

New Jersey Bioscience Careers Curriculum



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Introduction

WHY SHOULD TEACHERS USE THIS UNIT?

New Jersey is the global epicenter of the bioscience industry (pharmaceutical and biotechnology). If talent drives prosperity in the biosciences, New Jersey life science teachers and students alike are stakeholders in the economic fate of New Jersey. It is critical for New Jersey teachers to stress to their students the need for talented, scientifically-literate graduates in order to keep New Jersey, and ultimately the United States, competitive in the global market.

Teachers should use this unit to help their students realize the vast number and variety of careers available in New Jersey within the biosciences. This unit helps life science teachers reach their students with the "Big Picture" of why science is taught. Scientific literacy is a necessary life skill and teachers should expose their students to different situations in high school to show them why. Written by members of the Biology Teachers Association of New Jersey, this unit exposes students to real-world applications of the needed life skills related to obtaining a bioscience career in New Jersey.

HOW CAN TEACHERS USE THIS UNIT?

Each lesson can be used individually, with minor adjustments, or in combination as a 1-2 week unit. It is highly recommended that teachers using this unit set up a class Ning, which is a free, online social network. This will allow class time to be extended through a synchronous dialogue and collaboration between the teacher and the students. Detailed instructions on setting up the Ning are found in Appendix C. When the teacher sets up the Ning, discussion forums will allow students to post responses to reflection questions. Detailed instructions for the Ning novice are included to assist. Nings are very easy to set-up and navigate, even for technology-phobic individuals. There are various formative assessments within each lesson, as well as the "Perfect 100" which allows students to select individual tasks to accumulate 100 points based on their own preferences and learning styles.

These activities were designed to make the inclusion of this unit as user-friendly as possible, but modifications and adjustments can be made to suit the needs of individual teachers and time constraints. All of the rubrics, worksheets, answer sheets, and discussion questions are included for teachers to utilize.

There are four lessons included in this unit as well as the "Perfect 100" final assessment. Teachers should distribute the "Perfect 100" to their students after the first lesson is completed to allow time for the students to complete the tasks. It is suggested that teachers allow at least 2 days of dedicated class time for students to work on the "Perfect 100" once lessons 1-4 are completed. The "Perfect 100" cumulative assessment for these lessons is contained in Appendix A.

The lessons and their associated worksheets and resources are contained in one comprehensive document since they are designed to be used in totality. Teachers can scroll through the entire document to view each lesson and all of the resources.

WHO DEVELOPED THIS UNIT?

The lessons presented in this unit were written and reviewed by Shonara Awad, Jessica Ayers, Stephen Boyle, Susan Connell, Rebecca Dix, Todd Kruger, Rebecca McLelland-Crawley, Judith McLoughlin, Dana Philipps, Kristina Susca, and Yamini Varma.

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LESSON #1:**TITLE: A Picture is Worth a Thousand Words****ACTIVITY AT A GLANCE:**

Students are introduced visually to a variety of scientific fields and vocabulary through a guided gallery walk in the science classroom.

ESSENTIAL QUESTIONS:

- How do I decide what I want to be and how do I prepare for my career?
- How can scientific literacy influence or affect career options?
- How do I use my own interests to pursue a job within the sciences?
- How do family, school, community and workplace influence an individual's character and ethics?

ENDURING UNDERSTANDINGS:

- Each career has a set of preparation requirements, career exploration experiences and different opportunities for personal and professional growth and satisfaction.
- In the 21st century, people are likely to have multiple jobs and careers.
- Personal actions may have an affect on future employment.
- One's character and ethics are constantly being challenged and are ever-changing and evolving.

OBJECTIVES: Upon completion of this lesson, students will be able to:

- Define emotional reaction to a variety of scientific career photos.
- Discuss past knowledge of science career options as related to photos.
- Identify potential career paths.
- Evaluate how scientific literacy relates to potential career paths.

LESSON OUTLINE:

1. Students review a posted gallery of science career options and discuss their emotional reaction and preconceived notions of science careers.
2. Students complete both individual and group worksheets on their gallery walk.
3. Teachers guide a group discussion on science literacy and career options.

JOB FAMILIES COVERED:

- Discovery research
- Clinical development
- Manufacturing & supply chain
- Quality control & regulatory affairs

- Bio-business
- Sales & marketing

TIME:

One 45-minute class period.

NEW JERSEY CORE CURRICULUM CONTENT STANDARDS:

- 2.2.12 A 1 Communication
- 5.1.12 A. 1.2 Habits of Mind
- 5.1.12 C. Safety
- 5.2.12 A.1 Cultural Contributions
- 5.4.12 A.1 Science and Technology
- 9.2.12 A.1 Critical Thinking
- 9.2.12 C.2 Interpersonal Communication

VOCABULARY:

A vocabulary list can be found in Appendix B of this document.

MATERIALS:

- One notebook or folder for each student.
- Picture sets for class or groups.
- My Gallery Wall Individual Worksheet
- My Gallery Wall Group Worksheet

ADVANCED PREPARATION:

(Teachers should create a class Ning discussion forum for this topic in advance of the class. Instructions on how to create a Ning are located in Appendix C of this document.)

- Teachers should be aware of specific issues associated with the picture wall as it relates to the emotions of the students (i.e. hospitals, animal testing) and use sensitivity and appropriate discussion on topics as warranted.
- Teachers need to download the picture sets and decide which pictures to use and where to place them (in class, in groups, or in hallway). **Gallery wall pictures are located in Appendix I of this document and in a PowerPoint on the Bio-1 WIRED website www.bio-one.org.**
- Depending upon the challenges of the classroom, the teacher may want to distribute a set of photos to students in groups instead of a picture wall.
- In advance, teachers should prepare the groups to ease the transition from the individual gallery walk to the discussions among the groups.
- Teachers should make a double-sided copy of the “My Picture Wall Individual” worksheet.

SUGGESTED PRESENTATION:

1. The teacher should download, select and either place the picture sets at tables for groups or post pictures along the walls for a gallery effect.
2. Distribute the "My Picture Wall" worksheet for students to complete.
3. Instruct students to complete the "My Picture Wall Individual" worksheet as they make their way through the gallery and to select 8 pictures they are interested in for their worksheet. This part of the activity should take approximately 10 minutes.
4. If not in groups already, place students into groups where they can then complete "My Picture Wall Group" worksheet.
5. Distribute the "My Picture Walk Group" worksheet and instruct the students to complete as indicated.
6. The teacher should monitor the discussion, and then transition the class into a discussion on themes they noticed on their picture walk and their group discussions. Questions teachers can pose to the class include:
 - a. Why is science literacy a necessary life skill?
 - b. What careers did you notice in the pictures?
 - c. Why would we discuss science careers in a biology classroom?
 - d. What steps do you need to take to pursue these careers?
 - e. What were the most difficult photos to relate to science and why?
7. Wrap-up the class by leading a brief discussion connecting the importance of the life science course they are teaching to potential career options.
8. Distribute and discuss the "Perfect 100" assessment tool. Tell students that they are responsible for selecting 100 points from the listed tasks and that they should work on the "Perfect 100" tasks for homework while the remaining lessons are being taught in class. Teachers should also provide at least 2 class periods for students to work on the "Perfect 100" during class to allow for group collaboration and feedback from the teacher. It is suggested that each lesson (2-4) begin with a reminder and brief discussion on the "Perfect 100" assignment. **The "Perfect 100" grid, instructions and rubrics are contained within this document in Appendix A.**

SUGGESTED ASSESSMENT:

- **Formative:** Teacher observation of group and individual responses, anticipatory set responses, appropriate group collaboration.
- **Summative:** Accurate worksheet completion and "Perfect 100".

ENDING REFLECTION QUESTIONS:

1. Which photo elicits the strongest response and why?
2. Which photo is the hardest to relate to science and why?

RESOURCES & LINKS:

- Bio-1's goal is to make Central New Jersey (CNJ) the next "hot spot" for the global bioscience industry, by creating high-quality, high-paying jobs and a skilled workforce.
www.bio-one.org
- Short career videos on select careers, as well as an accompanying teacher educational materials guide, containing lesson plans, worksheets and handouts, now are available.
www.aboutbioscience.org/bc_title.html
- "How to Create a Ning" in a few easy steps from eHow.com.
www.ehow.com/how_2161154_own-social-network-Ningcom.html
- www.biotechnj.org/index.jsp
- www.doleta.gov/wired/
- **[Additional Biotechnology Web Resources – Appendix H](#)**

TEACHER NOTES/REFLECTION:

Name _____ Date _____ Class _____

My Picture Wall Individual Worksheet

Image #	Image #
Describe what you see.	Describe what you see.
Write a good caption or title.	Write a good caption or title.
Describe how the image makes you feel.	Describe how the image makes you feel.
Image #	Image #
Describe what you see.	Describe what you see.
Write a good caption or title.	Write a good caption or title.
Describe how the image makes you feel.	Describe how the image makes you feel.
Image #	Image #
Describe what you see.	Describe what you see.
Write a good caption or title.	Write a good caption or title.
Describe how the image makes you feel.	Describe how the image makes you feel.

Group Members _____ Date _____ Class _____

My Picture Wall Group Worksheet

Instructions: For each photo in the gallery, discuss how the career reflected related to science. List as many ways as you can with your group. A minimum of 3 ways is required.

Photo # ____	Photo # ____
Photo # ____	Photo # ____
Photo # ____	Photo # ____
Photo # ____	Photo # ____
Photo # ____	Photo # ____

Group Members _____ Date _____ Class _____

My Picture Wall Group Worksheet - Key

Instructions: For each photo in the gallery, discuss how the career reflected related to science. List as many ways as you can with your group. A minimum of 3 ways is required.

<p>Photo # <u>1</u> - hospital Medical school, technology, ex-rays, doctors, finding a cure, research, pharmaceutical drugs, nurses, the human body, operations, bacteria, viruses</p>	<p>Photo # <u>6</u> - animal testing Research, animal rights, injects, vaccines, immunizations, bacteria, viruses, genetics, drugs, cloning, stem cells</p>
<p>Photo # <u>2</u> - green test tube Research, microscopes, experiments, making measurements, observations, variables, controls, lab safety, labs, scientific method</p>	<p>Photo # <u>7</u> - warehouse Scientific literacy, storage of drugs, safety issues, regulations</p>
<p>Photo # <u>3</u> - marketing/business woman Marketing, public speaking, presentations, science literacy/vocabulary, related careers in science, written reports, data collection</p>	<p>Photo # <u>8</u> - doctor with patient Scientific dilemma, patient rights, bioethics, experimental drugs, medical testing, anatomy, illness, MRSA, problem solving</p>
<p>Photo # <u>4</u> - laboratory New discovery, research, using technology, lab safety, chemicals, lab equipment, investigation, production, efficacy</p>	<p>Photo # <u>9</u> - approved FDA, drug approval, testing, lab safety, a cure, efficacy</p>
<p>Photo # <u>5</u> - legal Animal rights, bioethics, drug lawsuits, environmental protection law, patent law</p>	<p>Photo # <u>10</u> - bottles Finished products tested/approved, made of chemicals, made in a lab, safe for use, safe to go down the drain, hygiene</p>

LESSON #2:

TITLE: Survey of Bioscience Careers

ACTIVITY AT A GLANCE:

Students are introduced to the different career families through a student-driven inquiry where they are asked to determine education level and job descriptions for assigned jobs. Students meet with others within their job families to discuss similarities within their group to determine why they are grouped together. They then present this to the class and determine if they are more suited for another job family.

ESSENTIAL QUESTIONS:

- How do I decide what I want to be and how do I prepare for my career?
- How can scientific literacy influence and affect career options?
- How do I use my own interests to pursue a job within the sciences?
- How do I decide or make choices?

ENDURING UNDERSTANDINGS:

- Each career has a set of preparation requirements, career exploration experiences and different opportunities for personal and professional growth and satisfaction.
- In the 21st century, people are likely to have multiple jobs and careers.
- Personal actions may have an effect on future employment.

OBJECTIVES: Upon completion of this lesson, students will be able to:

- Define the job requirements and functions of assigned occupation.
- Describe the associated job families.
- Compare the various job families.
- Identify the educational requirements of various jobs.

LESSON OUTLINE:

1. Introduce the job families to the students by distributing **AT RANDOM** color-coded cards or stickers indicating a job title to each student.
2. Students sit at the table identifying their color-coded card and identify the qualifications of each selected occupation, salary range, and determine an appropriate "job family" name for their "color family".

JOB FAMILIES COVERED:

- Discovery research
- Clinical development
- Manufacturing & supply chain
- Quality control & regulatory affairs

- Bio-business
- Sales & marketing

TIME:

One 45-minute class period.

NEW JERSEY CORE CURRICULUM CONTENT STANDARDS:

- 2.2.12 A 1 Communication
- 5.1.12 A. 1.2 Habits of Mind
- 5.1.12 C. Safety
- 5.2.12 A.1 Cultural Contributions
- 5.4.12 A.1 Science and Technology
- 9.2.12 A.1 Critical Thinking
- 9.2.12 C.2 Interpersonal Communication

VOCABULARY:

A vocabulary list can be found in Appendix B of this document.

MATERIALS:

- One notebook or folder for each student.
- Color-coded index cards with job title.
- Tri-fold table tent for each "color family" or "job family" on each group's table.
- Vocabulary sheet of commonly used career terms for each student.

ADVANCED PREPARATION:

(Teachers should create a class Ning discussion forum for this topic in advance of the class. Instructions on how to create a Ning are located in Appendix C of this document.)

- Make color-coded index cards for each of the careers.
- Make the table tents (**see Appendix E**) with information for each "color family" or "job family" for each group's table.
- Teachers should print out the student worksheet and place at each table.
- Teachers should organize the classroom into six groups. Each group should be assigned a "color family" so students know where to go when they enter the room with their respective color index cards.

SUGGESTED PRESENTATION:

1. The teacher should ask students entering the classroom to pick from a shuffled random pile of color-coded career index cards.
2. Instruct students to find the table with the same color as their index card for their assigned seat.

3. Ask students to complete the do now section of the student worksheet (anticipatory set).
4. Ask students to share their answers at the table with their group.
5. The teacher should lead a brief discussion with the students on why scientific literacy is necessary and how it assists in career options.
6. After brief discussion, give each group their informative table tent on their careers and ask students to complete their worksheets.
7. The teacher should circulate throughout the classroom to ensure the students are on-task, on the right track, and to assist with individual student needs.
8. As indicated on the worksheet, ask students to develop and present a brief (2-5 sentences) description for presentation to the class about their job family.
9. Ask the students to summarize on their worksheets what each of the other job families are responsible for as they present to the class.
10. Pass out actual job family index cards identifying the job family title and ask students to match their group to the actual job family.
11. Wrap-up the class by leading a brief discussion retouching the concept of scientific literacy and career options.

SUGGESTED ASSESSMENT:

- **Formative:** Teacher observation of group and individual responses, anticipatory set responses, appropriate group collaboration.
- **Summative:** Accurate worksheet completion and “Perfect 100”.

NING REFLECTION QUESTIONS:

1. How can scientific literacy impact your career options?
2. Which of the job families appeals to you the most? The least? Why?
3. How would you prepare for such a career?
4. What kind of impact does biotechnology have on the State of New Jersey?
5. In your own words, what does science literacy mean? Is it important?
6. Did you notice any correlation between education level and salary? How might you explain what you observed?

RESOURCES & LINKS:

- Bio-1’s goal is to make Central New Jersey (CNJ) the next “hot spot” for the global bioscience industry, by creating high-quality, high-paying jobs and a skilled workforce.
www.bio-one.org
- Short career videos on select careers, as well as an accompanying teacher educational materials guide, containing lesson plans, worksheets and handouts, now are available.
www.aboutbioscience.org/bc_title.html
- “How to Create a Ning” in a few easy steps from eHow.com.
www.ehow.com/how_2161154_own-social-network-Ningcom.html
- www.biotechnj.org/index.jsp
- www.doleta.gov/wired/
- **[Additional Biotechnology Web Resources – Appendix H](#)**

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TEACHER NOTES/REFLECTION:

Name _____ Date _____ Class _____

Introduction to Bioscience Careers Worksheet

PART 1 - DO NOW

- 1) List possible careers that require science literacy.
- 2) Come up with a group list.

PART 2 - ON YOUR CARD WHAT IS...

- 3) Your job title:
- 4) Your educational qualifications:
- 5) Your salary range:
- 6) What qualities do you possess that make you qualified for this job?

PART 3 - IN YOUR GROUP...

- 7) List all the job titles in your group:
- 8) In your group, what do all the jobs in your color family have in common?
- 9) Based on your answer to question 8, what do you think your department is called?
- 10) Why do you think there is a range in salary in each color group?

11) Create a 2-5 sentence description of your job family to present to the class.

12) As you listen to the other groups present, write down...

Group Name	Description
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

13) What is your actual job description?

14) Does it match correctly to what you had written as an answer to number 8? Why or why not?

15) Which color groups do you see yourself pursuing a career in and WHY? Rank your top three.

Name _____ Date _____ Class _____

Survey of Bio-Science Careers Handout 1 - Key

PART 1 - DO NOW

- 1) Individually, list possible careers which require science literacy.
Answers may vary. Some examples include physician, nurse, researcher, pharmaceutical sales representative, etc.
- 2) As a group, combine all the possible careers which require science literacy.
Answers may vary.

PART 2 - ON YOUR CARD WHAT IS...

Sample Answer

- 3) Your job title:
Medical Writer (quality control/regulatory affairs job family)
Medical Writer (clinical development)
- 4) Your educational qualifications:
B.S. in Science (e.g. biology, chemistry, & engineering)
- 5) Your salary range:
\$30,000 - \$50,000 (quality control/regulatory affairs job family)
\$80,000 - \$110,000 (clinical development)
- 6) What qualities do I possess that make me qualified for this job?
 - **Creative**
 - **Working understanding of science**
 - **Work well under pressure (deadlines)**
 - **Good organizational skills**
 - **Good command of the English language**

PART 3 - IN YOUR GROUP...

- 7) List all the job titles in your group:
Sample answer for quality control/regulatory affairs job family:
 - **Quality Assurance Manager/Administrator**
 - **Quality Control Engineer/Supervisor/Technician**
 - **Validation Director/Specialist**
 - **Manager Regulatory Affairs**

- **Medical Writer**
- **Technician**
- **Clinical Trial Associate**

8) In your group, what do all the jobs in your color family have in common?

Sample answer for quality control/regulatory affairs job family:

- **All jobs require a background in science**
- **Product Safety**
- **Standardization**
- **Quality Control**
- **Manage and review manufacturing procedures (raw materials and equipment)**
- **Implement and manage testing plans to make sure procedures meet regulatory requirements**
- **Ensure product development**
 - **Prepare procedural documents**
 - **Draft proper submission of documents**
- **Basic understanding of measurement requirements**

9) Based on your answer to question 8, what do you think your department is called?

Quality control/regulatory affairs

10) Why do you think there is a range in salary in each color group?

- **Education Level**
- **Experience**

11) Create a 2-5 sentence description about your job family that you will present to the class.

Sample answer for quality control/regulatory affairs job family:

- **The quality control/regulatory affairs job family involves establishing specific guidelines for the manufacturing process and implementing the work to make sure that the raw materials and equipment follow set manufacturing standards and to ensure that the resulting product meets regulatory requirements.**

12) As you listen to the other groups present, write down...

Group Name

Description

Bio-business	<ul style="list-style-type: none"> • Organization and communication with public and investors • Provide technical support • Negotiate contracts • Legal advice • Tracking finances and employment
Clinical Development	<ul style="list-style-type: none"> • Conducts research to see if the products are effective and safe on humans • Train clinical staff to conduct research • Carry out clinical trials, analyze data, and interpret results • Use advanced statistics to interpret data • Document clinical trial procedures and outcomes • Demonstrate that a drug is effective and safe for human consumption
Discovery Research	<ul style="list-style-type: none"> • Conducts basic/molecular research <ul style="list-style-type: none"> ○ Initial scientific experiments to develop a product to solve a problem ○ Animal studies • Strong science and medical background • Analyzes data, often using computer technologies • Good communication skills • Public speaking • Provides initial framework for clinical experiments
Manufacturing & Supply Chain	<ul style="list-style-type: none"> • Producing products and distributing them to consumers • Understanding market trends • Follow strict processes in the assessment of test samples • Availability of products for the consumer
Quality Control/Regulatory Affairs	<ul style="list-style-type: none"> • Manage and review manufacturing procedures (raw materials and equipment) • Implement and manage testing plans to make sure procedures meet regulatory requirements • Ensure product development <ul style="list-style-type: none"> ○ Prepare procedural documents ○ Draft proper submission of documents • Basic understanding of measurement requirements
Sales & Marketing	<ul style="list-style-type: none"> • Market products to consumers and physicians • Provide technical assistance and information to consumers • Provide ideas in packaging, marketing, budgeting, and product expansion

13) What is your actual job description?

Sample answer for medical writer (quality control/regulatory affairs job family)

- **Prepare procedural documents**
- **Ensure that the correct paperwork is submitted to the proper agencies**

Sample answer for medical writer (clinical development job family)

- **Organize and interpret clinical data**
- **Work with researchers and administrators to develop written documents for regulatory approval, scientific journals, conferences, and marketing initiatives**

14) Which color groups do you see yourself pursuing a career in and WHY? Rank your top 3.

Answers may vary.

LESSON #3:**TITLE: TEAM = Together Everyone Achieves More (Collaboration between job groups with a product in mind)****ACTIVITY AT A GLANCE:**

Students will review the different job areas available in the biotechnology/pharmaceutical industry, as well as examining which products are produced by this industry. Students will then meet in randomly assigned job families to determine their specific role in the production process. Subsequently, a jigsaw activity and class discussion will allow students to collaborate with their peers to develop an understanding of product development from start to finish.

ESSENTIAL QUESTIONS:

- How do I decide what I want to be and how do I prepare for my career?
- How can scientific literacy influence and affect career options?
- How do I use my own interests to pursue a job within the sciences?
- How do I decide or make choices?
- Why do I need to be accountable?
- How do I best communicate?

ENDURING UNDERSTANDINGS:

- Each career has a set of preparation requirements, career exploration experiences and different opportunities for personal and professional growth and satisfaction.
- In the 21st century, people are likely to have multiple jobs and careers.
- Personal actions may have an effect on future employment.
- Personal attitudes, behaviors, knowledge and skills promote self-awareness, personal responsibility and self-direction.
- Effective communication skills are necessary to convey meaning and understanding to others.

OBJECTIVES: Upon completion of this lesson, students will be able to:

- Define the roles of the occupations within the six major job groups.
- Identify the flow of information between the groups in order to bring a safe, effective product to market.

LESSON OUTLINE:

1. Review the general function of the six major job families within a biotechnology/pharmaceutical company.
2. Discuss the diversity of everyday products produced by biotechnology/pharmaceutical companies.
3. Break into student groups previously assigned at random; each group will represent one of the six major job families.

4. Students will determine the roles of the occupations within their job groups in order to bring a product to market.

JOB FAMILIES COVERED:

- Discovery research
- Clinical development
- Manufacturing & supply chain
- Quality control & regulatory affairs
- Bio-business
- Sales & marketing

TIME:

One 45-minute class period.

NEW JERSEY CORE CURRICULUM CONTENT STANDARDS:

2.2.12 A 1 Communication
5.1.12 A. 1.2 Habits of Mind
5.1.12 C. Safety
5.2.12 A.1 Cultural Contributions
5.4.12 A.1 Science and Technology
9.2.12 A.1 Critical Thinking
9.2.12 C.2 Interpersonal Communication

VOCABULARY:

A vocabulary list can be found in Appendix B of this document.

MATERIALS:

- One notebook or folder for each student.
- Writing utensils.
- Color-coded table tents indicating job groups.
- Vocabulary sheet with commonly used career terms for each student.
- Worksheet A (“Relating Jobs to Products”)
- Worksheet B (“Workflow Schematic”)

ADVANCED PREPARATION:

(Teachers should create a class Ning discussion forum for this topic in advance of the class. Instructions on how to create a Ning are located in Appendix C of this document.)

- Assign students the following homework the night before the lesson: Record five biotechnology/pharmaceutical products (i.e. shampoo, toothpaste, pain reliever) that are manufactured in New Jersey.

- Print out individual job families (**located in Appendix D of this document**) and make color-coded table tents for each of the six job groups (**sample table tent photos are located in Appendix E of this document**).
- Teachers should print out all worksheets and place at each workstation as needed.

SUGGESTED PRESENTATION:

1. Prior to class, the teacher should download and print all support documents for the lesson plan. Six job group stations should be set up around the classroom.
2. The teacher should review the general function of the six major job families within a biotechnology/pharmaceutical company.
3. As an anticipatory set, ask the students to take out the previous night's homework assignment ["Record five biotechnology/pharmaceutical products (i.e. shampoo, toothpaste, pain reliever) that are manufactured in New Jersey."]
4. Lead a brief discussion about the diversity of products that require these professions by soliciting responses from students.
5. Break the class into student groups previously assigned in lesson 2 at random; each group will represent one of the six major job groups.
6. Distribute the "Relating Jobs to Products" worksheet and instruct the students to complete as indicated.
7. Students will determine the roles of several occupations within their job group in order to bring a product to market. This part of the activity should take approximately 10-15 minutes.
8. The teacher should circulate throughout the classroom to ensure the students are on-task, on the right track, and to assist with individual student needs.
9. Depending on class size, direct students to form new groups. Each new group contains one student from each color family. Assign the same sample product to all student groups.
10. Instruct students to teach their new "company" about the responsibilities of their job group.
11. Identify the likely flow of information within the company using the student guide and make a graphic organizer to represent those findings ("HOW DO THE JOB FAMILIES RELATE TO EACH OTHER" worksheet). This part of the activity should take approximately 15 minutes.
 - a. Use "HOW DO THE JOB FAMILIES RELATED TO EACH OTHER" worksheet A for students who have lower cognitive skills.
 - b. Use "HOW DO THE JOB FAMILIES RELATED TO EACH OTHER" worksheet B for students who have higher cognitive skills.
12. The teacher should circulate throughout the classroom to ensure the students are on-task, on the right track, and to assist with individual student needs.
13. Ask each "company" to display the graphic organizers they developed.
14. Wrap-up the class by leading a brief discussion about the process of product development.

SUGGESTED ASSESSMENT:

- **Formative:** Teacher observation of group and individual responses, anticipatory set responses, appropriate group collaboration.
- **Summative:** Accurate worksheet completion and “Perfect 100”.

NING REFLECTION QUESTIONS:

1. Who helps to regulate the bioscience industry? How can we ensure products sold to consumers are safe?
2. Which of the six job groups appeals to you the most? The least? Why?
3. What is the most interesting product developed by a New Jersey bioscience company that you learned about? What makes it interesting or intriguing?
4. How do I use my own interests to pursue a job within the sciences?

RESOURCES & LINKS:

- Bio-1’s goal is to make Central New Jersey (CNJ) the next “hot spot” for the global bioscience industry, by creating high-quality, high-paying jobs and a skilled workforce. www.bio-one.org
- Short career videos on select careers, as well as an accompanying teacher educational materials guide, containing lesson plans, worksheets and handouts, now are available. www.aboutbioscience.org/bc_title.html
- “How to Create a Ning” in a few easy steps from eHow.com. www.ehow.com/how_2161154_own-social-network-Ningcom.html
- www.biotechnj.org/index.jsp
- www.doleta.gov/wired/
- **[Additional Biotechnology Web Resources – Appendix H](#)**

TEACHER NOTES/REFLECTION:

Name _____ Date _____ Class _____

Relating Product to Job Description Worksheet

PART 1: Color Family

1. What is the product assigned to your group?
2. Write a brief description of the role your color family plays in the development and marketing of this product.
3. Based on each job description in your color family, describe the roles in the development and marketing of this product. Be as DETAILED as possible. Describe at least 3 specific jobs, if your job family has more than 3 jobs listed.
4. What are two ways that the jobs in the same color family are similar to each other?
Be specific
5. What are two ways that the jobs in the same color family differ from each other? Be specific

PART 2: Product family

6. What is each color family's role in the development and marketing of this product?

- a. Bio-business

- b. Clinical development

- c. Discovery research

- d. Manufacturing and supply chain

- e. Quality control/regulatory affairs

- f. Sales and marketing

7. Why are so many different job families required in the production and marketing of a single product?

8. Does it surprise you that so many different job families are involved in the production of a single product? Why or why not?

9. In the production and marketing of this product, which color family and/or job are you likely to work most closely with? Why?

10. In the production and marketing of this product, which color family and/or job are you likely to have the least interaction with? Why?

Relating Product to Job Description Worksheet - **Key**

PART 1: Color Family

1. What is the product assigned to your group?

Answers will vary.

2. Write a brief description of the role your color family plays in the development and marketing of this product.

Bio-business	<ul style="list-style-type: none"> • Organization and communication with public and investors • Provide technical support • Negotiate contracts • Legal advice • Tracking finances and employment
Clinical Development	<ul style="list-style-type: none"> • Conducts research to see if the products are effective and safe on humans • Train clinical staff to conduct research • Carryout clinical trials, analyze data, and interpret results • Use advanced statistics to interpret data • Document clinical trial procedures and outcomes • Demonstrate that a drug is effective and safe for human consumption
Discovery Research	<ul style="list-style-type: none"> • Conducts basic/molecular research <ul style="list-style-type: none"> ○ Initial scientific experiments to develop a product to solve a problem ○ Animal studies • Strong science and medical background • Analyzes data, often using computer technologies • Good Communication skills • Public speaking • Provides initial framework for clinical experiments
Manufacturing & Supply Chain	<ul style="list-style-type: none"> • Producing products and distributing them to consumers • Understanding market trends • Follow strict processes in the assessment of test samples • Availability of products for the consumer
Quality Control/Regulatory Affairs	<ul style="list-style-type: none"> • Manage and review manufacturing procedures (raw materials and equipment) • Implement and manage testing plans to make sure procedures meet regulatory requirements • Ensure product development

	<ul style="list-style-type: none"> ○ Prepare procedural documents ○ Draft proper submission of documents ● Basic understanding of measurement requirements
Sales & Marketing	<ul style="list-style-type: none"> ● Market products to consumers and physicians ● Provide technical assistance and information to consumers ● Provide ideas in packaging, marketing, budgeting, and product expansion

3. Based on each job description in your color family, describe the roles in the development and marketing of this product. Be as DETAILED as possible. Describe at least 3 specific jobs, if your job family has more than 3 jobs listed.

Answers will vary. Refer to the "Get Growing/Career Paths" PDF for comparison.

4. What are two ways that the jobs in the same color family are similar to each other? Be specific.

Answers will vary. Refer to the "Get Growing/Career Paths" PDF for comparison.

5. What are two ways that the jobs in the same color family differ from each other? Be specific.

Answers will vary. Refer to the "Get Growing/Career Paths" PDF for comparison.

PART 2: Product family

6. Describe in detail what members of the other color families do for a living. What is each color family's role in the development and marketing of this product?

Refer to the chart above and the "Get Growing/Career Paths" PDF.

- a. Bio-business
- b. Clinical development
- c. Discovery research
- d. Manufacturing and supply chain
- e. Quality control/regulatory affairs

f. Sales and marketing

7. Why are so many different job families required in the production and marketing of a single product?

The production of an effective, safe product requires the expertise of many individuals. The process requires basic science research, clinical experimentation, adherence to regulatory standards, technology to allow for large scale production, legal guidance, and successful marketing. This system has a series of checks and balances to protect the consumers and the interests of the company.

8. Does it surprise you that so many different job families are involved in the production of a single product? Why or why not?

Answers will vary.

9. In the production and marketing of this product, which color family and/or job are you likely to work most closely with? Why?

Answers will vary. Refer to the "Get Growing/Career Paths" PDF for comparison.

10. In the production and marketing of this product, which color family and/or job are you likely to have the least interaction with? Why?

Answers will vary. Refer to the "Get Growing/Career Paths" PDF for comparison.

Name _____ Date _____ Class _____

HOW DO THE JOB FAMILIES RELATE TO EACH OTHER

Create a list of each step required in bringing a safe product to market. In your final group, place each job description you used in the order required to produce and market your product. Describe why you placed each job description/color family in this particular order. Use only the job description you used in your worksheet. You should have no more than 18 job descriptions covered.

STEPS	COLOR FAMILY	JOB DESCRIPTION	REASON FOR PLACMENT
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			

Name _____ Date _____ Class _____

HOW DO THE JOB FAMILIES RELATE TO EACH OTHER

Create a flow chart/web relating each step required in bringing a safe and effective product to market. In your final group, place each job description you used in the flow chart/web required to produce and market your product. Describe why you placed each job description/color family in this particular position in the flow chart or web. BE CREATIVE IN PRODUCING THIS FLOW CHART or WEB.

Name _____ Date _____ Class _____

HOW DO THE JOB FAMILIES RELATE TO EACH OTHER - **Key**

Create a list of each step required in bringing a safe product to market. In your final group, place each job description you used in the order required to produce and market your product. Describe why you placed each job description/color family in this particular order. Use only the job description you used in your worksheet. You should have no more than 18 job descriptions covered. *Answers will vary*

STEPS	COLOR FAMILY	JOB DESCRIPTION	REASON FOR PLACEMENT
1	Green	Scientist	Initial investigation of scientific question
2	Blue	Clinical Research Associate	Testing safety of product for humans
3	Pink	Manufacturing Supervisor	Large scale development of product
4	Orange	Quality control engineer	Check same standards are used throughout the manufacturing process
5	Yellow	Legal Council	Files a patent for the product
6	Red	Sales Rep	Making consumers aware of product
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			

Name _____ Date _____ Class _____

HOW DO THE JOB FAMILIES RELATE TO EACH OTHER

Create a flow chart / web relating each step required in bringing a safe and effective product to market. In your final group, place each job description you used in the flow chart / web required to produce and market your product. Describe why you placed each job description/color family in this particular position in the flow chart or web. BE CREATIVE IN PRODUCING THIS FLOW CHART or WEB.

SAMPLE SCHEMATIC

Discovery → Clinical → Manufacturing → Quality → Bio-business → Sales & Marketing

NOTE: Students actual responses may reflect more complex working relationships, i.e. a web of more specific occupations within job groups rather than a linear flow. It is important for the students to be able to justify their schematic.

LESSON #4:**TITLE: Scavenger Hunt of WIRED New Jersey****ACTIVITY AT A GLANCE:**

Students will examine New Jersey's role in the biotech and pharmaceutical industries through a scavenger hunt exercise.

ESSENTIAL QUESTIONS:

- How do I decide what I want to be and how do I prepare for my career?
- How can scientific literacy influence and affect career options?
- How do I use my own interests to pursue a job within the sciences?
- How do I decide or make choices?
- Why do I need to be accountable?

ENDURING UNDERSTANDINGS:

- Each career has a set of preparation requirements, career exploration experiences and different opportunities for personal and professional growth and satisfaction.
- In the 21st century, people are likely to have multiple jobs and careers.
- Personal actions may have an affect on future employment.
- Personal attitudes, behaviors, knowledge and skills promote self-awareness, personal responsibility and self-direction.
- Effective communication skills are necessary to convey meaning and understanding to others.

OBJECTIVES: Upon completion of this lesson, students will be able to:

- Identify and discuss the relationship between New Jersey and the biosciences.
- Describe and reflect on the qualifications necessary to obtain a career in the biosciences.

LESSON OUTLINE:

1. Students will work with partners to complete an online scavenger hunt related to NJ's role in the biotech and pharmaceutical industries.
2. Students will compile their information on a worksheet and reflect on the lesson via the class Ning.

JOB FAMILIES COVERED:

- Discovery research
- Clinical development
- Manufacturing & supply chain
- Quality control & regulatory affairs
- Bio-business
- Sales & marketing

TIME:

Two 45-minute class periods or one 90-minute block.

NEW JERSEY CORE CURRICULUM CONTENT STANDARDS:

2.2.12 A.1 Communication
5.1.12 A. 1.2 Habits of Mind
5.1.12 C. Safety
5.2.12 A.1 Cultural Contributions
5.4.12 A.1 Science and Technology
9.2.12 A.1 Critical Thinking
9.2.12 C.2 Interpersonal Communication

VOCABULARY:

A vocabulary sheet can be found in Appendix B of this document.

MATERIALS:

- One notebook or folder for each student
- Writing utensils
- Computers with Internet connectivity
- Vocabulary sheet with commonly used career terms for each student
- Student guide worksheets for each student

ADVANCED PREPARATION:

(Teachers should create a class Ning discussion forum for this topic in advance of the class. Instructions on how to create a Ning are located in Appendix C of this document.)

- Ensure that the Bio-1 WIRED website is accessible from school computers and student accounts and that student computers can open Adobe Acrobat files (*.pdf).
- Teachers should print out all worksheets and place at each workstation as needed.
- Assign students to review content on the class Ning.

SUGGESTED PRESENTATION:

1. Prior to class, the teacher should post a blog or a forum for reflective questions in the class Ning and invite the students to post reflective comments as they complete the scavenger hunt to the Ning.
2. Make copies of the scavenger hunt worksheet for each student.
3. The teacher should ask students to take out their notes on how to create wikis as they will be creating group wikis of their scavenger hunt answers.
4. As an anticipatory set, ask the students if they have ever traveled on the Route 1 corridor.

5. Lead a very brief discussion about the impact of the biotechnology and pharmaceutical industry within New Jersey, reflecting on the topics and discoveries of past lessons
6. Distribute the "Scavenger Hunt of WIRED New Jersey" worksheet and instruct the students to complete as indicated.
7. Each student is responsible for completing the entire worksheet.
8. The teacher should circulate throughout the classroom to ensure the students are on-task, on the right track, and to assist with individual student needs.
9. As students complete the scavenger hunt, remind students to post responses to reflection question in the class Ning.
10. Wrap-up the class by leading a brief discussion on their discoveries and reflections.

SUGGESTED ASSESSMENT:

- **Formative:** Teacher observation of group and individual responses, anticipatory set responses, appropriate group collaboration
- **Summative:** Accurate worksheet completion and "Perfect 100"

NING REFLECTION QUESTIONS:

1. What did you learn about New Jersey's role in the bioscience industry?
2. What skills do you already have that could help you find a career in the biosciences?
3. What skills do you need to gain in order to secure a career in the biosciences?
4. Which of the six job groups appeals to you the most? The least? Why?
5. Which skills required for a job in bioscience do you already have? Which skills do you think you need to work on?
6. What is the most interesting product developed by a New Jersey bioscience company that you learned about? What makes it interesting or intriguing?
7. How can New Jersey keep bioscience companies in the state? What do you think would happen if the industry declined?

RESOURCES & LINKS:

- Bio-1's goal is to make Central New Jersey (CNJ) the next "hot spot" for the global bioscience industry, by creating high-quality, high-paying jobs and a skilled workforce. www.bio-one.org
- Short career videos on select careers, as well as an accompanying teacher educational materials guide, containing lesson plans, worksheets and handouts, now are available. www.aboutbioscience.org/bc_title.html
- "How to Create a Ning" in a few easy steps from eHow.com. www.ehow.com/how_2161154_own-social-network-Ningcom.html
- www.biotechnj.org/index.jsp
- www.doleta.gov/wired/
- www.bio-one.org/content/Downloadables/bioscience_competency_model.pdf
- **[Additional Biotechnology Web Resources – Appendix H](#)**

TEACHER NOTES/REFLECTION:

Scavenger Hunt of WIRED New Jersey and Bioscience Career Qualifications

BIO-1 WIRED: To answer 1-6, log onto www.bio-one.org/index.html and go to the ABOUT BIO-1 Tab on the menu bar).

1. How did BIO-1 get its name?
2. What does WIRED mean?
3. What is BIO-1's goal for Central New Jersey (CNJ)?
4. What are the 8 BIO-1 partner companies?
5. Which colleges and universities are partnered with Bio-1 WIRED?
6. What does BIO-1 want to do for young people in New Jersey?

Bioscience Skills: Click on the [Bioscience Skills Inventory](#) link located on the HOME page. Scan through the entire PDF document to locate information to answer...

7. What are the Tier 1 - Personal Effectiveness Competencies? Be specific
8. Give an example of a reading skill necessary to be qualified for a bioscience career according to Tier 2 - Academic Competencies.
9. What are the basic computer skills necessary to be considered qualified for a bioscience career?
10. What are the 7 Tier 3 - Workplace Competencies?
11. What are two critical work functions within research and development?
12. What are two critical work functions of quality control and assurance?

Bioscience NJ: Use Google, Bing or a search engine of your choice to...

13. List 10 pharmaceutical products made in New Jersey:
14. List 5 pharmaceutical companies located in New Jersey:
Go to The Labrat at www.thelabrat.com/jobs/companies/BiotechNewJersey.shtml
15. Identify 3 companies in New Jersey who have contributed to stem cell research.
Direct students to go to www.stemcellresouces.org and run the cursor over the tab called "Who's Who" and select companies.

Ning Reflection

16. What did you learn about New Jersey's role in the bioscience industry?
17. What skills do you already have that could help you find a career in the biosciences?
18. What skills do you need to gain in order to secure a career in the biosciences?

Scavenger Hunt of WIRED New Jersey and Bioscience Career Qualifications - Key

BIO-1 WIRED: To answer 1-6, log onto www.bio-one.org/index.html and go to the ABOUT BIO-1 Tab on the menu bar).

1. How did BIO-1 get its name? *The five county Bio One partnership is named for the Route1 corridor from Rutgers to Princeton, around which most of CNJ biotech firms are clustered.*
2. What does WIRED mean? *Workforce Innovation in Regional Economic Development*
3. What is BIO-1's goal for Central New Jersey (CNJ)? *To make Central NJ the next "HOTSPOT" for global bioscience industry.*
4. What are the BIO-1 partner companies? *Johnson and Johnson, Celgene, PTC Therapeutics, Elusys, Vicus, Chromocell, Genmab, Merck*
5. Which colleges and universities are partnered with Bio-1 WIRED? *Rutgers University, Princeton University, Monmouth University, The College of New Jersey, University of Medicine and Dentistry of New Jersey (UMDNJ), Rider University, Robert Wood Johnson Medical School (RWJMS), Consortium of County Colleges including: Brookdale, Middlesex, Mercer and Raritan Community College.*
6. What does BIO-1 want to do for young people in New Jersey? *Excite young people about the bio-sciences, with a special focus on underrepresented groups.*

Bioscience Skills: Click on the Bioscience Skills Inventory link located on the Home Page. Scan through the entire PDF document to locate information to answer:

7. What are the Tier 1 - Personal Effectiveness Competencies? Be specific. *Interpersonal skills, integrity, professionalism, initiative, dependability & reliability, and lifelong learning.*
8. Give an example of a reading skill necessary to be qualified for a bioscience career according to Tier 2 - Academic Competencies.
 - *Locate, understand, and interpret written technical and non-technical information in documents such as manuals, reports, memos, graphs, charts, tables, schedules and signs.*
 - *Identify relevant details, facts, specifications, and main ideas.*
 - *Understand the essential message and purpose of written materials*
 - *Infer or locate meaning of unknown or technical vocabulary.*
9. What are the basic computer skills necessary to be considered qualified for a bioscience career?

Basic computer knowledge:

- *Basic computer hardware to perform tasks*
- *Computer terminology*
- *Fundamental capabilities of computers*

- Computer and information security

Applications:

- Word processing
- Internet and e-mail
- Spreadsheet, database, and presentation software.
- Data entry and file storage management.

10. What are the 7 Tier 3 - Workplace Competencies?

Teamwork, planning and organizing, innovative thinking, problem solving and decision making, working with tools and technology, checking examining and reporting and business fundamentals.

11. What are two critical work functions within research and development?

- Set up and conduct tests, assays.
- Evaluate document and report results of experiments.
- Prepare documents including experimental protocols, technical reports and numerical analyses.
- Understand the role of pre-clinical and clinical trials in bio-science product development
- Isolate, identify and prepare specimens for examination
- Clean, sterilize, troubleshoot, calibrate, operate, and maintain lab equipment.
- Participate in the care, use, and inventory of research plants and animals.
- Understand and utilize good control and inventory standards.

12. What are two critical work functions of quality control and assurance?

- Monitor, inspect, and verify quality of the product, procedure, or specimen to assure compliance with standards and specifications.
- Develop, install, and revise validation procedures and protocols.
- Control and maintain documentation about qualification and validation.
- Calibrate and validate equipment systems and assess equipment performance.
- Revise and update standard operating procedures.
- Take and document corrective and preventative action.
- Know and comply with current federal, state, local and industry regulations.
- Participate in compliance training.

Bioscience NJ: Use Google, Bing or a search engine of your choice to:

13. List 10 pharmaceutical products made in New Jersey:

- Any J&J product (baby powder, shampoo, lotion, baby oil, etc...)
- Celgene (REVLIMID, THALOMID, VIDAZA)
- PTC Therapeutics (Ataluren for genetic disorders)
- Elusys Therapeutics (*Staph aureus* HP Antibody, Staph (non MRSA) HP Antibody, Candida HP Antibody, Anthrax anti-toxin, CR1 Vaccines)
- Vicus (VT-122)

- Genmab (Arzerra, Zalutumumab, R1507, HuMax-CD38, R1671, R1512, R4930, HuMax-HepC, HuMax-TAC, HuMax-CD32b, HuMax-TF)
- Merck (ROTATEQ, GARDASIL, COZAAR, EMEND, FOSAMAX, FOSAMAX PLUS D, ISENTRESS, JANUMET, JANUVIA, MAXALT, PROPECIA, SINGULAIR, ZOCOR, VYTORIN, ZETIA)

14. List 5 pharmaceutical companies located in New Jersey:

Go to The Labrat at www.thelabrat.com/jobs/companies/BiotechNewJersey.shtml

15. Identify 3 companies in New Jersey who have contributed to stem cell research.

Direct students to go to www.stemcellresouces.org and run the cursor over the tab called "Who's Who" and select companies. Celgene, Cambrex, Covance, and Progenitor Cell Therapies.

Ning Reflection:

16. What did you learn about New Jersey's role in the bioscience industry?
17. What skills do you already have that could help you find a career in the biosciences?
18. What skills do you need to gain in order to secure a career in the biosciences?

APPENDIX A

Instructions for the “Perfect 100” Assessment

“The Perfect 100” is a form of a performance task assessment geared towards meeting the needs of students with different learning styles. This form of assessment allows students to demonstrate their understanding of a given topic using a variety of tools including videos, Nings, or written assignments. By using tasks that mirror real world applications, “the Perfect 100” assessment allows teachers to make students aware of the variety and range of career options that require science literacy.

1. The perfect 100 is a grid of 9 tasks (3 X 3).
2. Each task in a box has a different point value assigned to it.
 - a. The box gives a brief description of the task. Additional documentations define the task in detail and include a grading rubric for the task.
 - b. The point value is indicative of the difficulty and depth of the task. Therefore, a task worth 20 points should take less time and effort than a task worth 50 points.
3. The goal of the performance task assessment is for students to pick 3 tasks out of the 9 available in a way that the point values add up to 100 points
 - a. Alternately, teacher can allow students to select tasks adding up to more than 100 points. Teachers can choose to use the additional point value as extra credit.
 - b. The teacher can instruct students to select ANY 3 tasks adding up to a 100 points or more
 - c. The teacher can alternately determine 1 or more tasks that the students **MUST** select and then allow students to select the other 2 tasks on their own. (For example, students must select the “careerbuilder.com” OR “where’s bioscience in NJ” PLUS two additional tasks of their choice).
 - d. Alternately, teacher can pre-determine and assign specific tasks to a student or group of students.
4. Some tasks require students to work individually. Other tasks are pair or group tasks. The additional documentation on each task outlines the minimum/maximum number of students that are suggested per task.
 - a. Teacher can choose to change their group size at their discretion.
 - b. Groups do not necessarily need to be fixed in terms of number of students and/or the actual students who are in it. For example, a student can work with student B and C on “becoming a millionaire” and with student D on the “20/20 interview”.
5. As a class, teacher needs to instruct class regarding
 - a. Using the rubric
 - b. Ning reflection
 - c. Using the technologies and deliverables
 - d. Due dates
6. After discussing each task and the value of each, the teacher should allow students 1-2 days (HW) for students to research their interests and to determine which tasks they wish to work on and the select their groups.
 - a. Based on the tasks a student selects, teacher should provide students with the individual instructions and rubrics for each task (**located in Appendix A**).

7. It is suggested that teachers provide a week time frame for students to complete their projects. By providing at least 2-45 minute classes (not necessarily consecutive) this allows the teacher to make sure students are on track and provide assistance.
8. Teacher also needs to set aside and instruct students on 1-2 days when students will be presenting their deliverables if applicable.

THE PERFECT 100

<p style="text-align: center;">20/20 INTERVIEW</p> <p>Create a interview exchange scenario. The focus of the interview should be to explain two particular jobs from any of the job families. The interviews can be created in a variety of formats of your choosing: podcast/vodcast/iMovie/YouTube video/written script. (50 pts)</p>	<p style="text-align: center;">CAREERBUILDER.COM</p> <p>Write a professional resume for one job of your choosing from one of the six job families. (20 pts)</p> <p>Write professional resumes for 3 of the job titles in one job family of your choosing. (50 pts)</p>	<p style="text-align: center;">HELP WANTED AD</p> <p>Find a real job posting or wanted ad and use it as a model to create your own job posting for a job of your choosing from one of the six job families. (20 pts)</p>
<p style="text-align: center;">BECOME A MILLIONAIRE!</p> <p>Invent a hypothetical pharmaceutical or bio science product that could be manufactured in New Jersey. Trace the development of the product from creation to consumer or stores. (70pts)</p>	<p style="text-align: center;">SEE YOUR COUSELOR</p> <p>Create a poster or advertisement that the guidance department could hang up in their office that encourages students to explore careers in bio science. (20 pts)</p>	<p style="text-align: center;">WHAT'S IN IT FOR YOU!</p> <p>Write a song or jingle or rap about the importance of science literacy. (20 pts)</p>
<p style="text-align: center;">I'M THE GOVERNOR!!!!</p> <p>You are the governor of New Jersey. You are developing a tri-fold brochure that encourages companies to relocate to or stay in New Jersey. Address scientific literacy, the importance of bioscience and the impact of these industries on New Jersey's economy. (50pts)</p>	<p style="text-align: center;">MADE IN NJ</p> <p>Choose a pharmaceutical or bio science product manufactured in New Jersey. Write a one page research paper/Ning on what it does and how it is useful to society. (30 pts)</p>	<p style="text-align: center;">WHERE'S BIO SCIENCE?</p> <p>Research and create a map of New Jersey that shows</p> <ol style="list-style-type: none"> 1) Locations of bio science companies and the products they produce. 2) Locations of colleges & universities. <p style="text-align: center;">(30 pts)</p>

20/20 INTERVIEW (50pts)

- You must create TWO interview scenarios for TWO different, specific job titles. The interview could be a human resources interview for a new job opening, or you can interview a person who has that current job and is giving you an overview of their position in the company.
- Maximum Number of People in Category: 2
- You will do this along with another student—one of you will be the interviewer and the other will be the interviewee.
- You can present your interview scenario using any one or more of the following media option
 - Podcast
 - YouTube video
 - Paper script
 - Vodcast
- Categories of questions you must cover:
 1. Job description
 - a. Daily activities
 - b. Responsibilities
 2. Education—level, area of expertise
 3. Salary range—based on experience
 4. Other job families you need to interact with
 5. Importance of this role in the production of this product
 6. Role of science literacy in your job success
 7. Why are you a valuable employee to this company—why you vs. Jane Doe?
 - a. Think about why you should get this job vs. another person.
 8. What questions do you have for me/the company?
 - a. Make sure you come up with questions that a potential employee may want to know about this particular job.

GRADING RUBRIC

Category	4	3	2	1
Format & Creativity (4)	Uses creative materials throughout the entire presentation. Presentation is fluid throughout. Interview is conducted in a serious/professional manner.	Uses creative materials intermittently through presentation. Presentation lacked fluidity. Certain areas of the presentation lack professionalism.	Does not use creative materials but is still presented in an organized fashion. Certain area of the presentation lack professionalism.	Does not use creative materials. Many areas of the presentation lack professionalism.
Content (6.5)	Questions are in depth and well thought out. Responses are appropriate, extensive and contain accurate information. Covers all categories of questions above.	Questions are well thought out but lack depth. Responses are partial or contain some inaccurate information. Covers 4-6 categories of questions above.	Questions show detailed thought but lack accuracy in responses. Many responses do not answer the questions appropriately. Does not cover sufficient number of categories.	Questions are inappropriate and not in depth. Responses do not answer the question appropriately. Does not cover sufficient number of categories. Project is incomplete.
Mechanics (2)	All responses use proper grammar and correct spelling.	Most responses use proper grammar and correct spelling.	Majority of responses do not use proper grammar and spelling.	Does not use proper grammar and spelling.

BECOME A MILLIONAIRE (70pts)

- Invent a hypothetical product that could be manufactured in NJ. Trace the development of the product from creation to consumer.
- Maximum Number of People in Category: 3
- You can present your hypothetical product using any one or more of the following media option
 - PowerPoint presentation
 - Written paper
 - Poster
- Areas you must cover:
 1. What is your product?
 2. What is it used for?
 - a. For example,
 - i. Drug (pain reliever): what disease/condition does it cure/prevent/treat?
 - ii. Consumer product (hygiene, health): New or improved? Why would the consumer buy this?
 - iii. Biotech (gene therapy, cell research, stem cell)
 3. What department within the company came up with this product?
 4. What is the next step in product development? What department within the company actually develops the product? What are the steps involved in developing the product?
 - a. Think about research, development, testing (animal vs. human).
 5. During the production of this product, what is the role of the legal department?
 6. Once the product is developed,
 - a. Who is the target audience?
 - b. How is the audience informed of the product (types of advertisement, differences in meeting different age groups etc.)
 - c. How is it stored? Packaged? Transported? Supplied?
 7. How is the company going to protect its own rights in each of the steps above?
 - a. Patents, proprietary protection, competition, litigation.

GRADING RUBRIC

CATEGORY	4	3	2	1
Format/Creativity (4)	Information is very organized. Creative use of materials.	Information is organized, but product development not supported by details.	Information is organized, but product development is not in proper order.	The information appears to be disorganized. Most steps are out of order and inaccurate.
Mechanics (3)	No grammatical, spelling or punctuation errors.	Almost no grammatical, spelling or punctuation errors	A few grammatical spelling, or punctuation errors.	Many grammatical, spelling, or punctuation errors
Accurate Content (10.5)	5-6 job family roles reflect their proper function within the development process. Product development in correct order form start to finish. (creation to market)	4 job family roles reflect their proper function within the development process.	3 job family roles reflect their proper function within the development process.	Less than 3 job family roles reflect their proper function within the development process.

CAREERBUILDER.COM (50pts)

- Write a professional resume for one job title (20 points) or 3 of the job titles (50 points) of your choosing from one of the six job families
- Maximum Number of People in Category: 1
- FORMAT: This must be a paper presentation
- Areas you must cover:
 1. Objective
 2. Education
 3. Certifications (if relevant to job category)
 4. Related Experience
 5. Related Skills
 6. Professional Affiliations
 7. Other Experience
 8. Other Skills
 9. References
- Remember that there are more than 1 way to write a resume. Not every resume contains the same set of information, follows a specific format, or is of a fixed length. If relevant, your resume could be as short as one page and as long as 7. This is especially important to remember when you choose to do this as a 50 point product rather than a 20 point product. Please include information relevant to your job function. It is still possible to have a complete and excellent resume without covering every single area listed above.
- You may use one of the following websites or another of your choice as a reference point for resume writing tips.
 - <http://www.careerbuilder.com>
 - <http://www.gradview.com/articles/careers/resumetype.html>
 - <http://www.gradview.com/articles/careers/resumetype.html>

GRADING RUBRIC (50 point)

CATEGORY	4	3	2	1
FORMAT (3)	Follows a clear, easily readable format. Format is a standard resume format using standard text, verbiage font size etc.	Format has 1-2 errors. 1-2 inconsistencies with standard format. 1-2 errors in standard text, verbiage, font size	Format has 3-5 errors. 3-5 inconsistencies with standard format. 3-5 errors in standard text, verbiage, font size	Format has several errors. Several inconsistencies with standard format. Several errors in standard text, verbiage, font size Does not answer the question
CONTENT (6.5)	Covers ALL relevant information for given job title. Provides accurate information for each area covered	Missing 1-2 set of relevant information for given job title. Inaccuracies in information provided for 1-2 areas	Missing 3-5 set of relevant information for given job title. Inaccuracies in information provided for 3-5 areas	Missing several set of relevant information for given job title. Inaccuracies in information provided for several areas Does not answer the question
LANGUAGE (3)	Uses standard English No grammatical and/or spelling errors	Uses some non-standard abbreviations or syntax. 2-4 grammatical and/or spelling errors	Uses several non-standard abbreviations or syntax. 5-7 grammatical and/or spelling errors	Does NOT use standard abbreviations or syntax. multiple grammatical and/or spelling errors does not answer the question

GRADING RUBRIC (20 points)

CATEGORY	4	3	2	1
FORMAT (1)	Follows a clear, easily readable format. Format is a standard resume format using standard text, verbiage font size etc.	Format has 1-2 errors. 1-2 inconsistencies with standard format. 1-2 errors in standard text, verbiage, font size	Format has 3-5 errors. 3-5 inconsistencies with standard format. 3-5 errors in standard text, verbiage, font size	Format has several errors. Several inconsistencies with standard format. Several errors in standard text, verbiage, font size Does not answer the question
CONTENT (3)	Covers ALL relevant information for given job title. Provides accurate information for each area covered	Missing 1-2 set of relevant information for given job title. Inaccuracies in information provided for 1-2 areas	Missing 3-5 set of relevant information for given job title. Inaccuracies in information provided for 3-5 areas	Missing several set of relevant information for given job title. Inaccuracies in information provided for several areas Does not answer the question
MECHANICS (1)	Uses standard English No grammatical and/or spelling errors	Uses some non-standard abbreviations or syntax. 2-4 grammatical and/or spelling errors	Uses several non-standard abbreviations or syntax. 5-7 grammatical and/or spelling errors	Does NOT use standard abbreviations or syntax. multiple grammatical and/or spelling errors does not answer the question

HELP WANTED AD (20pts)

- Find a real job posting or wanted ad and use it as a model to create your own job posting for a job of your choosing from one of the six job families.
- Maximum Number of People in Category: 1
- You can present your job posting using any one or more of the following media option:
 - Word Document
 - Newspaper Advertisement
- Areas you must cover:
 - company name
 - job title
 - description of duties and responsibilities
 - educational qualifications
 - salary range
 - other specific skills needed for this position
 - personal attributes
 - instructions for where, when, and how to apply for the position

GRADING RUBRIC

CATEGORY	4	3	2	1
Format & Creativity (2)	Title is succinct and accurately describes the job posting. The contact information is clear. The information contains a person's name, mailing address, fax number and email address.	The title is succinct, but is only somewhat related to the job posting or the job posting accurately describes the job, but it is wordy. Most of the contact information is provided. One of the following is missing: contact name, mailing address, fax number, or email address.	The title is somewhat related to the job, and the job posting is wordy. Some of the contact information is provided. Two of the following are missing: contact name, mailing address, fax number, or email address.	The title isn't related to the job posting. Most of the contact information is missing. Only one of the following is provided: contact name, mailing address, fax number, or email address.
Content (3)	Job description accurately represents the job and is detailed. Salary information is present and correct.	Job description does accurately represent the job, but some minor information is missing. Salary information is present, but is less than 10% different from the actual salary range.	Job description does accurately represent the job, but much more information is needed. Salary information is present, but is between 10% and 20% different from the actual salary range.	Job description doesn't accurately represent the job. Salary information is present, but is 20% or more different than the actual salary range.
Mechanics (2)	The wanted ad is well organized, as well as grammatically correct.	The wanted ad is well organized, but contains a few grammatical errors.	Organization of the wanted ad needs some work.	Organization of the wanted ad is severely lacking.

MADE IN NJ (30pts)

- Your task is to identify a pharmaceutical/bioscience product manufactured in NJ and discuss through a one page paper/Ning the function and usefulness of the product.
- Maximum Number of People in Category: 1
- You can present your interview scenario using any one or more of the following media option:
 - Written one-page paper
 - Ning
- Aspects of the product you should discuss:
 1. The company that developed the product.
 2. Its date of release or proposed release.
 3. Use accurate biological concepts to explain how the product works.
 4. The needs the product satisfies in society.
 5. Predict the product's usefulness in the future.

GRADING RUBRIC

	4	3	2	1
FORMAT (1.5)	Uses proper essay format—using separate paragraphs for information as relevant Uses proper NING format	Has 1-2 errors in essay format 1-2 errors in NING format	Has 3-5 errors in essay format Has 3-5 errors in NING format	More than 5 errors in essay format More than 5 errors in NING format
CONTENT (4.5)	The company name and date of release is accurate. The description of the function contains accurate biological information. The discussion highlights the needs the product satisfies in society and forecasts the products usefulness in the future.	The company name and date of release is accurate. The biological explanation of the function contains 1-2 inaccurate concepts. The discussion of the product's usefulness does not give detailed information about the future usefulness of the product.	The company name or date of release is inaccurate. The biological explanation of the function contains several inaccurate concepts. The discussion of the product's usefulness fails to mention the future usefulness of the product.	The company name and date of release is wrong. The biological information used in the explanation contains many misconceptions and flawed concepts. There is no mention of the usefulness of the product or its forecasted usefulness for the future Project is incomplete
MECHANICS (1.5)	No grammar or spelling mistakes. Uses standard syntax	1-2 grammar or spelling mistakes 1-2 syntax errors	3-5 grammar or spelling mistakes 3-5 syntax errors	More than 5 grammar or spelling mistakes More than 5 syntax errors

SEE YOUR COUSELOR (20pts)

- You will work on your own to create a poster advertisement that the guidance department (office) could hang up in their office that encourages students to explore careers in bioscience.
- Maximum Number of People : 1
- Information you must cover:
 - Types of jobs available/job descriptions (Daily activities, Responsibilities)
 - Education—level, area of expertise
 - Salary range—based on experience
 - Role of science literacy in job success (How is science used in their job to create a product?)

GRADING RUBRIC

CATEGORY	4	3	2	1
Format (1.5)	All items of importance are clearly labeled Can be read from at least 3 ft. away Exceptionally attractive in terms of design, layout, and neatness.	Almost all items of are clearly labeled Can be read from at least 3 ft. away Attractive in design, layout and neatness.	Several items of are clearly labeled with Can be read from at least 3 ft. away. Acceptably attractive though it may be a bit messy.	Labels too small to view OR no important items labeled. Distractingly messy or poorly designed.
Content (4.5)	Includes all required elements and additional information. Student can accurately answer all questions related to facts in the poster.	All required elements are included. Student can accurately answer most questions related to facts in the poster.	All but 1 of the required elements included. Student can accurately answer about 75% of questions related to facts in the poster.	Several required elements were missing. Student appears to have insufficient knowledge about facts used in the poster.
Mechanics (1.5)	There are no mechanical or grammatical mistakes on the poster.	There is 1 mechanical or grammatical mistake on the poster.	There are 2 mechanical or grammatical mistakes on the poster.	There are more than 2 mechanical or grammatical mistakes on the poster.

WHAT'S IN IT FOR YOU?!? (20pts)

- You must write a song/jingle/rap about the importance of science literacy. The composition should be directed toward high school age students trying to promote scientific literacy. You will recite your composition to the class when completed. Alternately, you may record (video or audio) yourself.
- Maximum Number of People: 1
- Ideas to include in composition:
 - Explain, predict, describe natural phenomena
 - Creating literate students to compete on a global scientific scale
 - Read and understand scientific press
 - Engage in social conversations about science

Grading Rubric:

	4	3	2	1
FORMAT (1)	Creative Continuity of lyrics Select appropriate instrumental music to accompany lyrics	Creative <u>OR</u> Continuity of lyrics <u>OR</u> Select appropriate instrumental music to accompany lyrics	Lacks creativity <u>OR</u> Lyrics don't flow <u>OR</u> Accompanying music is not appropriate	Lacks creativity Lyrics don't flow Accompanying music is not appropriate
CONTENTS (3)	Student is prepared and obviously well rehearsed. Demonstrates full understanding of topic.	Student is prepared and obviously well rehearsed. <u>OR</u> Shows a good understanding of topic.	Student seems pretty prepared, but could have spent more time rehearsing. Shows a partial understanding of topic.	Student is not well prepared and did not rehearse. Did not show an understanding of topic. Project was incomplete.
MECHANICS (1)	Uses proper language Uses vocabulary appropriate for audience and topic.	Language used lacks sophistication Missing some vocabulary required	Poor use of language Missing most of appropriate vocabulary required	Uses inappropriate language. Lacks sufficient appropriate vocabulary Does not use proper language or vocabulary

WHERE'S BIOSCIENCE? (30pts)

- Research and create a map of New Jersey that shows:
 - Locations of bioscience companies and the products they make.
 - Locations of colleges and universities.

- Maximum Number of People in this Category: 1

- You can present your map using any one or more of the following media options:
 - PowerPoint presentation
 - Poster with key
 - Journal/Diary of a New Jersey road trip with pictures
 - Video diary

- Your map must include:
 1. 10 bioscience company locations and at least one product made by that company.
 - a. Each location should include the city/town and a picture of the product made.
 2. 10 college and/or university locations (5 public, 5 private).
 - a. Each location should include the city/town and a picture of the logo.

GRADING RUBRIC

Category	4	3	2	1
Format & Creativity (1.5)	Project is well organized. Locations represent all areas of New Jersey.	Project is well organized. Locations represent most areas of New Jersey.	Areas of the project lack organization. Locations do not represent different areas of New Jersey.	Project lacks organization. Locations do not represent different areas of New Jersey.
Content (4.5)	Contains 9-10 Bio Science locations and pics. Contains 5 public/5 private college locations and pics. Contains a key	Contains 6-8 Bio Science locations and pics. Contains 6-8 college locations. A mix of public/private. Contains a key	Contains 3-5 Bio Science locations and pics. Contains 3-5 college locations. A mix of public/private. Contains an incomplete key.	Contains less than 3 Bio Science locations and pics. Contains less than 3 college locations and pics. A mix of public/private. Does not contain a key.
Mechanics (1.5)	No grammar/spelling mistakes and uses standard syntax.	1-2 grammar/spelling mistakes. 1-2 syntax error.	3-5 grammar/spelling mistakes. 3-5 syntax error.	More than 5 grammar/spelling mistakes. More than 5 syntax errors.

YOU ARE THE GOVERNOR! (50pts)

New York, Pennsylvania and other states are competing with the existing businesses in New Jersey. Bioscience and pharmaceutical companies comprise a major sector of the New Jersey business community. As governor, you need to protect and grow New Jersey's economy. Research shows that marketing works. Since education and business impact each other, you want to point out the connection between each.

- You decide to launch 2 marketing campaigns using tri-fold brochures.
 - Goal: Raise student awareness of the importance of scientific literacy, the importance of bioscience, and the impact that these industries have on New Jersey's economy.
 - Goal: Attract new and keep existing bioscience and pharmaceutical companies.

- Maximum Number of People in Category: 2
 - You will collaborate with another student on the content of each brochure. One will design the business tri-fold, the other will design the brochure for students.

- Modifications: Students can "market" NJ or science literacy using any one or more of the following media options depending upon available technology.
 - Podcast
 - YouTube
 - Vodcast
 - Paper/poster
 - Commercial
 - Rap/song
 - Play

Content requirements:

I) BUSINESS BROCHURE:

- a. What do bioscience and pharmaceutical companies need in order to be successful in an area or state? (i.e. what factors attract them to an area.)
- b. Financial considerations
- c. Workforce considerations
- d. Transportation considerations
- e. Support businesses
- f. Social/cultural considerations

- g. Other considerations
- II) STUDENT BROCHURE:
- Bioscience & pharmaceutical industries' positive impact on life in New Jersey.
 - Economic impact if New Jersey lost many of these industries to other states or countries.
 - What might be the impact on student life and activities if New Jersey lost many of these industries to other states or countries.
 - Personal / individual benefits student may receive from investing in science courses even if they don't want to be researchers or doctors.
 - How does society and our culture gain when students invest themselves in science?
 - Why is YOUR knowledge/ understanding of science important to our state/ economy.

GRADING RUBRIC

Governor 's Tri-fold Rubric	4	3	2	1
FORMAT (4.0) Graphics	Graphics go well with the text, good graphics.	Graphics go well with the text, but too many which distract from the text.	Graphics go well with the text, but too few; "text-heavy".	Graphics do not go with the text or appear to be randomly chosen.
Attractiveness and Organization	Exceptionally attractive, well-organized information.	Attractive formatting well-organized information.	The brochure has well-organized information.	formatting and organization are confusing to the reader.
Tri-fold format	Brochure has proper format, evenly spaced columns and properly labeled sections.	Most follows proper format, with evenly spaced columns and properly labeled sections.	Some follows proper format, with evenly spaced columns and properly labeled sections.	Improper format, or unevenly spaced columns or improperly labeled sections.

<p>CONTENT (6.0)</p> <p>Accuracy and depth of content</p>	<p>All content is covered in depth, reflecting thorough understanding of the concepts.</p>	<p>Most of the content is covered in depth, reflecting clear understanding of the concepts.</p>	<p>Some of the content is covered in depth, reflecting a basic understanding of the concepts.</p>	<p>Limited content covered in depth, reflecting basic understanding of the concepts.</p>
<p>MECHANICS (2.5)</p> <p>Writing organization</p> <p>Writing mechanics</p> <p>Spelling and grammar</p>	<p>Sections have clear beginning, middle, and end.</p> <p>All capitalization and punctuation are correct throughout the brochure.</p> <p>No spelling errors remain after one person other than the typist reads and corrects the brochure.</p>	<p>Almost all brochure sections have a clear beginning, middle & end.</p> <p>Most capitalization and punctuation are correct throughout the brochure.</p> <p>No more than 1 spelling error remains after one person other than the typist reads and corrects the brochure</p>	<p>Most sections have a clear beginning, middle and end.</p> <p>There are 1-2 capitalization and/or punctuation errors in the brochure.</p> <p>No more than 3 spelling errors remain after one person other than the typist reads and corrects the brochure.</p>	<p>Less than half of sections have clear beginning, middle and end.</p> <p>There are several capitalization or punctuation errors in the brochure.</p> <p>Several spelling errors are in the brochure.</p>

APPENDIX B

Bioscience Vocabulary List

An **analyst** is someone who is skilled in conducting interpreting data.

An **associate** generally works below a higher ranking person within a company, for example a sales associate works for the general manager of a store.

Assurance within a company refers to the department that provides security and confidence in a product or within the company.

Bioinformatics is the use of computers and mathematical software to analyze vast quantities of mathematical data in a short amount of time.

The **chief executive officer** (CEO) is the head administrator of a company. A CEO is in charge of company strategy, vision and operations.

An individual that **counsels**, advises or represents another in a legal matter. This counselor may represent a plan of action or advise policy.

Efficacy is synonymous with efficiency.

An **engineer** is concerned with developing economical and safe solutions to practical problems by applying mathematics and scientific knowledge.

Facilities are buildings or installed additions for a specific purpose or function, for example transportation facilities; educational facilities; a new research facility.

Finance is the management of revenues (money, capital and/or other assets).

Forecasting is the process of estimation or prediction in unknown situations.

The **human resources** part of a company finds, interviews, recruits and trains job applicants, as well as administers employee-benefit programs.

A **liaison** is a communicator between two parties.

A **paralegal** is a person who assists lawyers through conducting legal research, as well as preparing documents related to a case.

A **patent** is the exclusive right granted by the government to an inventor to manufacture, use or sell a product.

Proprietary refers to property ownership of something made and sold by one with the sole right to do so.

Protocol is the unwritten rule of how an organization operates or a set of rules for how something is done.

The **regulatory affairs** department of a company acts as primary interpreter of federal laws and FDA regulations for other members of the company's R&D, manufacturing, and compliance staff.

A **statistician** is a mathematician who works with numerical data to analyze and interpret patterns within the data.

A **supervisor** is someone who oversees a group of workers and guides their collaborative work.

A **technician** is generally someone with a practical understanding of a general field and provides support. A person with a specialized skill in a given area, like a lab technician or a computer technician.

Validation is the act or process that may authenticate, verify or prove a specific situation.

APPENDIX C

How To Set Up A Ning

Teacher Ning accounts:

1. The teacher should go to www.Ning.com and sign up for a free Ning account.
2. Click on “Create Your Own Social Network”.
3. Give your social network a name that describes your class, for example Mr. Dan’s Career Awareness Project.
4. Pick a web address for your site, for example mrdanclass.Ning.com.
5. Describe your social network and make your Ning private if you only want YOUR students to have access to the site.
6. Add the features to your social network that you as a teacher find necessary or useful, such as a blog, a forum, etc.
7. Customize the appearance of your Ning to suit your taste.
8. Once you reach the welcome screen, you can add the students in your class by clicking on INVITE MEMBERS.
9. Send an invitation to each student in your class so that you have control of the postings in your Ning social network.
10. Your students will receive an email invitation with a link that automatically adds them to the Ning.
11. You can view each student’s contributions on their page by clicking on the MEMBERS link of the horizontal menu bar.
12. Once you see the full page of members, you can click on each student individually to view their contributions to the Ning.

Student Ning accounts:

1. The teacher should tell the students to go to www.Ning.com and sign up for their own Ning accounts with the email address he/she has for them on file.
2. The email address of the student must match the email address of their Ning account so the teacher can properly invite each student without complications.
3. Instruct them to use their real first and last name since you will be making a private social network in order to protect their identity.
4. Students should be encouraged to keep the Ning basic without customizing their page with personal information, pictures or elaborate backgrounds.

*Notify the students that you will invite them to the class Ning once they have signed up for the social network.

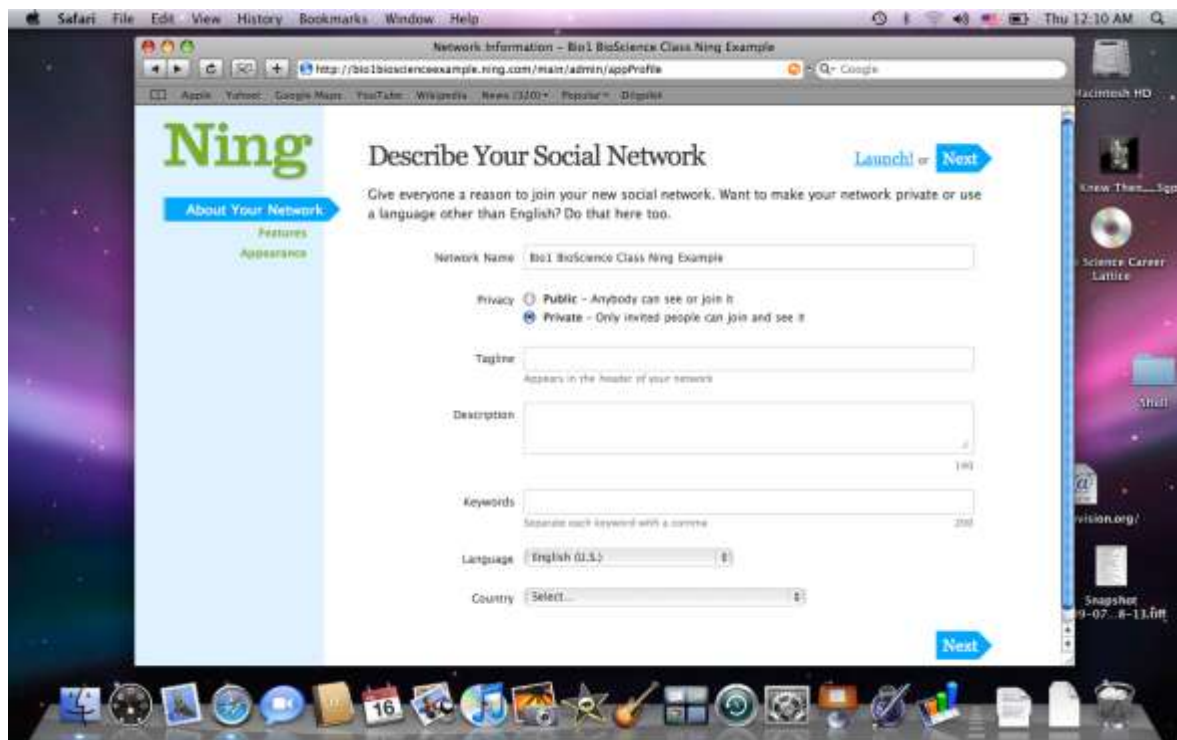
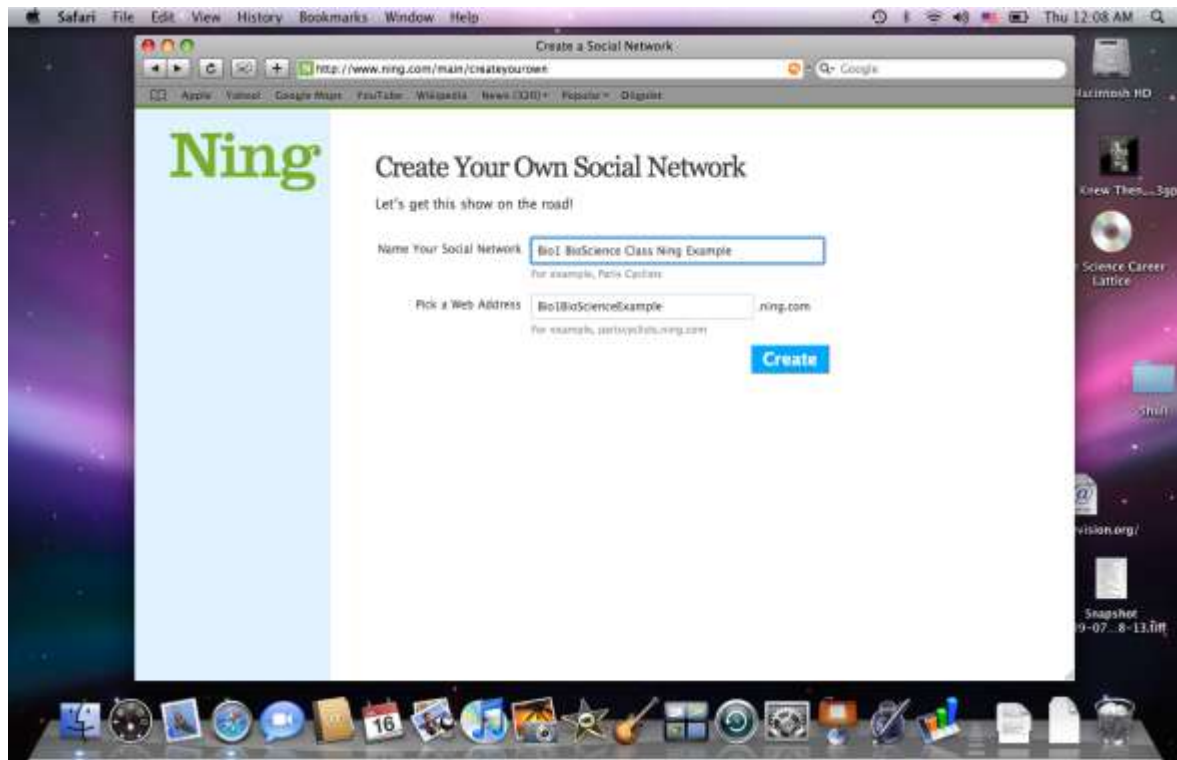
Suggested Reflection Rubric

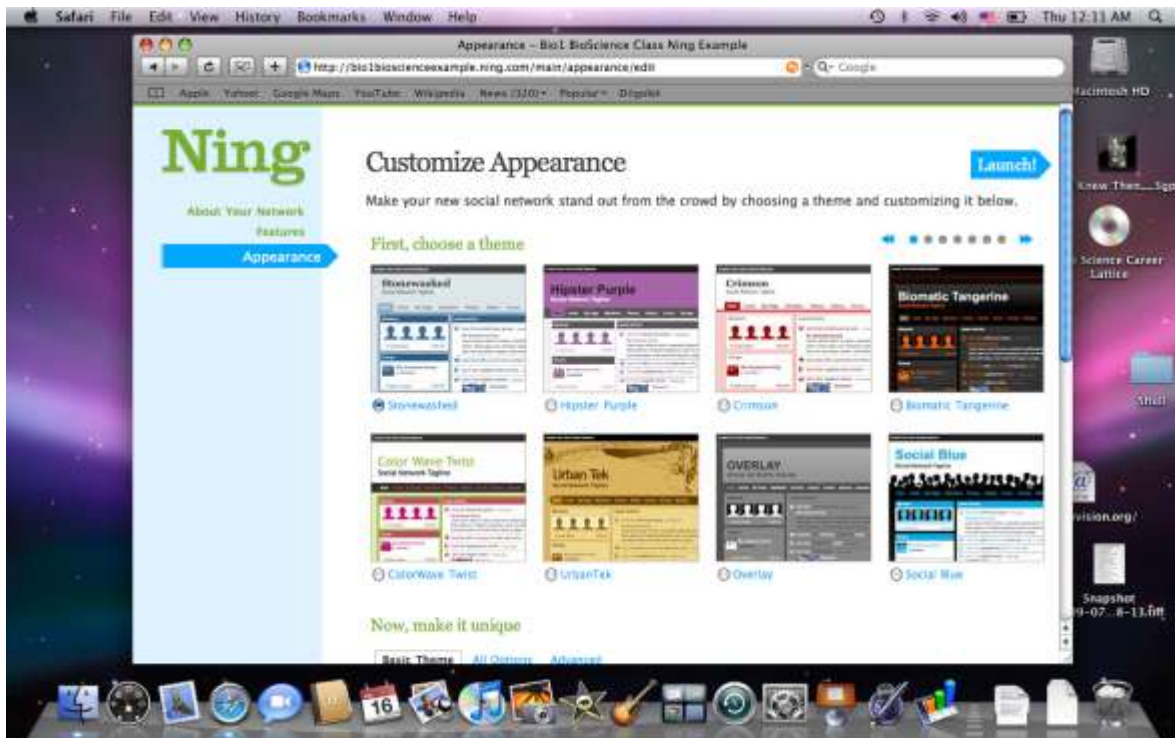
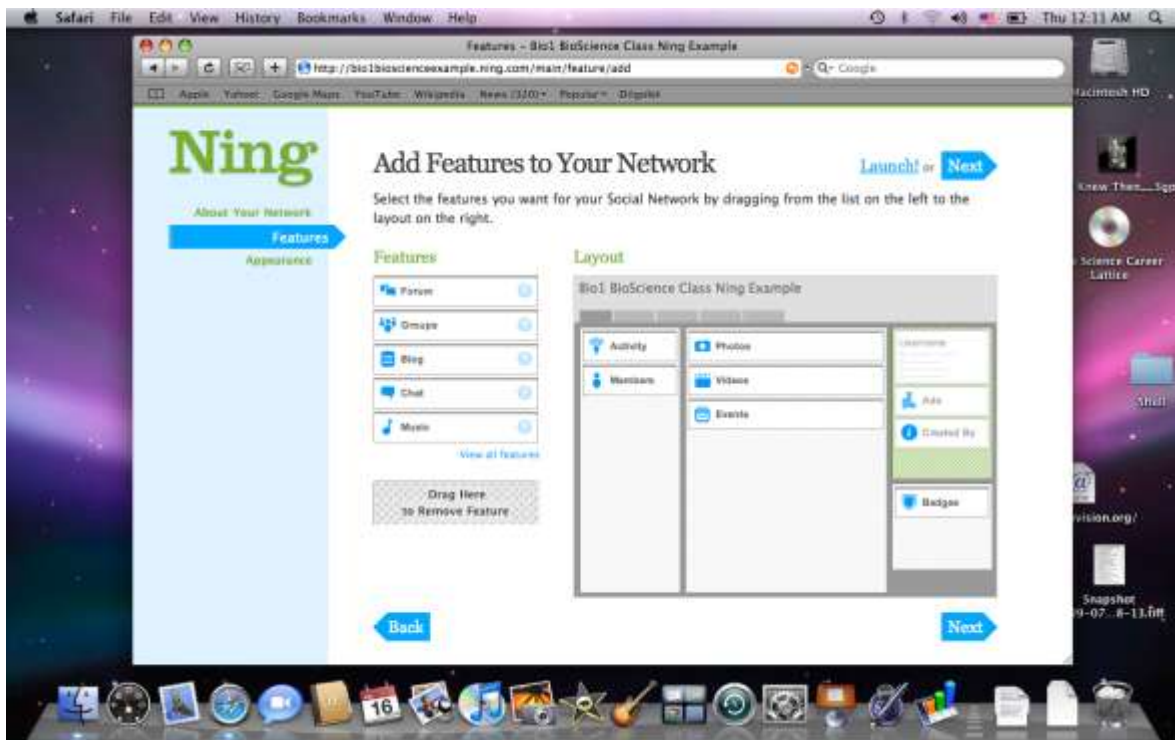
<i>Objective</i>	<i>Exceeds Expectations</i>	<i>Meets Expectations</i>	<i>Approaches Expectations</i>	<i>Does Not Meet Course Expectations</i>
Demonstrates reflection on content of lessons	Cites outside references to add to reflection of lesson no mechanical mistakes.	Often reflects and relates messages to curriculum and classroom activities with very little mechanical mistakes.	Occasionally reflects and relates messages to curriculum and classroom activities with very little mechanical mistakes.	Rarely posts comments or posts without any evidence of thought and has several spelling and grammatical errors.
Articulates developing understanding	All of the Ning reflection postings are completed	Almost all of the Ning reflection postings are completed	More than half of the Ning reflection postings are completed	Very few Ning reflection postings are completed
Engages in online learning environment to enrich classroom conversation	Responses are posted on-time* and responds to at least 3 other student responses in a thoughtful, reflective manner.	Responses are posted on-time* and responds to at least 2 other student responses in a thoughtful, reflective manner.	Responses are posted on-time* and show minimal collaboration among peers.	Responses are rarely posted on-time or show no collaboration with peers.

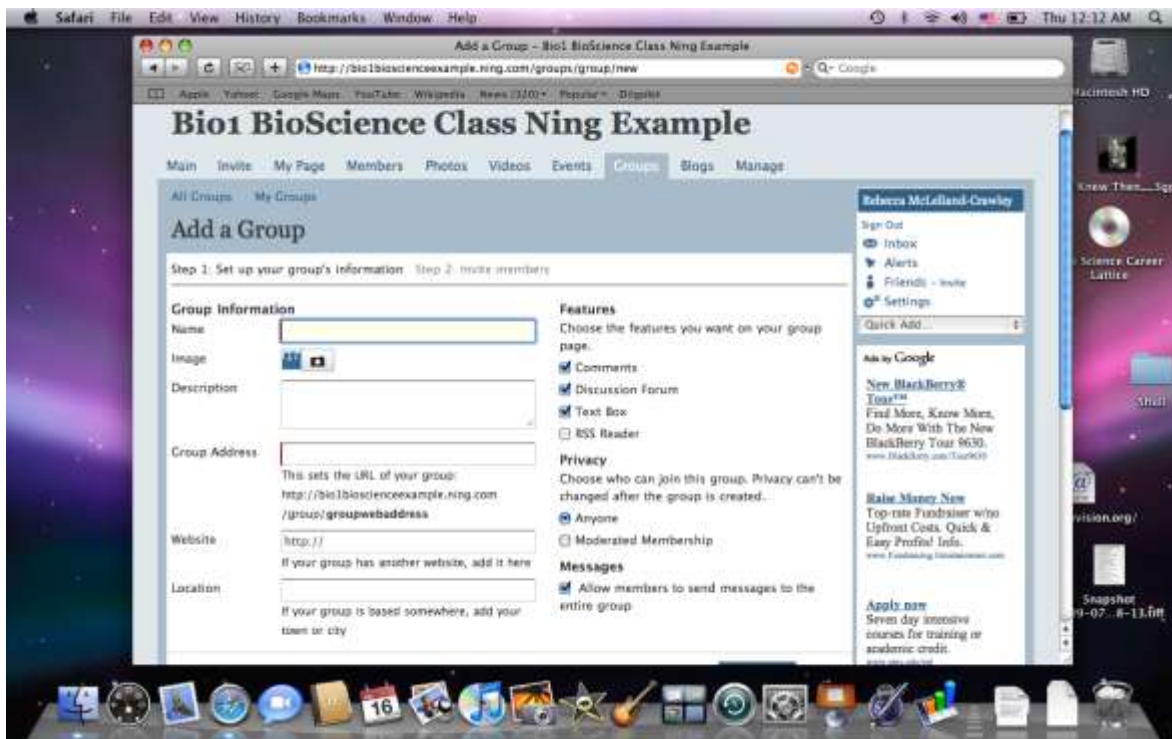
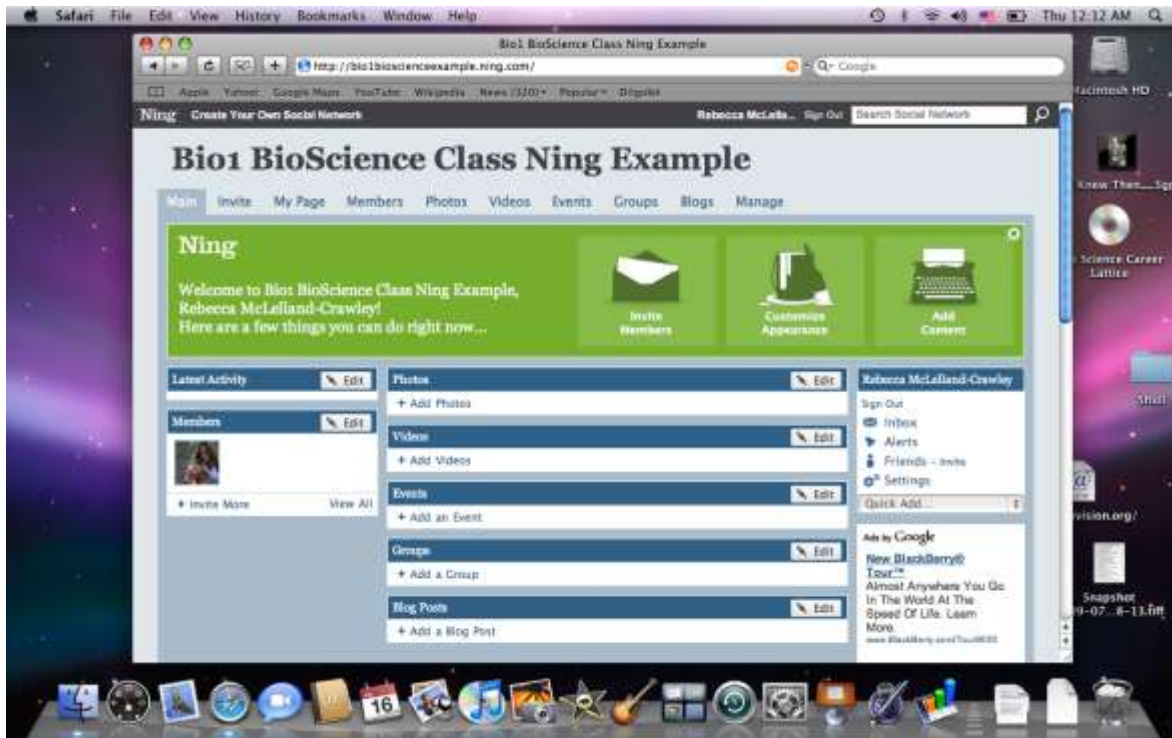
*note: Students can change the date of their postings. Teachers should check the Ning site on assigned dates to avoid this predicament if they use blogs. Discussion forums include a date/time stamp and are therefore recommended for classroom use. Teachers should assign their own point value to the above rubric.

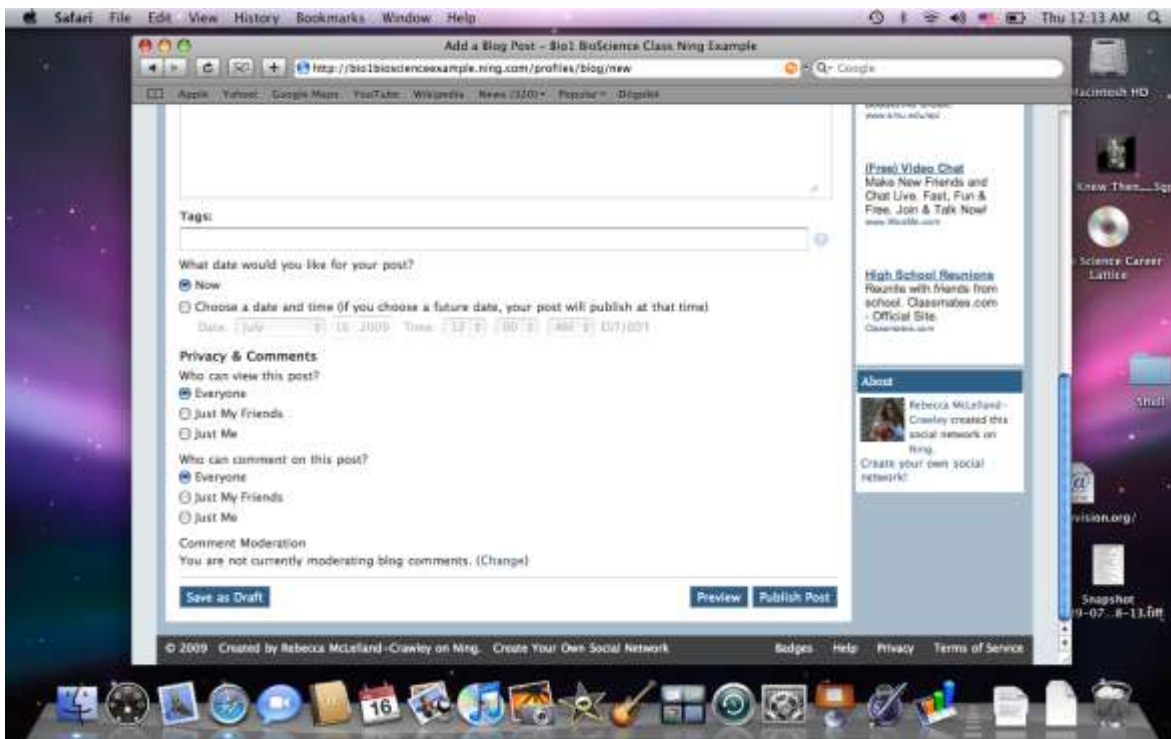
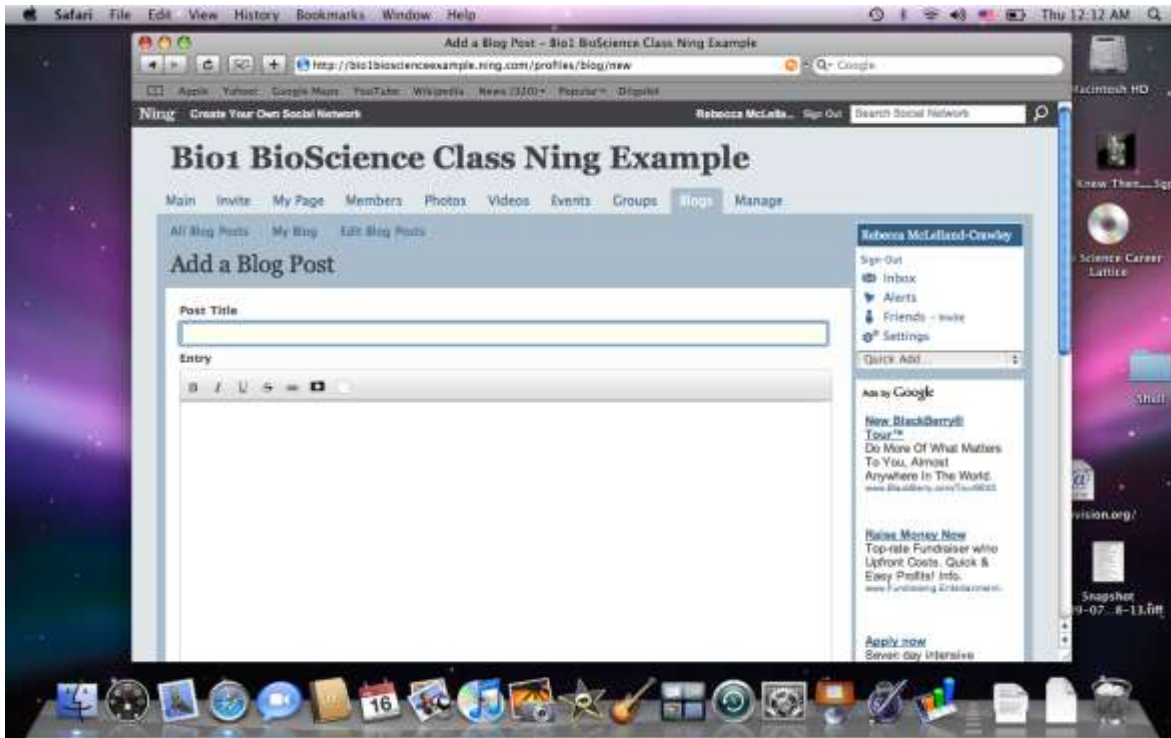
Additional general reflection questions can be found in Appendix G.

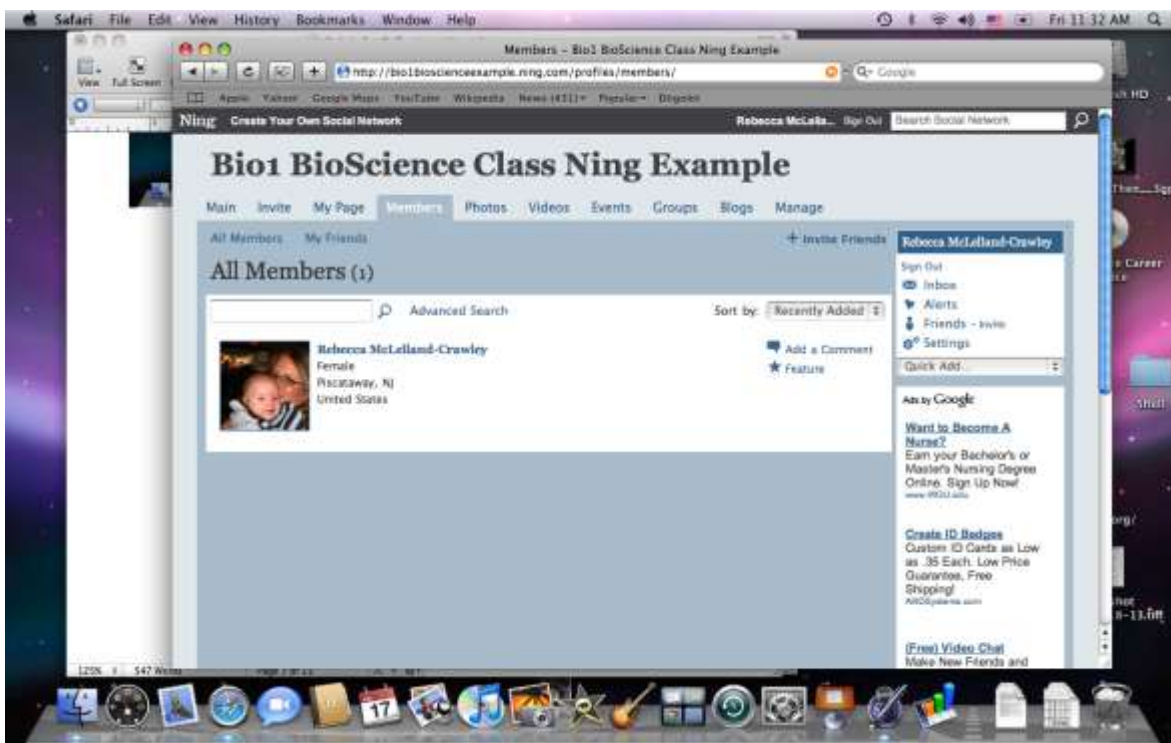
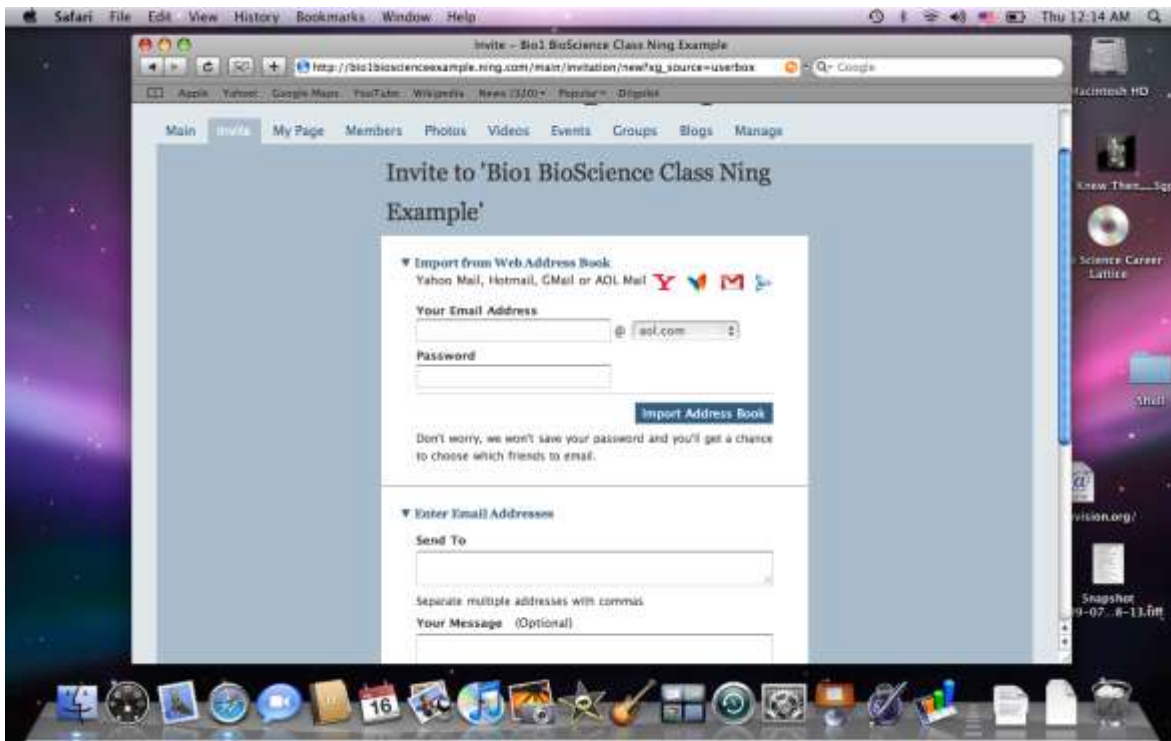
Ning Screen Shots:











Job Families

MS
manufacturing & supply chain

JOB GROUPS

<p>PLANNING & SUPPLIER MANAGEMENT</p> <p>Workers involved with planning and supplier management ensure that the organization is aware of the market trends that may influence production. In addition, they manage the vendors who supply the raw materials used in drug production.</p>	<p>PRODUCTION & OPERATIONS</p> <p>Workers involved in production and operations follow strict processes in the assessment of test samples, purification procedures, and maintenance of advanced management equipment. In addition, organizations must ensure that the raw materials needed at various stages of production are available.</p>	<p>TRANSPORTATION & DISTRIBUTION</p> <p>Products must be made available to customers. There are many workers in an organization that are involved in the process of putting shipments together and transporting them to customers. For example, workers must package and monitor shipments and make sure that the company is following all of the state laws associated with transporting of goods.</p>	<p>FACILITIES</p> <p>These workers maintain facility equipment and space to ensure that all safety standards are met. In addition, they provide guidance to develop standard operating procedures.</p>
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EXAMPLE OCCUPATIONS

<p>DIRECTOR OF PLANNING & FORECASTING</p> <p>Qualifications: Ph.D. in science (e.g., Biology, Chemistry, Engineering) Salary Range: \$150,000 - \$200,000</p>	<p>MANUFACTURING SUPERVISOR</p> <p>Qualifications: B.S. in Science (e.g., Biology, Chemistry, Engineering) Salary Range: \$80,000 - \$120,000</p>	<p>TRANSPORTATION ANALYST</p> <p>Qualifications: H.S. Diploma / B.S. in Business Salary Range: \$40,000 - \$80,000</p>	<p>SENIOR ENGINEER</p> <p>Qualifications: B.S. in Engineering Salary Range: \$80,000 - \$120,000</p>
<p>PLANNER</p> <p>Qualifications: B.S. in Science (e.g., Biology, Chemistry, Engineering) Salary Range: \$40,000 - \$80,000</p>	<p>MANUFACTURING TECHNICIAN</p> <p>Qualifications: High School Diploma Salary Range: \$40,000 - \$80,000</p>	<p>WAREHOUSE TECHNICIAN</p> <p>Qualifications: High School Diploma Salary Range: \$30,000 - \$40,000</p>	<p>FACILITIES TECHNICIAN</p> <p>Qualifications: A.A./A.S. in Mechanical/ Electrical Field Salary Range: \$30,000 - \$40,000</p>



JOB GROUPS

RESEARCH DISCOVERY

Researchers in this area conduct experiments and direct research activities to discover new medications. Researchers work to design and perform research experiments at the molecular level through detailed manipulation, observation, data analysis, and interpretation. After performing experiments, these professionals analyze the data and interpret the results.

BIOINFORMATICS

Bioinformatics professionals build the technological tools that are needed to improve the data analysis process for large data sets. In short, workers in the bioinformatics job group use advanced mathematical algorithms and computer science to organize, analyze, and interpret biological data.

EXAMPLE OCCUPATIONS

SCIENTIST/PHARMACOLOGIST

Qualifications:
M.S. or Ph.D. in Biology
Salary Range:
\$60,000 - \$120,000

BIOINFORMATICS SCIENTIST

Qualifications:
M.S. or Ph.D. in Statistics/Biostatistics
Salary Range:
\$85,000 - \$110,000

LABORATORY ASSISTANT

Qualifications:
High School Diploma
Salary Range:
\$25,000 - \$45,000

ANALYST

Qualifications:
B.S. in Computer Science, Mathematics,
Bioinformatics, or Molecular Biology
Salary Range:
\$25,000 - \$35,000



sales & MARKETING

JOB GROUPS

SALES

Those working in the sales job group provide technical assistance and information to customers, the medical and scientific community, and pharmaceutical employees.

MARKETING

Marketing specialists use their expertise to provide recommendations for activities such as product packaging, marketing budgets, product launches, and product expansion.

EXAMPLE OCCUPATIONS

MEDICAL/CLINICAL SCIENCE LIAISON

Qualifications:
B.S. in Science (e.g., Biology, Chemistry, Engineering), MBA is preferred
Salary Range:
\$80,000 - \$120,000

MARKETING RESEARCH MANAGER

Qualifications:
B.S. in Marketing or Business, MBA preferred
Salary Range:
\$80,000 - \$120,000

SALES REPRESENTATIVE

Qualifications:
B.S./M.S. in related scientific discipline (e.g., biology), marketing, or communications
Salary Range:
\$30,000 - \$120,000

MEDICAL INFORMATION SPECIALIST

Qualifications:
B.S. in Pharmacy or Nursing or M.S./Ph.D.
Salary Range:
\$30,000 - \$70,000



JOB GROUPS

COMMUNICATIONS

Communication specialists support organizational relations with the public and investors. These individuals work to increase public awareness of company activities and scientific contributions.

INFORMATION SYSTEMS

Workers in this area provide technical support, computer software and hardware installation, system management, and maintenance of computer systems.

BUSINESS DEVELOPMENT

Workers in this job group engage in the preparation, negotiation, and management of contracts that have been secured. In addition, workers in this area identify strategic alliances for future contracts and licensure.

FINANCE/ ACCOUNTING

Workers in this job group keep track of the financial operations of the organization. They track financial systems such as external contracts, employee compensation, and stocks.

LEGAL

Many of the functional areas in life science companies benefit from legal advice when entering into contracts and agreements with everyone from clinical trial participants to material suppliers. In addition, these professionals may also help to prepare patent filings for the company.

HUMAN RESOURCES

Human resources managers manage personnel in this group. They specialize in large firms and compensate employees at an equal level.

EXAMPLE OCCUPATIONS

CORPORATE COMMUNICATIONS MANAGER

Qualifications: B.A. in Communications, English, or Business Related Field
Salary Range: \$100,000 - \$150,000

CHIEF INFORMATION OFFICER

Qualifications: B.S./M.S. in Computer Science, Information Technology, Business Administration or a Related Field
Salary Range: \$150,000 - \$250,000

BUSINESS DEVELOPMENT MANAGER

Qualifications: B.S. in Marketing/ Business
Salary Range: \$80,000 - \$100,000

FINANCE ACCOUNTING MANAGER

Qualifications: B.S. in Accounting, Finance
Salary Range: \$80,000 - \$100,000

LEGAL COUNSEL

Qualifications: Law Degree
Salary Range: \$150,000 - \$250,000

HUMAN RESOURCES MANAGER

Qualifications: B.S. in Human Resources or a Related Business Field
Salary Range: \$80,000 - \$100,000

COMMUNICATIONS SPECIALIST

Qualifications: B.S. or B.A. in Communications or Business
Salary Range: \$40,000 - \$80,000

INFORMATION SERVICE TECHNICIAN

Qualifications: High School Diploma
Salary Range: \$40,000 - \$80,000

CONTRACTS ADMINISTRATOR

Qualifications: B.S. in Business
Salary Range: \$50,000 - \$80,000

FINANCIAL ANALYST

Qualifications: B.S. in Finance Accounting
Salary Range: \$50,000 - \$80,000

PARALEGAL

Qualifications: B.S. Degree
Salary Range: \$40,000 - \$80,000

HUMAN RESOURCES REPRESENTATIVE

Qualifications: B.S. in Human Resources or Business Administration
Salary Range: \$40,000 - \$80,000



JOB GROUPS

MEDICAL EXPERT

Medical experts provide support services throughout pharmaceutical companies. They provide training for clinical staff and use their medical expertise to consult marketing, sales, and regulatory affairs teams.

CLINICAL RESEARCH

Workers in the clinical research group carry out clinical trials, analyze data, and interpret results to make recommendations about whether new products should go to market.

BIostatISTICS

Scientists who engage in clinical trials are often supported by specialists who are skilled in applying advanced statistics in the analysis of diverse data sets. Scientists in this area use their expertise to guide the experimental design, data collection effort, and analysis.

MEDICAL WRITER

Clinical trial procedures and outcomes must be well documented to protect the company, trial participants, and consumers. Medical writers work with researchers and administrators to develop written documents for regulatory approval, scientific journals, conferences, and marketing initiatives.

CLINICAL TRIAL

Before a drug can be developed or marketed, it must demonstrate that it is safe for human use. Managing the clinical trial process requires workers to develop and carry out recruitment plans with participants.

EXAMPLE OCCUPATIONS

MEDICAL EXPERT

Qualifications:
M.S. or Ph.D. in a Science (e.g., Biology)
Salary Range:
\$120,000 - \$200,000

DIRECTOR OF CLINICAL RESEARCH DEVELOPMENT

Qualifications:
M.S. or Ph.D. in a Science (e.g., Biology)
Salary Range:
\$150,000 - \$200,000

DIRECTOR OF CLINICAL BIostatISTICS

Qualifications:
M.S. or Ph.D. in Biological/Biomedical Sciences
Salary Range:
\$120,000 - \$200,000

PROTOCOL DEVELOPMENT SCIENTIST

Qualifications:
B.S. or M.S. in Biological/Biomedical Sciences or R.N.
Salary Range:
\$80,000 - \$200,000

DIRECTOR OF CLINICAL PROJECTS MANAGEMENT

Qualifications:
B.S. or M.S. in Science
Salary Range:
\$80,000 - \$200,000

CLINICAL RESEARCH ASSOCIATE

Qualifications:
B.S. in Biological/Biomedical Sciences or R.N.
Salary Range:
\$40,000 - \$80,000

BIostatISTICS ASSOCIATE

Qualifications:
B.S. in Biological/Biomedical Sciences
Salary Range:
\$80,000 - \$110,000

MEDICAL WRITER

Qualifications:
M.S. in Science (e.g., Biology) or R.N.
Salary Range:
\$80,000 - \$110,000

CLINICAL TRIAL MANAGER

Qualifications:
B.S. in Science or R.N.
Salary Range:
\$40,000 - \$80,000



JOB GROUPS

QUALITY ASSURANCE

Workers in the quality assurance job group take the first steps to minimize product defects by establishing specific guidelines for the manufacturing process. Workers in this area manage and participate in the review of the manufacturing procedures.

QUALITY CONTROL

Once the process for manufacturing has been outlined and implemented, workers in the area of quality control work to make sure that the raw materials, equipment, and applied process all meet both internal and external standards.

VALIDATION

Validation specialists develop, implement, and manage testing plans and methods to ensure that the manufacturing procedures and resulting products meet regulatory requirements.

REGULATORY

Workers in the regulatory affairs job group ensure that the product development process and the final product meet the requirements of various regulating agencies. These workers prepare procedural documentation, ensure that the correct paperwork is submitted to the proper agencies, and notify employees within the organizations of required policies and procedures.

DISPENSARY MEASUREMENT

In order for the quantities of raw materials to be scaled down for production, workers in this area need a solid understanding of measurement

EXAMPLE OCCUPATIONS

QUALITY ASSURANCE MANAGER

Qualifications:
B.S. in Biological/Biomedical Science
Salary Range:
\$80,000 - \$120,000

QUALITY CONTROL ENGINEER/SUPERVISOR

Qualifications:
B.S./M.S. in Engineering
Salary Range:
\$60,000 - \$120,000

VALIDATION DIRECTOR

Qualifications:
B.S./M.S. in Science (e.g., Biology, Chemistry, Engineering)
Salary Range:
\$120,000 - \$200,000

MANAGER REGULATORY AFFAIRS

Qualifications:
(B.S./M.S. in Science (e.g., Biology, Chemistry, Engineering)
Salary Range:
\$80,000 - \$120,000

SENIOR TECHNICAL

Qualifications:
Experience in Manufacturing
Salary Range:
\$40,000 - \$80,000

QUALITY ASSURANCE DOCUMENTATION ADMINISTRATOR

Qualifications:
High School Diploma
Salary Range:
\$30,000 - \$50,000

QUALITY CONTROL TECHNICIAN

Qualifications:
High School Diploma
Salary Range:
\$35,000 - \$60,000

VALIDATION SPECIALIST

Qualifications:
B.S./M.S. in Science (e.g., Biology, Chemistry, Engineering)
Salary Range:
\$40,000 - \$80,000

MEDICAL WRITER

Qualifications:
B.S. in Science (e.g., Biology, Chemistry, Engineering)
Salary Range:
\$30,000 - \$50,000

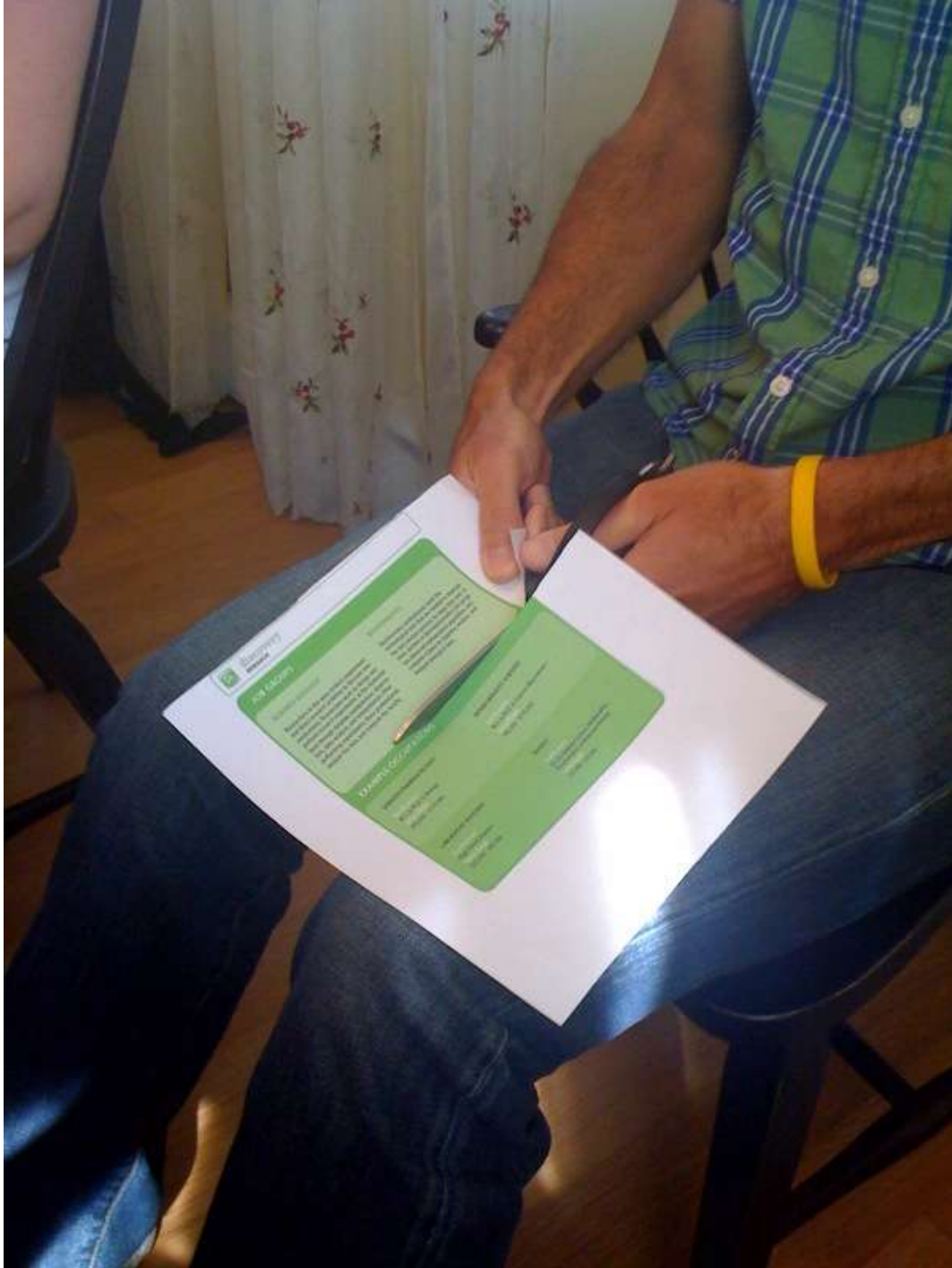
CLINICAL TRIALS

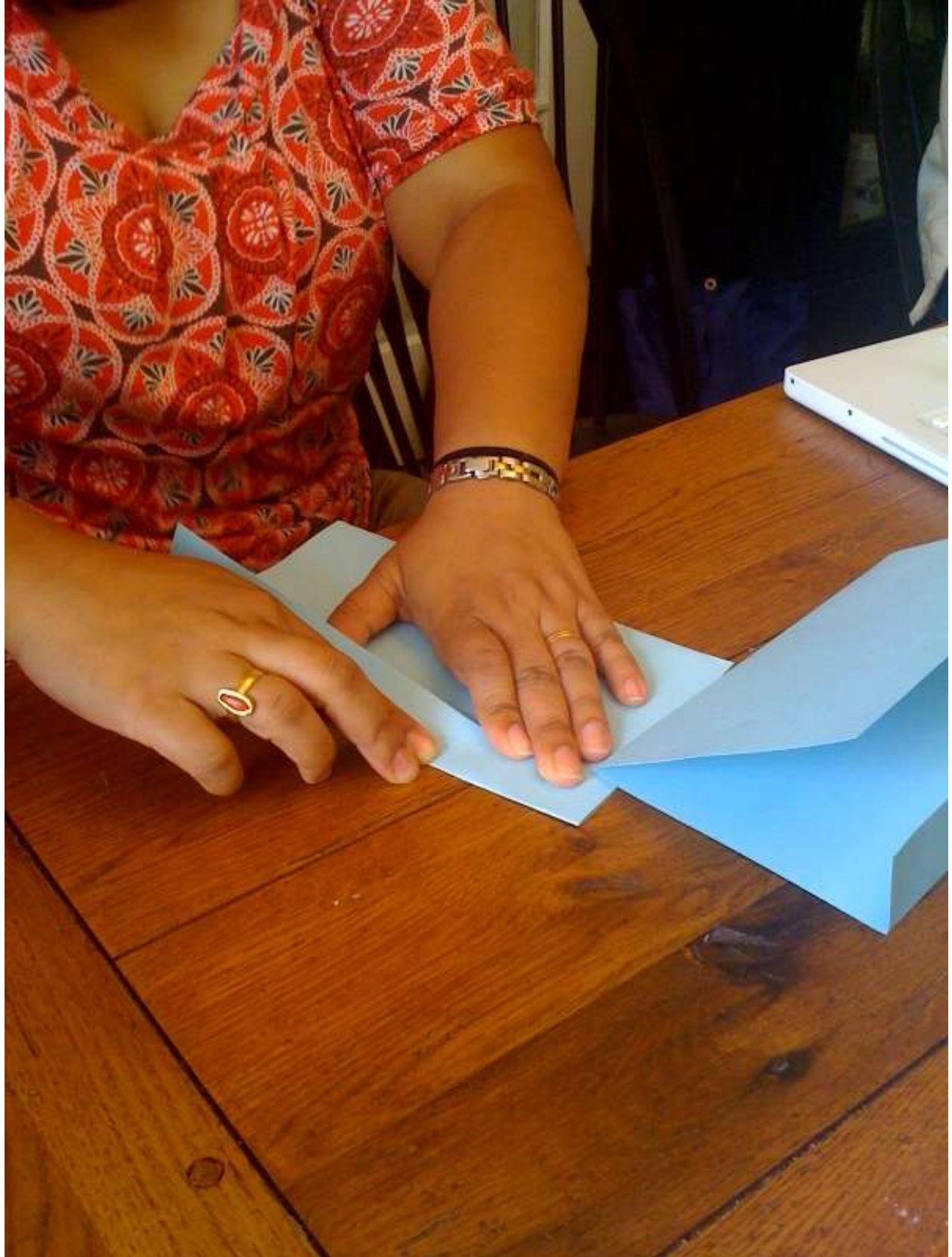
Qualifications:
Experience in Manufacturing
Salary Range:
\$30,000 - \$50,000

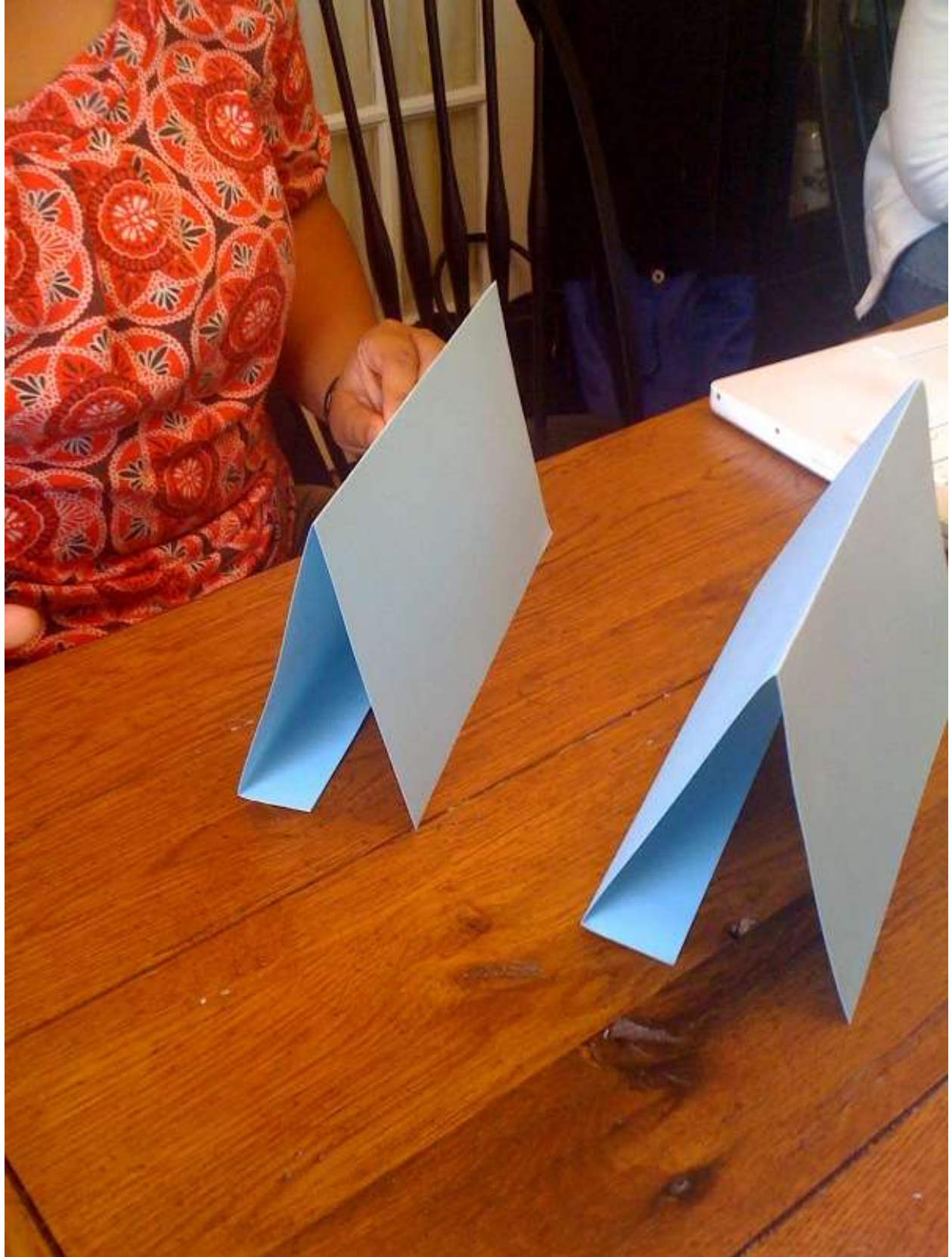
APPENDIX E

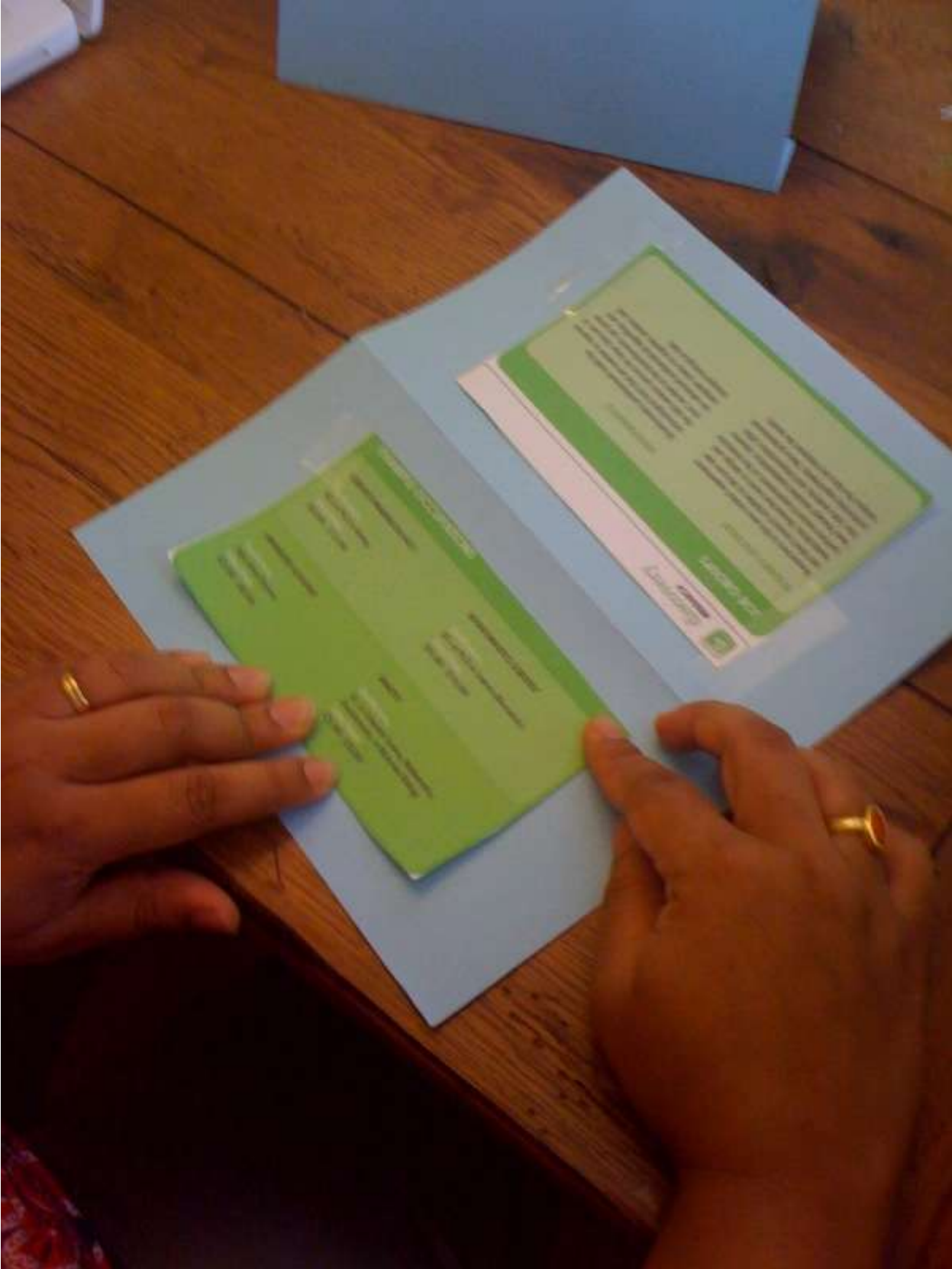
Example Table Tent Photos

Directions can be found online at http://www.ehow.com/how_4480649_make-fold-table-tents.html.











EXAMPLE OCCUPATIONS

SCIENTIST/PHARMACOLOGIST

Qualifications:

M.S. or Ph.D. in Biology

Salary Range:

\$60,000 - \$120,000

BIOINFORMATICS SCIENTIST

Qualifications:

M.S. or Ph.D. in Statistics/Biostatistics

Salary Range:

\$85,000 - \$110,000

LABORATORY ASSISTANT

Qualifications:

High School Diploma

Salary Range:

\$25,000 - \$45,000

ANALYST

Qualifications:

B.S. in Computer Science, Mathematics,
Bioinformatics, or Molecular Biology

Salary Range:

\$25,000 - \$35,000



discovery
RESEARCH

JOB GROUPS

RESEARCH DISCOVERY

Researchers in this area conduct experiments and direct research activities to discover new medications. Researchers work to design and perform research experiments at the molecular level through detailed manipulation, observation, data analysis, and interpretation. After performing experiments, these professionals analyze the data and interpret the results.

BIOINFOR

Bioinformatics
technological
the data ana
short, work
use advanced
computer sci
interpret bio

APPENDIX F

Terminology References

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APPENDIX G

General Reflection Questions

(from: <http://www.goodcharacter.com/SERVICE/primer-6.html>)

1. What do you think you will do and what impact do you think you will have?
2. What needs did/does/will your project help fill?
3. What are the causes of those needs?
4. How do people contribute to this problem? How do we help to solve it?
5. What expectations do you have about your service experience? Did anything surprise you? If so, what?
6. What did you do today that made you feel that you made a difference? Why?
7. Did anything happen that made you feel uncomfortable? If so what, and why do you think it made you feel this way?
8. What did you do that seemed to be effective or ineffective in service to others?
9. How does your understanding of the community change as a result of your participation in this project?
10. How can you continue your involvement with this group or social issue?
11. How can you educate others or raise awareness about this group or social issue?
12. What are the most difficult and most satisfying parts of the service you are performing? Why?
13. What do you think is your most valued contribution to the project?
14. Is there a person or activity you find interesting or challenging in your project?
15. How do you see your role with this project? How does that compare with how others may see your role?
16. Have you learned from any disappointments or successes from your project?
17. Has there been a problem situation that you want to discuss with your teacher?
18. How is your service relevant to what you are learning in class?

APPENDIX H

Biotechnology Web Resources

Online Journals

Nature Biotechnology <http://www.nature.com/nbt/index.html>

BMC Biotechnology <http://www.biomedcentral.com/bmcbiotechnol/>

Science (AAAS publication) <http://www.sciencemag.org/>

Proceedings of the National Academy of Sciences (PNAS) <http://www.pnas.org/>

Wired Magazine <http://www.wired.com/wiredscience/>

Professional Organizations

Biotechnology Industry Organization <http://www.bio.org/>

Pharmaceutical Research & Manufacturers of America <http://www.phrma.org/>

New Jersey Academy of Science <http://www.njas.org/>

American Association for the Advancement of Science (AAAS) <http://www.aaas.org/>

Libraries/Databases

National Center for Biotechnology Information <http://www.ncbi.nlm.nih.gov/>

Public Library of Science (PLOS) <http://www.plos.org/index.php>

National Agricultural Library

http://riley.nal.usda.gov/nal_display/index.php?info_center=8&tax_level=2&tax_subject=8&topic_id=1067&placement_default=0

Government Regulatory Agencies

Food and Drug Administration (FDA) <http://www.fda.gov/>

Centers for Disease Control & Prevention (CDC) <http://www.cdc.gov/>

Occupational Safety and Health Administration (OSHA) <http://www.osha.gov/>

Environmental Protection Agency (EPA) <http://www.epa.gov/>

National Institutes of Health (NIH) <http://www.nih.gov/>

Employment Opportunities

CareerBuilder <http://science-biotech.careerbuilder.com/sb.ic/NewJersey/?ff=21>

Yahoo!HotJobs http://hotjobs.yahoo.com/jobs-c-Pharmaceutical_Biotech-1-NJ

Science Careers <http://sciencecareers.sciencemag.org/>

Nature Jobs <http://www.nature.com/naturejobs/index.html>

Careers in Life Sciences http://careerservices.rutgers.edu/mh/biological_sciences.shtml

Bureau of Labor Statistics Occupation Handbook <http://www.bls.gov/oco/ocos047.htm>

Alternative Science Careers http://dbs.umt.edu/students/advising/alt_careers.htm

Access Excellence <http://www.accessexcellence.org/RC/CC/>

Education

NJ Higher Education <http://www.nj.gov/highereducation/colleges/index.html>

Action Bioscience <http://www.actionbioscience.org/>

Science Literacy <http://nces.ed.gov/programs/coe/2008/section2/indicator19.asp>

Career Training <http://www.training.nih.gov/careers/careercenter/caropts.html>

NJ DOE Science Standards <http://www.state.nj.us/education/aps/cccs/science/>

New Jersey Science Links

<http://www.scc.rutgers.edu/njpharm/>

http://www.state.nj.us/njbusiness/pdfs/Migration_Press_Release_Draft.pdf

<http://www.bio-one.org/content/Downloadables/About%20WIRED%20Bio-1%202.pdf>

BioNJ <http://www.biotechnj.org/index.jsp>

StarLedger http://www.nj.com/news/index.ssf/2009/06/pharmaceutical_industry_pumped.html

USGS Profile <http://www.usgs.gov/state/state.asp?State=NJ>

APPENDIX I

Gallery Wall Pictures

(Note: These royalty free images are available for teachers to use with lesson 1 for this curriculum only.)





















