



Mathematics, Science & Technology

PART II.3

Biology Career Exploration.....2

NOTE: This document is a work in progress. Parts II and III, in particular, are in need of further development, and we invite the submission of additional learning experiences and local performance tasks for these sections. Inquiries regarding submission of materials should be directed to: The Mathematics, Science, and Technology Resource Guide, Room 681 EBA, New York State Education Department, Albany, NY 12234 (tel. 518-474-5922).



<http://www.nysed.gov>

Biology *Career Exploration*

MST

2

▲ access/select/collate/
analyze

MST

7

▲ analyze problems/issues
▲ consumer decisions

Recommendation—Send a computer floppy to Susan and ask for her Student Handout. It contains the following chapters:

- Biology Career Exploration
- Scoring Guide for Biology
- Career Exploration Project
- Careers Involving Biology
- Career Summary Sheet
- Interview or Shadowing
- Verification Sheet
- Modified project for use with non-Regents level classes
- Information on "Common Application"

In the temple of science there are many mansions... and various indeed are they that dwell therein and the motives that have led them there.
Albert Einstein

Yes, I know this is a strange one. But it is also one that I feel is a critical part of my biology program. Some things you do in teaching have a strange history of development. They start with a small, real-life experience and develop through trial and error experiences in the classroom. The idea for this project began when my daughter was a senior going through the process of applying for college. She said, " Mom, somebody should have told me what these applications look like when I was in 9th grade. I would have made a lot of changes in what I did during high school. I would have...." The next year, I took her suggestion and began a small scale career exploration project.

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Grades 9 & 10

I quickly learned that I needed to help students develop skills for career research. I also learned that I needed to go beyond the traditional career research to get students started on the process of thinking about their future. What started as a three-day research project has gradually grown into a project theme that I will use for 11 weeks at the beginning of the school year.

Assessment of student work is embedded in the project.

Each year, I weigh the advantages and disadvantages of allowing students to select careers—particularly ones that have a distant relationship to biology. But I still feel that it is critical that we encourage students to tie this project to a career that is truly relevant to their future. The intrinsic motivation that occurs when students are allowed choice is essential to this project.

Each year, I wrestle with justifying the use of potential “content time” for this activity. But for many reasons, the project seems to grow in importance and in size each year. It enables students to see biology careers extend beyond research scientists and doctors. But more importantly, it encourages students to think about their own future—to realize that what they do in 9th and 10th grade is important for college admissions and future careers. I have found that class averages and student motivation increase significantly after completion of this project. The project also gives me an opportunity to talk with students about their talents and interests.

What the students do:

- select a biology or biology-related career for research
- use school and community resources to gather and apply for information on this career
- use these resources in preparation for this career
- complete a college application
- share what they have learned with classmates
- reflect on how this project increased their understanding of careers, career resources, and skills for long-term assignments
- more detailed information is provided in the form of student handouts and a scoring guide.

Teacher

When people think of biology careers they tend to think of careers such as doctors, laboratory research scientists, and ecologists. They do not realize that there are many different kinds of biologists including genetic counselors, sports trainers, and farmers. We would like you to be aware that even careers that seem far removed from biology may rely on a knowledge of biology. Lawyers, sales people, and elementary school teachers, for example, may find that their careers involve a need to understand biology.

What the teacher does:

- assigns project and monitors student progress toward completion
- arranges for access to career center, computer lab, and community resources
- answers questions regarding information-seeking process or career information
- helps students see possible relationship between their career and biology.

For my non-Regents biology class that includes a wide range of student abilities and motivation levels, this project is modified significantly. Most of the modification involves breaking the assignment into many smaller assignments and providing additional class time for helping students master research, writing, and speaking skills. Copies of the simplified assignments that I use are included at the end of the student handouts. I also provide information on, and applications for, training programs that do not require college education. The special education staff in my building has been fantastic in working with me to provide both resources and teaching support.

This career project requires serious thought for use with special education students. Because I teach in a wealthy suburb, many of my students have unrealistic plans for careers. Students who are working toward IEP diplomas may wish to become vets, doctors, or marine biologists. I never tell students that their dreams are impossible, but I do try to make them aware of related

careers that require less academic preparation. Other students may have no plans beyond that day. Use of classified ads from the newspaper and patience with exploring their current interests can help to steer students to beginning to think about their future.

I have learned that this project can trigger intense animosity from at-risk students, but I have also learned that if you are accepting of their anger, you can help them begin to think about their future.

Physical modifications of the classroom setting:

- Prepare a quiet, private conference area so that you can talk to individual students without an audience, yet still keep an eye on the rest of the class.
- If available, move the class to a career center, school library, or community library for some of the work on this project.

Week 1 - What careers are you considering?

Begin by making a list of 10 possible careers that you are currently considering for your future. These do not have to be biology careers. Try to make a list that includes career options that are as different from each other as you can imagine. Write a “B” after careers that you consider to be biology careers. Write an “I” after careers that you think might involve biology. For each career, write a paragraph that explains why the career appeals to you.

Week 2 - What biology -related careers would you consider?

Visit the career center with your class to learn about the resources available for your use. Spend the period simply looking for additional careers that are related to your areas of interest and to biology.

If you are considering a career in biology already, you will need to think about what specific types of biology careers you could pursue. For example, you could become a biophysicist, a museum curator, a laboratory technician, a nurse, or a professor. Try to explore and find unusual and interesting careers—careers that are out of the ordinary and really appeal to you.

If you are considering other careers, you will need to think of ways your career interests could be related to biology. Many people have found that they are more employable if their training and background involves combining two different areas of specialty. For example, if you envision a career in business, you could become a sales representative for a science supply company, the administrator of a nursing home or hospital, or the owner of a pet shop. If you are interested in a career in art, you could become an illustrator for biology textbooks, a nature photographer, or a landscape designer. If you want to become a writer, you could write children’s science books, technical manuals, science fiction, or science magazine articles. You could become a lawyer or politician who specializes in environmental or bioethical issues.

You will be expected to turn in a list of six careers in biology or related to biology. For each of these six careers you should:

- Write a paragraph that explains why you are considering this career.
- Write a paragraph that explains how a knowledge of biology is important to the career.

Week 3 - How can you learn about the careers that you have selected?

Visit the Career Center with your class and look up information on the careers that you have selected. You will need to complete a career summary sheet for at least three careers in biology or related to biology that you might seriously consider for your future. Include the following sections in your summary sheet:

- Description of the type of work done
- Potential places of employment
- Education and training required
- Salary range
- Job outlook
- Related occupations
- Addresses to write to for further information

Visit the Internet center with your class. Use the Internet to obtain additional information about the careers that you have selected. Make a list of at least three Internet addresses that could be used to get more information about the career. Print information from each of these sources.

Type a business letter requesting further information on the three careers that you have selected. Give these letters and stamped, self-addressed envelopes to your teacher.

Week 4 - How can you gather more detailed information on a career?

Review the information that you have researched. Select one career in biology or related to biology that you feel would be the most interesting to research. Return to the career center, Internet center, or use community library facilities to obtain additional information on the career that you selected.

Write a report that includes the following information.

- Description of the type of work done
- Typical work day—types of tasks the career involves
- Potential places of employment
- Working conditions
- Education and training required
- Salary range
- Related occupations
- Job outlook
- Addresses to write to for further information
- An explanation of why you chose this career
- An explanation of why you eliminated the other two careers
- An explanation of what you can do now to work toward this career
- A list of 10 questions you would ask if you had an opportunity to interview someone in this career
- An explanation of what chapters in your textbook would be relevant to someone with this career
- A summary sheet for two related occupations
- An explanation of why exploring related occupations might be important in the career decision making process.

Week 5 - What educational programs are involved in preparing for this career?

Visit the career center. Identify a college that offers a degree program which could lead to the career that you have selected. Use the catalog from that college to:

- Identify an appropriate degree program
- Identify a college that offers this degree program
- Make a copy of the pages in the college catalog that describe the general requirements for graduation
- Make a copy of the pages in the college catalog that describe the specific requirements for the degree that you are planning
- Explain what high school courses you would need as background for college admission and success
- List the kinds of courses you should take in college to obtain a degree in the field that you have selected
- Explain what education beyond this college program might be required for entry into this career
- Explain what education beyond this college program might be required for advancement in this career.

Arrange for a career interview or shadowing with someone in the community who is involved in the career that you have researched. Complete the upper part of the career shadowing/interview form and hand it in to your teacher.

Week 6 - What is it like to complete a college application?

Your teacher will provide copies of the “Common Application,” a sample college application that is used by a cooperating group of colleges. Complete the “Common Application” based on what you think your high school record will be like by the beginning of your senior year.

Be sure to include at least one fictitious recommendation form from each of the following:

- science teacher
- guidance counselor
- employer or an extracurricular advisor.

Your teacher will provide copies of essays that were selected from a variety of college applications. Select one of these and write a 200-word essay to illustrate how you would answer this on a college application.

Interview at least five seniors who have applied to college about their experiences with the college application process. Ask them, “What advice would they give to freshman or sophomores about ways to improve their chances of getting into college?” and “What have they done to gain experience related to their planned career?”

Write an essay in which you explain what you could do from now until your senior year to improve your chances of getting into college and to gain experience related to your career.

Week 7 - How can you use the community beyond the school to develop a deeper understanding of the career?

You should complete at least five of the following additional components:

- An idea web in which you brainstorm career directions (20) that you could take that would be related to your original career choice.
- A collection of classified newspaper advertisements (10) from the Help Wanted column that advertises the career.
- A collection of current event newspaper articles (10) that might involve individuals with the career.
- A resource folder of 10 brochures, computer printouts, and copied references that provide more information on the career.
- A poster that could be used to recruit individuals for this career.
- An original *Spotlight on Careers* section that could be included in a high school biology textbook. See your textbook for exemplars. Explain where in your textbook this should appear.
- An application for East's Student Internship Program for this career.
- An observation log of a visit to a potential workplace for the career.
- A sample of a job application for this career—real or one you design.
- A list of 10 questions that an employer might ask during a job interview for this career.
- Information on scholarships that are available to students who select this career.
- A list of 10 ways in which you can get experience related to this career during high school and college.
- An explanation of the types of talents, skills, and interests that would be important for someone to be successful in this career.
- An explanation of how much math, science, technology, writing, and cooperative work might be involved in the career. Discuss what courses you could take in high school to obtain the appropriate background for this career.
- Contact information about two people with this career who would be willing to be guest speakers or conduct a class field trip.
- Report on interviews with three people who have made at least two career changes.
- Report on interviews with ten people in which you ask them to describe what career plans they had in high school and how they arrived at their current career.
- A creative way of demonstrating that you have developed a real understanding of what it would be like to be a person with the career that you have researched. Be sure to get prior teacher approval.
- Be certain to include a completed *Interview* or *Shadowing Verification Sheet*.

Week 8 - How can you use the community beyond the school to develop a deeper understanding of the career?

You should include two of the following additional components:

- A biography of a biologist with the career.
- A videotape or multimedia presentation that could be used to recruit individuals for this career in biology.
- A career interview report in which you ask the questions that you developed during **Week 3** of this project.
- A career interview report in which you ask questions about the amount of math, science, technology, writing, and cooperative work involved in the career.

- A career shadowing report in which you describe the workplace and explain the types of work done by the person you are shadowing.
- An explanation of two bioethical dilemmas that people with this career might face.
- A creative way of demonstrating that you have developed a real understanding of what it would be like to be a person with the career that you have researched. Be sure to get prior teacher approval.
- Be certain to include a completed *Interview* or *Shadowing Verification Sheet*.

Week 9 - Sharing what you have learned with your classmates

Be prepared to participate in a five-minute role-play with your classmates. Your classmates will play the role of people at a party who are asking you about your career. You will play the role of someone with the career that you have researched. You should be able to answer the following questions:

- Where do you work?
- What do you really do in your job?
- What kinds of people do you work with?
- How did you end up in this career?
- What kinds of training did you have to have to get into this career?
- My kid is interested in this career. What advice would you have for him/her?
- Do you enjoy what you do? Why?
- What don't you enjoy about what you do?
- What does it take to be successful in your career?
- If you could change careers, what other careers would you consider?
- How much math is involved in your career?
- How much technology is involved in your career?
- How much writing is involved in your career?
- How much teamwork or working with other people is involved in your career?
- What bioethical dilemmas do you face in your career?
- Do you really use the "scientific method" as part of your job?

Week 10 - Reflecting on what you have learned

Reflect on what you have learned from this project by answering the following essay questions.

1. How has this project helped you:
 - understand the different types of careers in biological sciences
 - understand that knowledge of biology can be important in non biology careers?
2. What are the three most important things that you have learned about each of the following:
 - the process of gathering and interpreting information about potential careers
 - the process of applying for college admission
 - the process of preparing for careers
 - handling long-term projects?
3. What part of this project are you proudest of? Why?
4. What part of this project was most interesting? Why?
5. What part of this project was least interesting or least beneficial? Why?
6. If you could do this project over again, what would you do differently?
7. What advice would you have for future students about how to get the most out of this project?

8. If your teacher revised this project for use with future students, what changes should be made to make it more interesting or relevant for students?
9. Have your parents review your work and answer the following question in writing:
“What suggestions do you have for how his/her work on how this project could have been improved?”
10. Have your parents review your work and answer the following question in writing:
“What suggestions do you have for your child’s teacher on how the design of this project could have been improved?”

Week 11 - Revision to prepare this project for your portfolio

Revision is an important part of preparing your project for inclusion in your final examination portfolio. Follow the instructions below to complete the revision process.

Organize your notebook. Put the scoring guide first and then arrange the other parts using your scoring guide as a reference. Use labeled dividers to separate the different weeks of the project.

Highlight the things on the the scoring guide for which you did not get full credit.

Make revisions to include all of the missing parts and to follow the recommendations that your teacher and your parents made.

Highlight the right margin of any pages that represent revision work.

Add these revisions to your notebook in the front of the appropriate weekly section.

Make a list of 10 ways that you could improve your work habits to avoid the need for later revisions. Include this in the front section of your notebook.

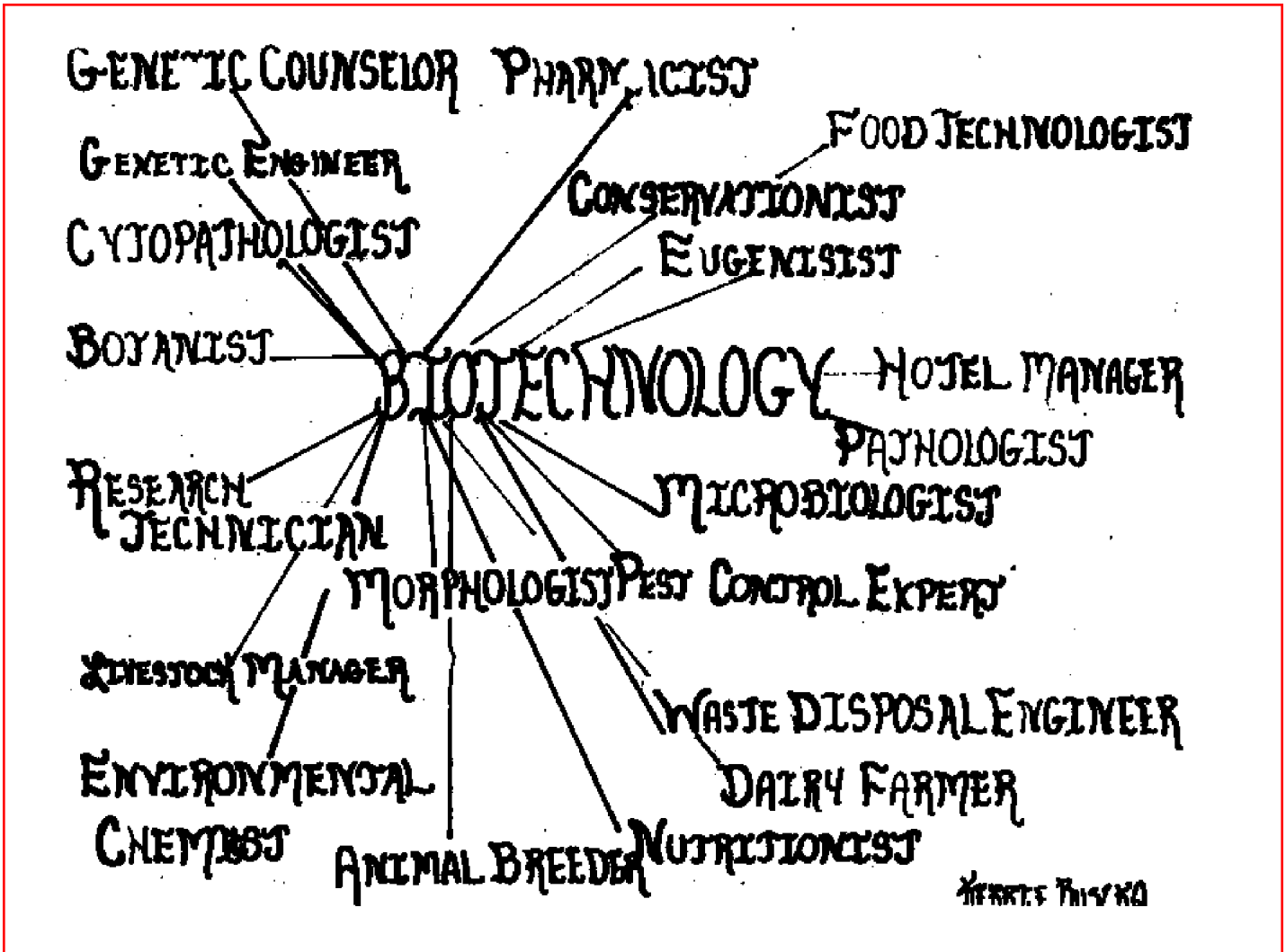
Also, have your parents write a response to the following question: “Do you feel your son’s/ daughter’s revised work on this project represents quality work that he/she should be proud of? Why or why not?” Include this in the front section of your notebook.

ASSESSMENT

Since this is my students’ first experience with a long-term project, it is essential that the have access to :

- defined, weekly checkpoints described in the project instructions
- opportunities to seek clarification of instructions or process being used
- grades to evaluate each part of the project
- a grading system that rewards keeping up with the suggested work pace
- a scoring guide that students can use as a checklist to evaluate their progress
- multiple opportunities for analysis, application, and self-reflection that encourage them to go beyond simple copying of information
- a final self-reflection that also provides feedback for the teacher
- an opportunity to revise their work based on their self-reflection and teacher recommendations.

The *Scoring Guide* serves both as an assessment tool for use by both the student and the teacher.



REFLECTION:

REFLECTION

The project:

- Uses an interdisciplinary theme that includes learning standards from other subject areas.
- Shares in task of helping students prepare for their future.
- Brings real world situations into the classroom.
- Allows for student choice to focus on personal interests.
- Uses a *Scoring Guide* that is shared with the students and encourages self-evaluation in monitoring progress throughout the project.
- Incorporates opportunities for analysis, application, and self-reflection and encourage the students to construct knowledge and relate what they have learned to their future.

Scoring Guide for Biology Career Exploration

Student Name _____

Week 1 - What careers are you considering?

2	List of 10 careers	Total points possible = 30
3	Indicates "B" and "I"	Actual points = _____
20	Explains each selection	Recommendations
5	Completes checkpoint when due	

Week 2 - What biology-related careers would you consider?

1	List of 6 biology related careers	Total points possible = 30
12	Explains why considering	Actual points = _____
12	Explains how biology important	Recommendations
5	Completes checkpoint when due	

Week 3 - How can you learn about the careers you have selected?

7	Completes one summary sheet	Total points possible = 50
7	Completes two summary sheets	Actual points = _____
7	Completes three summary sheets	Recommendations
4	In depth work on summary sheets	
6	Three Internet addresses	
6	Three Internet printouts	
5	Business letter requesting information	
3	Stamped addressed envelope	
5	Completes checkpoint when due	

Week 4 - How can you gather more detailed information on a career?

2	Title page with name of career	Total points possible = 100
2	Description of work done	Actual points = _____
2	Typical workday	Recommendations
2	Potential places of employment	
2	Working conditions	
2	Education and training required	
2	Salary range	
10	Related occupations	
2	Job outlook	
4	Addresses to write	
5	Why chose this career	
5	Why eliminated other two	
5	What can do now	
10	Ten questions for interview	
10	Text chapters relevant to career	
10	Summary sheet for one related career	
10	Summary sheet for two related careers	
5	Exploring related careers important	
10	Completes checkpoint when due	

Week 5 - What education is involved in preparing for this career?

5	Identifies appropriate degree program	Total points possible = 50
5	Identifies college	Actual points = _____
5	Copy of general requirements	Recommendations
5	Copy of specific requirements	
5	High school course background	
5	College courses	
5	Education beyond for entry	
5	Education beyond for advancement	
5	Career interview/shadowing form	
5	Completes checkpoint when due	

Week 6 - What should be done to complete a college application?

5	Personal data	Total points possible = 100
5	Educational data	Actual points = _____
5	Test information	Recommendations
5	Family	

- 5 Academic honors
- 5 Activities
- 5 Work experience
- 10 Personal statement (200 words +)
- 10 Fictitious teacher evaluation
- 10 Fictitious school report
- 10 Senior interview record
- 15 List of what can do to improve
- 10 Completes checkpoint when due

Week 7 - How can you apply what you have learned?

- 10 One completed
- 10 Two completed
- 10 Three completed
- 10 Four completed
- 10 Five completed
- 10 Demonstrates depth of understanding
- 10 Completes checkpoint when due
- max of 30 10 bonus points for each additional

Total points possible = 70
Actual points = _____
Recommendations

Week 8 - How can you use the community beyond the school?

- 10 Suggestions for class rubric
- 20 One completed by due date
- 20 Two completed by due date
- 20 Score on class developed rubric
- 20 Uses feedback to revise work to 20
- 10 Completes checkpoint when due

Total points possible = 70
Actual points = _____
Recommendations

Week 9 - Sharing what you have learned

- 5 Thorough, clear answers to question 1
- 5 Thorough, clear answers to question 2
- 5 Thorough, clear answers to question 3
- 5 Thorough, clear answers to question 4
- 5 Thorough, clear answers to question 5
- 5 Obvious preparation for presentation
- 5 Uses terminology accurately
- 5 Uses clear voice and loud enough
- 5 Maintains eye contact
- 5 Uses conversational tone
- 5 Avoids distracting behaviors
- 5 Completes checkpoint when due

Total points possible = 60
Actual points = _____
Recommendations

Week 10 - Reflecting on what you have learned

- 5 1. Understand careers/biology
- 5 2. Processes of project
- 5 3. Proudest and why
- 5 4. Most interesting and why
- 5 5. Least and why
- 5 6. If could do over
- 5 7. Advice for future students
- 5 8. Suggestions for teacher
- 5 9. Parent regarding your work
- 5 10. Parent regarding project design
- 10 Completes checkpoint when due

Total points possible = 60
Actual points = _____
Recommendations

Week 11 - Opportunity for revision

- 10 Organizes project reorder/dividers
- 10 Highlights scoring guide
- 10 Includes original work
- 10 Adds and highlights revised work
- 20 Made all necessary revisions
- 10 Explains improved work habits
- 10 Parent response to revisions
- 10 Completes checkpoint when due

Total points possible = 70
Actual points = _____
Recommendations

Career Summary Sheet

Student Name _____

Name of Career _____

- Description of the type of work done
- Potential places of employment
- Education and training required
- Salary range
- Job outlook
- Related occupations
- What I think I would like about this career
- What I think I might not like about this career
- Addresses to write away for further information

Interview or Shadowing Verification Sheet

To be completed by student.

Name of interviewer/shadower _____

Date of interview/shadowing _____ Start time _____ End time _____

Location of interview/shadowing _____

Name of person interviewed _____

Company _____

Address _____

Phone number _____ Fax number _____

THANK YOU FOR YOUR COOPERATION IN THIS PROJECT!

To be completed by person being interviewed or shadowed.

Please verify the information above.

Signature _____

Was the student on time for the interview/shadowing? _____

Did the interviewer/shadower act in a courteous and prepared manner? _____

What suggestions do you have for **this student** about the interview/shadowing process.

What suggestions about the interviewing/shadowing process would you make for **other students** involved in this project?

What suggestions do you have for **the teachers** involved in the career exploration project?

Please feel free to contact _____ at _____ if you have any questions, suggestions, or concerns about this career project.

Essay:

There were two other careers that I was interested in aside from forestry. One was a "ski resort owner." I eliminated this idea because it is a seasonal job and you'd have to find a different business for the other three seasons of the year. It also depends on the weather, which can sometimes be very unpredictable. One winter could be cold and snowy and the next could be warm and rainy. Skiing is a very expensive sport and when the economy is poor, this can have a negative effect on whether people go skiing or not.

My other choice was "architecture." I do not have any real objections to this career, only that I lost out on a great opportunity which was, not taking architectural courses here at Williamsville East. We have one of the best pre-architectural programs in New York State and I feel that I lost my chance, so I will just move on.

When I am outside in the woods, or in the mountains, or skiing, this great feeling of freedom just rushes through my body. The smell of all the wildlife around me as I hike, is one of the best natural highs there is. Standing on the top of a mountain, being out of breath and looking at the world below you, is mesmerizing. I believe you experience many great things out doors, and if I had the choice I would want to spend my life outdoors. I wouldn't want to live out doors all the time, but when I get older and have to get a job I would like for most of it to be spent outdoors and in the wilderness. I don't see myself (later in life) being confined to sitting in an office doing paper work all day.

This is why I see "forestry" as a good career for myself. I am interested in animals and their surroundings. I would like to help provide a beautiful place for them to live. That goes for humans too. We take a lot of our resources for granted. Most of them come from nature, and foresters help save our earth. Conserving our rain forests and forests will make the earth a happier and healthier place to live.