune/Papers/pmrc11(2).pdf) computer modeling and simulation of human movement

<http://www.usawaterquality.org/themes/watershed/research/planning.html> water quality modeling URI

http://www.oandp.com/articles/NEWS_2010-03-11_01.asp computer modeling and prosthetics

<http://www.informaworld.com/smpp/content~content=a909592361&db=all> computer modeling and prosthetics

[http://www.medengphys.com/article/S1350-4533\(04\)00217-6/abstract](http://www.medengphys.com/article/S1350-4533(04)00217-6/abstract) Journal of medical engineering and physics

<http://www.sciencedaily.com/releases/2007/10/071003130747.htm> New prosthetic devices convert brain signals into action

<http://www.astronomy.com/asy/default.aspx?c=a&id=8337> Texas size computer finds most massive black hole

B. Each group summarizes the article for class using their assigned roles and the categories in 3 above. The following must also be addressed in their presentation

- Explain how computer modeling integral in the development of the findings of the article. Give at least 2 specific examples
 - List at least three possible input parameters that the model used.
 - Discuss the model's benefits and limitations.
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