

Physical Differences Are Part of the Human Experience



**Controlling Question for the Culminating Activity:
How Do the Individual and Society Respond to
Physical Differences?**

Interdisciplinary Curriculum Project

**Suggested for
10th Grade**

The following Interdisciplinary Curriculum Development team members have worked countless hours in the development, collation, and editing of the interdisciplinary, integrated curriculum project model. To say thank you seems inadequate for their energy and time spent throughout the entire process. The team members were not acquainted with one another prior to the inception of this work, yet through the numerous work sessions and process struggles they truly became an incredible team. Jeanne Shaw deserves special credit for her tireless efforts as the team coordinator. Her expertise in her subject area, as well as with the entire interdisciplinary teaming process in curriculum development, guided the team to a previously elusive sophistication. I have taken great delight in participating in this process.

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“Use what talents you possess; the woods would be very silent if no birds sang there except those that sang best.” Henry Van Dyke

Physical Differences Are Part of the Human Experience

Controlling Question for Unit

How do the individual and society respond to physical differences?

Culminating Activity

Students will identify a physically limiting condition, determine the causes, discuss individual and institutional responses, then propose the resulting needs and present findings.

Project Goals

- To research a physically limiting condition
- To share research and proposal
- To make adolescents more comfortable with themselves and others

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Project Introduction

Project Introduction

One thing that education does quite well is to visit and revisit a theory until a plethora of writings exist on the subject. A case in point is curriculum integration. The following document is yet another example of interdisciplinary, integrated curriculum. As a reader, you might ask yourself, “Why should I read this document?” The answer lies in your motivation: a sincere search for high-quality strategies to facilitate motivation, learning and achievement in your students. This document contains a model of an interdisciplinary, integrated curriculum project to designed to help you achieve this goal.

For the purpose of this model, the term interdisciplinary, integrated curriculum has a dual intent:

- ❶ To team five different discipline areas in an effort to reduce the boundaries between content areas, so that students will make natural connections between the disciplines;
- ❷ To integrate an issue or issues surrounding health care into existing standards-based curriculum where it fits naturally to facilitate students’ making the connection that content taught in school will be important in the outside world.

Research indicates that this approach will facilitate more coherent learning and thereby greater student achievement. Additionally, this kind of project presents an opportunity for students to apply and to demonstrate mastery of standards addressed.

One caution before implementation of any integrated activity. Do not try to “force-fit” the career area into the course of study. This can and will happen successfully around an issue or a theme when students are allowed to make the connections through active involvement in their learning process and by providing a context to their academic content.

This introduction is intended to address the process of utilizing the interdisciplinary, integrated curriculum model in this document. This project and three others were created by an interdisciplinary team of teachers from throughout California, field-tested by various school sites, and then revised accordingly. Even though this project can be utilized as is, the overall goal of its development is to provide a guide or a “road map” for individual interdisciplinary teams to use as one resource in developing their own contextual, instructional strategies to facilitate student learning and achievement.

Why Be Involved?

With many viable methods or models for curriculum integration available, one might become confused as to which one is the best. The good news is that there is no single “right way” for interdisciplinary, integrated curriculum development; rather, there are strategies that might be preferred by a team, dependent upon the team’s and the school’s personality. The bottom line with every method is to make **connections** between subject areas, to stress linkages and relationships between knowledge groups.

Students will have more desire to learn when they see the connections, both between their individual courses and between school as a whole and the “real” world in which they live. At the danger of restating a concept that has been shouted from the mountaintops, we do not live in a compartmentalized society, and therefore we should not expect our students to truly learn in a compartmentalized academic setting. When the content barriers come down for the students, teachers will find greater connectedness to their colleagues as well. The last thing that teachers want, or need, is to have more tasks added to their already impacted schedules. In light of this well-recognized fact, why should a teacher or a school site

become involved in interdisciplinary, integrated curriculum? As educators, we must decide whether our focus is to be on teaching strategies or on learning strategies. We can teach brilliantly, and yet our students may never truly learn a single concept. With interdisciplinary, integrated curriculum students learn because the concepts are made meaningful to them. It is important to restate an important principle of this type of strategy: to be successful, this **cannot be an add-on to the curriculum**, rather it must be a strategy that is solidly standards-based.

Make no mistake, this type of curriculum requires effort as well as change. However, the benefits gained from this effort are real for students as well as for teachers. Those teachers able to let go of the need to be in control will then be able to learn new concepts themselves, and thereby model the concept of life-long learning for their students. Students will find that too-oft sought after, yet seemingly elusive connection between school and the “real world.” If, in fact, the overarching goal of the educational process is to develop productive, thinking citizens for the 21st century, then the result of interdisciplinary, integrated teaching will be students who think.

“ . . . students who will see, understand, and articulate connections; students who are able to apply knowledge and skills across content; and students who will, themselves, consciously look for and make connections between and among the content and skills they are taught both as young people and as adults—in other words, students who think.”

Joan Palmer, ASCD Yearbook

One Team’s Journey

As a development team, we found that the process was equally as important as the product. As teachers, we often work alone, so our collaborative skills may be underdeveloped. How can we then encourage our students toward collaborative learning? Again, teachers who take the risk to move outside of their comfort zone or out of the traditional teaching “box” as some have described, find that they become models for their students in the collaborative process of learning.

The first question we dealt with as a team was the rationale for the time spent on interdisciplinary integrated projects. Our conclusion was that encouraging stronger understanding in one subject area by building on the knowledge gained in another is not “add-on” work, but rather is a strategy to make curriculum meaningful for students and thereby truly address standards in each of the disciplines. The theory that the team overwhelmingly adheres to is that higher-order thinking is stimulated by relevant curriculum: Students learn because something is meaningful to them.

Current research indicates that the characteristics of the ideal team include:

- voluntary members
- willingness to implement the product
- love of teaching and of students
- willingness to learn
- risk-takers as members
- demonstration of interpersonal skills
- perception of the teacher as a facilitator

- generalists who “love” a specialized area or
- specialists interested in a generalized approach
- members are innovative and creative
- members have taught several subjects
- members are technologically literate

As a team, we felt that we possessed many of these characteristics and therefore should be able to accomplish our goal without difficulty. After all, we had support, financing, enthusiasm, understanding—what more did we need? We found our own set of hurdles, hurdles that caused some conflict. However, in conflict there is often creativity.

We found that frequently one teacher will have an idea, or the team will create an interdisciplinary, integrated project where the largest percentage of the work fits best in a particular subject area. The work is still interdisciplinary, but the impetus comes from a particular subject area and therefore the leadership role, not the overwhelming workload, may fall in a particular course.

Another hurdle that we encountered was the tendency to create individual “mini-projects” within the context of the whole. To jump this hurdle will take **active** communication between team members, revisiting the central focus frequently, and big chunks of team development time.

Explanation of Project Format

As you peruse the following project model, you will notice some distinct formatting styles that bear explanation at this point. Following the Table of Contents there is a “Project at a Glance” and a “Venn Diagram of Subject Area Activities” that are designed to provide a visual overview of the entire project and how the activities overlap. The “Project at a Glance” was created as a quasi-flow chart with and the overarching theme and question as the focal points. The process standards are the SCANS Competencies, and the Content Standards are those addressed in the whole of the project. Each of the five subject areas contains a list of the activities by title which flow into the culminating project and then finally into the overall assessment. The “Venn Diagram” was created as an alternative visual to display what activities overlap within the disciplines. These were found to be useful for the Development Team, but may not be helpful for your particular team. Some interdisciplinary teams may prefer a traditional activities timeline. The important idea is that a visual display of interrelatedness is helpful to maintain the team’s focus.

The section delineated “Process and Tools” contains some tips and suggestions on technology usage, Web searches, and student-centered behaviors. These will not be necessary for every team, but new teachers or newly formed teams may benefit from the suggestions. We felt these items were of such importance that they should be available at the beginning of the project rather than buried in the appendix.

The “Standards” section contains an overall list of every subject-matter standard that is addressed in the project if done in its entirety. Where the actual standards are addressed is listed on the appropriate activity. In this section, you will also find a concise description of the SCANS Competencies and Three-Part Foundations. The Secretary’s Commission on Achieving Necessary Skills (SCANS) identified five competencies or skills they felt necessary for workplace success, and foundations that were necessary qualities to achieve the aforementioned. These are listed for your information as you begin. Again, the team felt that their overall importance in the project and in the overall process warranted their placement.

Next, you will find a description of the suggested culminating project and the actual activities that surround this culmination of the project. The activities for each subject area follow under their individual sections. Each of these sections has its own Appendix that contains back-up materials for activities and possible “Extension” activities where indicated for advanced classes.

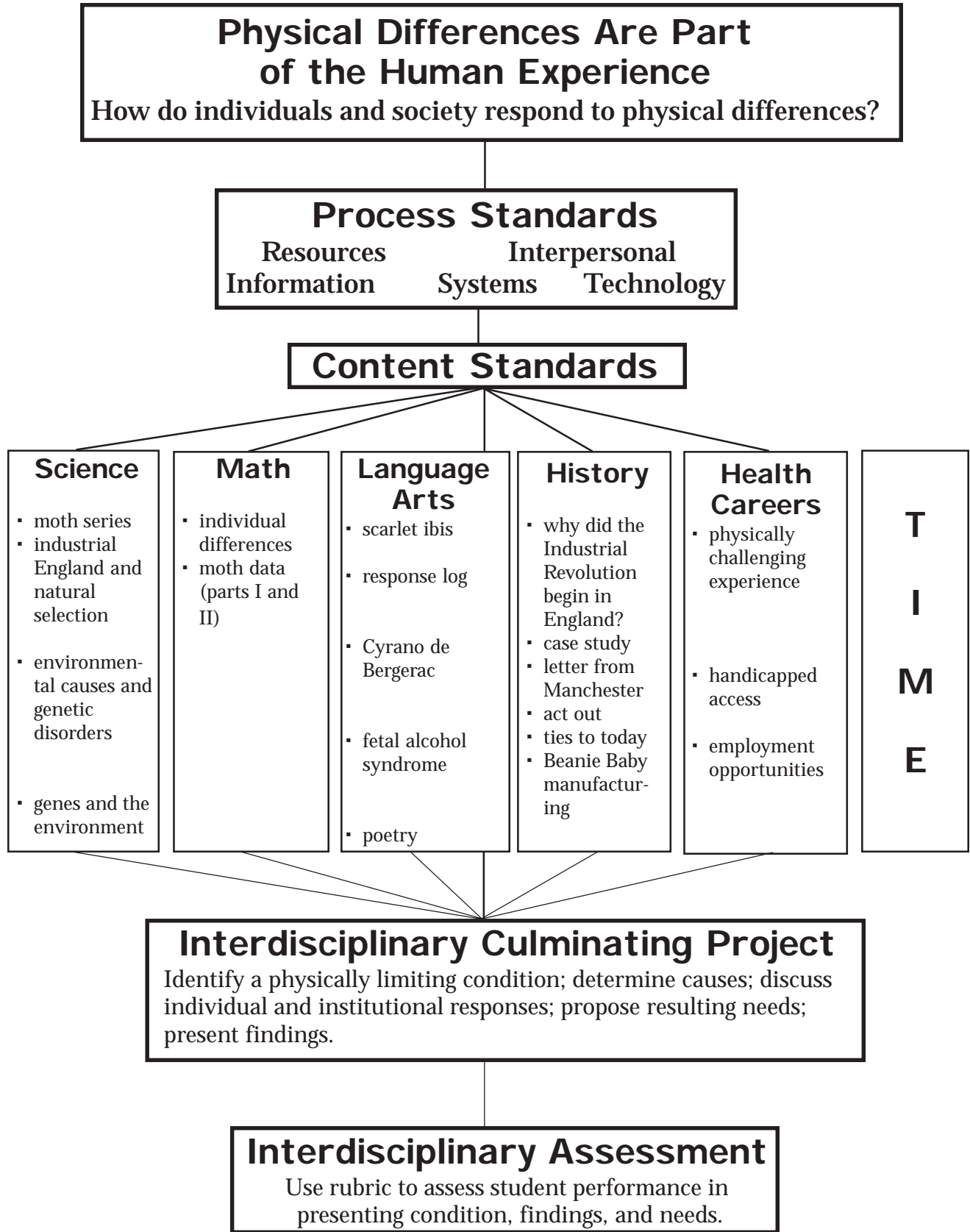
It is important to note that the culminating project is to have a health care context, whereas many of the activities in the individual subject areas will appear to lack that context. This is due, in large part, to the fact that these activities frequently are process oriented. For example, when developing a magazine that centers around a medical context, the process activities in language arts might be the development of skills in technical writing or the editing process. The beauty of this aspect is that as the students meet English standards, they are building necessary skills for the completion of the culminating project, which in turn will demonstrate that they mastered the addressed standard.

At the end of the model, you will find a generic “Resources” section that contains booklists, agencies, and other resources that fit with the whole project rather than a specific subject area. Finally, there is an extensive “Assessment” section that contains a variety of rubrics for use in an activity or in the culminating project assessment. These rubrics have been gleaned from a variety of sources and can be used “as is” or modified to fit your particular needs.

Conclusion

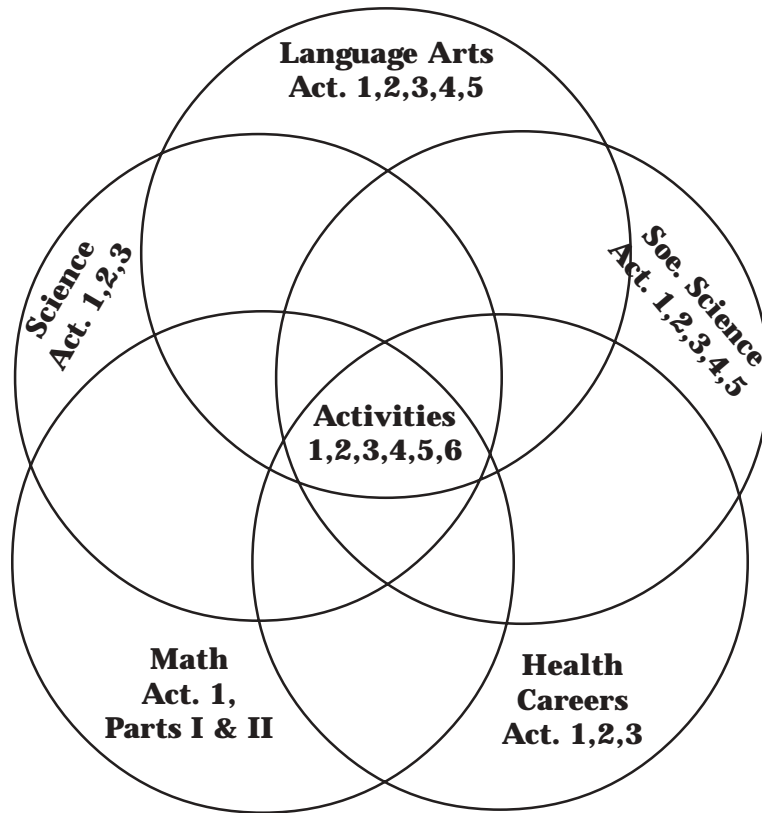
Each project model was developed with the philosophical goal of providing a health care context by which students can truly learn their subject matter. There was never the intent to create career search projects, per se, but to allow the natural evolution of career awareness to occur throughout the students’ work. This is not to indicate that one is superior to the other, but merely that it was this particular teacher teams’ preference.

Project at a Glance



Integration of Subject Area Activities

Physical Differences Are Part of the Human Experience



Suggested Use of Venn Diagram

This diagram or the Project at a Glance on the previous page can be enlarged and posted to serve as a daily reminder to assist the teachers in judging how their activities are flowing with the other disciplines involved in the integrated project. This will also serve as a good reminder to teachers to bridge the concepts between disciplines at the appropriate times.

Involvement of the actual disciplines in areas of integration, especially in the Culminating Project, will vary according to teachers, site and topic selected by student.

Processes and Tools

Using Technology

The use of technology as a tool to enhance learning is growing rapidly. Depending on the availability of technology at the school site, this can be effectively integrated into the project. Utilization is encouraged as an invisible partner to enrich all activities, particularly the quality of presentations, videos, magazine production and exhibits.

Suggested technology to use for this project:

- Internet for research and distribution of product
- desktop publishing program to format the product
- photo equipment (e.g., digital camera, scanner) to visually enrich the culminating product and document work in progress
- presentation program to promote the product to classmates (e.g., PowerPoint, Hyper Studio)
- World-Wide Web display of a video, a presentation or a “virtual” magazine
- media centers
- libraries

Conducting a Web Search

Basic Search Guidelines

Most search engines found on the World Wide Web are organized like an outline. They start with general topics such as Arts, Government, Science, etc. After you select from such a list of broad topics, the search engine then proceeds to more specialized sub-topics. For example, under science are found branches of science such as agriculture, medicine, or physics. At each level you are asked to choose from a range of more specialized topics until you arrive at the level of individual “sites” which may contain the information that you are seeking. Commonly used search engines include Yahoo, Alta Vista, Ask Jeeves, Excite, Google, GoTo, Lycos, Dogpile and Netscape. Most of these can be found by typing [www.\(engine name\).com](http://www.(engine name).com).

When conducting web search in health-related areas, there are things that you can do to ensure that the sites found contain accurate information:

- Utilize a medical search engine* to provide links to other relevant sites.
- Find out who is behind the site to gain insight into the site’s point of view as well as the reliability of the information provided. One way to conduct this research is to do a “Whois” search at Network Solutions (www.nsi.com).
- Determine whether the site demonstrates only opinions and biases, or facts and pertinent data. On what data is the information based? This determines the reliability of such information.

- Be aware that information sponsored by advertisers may indicate a varying amount of editorializing.
- Check the date to ascertain current information. Medical information is changing rapidly. If the information is more than two years old, it may be out of date.

The individual **must** take responsibility for the direction of the search in order for it to be subject-relevant as well as timely. The following Web sites will be valuable, but only as a start in connecting with information driven by questions and organization that are well designed from the heart of the research/project topic.

***Reliable health-related Web sites/search engines:**

Achoo—www.achoo.com (search engine)

Alzheimer's Association—www.alz.org

American Botanical Council—www.herbalgram.org

American Heart Association—www.americanheart.org

American Medical Association—www.ama-assn.org

CBSHealthWatch—www.healthwatch.medscape.com

Federal Trade Commission—www.ftc.gov

Food and Drug Administration—www.fda.gov

HealthAtoZ.com—www.healthatoz.com

Healthfinder—www.healthfinder.gov (search engine)

Medlineplus—www.medlineplus.gov

MedWebPlus—www.medwebplus.com (search engine)

Quackwatch—www.quackwatch.org (also in German, French, Spanish, Portuguese)

Reuters Health—www.reutershealth.com (also in Spanish and Portuguese)

The Med Engine—www.themedengine.com (search engine)

WebMedLit—www.ovid.com

Web Site Evaluation

1. Site Name _____

2. Site Address http:// _____

3. Did this site load: quickly or slowly?

4. What kinds of information or topics are covered at this site? _____

5. Check the features of this site: Pictures Sound Movies

Fill-in Forms Animations Hyperlinks

6. Rate the quality and depth of the site: H= high M= medium L= low

Quality (H) (M) (L) Depth (H) (M) (L)

7. Does the page have a table of contents? Yes No

Was the table of contents useful? Yes No

8. Evaluate the ease of reading the text:

Was the vocabulary easily understood? Yes No

Were the colors of text and background easy to see? Yes No

9. Rate from 1–10 (10 top rating) the appeal of the page: 1 2 3 4 5 6 7 8 9 10

10. Does the site have: a long opening page or hyperlinks to underlying pages?

11. Were there useful hyperlinks to others related sites on this page? Yes No

If so, name one other good hyperlink site: _____

12. Write down two interesting things you learned at this site. _____

13. Was the information from a reliable source? Yes No

What makes you think so? _____

14. Was there an e-mail address at the bottom of the first page? Yes No

15. Would you recommend this site to others for:

Research? Yes No **Fun?** Yes No

Student-Centered Behaviors

A student-centered classroom can be difficult to manage if expectations for the students are not made clear. Due to years of conditioning, students are often very teacher-dependent and wait until the teacher tells them what to do. However, certain tools help promote student independence while maintaining teacher-student communication. They include:

Teacher as Facilitator

Teachers act as coaches, observe as well as periodically participate in groups, help with research, and clarify what is expected of their students. Remember, a student-centered classroom is usually the foundation for research and is driven by an essential question, so your planning is based on how best to facilitate your students' research, and secondly, their understanding of the material they find. Teachers may find it tiresome to have 30 or more students involved in different tasks. Facilitating this takes practice and often patience. Some days will feel out of control; others will run smoothly. Teachers need to plan for this type of teaching and be flexible in respect to their students' pacing. They also need to plan for down time. For example, in an English class, everyone should have a novel to read during down time. If the class gets too hectic, call off the research for a day and take a rest.

Time Management

Calendar

Students need to learn how to plan their time. Once the students understand a particular project, pass out a blank calendar to help them plan their use of time in and out of the classroom. As the teacher, you can help them plan their first weeks of research and then slowly allow them to take over this responsibility. As time progresses, student groups will manage their own calendar. Start out class with five minutes of planning and/or reporting on what students expect to accomplish each day. This clarifies activities for both students and teacher.

Progress Memos

Students can also write "Progress Memos" at the end of the week to update the teacher on the group's progress.

Weekend Planning

On Fridays, students need to spend time planning possible weekend activities related to their project.

Due Dates

Due dates are the prerogative of the teacher. Generally, students should write them on their calendar and expect to meet each deadline. However, a student-centered classroom is often surprising. When students become deeply involved in a project, they can have a legitimate reason for needing more time. Allow for the possibility of flexibility when you are planning.

Peer Teaching

Peer teaching can take a variety of forms. Provide a board where students can share information such as times that libraries and bookstores are open, organizations that might be helpful to other groups, teachers on campus who are knowledgeable about a certain subject, Web sites of interest, etc.

Peer teaching can also mean that students share their work in-progress so that students having difficulty may gather ideas in relation to their project work. Frequently, students can be highly effective in helping their peers understand a project or an idea.

Students who are efficient and catch on quickly can tutor once they complete their project. Offer extra credit for helping others.

Expected Behaviors

Identify the role of each student in a group by writing the roles out or having the class develop a list. The facilitator must be someone who can keep the group moving, the recorder a decent writer, etc. Ask the recorder to write down what each student is expected to do for their particular project. This becomes an accountability strategy and protects the integrity of the group process.

Interdisciplinary Project Log

(Optional)

Rationale

The interdisciplinary project log is a “process portfolio” that can be used with any of the interdisciplinary units. The project log provides students with continuity as they move from class to class and helps them make connections between subject areas as they build a knowledge base. It is also a method of assessing each student’s involvement in the project.

Introductory Activity: The Interdisciplinary Project Log

Students organize a notebook in which they keep notes, research information, labs, reading logs, ideas, assignments, etc. They utilize this notebook in classes involved with the interdisciplinary project.

Objective

The student will:

- Keep the project work organized;
- Build a body of information for the culminating project;
- Make connections between subject areas;
- Demonstrate individual involvement in the interdisciplinary project;
- Assess individual involvement in the interdisciplinary project.

Process

The student will:

- Organize a notebook to use as an interdisciplinary project log;
- Carry the interdisciplinary project log for use in each class;
- Keep notes, research information, labs, reading logs, ideas, assignments, etc. in the interdisciplinary project log;
- Use the material in the interdisciplinary project log for class discussions and planning;
- Periodically evaluate their progress with peers and teachers;
- Write a letter of evaluation assessing individual work and study habits.

The teacher will:

- Explain the purpose of the interdisciplinary project log;
- Provide students with an appropriate format for the interdisciplinary project log;
- Use the interdisciplinary project log to assess the needs of individual students;
- Provide feedback;
- Develop a scoring guide for assessing the interdisciplinary project logs. (The team of teachers can develop the scoring guide alone or in conjunction with the students.)

Assessment

- Students write letter of evaluation to put in the front of their interdisciplinary project log;
- Students turn in interdisciplinary project log for teacher(s) to evaluate using scoring guide.

Standards

Standards

Content Standards Alignment

Health Careers Core Standards

3. **Safety:** Students will know safety issues as they relate to employer, employee, and patient within the health care setting.
4. **Communication and decision making:** Students will know how to use critical and creative thinking, logical reasoning and problem-solving skills using various methods.
6. **Career Planning:** Students will know the importance of comparing personal profiles to various health career requirements.

History-Social Science Standards

United States History and Geography

- 10.3.1: Analyze why England was the first country to industrialize.
- 10.3.2: Examine how scientific and technological changes and new forms of energy brought about massive social, economic, and cultural change (e.g., the invention and discoveries of James Watt, Eli Whitney, Henry Bessemer, Louis Pasteur, Thomas Edison).
- 10.3.3: Describe the growth of population, rural to urban migration, and growth of cities associated with the Industrial Revolution.
- 10.3.4: Trace the evolution of labor and work, including the demise of the slave trade and the effects of immigration, mining and manufacturing, division of labor, and the union movement.
- 10.11: Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).

Math Standards

Algebra 1

- 5.0. Students solve multi-step problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
- 6.0. Students graph a linear equations and compute the x- and y-intercepts. They are also able to sketch the region defined by linear inequality.
- 7.0. Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations by using the point-slope formula.
- 9.0. Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.
- 16.0. Students understand the concepts of a relation and a function, determine whether a given relation defines a function, and give pertinent information about given relations and functions.

- 17.0. Students determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression.
- 18.0. Students determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion.

English-Language Arts Standards, 9–10

Reading

1.0 Word Analysis, Fluency, and Systematic Vocabulary Development

Students apply their knowledge of word origins to determine the meaning of new words encountered in reading materials and use those words accurately.

3.0 Literary Response and Analysis

Students read and respond to historically or culturally significant works of literature that reflect and enhance their studies of history and social science. They conduct in-depth analyses of recurrent patterns and themes.

Writing

Writing 1.0 Writing Strategies

Students write coherent and focused essays that convey a well-defined perspective and tightly reasoned argument. The writing demonstrates students' awareness of the audience and purpose. Students progress through the stages of the writing process as needed.

- 1.3: Use clear research questions and suitable research methods to elicit and present evidence from primary and secondary sources.
- 1.4: Develop the main ideas within the body of the composition through supporting evidence.
- 1.5: Synthesize information from multiple sources and identify complexities and discrepancies in the information and the different perspectives found in each medium.
- 1.6: Integrate quotations and citations into a written text while maintaining the flow of ideas.
- 1.7: Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals.
- 1.8: Design and publish documents by using advanced publishing software and graphic programs.
- 1.9: Revise writing to improve the logic and coherence of the organization and controlling perspective, the precision of word choice, and the tone by taking into consideration the audience, purpose, and formality of the context.

Listening and Speaking

1.0 Listening and Speaking Strategies

Students formulate adroit judgments about oral communication. They deliver focused and coherent presentations of their own that convey clear and distinct perspectives and solid reasoning. They use gestures, tone, and vocabulary tailored to the audience and purpose.

2.0 Speaking Applications (Genres and Their Characteristics)

Students deliver polished formal and extemporaneous presentations that combine the traditional rhetorical strategies (e.g., narration, exposition, persuasion, description). Student speaking demonstrates a command of standard American English and the organizational and delivery strategies outlined in Listening and Speaking Standard 1.0.

Science Standards

Biology/Life Sciences

Ecology

6. Stability in an ecosystem is a balance between competing effects.

Evolution

7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time.

8. Evolution is the result of genetic changes that occur in constantly changing environments.

SCANS Competencies and Foundation

Secretary's Commission on Achieving Necessary Skills (SCANS)
U.S. Department of Labor, 1991

Three-Part Foundation

Basic Skills: Reads, writes, performs arithmetic and mathematical operations, listens and speaks

- A. Reading—locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules
- B. Writing—communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts
- C. Arithmetic/Mathematics—performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques
- D. Listening—receives, attends to, interprets, and responds to verbal messages and other cues
- E. Speaking—organizes ideas and communicates orally

Thinking Skills: Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn, and reasons

- A. Creative Thinking—generates new ideas
- B. Decision-Making—Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative
- C. Problem-Solving—recognizes problems and devises and implements plan of action
- D. Seeing Things in the Mind's Eye—organizes and processes symbols, pictures, graphs, objects, and other information
- E. Knowing How to Learn—uses efficient learning techniques to acquire and apply new knowledge and skills
- F. Reasoning—discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem

Personal Qualities: Displays responsibility, self-esteem, sociability, self-management, and integrity and honesty

- A. Responsibility—exerts a high level of effort and perseveres towards goal attainment
- B. Self-Esteem—believes in own self-worth and maintains a positive view of self
- C. Sociability—demonstrates understanding, friendliness, adaptability, empathy, and politeness in group settings
- D. Self-Management—assesses self accurately, sets personal goals, monitors progress, and exhibits self-control

Five Competencies

Resources: Identifies, organizes, plans, and allocates resources

- A. Time—selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules
- B. Money—uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives
- C. Material and Facilities—acquires, stores, allocates, and uses materials or space efficiently
- D. Human Resources—assesses skills and distributes work accordingly, evaluates performance and provides feedback

Interpersonal: Works with others

- A. Participates as Member of a Team—contributes to group effort
- B. Teaches Others New Skills
- C. Serves Clients/Customers—works to satisfy customers' expectations
- D. Exercises Leadership—communicate ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies
- E. Negotiates—works toward agreements involving exchange of resources, resolves divergent interests
- F. Works with Diversity—works well with men and women from diverse backgrounds

Information: Acquires and uses information

- A. Acquires and Evaluates Information
- B. Organizes and Maintains Information
- C. Interprets and Communicates Information
- D. Uses Computers to Process Information

Systems: Understands complex inter-relationships

- A. Understands Systems—knows how social, organizational, and technological systems work and operates effectively with them
- B. Monitors and Corrects Performance—distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions
- C. Improves or Designs Systems—suggests modifications to existing systems and develops new or alternative systems to improve performance

Technology: Works with a variety of technologies

- A. Selects Technology—chooses procedures, tools or equipment including computers and related technologies
- B. Applies Technology to Task—understands overall intent and proper procedures for setup and operation of equipment
- C. Maintains and Troubleshoots Equipment—prevents, identifies, or solves problems with equipment, including computers and other technologies

Culminating Project

Interdisciplinary Culminating Project

Physical Differences Are Part of the Human Experience

Rationale

Differences among people are a natural part of the human experience. However, these differences are not always easily accepted and our attitudes about them evolve over time. We teach ourselves tolerance, compassion, and finally acceptance of many of the human differences as we become educated. When we reach this acceptance, we realize that our differences inform our lives.

Adolescents, in particular, are acutely aware of their emotional and physical differences. Usually, they are able to point out something about themselves they do not like, or they may show their feelings about being different through their dress. They can be highly critical of their peers as well, especially if they do not conform to a standard they find personally acceptable.

This project is meant to explore human differences through literature and to research how individuals, families, and society respond to them. We have purposely left the idea of human differences open to interpretation. Literature examines a variety of human differences that adolescents will find interesting and worth exploring. However, when students begin to brainstorm research topics, you should narrow the subject to a health-related condition that parallels what students have been studying in science, health, history, and math. This will provide them with insights into how subjects are linked to one another and help them focus on the causes, effects, and possible solutions or treatments for a particular health-related condition.

Within this project, each subject area has provided a menu of recommended activities to facilitate learning for students. We recommended activities to facilitate learning for students. We recommend that each teaching team determine, during shared planning times, which activities are preferable for their purpose. If the suggested core and extended literature from this project is not listed in a particular district's core and extended literature list, there are procedures within each district to add to or change the approved list. The recommended literature can also be changed if desired.

Objective

The student will:

- Develop some expertise in understanding a specific physically limiting condition;
- Share research and proposal;
- Begin to feel more comfortable with themselves and with others.

Process

The student will:

- Identify a physically limiting condition;
- Determine the causes and effects of that condition;
- Discuss individual and institutional responses;
- Propose further steps to meet resulting needs.

Culminating Project

Students will use research to investigate and deliver information to a broader audience. For example, a group of students who research the effects of fetal alcohol syndrome might prepare a documentary video to show in Family Life classes or at a Planned Parenthood center, or students researching multiple sclerosis might prepare a bilingual brochure at a community cultural center.

Assessment

Use the rubric on Assessing Student Performance*

*Refer to “Resources” section at the end of the project.

Culminating Project

**Interdisciplinary
Activities**

Culminating Project Activity #1

Brainstorming Ideas for Research Topic

Brainstorm a list of possible research topics based on literature and studies completed in the other subject areas. Examples might include Cerebral Palsy, Sickle Cell Anemia, Down Syndrome, blindness, anorexia, depression, cancer, etc.

Rationale

Through Language Arts Activities 1–4 and Social Science Activities 1–5, students gain an awareness of human differences and the responses these differences evoke in others. These activities assist students in formulating a list of possible research topics.*

Basic Health Services Connection

This culminating project activity is a foundation activity for the actual research to be conducted. During this research, students will discover career connections that may otherwise not have been apparent.

Standards Addressed

English-Language Arts: Listening and Speaking 1.0

Science: Any discipline, depending on disease or physical disorder selected

Objectives

The student will:

- Gain an awareness of possible research topics;
- Identify personal interest;
- Understand the research process and how it leads to the exhibition;
- Learn to work as a member of a team.

Process

The student will:

- Group with no more than three other students;
- Brainstorm a list of research topics with classmates;
- Discover an area of personal interest for research;
- Review guidelines for research project;
- Clarify the idea of research as the foundation for the exhibition;
- Become a member of a team.

Assessment

- Informal evaluation of research topic list and discussions;
- Evaluation of students as team members (See Appendix).

Bibliography/Resources

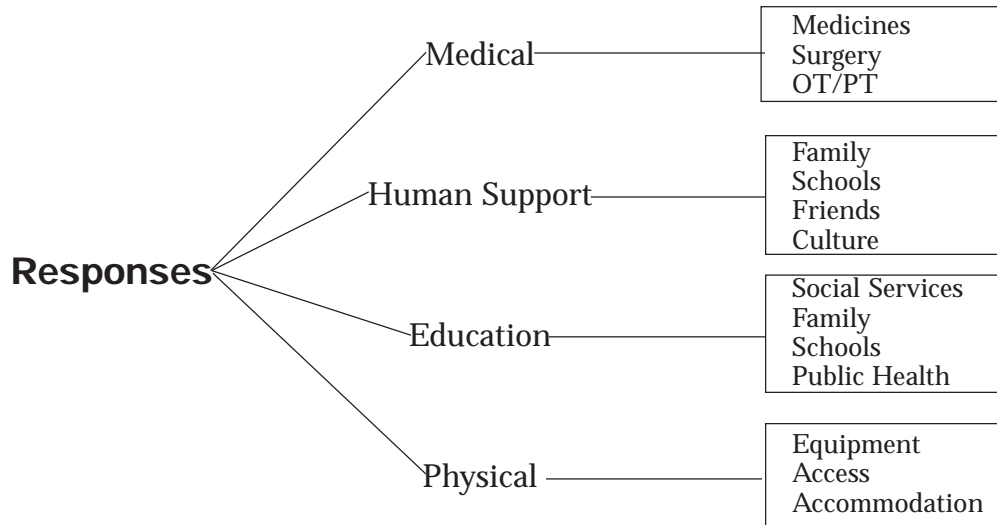
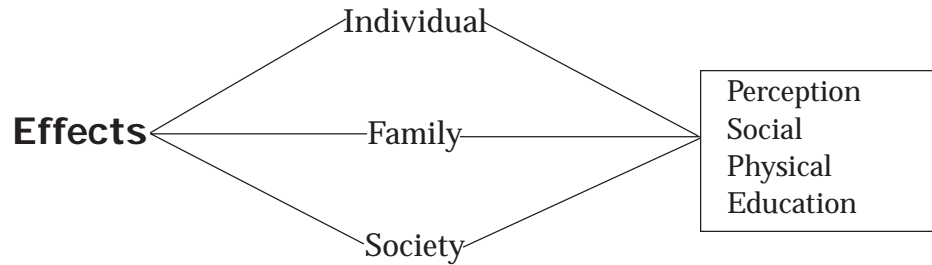
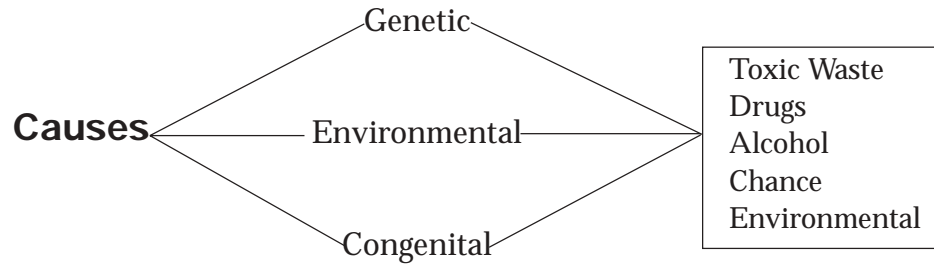
None

*See suggested Genetic Disorder list in the Resource section at the end of the project.

Research Path

After core literature is read and discussed, and after completion of activities of related topics in science, history-social science, and math, students will brainstorm a list for possible research topics identifying physical limiting conditions caused by genetic and environmental factors. Then research groups will be selected by student interest after the brainstorming list is generated.

Research must include:



Culminating Project Activity #2

Literature Circles

Students discover and read literature (essays, poetry, plays, novels) connected with the group research topic. Both the teacher and the students generate the literature selection. The list provided below includes literature about health-related issues, both inherited and environmentally caused, that might be researched.

Rationale

Through literature, students explore possible research topics to learn about a health-related condition and the individual's and/or societal responses to the condition.

Basic Health Services Connection

This culminating project highlights human differences and the responses these differences evoke. During this research, students will discover career connections that may otherwise not have been apparent.

Standards Addressed

English-Language Arts: Reading 3.0–3.12

Science: Any discipline, depending on disease or physical disorder selected

Objectives

The student will:

- Broaden his/her understanding of a health-related condition;
- Become aware of individual and societal responses to it;
- Make connections between reading and personal life experiences.

Process

The student will:

- Read and keep a response log to use in a Literature Circle with Research Group to discuss reading;
- Identify ideas and information for written paper and exhibition.

Assessment

- Informal evaluations of group and class discussions using Reading Response Logs, as well as ideas and information gathered on research topics;
- Informal observations of student involvement during Literature Circle discussion;
- Short reading quizzes.

Bibliography/Resources

Body of Knowledge by Carol Dawson (This book is about four generations of a Southern family who has to deal with obesity)

Ceremony by Leslie Silko (a Native American returns shell-shocked from World War II)

Charlie (movie)

Children of a Lesser God by Mark Medoff (video available too)

Elephant Man by Bernard Pomerance

Flowers for Algernon by Daniel Keyes (a retarded boy's experiences with experimental drugs and how they affect his mental abilities)

Hiroshima by John Hersey

Hot Zone by Robert Preston; (about the *ebola* virus)

If You Could See What I Hear by Tom Sullivan and Derek L. Gill

King of Hearts by G. Wayne Miller (the story of open heart surgery; some stories of patients with deformed hearts);

Lovely A Very Special Child by Mary MacCracken (story about an emotionally disturbed child and a remarkable teacher; shows freedom from fear and loneliness)

Of Mice and Men by John Steinbeck

"Our Son Mark" by S.I. Hayakawa in *Outlooks and Insights, A Reader for College Writers*, edited by Paul Eschholz and Alfred Rose, St. Martin's Press (About mental retardation)

Still Me by Christopher Reeve ("Superman" tells of his life before and after the tragic accident that left Reeves paralyzed)

Stones from the River by Ursula Hegi (The setting of the book is World War II; the storyline deals with a young dwarfed girl)

The Bell Jar by Sylvia Plath (autobiography about Sylvia's depression)

The Blind Man by D. H. Lawrence

The Heart is a Lonely Hunter by Carson McCullers

The Hunchback of Notre Dame by Victor Hugo

The Miracle Worker by Will Gibson

The Phantom by Christopher Pike

The Phantom of the Opera by Gaston Le Roux

The Story of My Life by Helen Keller

"Vengeance" and "King of Skateland" by Gerald Haslam from *That Constant Coyote*, University of Nevada Press; (story about a mentally retarded boy who shows up the king of skateland with his skating ability);

With Love, From Karen by Karen Killilea (struggle of a young girl and her family to overcome challenges created by Cerebral Palsy)

Professional Resource

Daniels, Harvey, *Literature Circles, Voices and Choices in the Student-Centered Classroom*, York, Maine: Stenhouse Publishing, 1994.

Culminating Project Activity #3

Research Groups

Student groups research their topics.

Rationale

Students learn research methods as they gain an understanding of their topic.

Basic Health Services Connection

This activity is necessary for the successful completion of the final product. During this research, students will discover career connections that might otherwise not have been apparent.

Standards Addressed

English-Language Arts: Reading 1.3–1.8

Science: Any discipline, depending on disease or physical disorder selected

Objectives

The student will:

- Collect, read, and analyze research materials to understand his/her topic;
- Work as a member of a group.

Process

The student will:

- Conduct a library search (Internet, books, periodicals, etc.) on a selected topic;
- Take notes on what he/she knows and what he/she needs to find out;
- Read, highlight, and take notes on the causes, effects, prevention, solution/treatment and scientific research of their topic using the jigsaw method;
- Find and view video documentaries/films on his/her selected topic;
- Report to his/her research group.

Assessment

- Informal observation of research process;
- Research conducted in a timely manner.

Bibliography/Resources

- Internet;
- Student-selected resources.*

*Refer to Resources section at the end of the project.

Culminating Project Activity #4

Interview

Arrange and conduct an interview using student-generated interview questions.

Rationale

During their research, students develop the skills necessary to conduct an effective interview, analyze information they have gathered, and incorporate it into their project assignments.

Basic Health Services Connection

This culminating project activity highlights human differences and is necessary for the successful completion of the final product.

Standards Addressed

English-Language Arts: Writing 1.3; Listening and Speaking 2.3

Objective

The student will:

- Understand how to conduct an interview and use this strategy for research projects.

Process

The student will:

- Brainstorm interview techniques in small research groups;
- Practice interview techniques with research group partners utilizing guidelines provided by the teacher on arranging and conducting an interview, proper phone etiquette, interview note-taking;
- Role play the interview process;
- Develop a list of possible people to interview;
- Decide whom to interview;
- Generate a list of suitable questions;
- Complete an interview report utilizing a variety of formats, i.e., question/answer, narrative, synopsis;*
- Use peer responses when revising and editing;
- Write thank-you letters to interviewees.

Assessment

- Informal evaluation of interview questions, role playing, timeliness of interview process;
- Form evaluation of interview report using a teacher-/student-generated rubric.

Bibliography/Resources

- Find newspaper and magazine interviews to use as a model when students write their interviews.

* Teacher may need to facilitate appropriate mini-lessons on the conventions of writing.

Culminating Project Activity #5

Written Paper

Each student will choose a written format to present what is learned through his or her research: informative report, cause/effect; or I-search paper.

Rationale

Writing a paper helps students synthesize and reflect on their research, as well as practice the writing process.

Basic Health Services Connection

This culminating project activity highlights human differences and the responses these differences evoke. During the research process, the student will discover career connections that might otherwise not have been apparent. In this writing process, the student will begin to synthesize these connections in addition to other vital information gleaned.

Standards Addressed

English-Language Arts: Writing 1.3–1.9

Objectives

The student will:

- Demonstrate in writing what he/she has learned through research;
- Demonstrate ability to write clearly and to document sources;
- Practice the writing process (revision and editing).

Process

The student will:

- Complete the writing process:
 - ◆ Pre-writing using research reports, notes, and interviews
 - ◆ Draft #1 – peer responses and revisions (content)
 - ◆ Draft #2 – peer responses for conventions
 - ◆ Final product
- Participate in appropriate mini-lessons for various types of writing;
- Document sources or cite research in paper per APA or MLA.

Assessment

- Utilize Writing Rubric for Report of Information;*
- Research.

Bibliography/Resources

- Any writing handbook with information about MLA or APA

*See Assessment Appendix at the end of the project.

Culminating Project Activity #6

Exhibition

Students prepare an exhibition for a larger audience (school and community) to teach what they have learned through their research.

Rationale

Because students learn best by teaching and/or sharing what they have researched, the culminating activity for this project is an exhibition that allows students to share what they know with others.

Basic Health Services Connection

This culminating project will allow the student to demonstrate understanding of human differences and the responses these differences evoke. In addition, the student will synthesize all career connections that might otherwise not have been apparent.

Standards Addressed

English-Language Arts: Listening and Speaking 1.0, 2.3

Health Careers: Standard 4

Science: Any discipline, depending on disease or physical disorder selected

SCANS: Information, Interpersonal, Technology

Objectives

The student will:

- Learn organizational skills;
- Work with other students and teachers as a member of a team;
- Teach what has been learned from their research;
- Learn to communicate by using a presentation format: video, drama, oral presentations, etc.

Process

The student will:

- Help organize the exhibition;
- Divide the work fairly among the students;
- Base the presentation(s) on their research and written papers;
- Select the presentation from a variety of models;
- Display, brochure, oral presentation, drama, video, documentary, puppet or talk show, etc.
- Include causes, effects (physical, social, personal) solutions, and treatments;
- Rehearse presentation;
- Participate in the exhibition.

Assessment:

- Teacher-/student-generated rubric for exhibition.*

* See Assessment Appendix at the end of the project.

English- Language Arts Activities

English-Language Arts Activity #1

Scarlet Ibis

Read and discuss the short story by James Hurst. (This story is an excellent “into” activity before beginning a longer, more complex work such as *Cyrano de Bergerac*.)

Rationale

“Scarlet Ibis” provides an example of someone who is physically challenged, allowing students to reflect on how a family reacts to this condition. This is a story about a boy and his young brother, Doodle, who is a sickly baby. Though he is not mentally retarded, he is a weak child and unable to walk. The older brother loves his sibling, but is ashamed that his brother is crippled and decides to teach him to walk. Doodle makes little progress, and the story ends in tragedy.

Basic Health Services Connection

This activity is foundational to student understanding and empathy for the differences found in life. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

English-Language Arts: Reading 3.1–3.12

Objective

The student will:

- Become aware of individual and family responses to someone who is physically challenged.

Process

The student will:

- Research the meaning of the title; list the qualities of a scarlet ibis, and make predictions about the story based on the title;
- Read portions of the text, predict, and reevaluate predictions formulated earlier;
- Complete the reading, develop questions or a one-page response for further discussions;
- Make meaning of the text through other activities: story map, grand conversations, questioning activity, ladder of responsibility;*
- Write one of the following: an essay from a parent’s perspective discussing what can be said about Doodle’s death; a diary entry from the point of view of one parent or Doodle’s brother; a paragraph poem using the one-page response to the story.

Assessment

- Informal evaluation of discussions using student-developed questions or one-page response;
- Evaluation of Ladder of Responsibility, rationale, and presentation;*
- Evaluation of essay, diary entry, or paragraph poem.

Bibliography/Resources

- “Scarlet Ibis” by James Hurst;
- “Destroying Angel” by Eric Cameron.

* See Language Arts Appendix 8, 9, 11 & 12 following this section for strategy descriptions.

English-Language Arts Activity #2

Quick Write in Response Log

Prepare a response log as an “intro” strategy.

Rationale

Physical differences are a part of the human experience and have been expressed in literature, art, music, etc. This activity is an “intro” strategy for *Cyrano de Bergerac*.

Basic Health Services Connection

This activity provides a foundation for student understanding and empathy for differences found in life. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

English-Language Arts: Reading 3.0

Objectives

The student will:

- Make personal connections with the theme of physical imperfections in the play, *Cyrano de Bergerac*.

Process

The student will:

- Complete Parts A and B of the Response Log;*
 - ◆ Part A: (*Top half of Response Log entry*)
Write about a physical feature with which you are happy, and tell why you feel comfortable with this feature.
 - ◆ Part B: (*Bottom half of Response Log entry*)
Write about a physical feature with which you are unhappy. Describe the feature and tell why you feel uncomfortable with it.
- Share in pairs or as a class (optional).

Assessment

- Completed Response Log;
- Discussion.

Bibliography/Resources

- *Cyrano de Bergerac*, by Edmond Rostand

*The teacher should model and prepare a Quick Write before students write their own. See Language Arts Appendix 5 & 6 following this section.

English-Language Arts Activity #3

Cyrano de Bergerac

Read and make meaning of *Cyrano de Bergerac* by Edmond Rostand.

Rationale

Cyrano de Bergerac is a play about a young poet whose physical imperfection stands between him and the woman he admires. In this play, students explore physical appearance and how it shapes self identify, and discover, with the main character, the importance of inner beauty and talent.

Basic Health Services Connection

This activity provides a foundation for student understanding and empathy for differences found in life. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

English-Language Arts: Reading 3.0–3.12

Objectives

The student will:

- Make meaningful and personal connections to *Cyrano*;
- Connect the play to the theme of responding to physical imperfections.

Process

The student will:

- Role play scenes from *Cyrano*;
- Complete Double Entry Log and share regularly in small groups;*
- Complete activities from suggested menu (teacher selected) to help understand the literature (Character Map, Interior Monologue, Story Organizers, Hot Seat).*

Assessment

- Teacher observation of role playing;
- Literature response log/double entry log;
- Discussion;
- Completion of optional activities listed in Appendix.

Bibliography/Resources

- *Roxanne*—modern day film of *Cyrano*;
- *Cyrano de Bergerac*—French and American films;
- *Cyrano de Bergerac* (play) by Edmond Rostand.

* See Language Arts Appendix 1–4, 7 & 10 following this section.

English-Language Arts Activity #4

Fetal Alcohol Syndrome

Read an excerpt of *A Broken Cord* and make meaning of the text.

Rationale

A Broken Cord is a non-fiction book by Michael Dorris about his adopted son who had Fetal Alcohol Syndrome (FAS). This book helps students understand FAS by building knowledge.

Basic Health Services Connection

This activity provides a foundation for student understanding and empathy for differences found in life. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

English-Language Arts: Reading 3.0

Objective

The student will:

- Gain an understanding of how alcohol can cause health problems by reading about and discussing Fetal Alcohol Syndrome.

Process

The student will:

- Complete an Inquiry Chart by responding to the following questions:
 - ◆ “What do I know about alcohol use during pregnancy?”
 - ◆ “What do I want to know about alcohol use during pregnancy?”
- Share responses with another student in the class, adding good ideas to their charts;
- Create a Class Inquiry Chart;
- Complete the Tea Party Activity using strips of information from professional journals and articles written about FAS;*
- Add and revise the Class Inquiry Chart using information from the Tea Party Activity;
- Complete a Shared Reading from the excerpt of *A Broken Cord*.*
- Complete activities from suggested menu (teacher selected) to help understand the literature (Double entry response log, Save the Last Word for Me, Quick Write, Hot Seat, Response Logs, Read-Arounds).*
- Return to the class Inquiry Chart to affirm valid prior knowledge, make corrections, check off answered questions, and ask new questions. (Students who wish to use FAS as the topic for their culminating project might focus on the new set of unanswered questions for their research.)

Assessment

- Written response in Response Log;
- Informational essay to share with class;
- Fact sheet on FAS (could be used later in a brochure for the culminating project).

Bibliography/Resources

Broken Cord, by Michael Dorris

*See Language Arts Appendix 1, 5–7, following this section.

English-Language Arts Activity #5

Poetry

Read a variety of poems related to the theme and utilize small groups to give interpretive presentations to the class.

Rationale

Poetry provides students with a powerful way to understand the human condition and to explore their thoughts and feelings about the theme.

Basic Health Services Connection

This activity provides a foundation for student understanding and empathy for differences found in life. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

English-Language Arts: Reading 3.1–3.12; Listening and Speaking 1.0

Objective

The student will:

- Understand the theme in a variety of contexts and convey his/her ideas to classmates through a presentation.

Process

The student will:

- Read an assigned or self-selected poem in a small group
- Discuss the meaning, decide how to give a class presentation to convey the group's interpretation (props, visuals, movement, music, etc.);
- Write personal responses to the poem in Response Log;*
- Share his/her writing in small groups or with a partner before a class discussion;
- Present poem to the class using an activity from suggested activities menu, e.g., Read Around, Wondering/Wandering, One Pager;*
- Complete a creative writing assignment, e.g., Paragraph Poem and Poem Presentation.*

Assessment

- Evaluation of presentation using Interpretive Poem Presentation Rubric*

Bibliography/Resources

- “Hunchback In The Park” by Dylan Thomas;
- “Puzzle” by Myra Cohn Livingston, *Remembering and Other Poems*, 1989;
- “Speech Class” by Jim Daniels, *The Place My Words Are Looking For*, 1990;
- “What Do You Say When He Tells You Have the Softest Skin” by Mary Mackey.

* See Language Arts Appendix 5, 6, 14–16 following this section.

English- Language Arts Appendix

Double-Entry/Dialectical Journal

Character Map

Interior Monologue—Open Mind

Interior Monologue

Reader Response Logs

Tea Party

Quick Write

Read Arouds

Language Arts Appendix 1

Sample Form

Date: _____

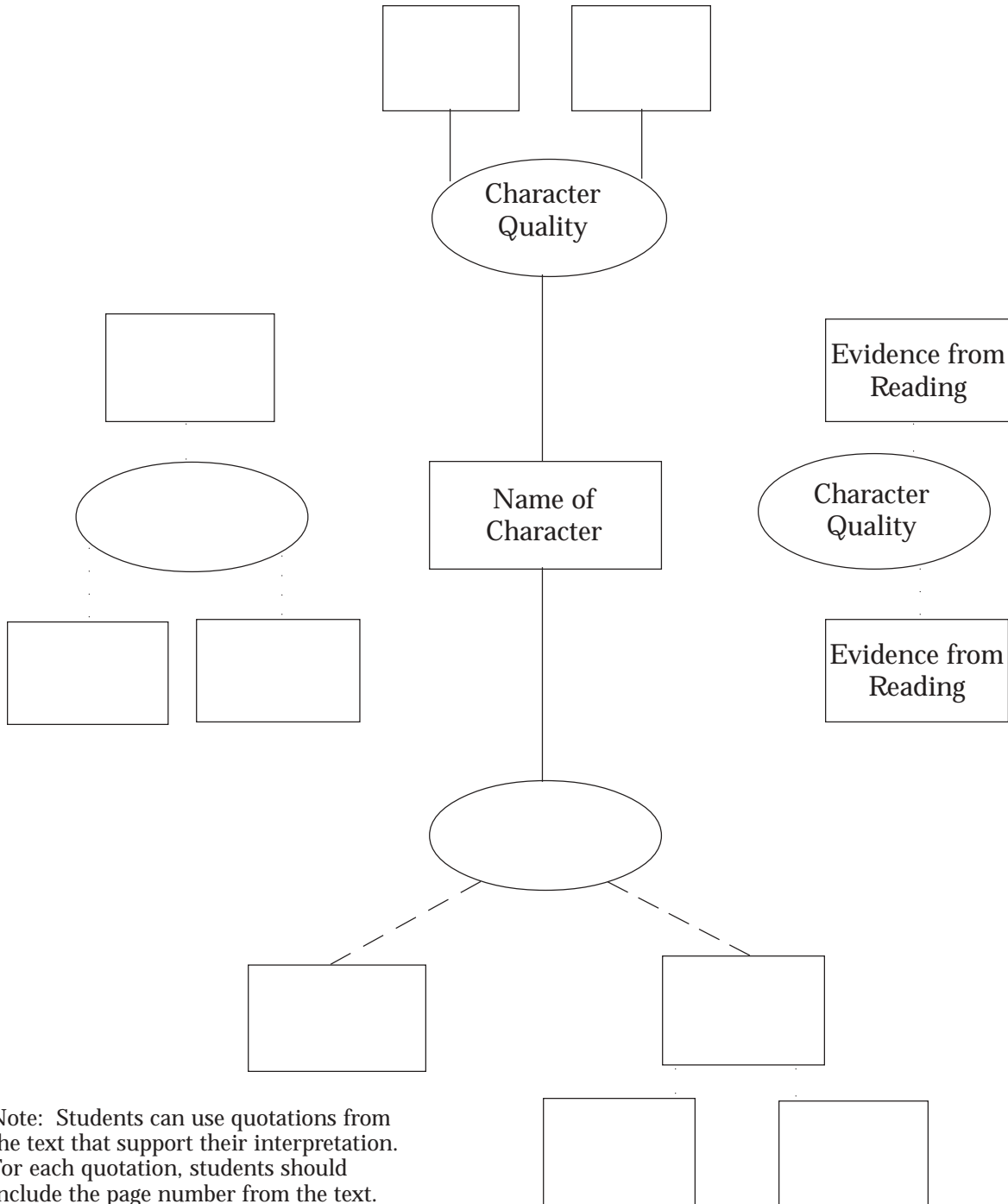
Double-Entry Dialectical Journal

| Quotation/Phrase/Passage from Text | My Thoughts about this Passage |
|---|---------------------------------------|
| | |

Language Arts Appendix 2

Character Map

The purpose of a character map is to focus the reader's attention on the main characters in the story, identifying their qualities or traits based on their actions in the story. This activity can be done independently or in cooperative groups. A character map helps to develop students' interpretive reading skills. This activity forces students to return to the text to find evidence to support their characterization.



Note: Students can use quotations from the text that support their interpretation. For each quotation, students should include the page number from the text.

Language Arts Appendix 3

Interior Monologue

— Open Mind —
(Scripting or Sketching)

This character analysis activity is typically used to respond to a character’s thought processes immediately after a reading. The student can be instructed to respond in either symbol format (sketching), or with a written “stream of consciousness” first person (“I”) monologue. In completing this activity, the student must begin to focus his/her understanding of a specific character and the unique traits and qualities that this character exhibits. This activity can be a very effective pre-writing or pre-discussion activity on methods of character portrayal and in-depth character analysis.

Note

This activity is applicable to fiction as well as non-fiction/content area writing. Figures from the world of sports, science, medicine, history, or the humanities can provide excellent opportunities for character analysis and speculation.

Directions for Student**Scripting Format/Prompt**

Using the first person point of view, write the thoughts of the character as he/she might react/respond to the conflicts, characters, or setting in the story, poem, play, or video you have selected. Try to present what the character is thinking about, what his/her priorities are, or how the character perceives himself/herself. Attempt to make your writing reflect the actual way your character would respond. Write your character’s name and thought responses in the “Interior Monologue” head design.

or

Sketching Format/Prompt

Draw a series of items, symbols, or pictures that represent the character or the character’s thoughts inside the outline of the character’s mind (“Interior Monologue” head design). Try to illustrate items/aspects of the character’s thought process, what his/her priorities are, or how the character perceives himself/herself. You also may wish to use words or phrases from the text that help portray various aspects or dimensions of the character.

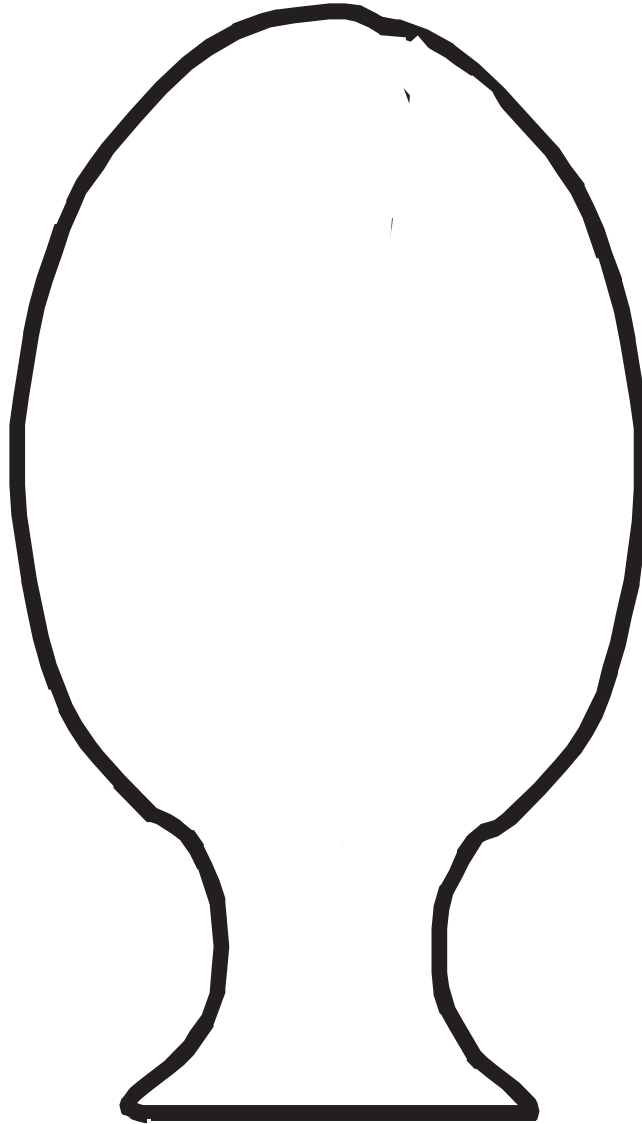
Note: Other strategies that develop character analysis include: Quick Writes, Hot Seat, Tableau, or CAP-directed Character Interpretation Essays.

Schulz: 1/91

Adapted from “Meaning-Making Strategies”

CLP : Domingues Hills, 1989

Language Arts Appendix 4



Interior Monologue

WHAT? Using your voice (or that of another character), respond to the text. In a “stream of consciousness” format, write your reactions, feelings, questions, observations, and analysis. Capture your (or another character’s) voice—your humor, your insights, and your questions.

WHY? This strategy can help you create a dialogue with the text, help you make meaning, and establish a clear sense of voice. It requires you to respond consciously to the text and to record your responses.

Language Arts Appendix 5

Reader Response Logs

During or after reading a selection, the reader writes down responses to ideas or thoughts presented in the reading. Students can do any or all of the following in their response log: write questions about the text, challenge the text or the author, write reactions (thoughts and feelings) to what is written, make personal connections, identify powerful sentences in the reading and explain why the sentence is powerful. Readers can admit confusion, add insight, summarize, or reflect about what is written. This response log can then be used during discussion. This serves to help the reader make meaning of the text.

Tea Party

The Tea Party activity is an “INTO” activity that helps to build knowledge for students on a given topic. This activity can be used to preview a text that is to be read. It guarantees that each student speaks to every other student in the class. The text used can be either expository or narrative.

Besides informing students about FAS, this activity allows students to practice reading and improves fluency. For some students, it helps to build vocabulary. The name “Tea Party” comes from the fact that at a tea party participants socialize by talking to everyone at the party.

- Students are each given a strip of paper with a quotation from the text written on it. Students then read the strip and make sure they understand the sentence.
- When using this as an “INTO” activity for Michael Dorris’ *Broken Cord*, the teacher can select information from professional medical journals about Fetal Alcohol Syndrome.
- Students are to read their strips to other students as well as to listen to what other students read to them. The goal is to get as much information as possible and to interact with their classmates.

After a given amount of time, the teacher can conduct a whole class discussion, returning to the Inquiry Chart and adding new information learned, correcting incorrect information, and adding more questions.

Language Arts Appendix 6

Quick Write

The Quick Write invites the writer to write without planning and organizing. Students write about a selected topic for a given amount of time, and when unable to think of anything else, the writer can repeat the last word until something comes to mind. There is no regard for punctuation, complete sentences, or spelling. The idea is to write down ideas, thoughts, and feelings about the given topic.

The Quick Write can be used at any phase of the learning process and as a way to help students connect to prior knowledge or “make meaning” of the text. Quick Writes are often shared with a partner or in small groups. This activity allows students to think on paper before discussion begins, giving students more confidence when talking with others about a topic. Quick Writes can be used in a Read Around or can serve as pre-writing for more formal writing assignments.

Read Around

The purpose of the Read Around is to allow students to positively interact with the written thoughts and ideas of their fellow students. Read Around groups usually consist of four or five people. During the Read Around, students sit in a small circle with their group and pass around individual papers to each member of the group for private reading. Writing shared might be a draft, a Quick Write, or a literature response (double entry, quick write, etc.). Students write responses to the writer’s idea(s).

Students are not editing, but are responding to specific ideas the writer has shared. The student might also respond by giving his/her opinion or thoughts about ideas the writer has shared about the topic. Also, the student might share new insight or understanding gained from reading the writer’s response to the topic. The reader signs his/her name when completing the response and then passes the paper to another student in the group. The teacher can allow for a given amount of time for each student’s reading and written response to a group member and can indicate when papers should be passed to the next student.

Note: In the activity described, the Read Around is used to discuss ideas and gain new insight and understanding from other students; it is not used to correct spelling and punctuation. However, in other contexts, this process can be modified to make it a peer responding, editing activity.

Language Arts Appendix 7**Save the Last Word for Me**

In this activity, students are assigned reading and given three file cards. After completing the reading, students are to find three significant lines from their particular reading. They then write each line on one side of the card, noting the page number of the quotation. On the back of the card, students write their reactions, thoughts, and feelings about the quotation.

While sitting in groups of three or four, a student in the group holds up a card, both showing and reading the quotation to the group. One at a time, group members react to the quotation, sharing what it means, what insight the quotation adds to the reading, as well as personal connections.

After everyone in the group has responded, the student holding up the significant line tells why it was selected, sharing the reactions, thoughts, and feelings written on the back of the card. The title “Save the Last Word for Me” refers to the fact that the last person to share thoughts and reactions is the person who held up the card. Each student shares a significant line until all of the cards are discussed. At the end of this discussion, students can summarize the understanding and the insights gained about the reading. This summary can then be shared with the entire class.

Hot Seat

Hot Seat is a comprehension activity that works best in groups of four or five. Each student role plays a character and prepares for an interrogation from the other students in his/her group. The other students prepare questions about that character that they would like to have answered. Students need to be encouraged to select or to write questions that require more than simple recall as well as to avoid questions that merely have a “Yes” or “No” response.

After preparation, the first character sits in the “hot seat” and the others ask questions. The character must come up with appropriate responses. Participants on the “hot seat” are encouraged to keep their answers closely aligned with the text and their perception of the character. Each “character” in the group takes his or her turn in the “hot seat.”

This activity can also be done as a full class activity. In fact, when first teaching this strategy to your students, it is best if you introduce the activity by modeling a minor character for the group. It is also valuable to brainstorm appropriate questions and to discuss how to draft good “thinking” questions.

Another idea that is helpful might be to form “expert groups” before you do this as a whole class activity. Expert groups of about four students form to discuss their understanding of a particular character. After the expert group discussion, one person from each group can be selected to be on the “hot seat” for the full class activity. The students usually feel better prepared to respond to the questions posed by the class since the expert group creates greater understanding of the character.

Language Arts Appendix 8

Questioning Activity

This activity allows students to practice the reading strategy of questioning. Students have the opportunity to ask questions about the text that will further their understanding of the reading. Students complete a reading and then complete the following process:

- Each student writes down any question(s) about the reading. Any question they want answered is legitimate. Students are not quizzing each other; they are asking questions whose answers would create better understanding of the reading.
- Once students write three to five questions about the text, the teacher passes out file cards with a colored dot and a number on each card. The teacher needs to make enough cards so that there are enough colors and numbers to create groups of no more than four.
- Students then are asked to report to their assigned **color** group. The goal for each student is to get all of the questions answered. Students take turns sharing questions, then work in their group to discuss possible answers to the questions. Students are encouraged to return to the text to examine actual evidence that might support possible responses. Students can use “Questioning Chips” to guarantee that each person has a question addressed. Allow about 20 minutes for the first discussion group.
- When time is called, students are directed to cross off questions they now have answers for and to add any new questions they have developed about the reading.
- Students then get into the **number** group that is made up of students from various colored groups. They repeat the process of getting responses to questions. At the end of the number group discussion, students cross off questions answered and add new questions.
- The number group then decides on one question they would like to pose to the entire class. The teacher might ask students, “What one question do you still have about the text—one question that if your group had some answers to, you would better understand the reading?”
- Each group writes their question on the chalkboard. The teacher will then facilitate a class discussion.
- At the conclusion of this activity, students can write in their Response Logs or Learning Logs about the understanding they now have of the reading.

Language Arts Appendix 9

Story Map

| |
|------------------------------|
| The setting/main characters: |
| Statement of the problem: |

| |
|----------|
| Event 1: |
| Event 2: |
| Event 3: |
| Event 4: |
| Event 5: |
| Event 6: |
| Event 7: |

| |
|----------------------------|
| Statement of the solution: |
|----------------------------|

| |
|---|
| Story theme (What is the story <i>really</i> about?): |
|---|

| |
|----------------------------------|
| Values brought out in the story: |
|----------------------------------|

Language Arts Appendix 10

Story Organizer for Narratives
Folktales or Stories with a Definite Conflict

| Someone (Character) | Wanted (Goal) | But (Problem) | So (Solution) |
|-------------------------------|-------------------------|-------------------------|-------------------------|
| | | | |

Suggested in *Health Reading* (1989)
Format by A. Schulz (3/93)

Language Arts Appendix 11**Grand Conversation**

Grand Conversation is a group discussion activity that is frequently used upon completion of a reading assignment encompassing either a chapter or the entire text. The reading may be from a textbook or may be literary in nature. This activity is typically thought of as an approach to help students in the meaning-making process as they move through the text. Text or literature study frequently employs this approach in the initial and in the subsequent discussion sessions of a completed book. It has a *free flow* to it, not searching for a “right” answer, but rather allowing students to engage and interact with the text and to share the meaning they have gained from their reading and rereading.

The teacher, or a student leader, encourages readers to engage in an open discussion on a reading assignment or a piece of literature by asking an open-ended question such as, “Well, what do you make of this?” or “What did you think of the story?” Students begin sharing an aspect of their reading experience or their interpretation. The sharing tends to work best when students are in a circle and are able to maintain eye contact with all members of the group. Having each student respond or pass when their turn comes insures that all students have the opportunity to share. The leader encourages clarification, elaboration, and/or explanation.

The purpose is to enable the students to get beyond the surface response of “I liked the story because it was exciting” or “I liked the story because it had interesting characters.” The leader’s role is to facilitate the discussion and to keep a record of the topics about what has been shared or stated. At times, the leader may need to probe the statements/opinions shared by members of the group. At the end of the conversation, the leader may look for any patterns that appear in the various participant responses, summarize the information, and briefly report them back to the group. Grand Conversation works well with the entire class or with smaller groups.

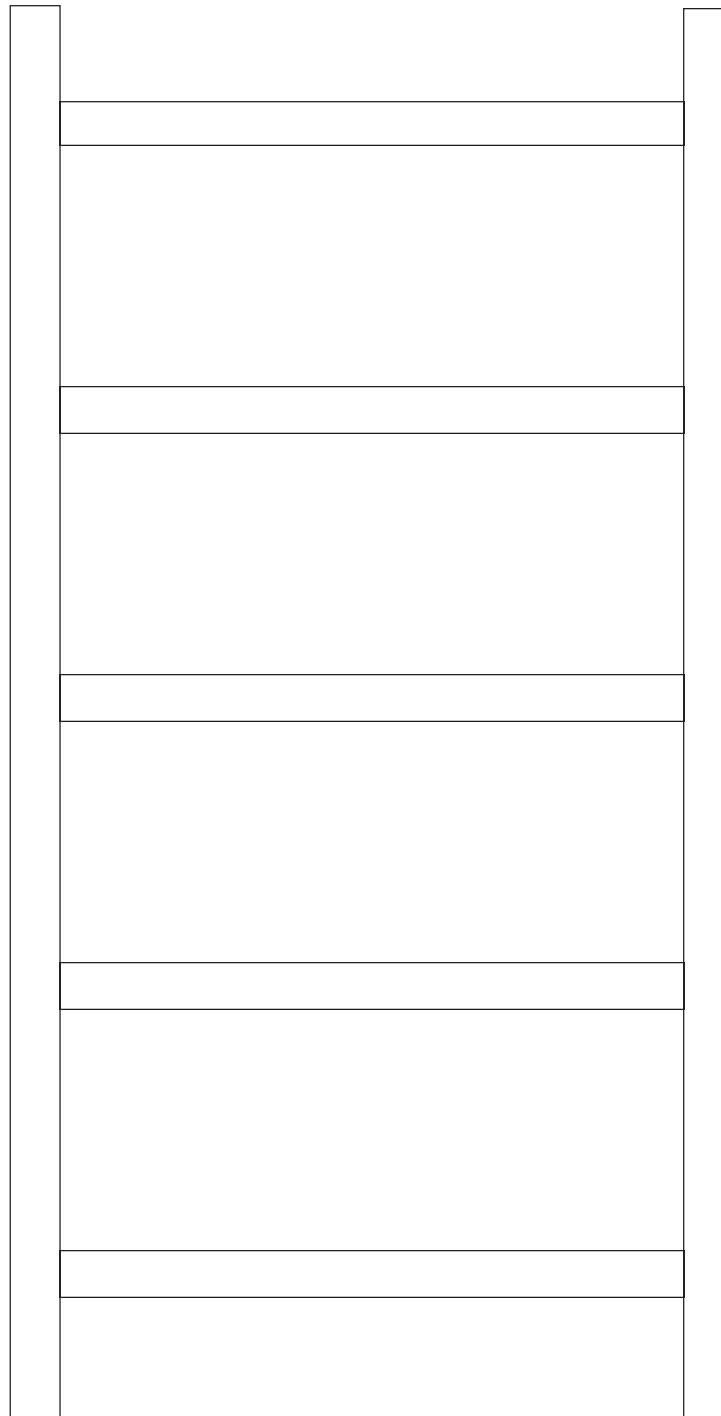
This approach to reading comprehension moves the discussion from a “formal inquiry” by the teacher to an interactive sharing process. It also eliminates “end-of-the-chapter/book” questions. It allows students to orally share their perceptions of the reading assignment, to clarify their interpretation, and to possibly expand their understanding of the assigned reading through interaction with other readers. Listening and speaking skills are practiced. A writing activity could easily follow, or even precede, this activity.

Language Arts Appendix 12

Ladder of Responsibility

Example

List in order from the **most** to the **least** responsible for the death of Dindleby in “Scarlet Ibis.”



Most Responsible
(Explain reasoning)

Least Responsible
(Explain reasoning)

Language Arts Appendix 13**Paragraph Poem****Directions**

- Write a paragraph approximately one-half page long on a personal experience, an observation, or an idea that you are learning about in another class that relates to the theme of physical differences;
- Be aware of details. The more specific your writing, the more interesting your poem will be when it is completed;
- When you have written your paragraph, read it aloud. Listen to where your voice naturally pauses. Place a slash (/) when you pause. Slash your paragraph completely, listening closely to the pauses in your voice.

Example: My brother has multiple sclerosis/ and sometimes he can walk/; but other times/ he must use a wheelchair.

- When you finish slashing the paragraph, rewrite the poem, breaking the lines wherever you have put a slash.

Example:

My brother has multiple sclerosis
and sometimes he can walk;
but other times
he uses a wheelchair.

- This sounds too wordy. When you have broken the poem into lines, take out excess words

Example:

My brother has multiple sclerosis
Sometimes he can walk.
Other times,
He uses a wheelchair.

(Notice that “and” and “but” were unnecessary. This is one way to tighten the lines of your poem.)

- Now reread the poem and repeat the process of slashing lines and removing excess wording until you feel your poem is finished.
- When you are satisfied with your poem, give it a title and type it.
- Bring it to class to share.

Language Arts Appendix 14

Poem Presentation (Sample Rubric)

High Achievement

- **Organized.**
- **Rehearsed**—can be heard, smooth transitions, fluent reading of lines.
- **Interpretive**—more than just a rereading of poem; shows understanding of what the words mean.
- **Use of Voice(s)**, movements, props, lights, music, etc. adds to meaning.
- **Explanation** at the end of the poem—explaining group’s understanding of the meaning as well as why the group did what they did to show meaning.
- **Every** group member participates.

Middle Achievement

- **Organized.**
- **Perhaps not as rehearsed**—some parts not smooth.
- **Interpretive**—more than just a rereading of poem; shows understanding of what the words mean.
- **Use of Voice(s)**, movement, props, lights, music, etc. adds to meaning, but not as imaginative or creative.
- **Explanation** at the end of the poem—explaining group’s understanding of the meaning as well as why the group did what they did to show meaning.
- **Every** group member participates.

Basic Achievement

- **Not rehearsed** or organized.
- **Not interpretive**—a reading of the poem.
- **Explains** the meaning of the poem.
- **Every** group member participates.

Language Arts Appendix 15

One-Pager (Reading Response Activity)

from Gabrielle Lusser Rico

“How do I know what I think until I see what I say?”
“Only connect.”

E.M. Forster

A One-Pager is a single-page response to your reading, a way of making your own pattern of your unique understanding. This is a response approach that allows you to be creative and experimental, a way to respond imaginatively and honestly, as well as an approach that encourages you to be brief and compressed.

The purpose of a One-Pager is to take ownership of what you are reading. We learn best when we create our own patterns. A One-Pager connects the verbal and the visual; it connects the ideas in what you read to your thoughts. Basically, it connects words and images. A One-Pager becomes a metaphor for the reading you have done.

To produce a One-Pager, do any or all of these items:

- Pull out a **quotation** or two, using them to explore one of your own ideas, and write them on the page (perhaps using a different colored pen);
- Use **visual images**, either drawn or cut from magazines, to create a visual focus;
- **Cluster** around a dominant impression, feeling, or thought you have while reading;
- Make a **personal statement** about what you have read;
- Ask a **question** or two and answer it/them;
- Create the one-pager so that your **audience will understand** something about the reading from what you do;
- Feel free to **use colored** pens or pencils.

What not to do:

- Don't merely summarize;
- Don't be restricted by the lines on the paper. Use unlined paper if you need to;
- Don't think a half page will do. Make your response page rich with quotes and images.

If your teacher is grading this assignment, full credit depends on completeness, but imagination and creativity count, too!

Language Arts Appendix 16

Wonderings and Wanderings

Invitation for a Reader's Log *

California Literature Project, Suggested by Joellyn Wise-Fuller and Janet Ghio, 5/95

As you read, keep a daily log where you discuss both your responses and the ideas in your book. In this way, you will begin to connect these ideas to your own experience, making the novel your own, a part of your storehouse of knowledge and experience.

As you reflect, ruminate, and question, listen carefully to yourself and attempt to describe the effect the book is having on you. Let your response connect to an idea, reject an idea, or create an idea. Find associations. See where they lead—To images? To fantasies? To human experience? How is the writing speaking to you? This is your reading process. Examine it and take note of what you do with the material you read. Respond deeply, write honestly, admit confusion, expand your author's ideas, attempt to discover your own ideas.

Try exploring with the following sentence starters:

- I wonder . . .
- I began to think of . . .
- I suppose . . .
- I don't see . . .
- I like the idea . . .
- I know the feeling . . .
- I noticed . . .
- I love the way . . .
- I was surprised . . .
- I can't really understand/believe . . .
- If I had been . . .
- Why did . . .
- I wish . . .
- It bothers me when . . .
- Maybe . . .

Each time you read, respond by writing in your journal. Enter the date of each response. Your journal will be invaluable to you when discussing the book or when attempting to write about the book. At the end of the year, you will have accumulated thesis statements and supporting evidence enabling you to write intelligently about what you have read. But most importantly, you will have created something all your own, and you will know and remember what you have read.

*Adapted from Audre Allison of Shoreham-Wading River High School in Shoreham-Wading River, New York. For a more detailed discussion of the use of this material, see Chapter 2 in *Through Teacher's Eyes* by S. Perl and N. Wilson. Heinemann Educational Books, Inc. 1986.

History-Social Science Activities

History-Social Science Activity #1

Why did the Industrial Revolution begin in England?

Search text and list reasons by topic detailing why the Industrial Revolution began in England in the 17th Century.

Rationale

Students will reference their textbook for data that confirms factors leading to England's early Industrial Revolution.

Basic Health Services Connection

This activity is foundational to student understanding and empathy in regards to differences brought about by environmental factors. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

History-Social Science: World History, Culture, and Geography 10.3.1, 10.3.2, 10.3.3

Objectives

The student will:

- Read textbook information on Industrial Revolution;
- Analyze and list factors contributing to the Industrial Revolution;
- List information on grid provided.

Process

The student will:

- Read text in pairs;
- Participate in discussion of materials from the text;
- Fill in grid with facts and symbols after teacher models the process.*

Assessment

- Pairs of students will share grids with two other pairs;
- A compilation of student grids will be collated on the overhead;
- Information will be retained by students for further reference.

* See History-Social Science Appendix 2 following this section.

History-Social Science Activity #2

Case Studies with Jigsaw Format

Students will read and share a variety of case studies using jigsaw format and thereby obtain a glimpse at “real” people.

Rationale:

Students can personalize textbook materials by reading primary source documents.

Basic Health Services Connection

This activity is foundational to student understanding and empathy in regards to differences brought about by environmental factors. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

History-Social Science: World History, Culture, and Geography 10.3.4, 10.3.5

Objectives

The student will:

- Look for conditions that affect the human body (e.g., premature birth, malnutrition, disease);
- Relate these conditions to working and living conditions.

Process

The teacher will:

- Divide class into teams of five. Give each team the name associated with Industrial Revolution sites (Leeds, Manchester, Dundee, Lancaster, Bedford);
- Give each group five strips of colored paper, one per person (red, green, blue, yellow, pink);
- Move students from town groups into color groups.
- Give each color group a primary source document *
 - Red – Joshua Drake
 - Green – Matthew Crabtree
 - Blue – John Hall
 - Yellow – Elizabeth Bentley
 - Pink – Peter Smart
- Elicit student input to form a master list for the class. Display on overhead or list on board.

The student will:

- Read and discuss document listing conditions that could affect workers’ bodies;
- Return to town teams, and share a summary of each case study, using “A Look at Real People;”*
- Compile a summary of each of the case studies.

Assessment

This information will be assessed in the letter that accompanies the next activity.

**See History-Social Science Appendix 3 & 4 following this section.

History-Social Science Activity #3

Factory Town: "A Letter from Manchester, 1832"

After reading a document from James Phillips Kay's book, *The Moral and Physical Condition of the Working Classes Employed in the Cotton Manufacture in Manchester*, students will write a letter telling of the life in Manchester in 1832.

Rationale

Students will expand their knowledge of individuals and working conditions by probing the dynamics of English factory homes and towns.

Basic Health Services Connection

This activity is foundational to student understanding and empathy in regards to differences brought about by environmental factors. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

History-Social Science: World History, Culture, and Geography 10.3.2, 10.3.4, 10.3.5

Objectives

The student will:

- Assume he/she has gone to Manchester to care for an ill relative;
- Show understanding of living conditions in and out of the home;
- Have a clear understanding of daily life during the Industrial Revolution;
- Make connections between daily living and health issues.

Process

The student will:

- Read and discuss the reading from Kay;*
- Pay particular attention to details of food, income, spending, living quarters, use of leisure time, daily schedule, cleanliness, child care;
- Review the rubric for grading a letter;
- Write a letter giving details of life in Manchester, 1832.

Assessment

- Letter will be evaluated according to Rubric;**
- Letters will be read among students in groups of four or five;
- Letters will be displayed in classroom.

* See History-Social Science Appendix 5 following this section.

** See History-Social Science Appendix 6 following this section.

History-Social Science Activity #4

Assessment

Students will show mastery of materials from this unit by taking a standardized test and performing an “Act It Out,”

Rationale

This activity evaluates the importance of creating a safe working environment. Students will recognize that employment in the early factories had grave consequences upon the human body.

Basic Health Services Connection

This activity is foundational to student understanding and empathy in regards to differences brought about by environmental factors. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

History-Social Science: World History, Culture, and Geography 10.3.2, 10.3.3, 10.3.4

Objectives

The students will:

- Be able to explain the Industrial Revolution and its impact upon the health of the individual and society;
- Present a mini drama of life in an English town during the Industrial Revolution.

Process

The student will:

- Participate in an “Act It Out” as a family at a meal discussing their work, their home, their town, health issues, etc. This will be in groups of four or five students;
- Assume the role of foreign industrialists presenting a panel discussion to fellow industrialists, advising them how to avoid some of the problems English factory owners have faced and how to maximize profits at the same time.

Assessment

- Teacher will evaluate based on rubric;*
- Attached matrix test.**

* See History-Social Science Appendix 9 following this section.

** See History-Social Science Appendix 10 following this section.

History-Social Science Activity #5

Ties to Today: Current Event

Looking at the newspaper, one can find that working conditions still impact the health and safety of workers.

Rationale

Learning history is most valuable when connections are made to today's world.

Basic Health Services Connection

This current events activity is foundational to student understanding and empathy in regards to differences very much present in today's society. The subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

History-Social Science: World History, Culture, and Geography 10.11

Objectives

The student will:

- Read the attached current event from the *Los Angeles Times*.*
- Use the Venn Diagram to compare and contrast working conditions in today's world with those in the Industrial Revolution.*

Process

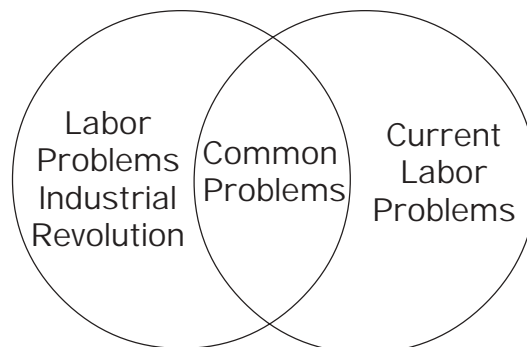
The student will:

- Read pertinent current events;
- Complete the Venn Diagram;
- Present the Venn Diagram to a group of four or five students;
- Compare and contrast modern and historic working conditions.

Assessment

- Teacher will evaluate student's work;
- Display of student work.

Sample of Venn Diagram



*See History-Social Science Appendix 7 & 8 following this section.

History-Social Science Appendix

Activities-at-a-Glance

Why Did the Industrial Revolution Begin in England?

A Look at Real People

The Life of the Industrial Worker in 19th Century England

**James Kay, The Moral and Physical Condition of the Working
Classes...in Manchester (1832)**

Rubric Sample: Letter from Manchester, 1832

Venn Diagram

Beanie Baby Manufacturing Facts

Act-It-Out Directions and Rubric

Standardized Assessment Activity and Test Format Answer Key

History-Social Science Appendix 1

Industrial Revolution: How did working conditions affect human health in England?

Activities at a Glance: A Quick Look for Busy Teachers

| | |
|--|---|
| <p>Day One</p> <p>Why did the Industrial Revolution begin in England?</p> <p>Activity One</p> <ul style="list-style-type: none"> ■ Textbook research ■ Organize research by topic ■ May require work outside class | <p>Day Five</p> <p>Life in a Factory Town</p> <p>Activity Three</p> <ul style="list-style-type: none"> ■ Primary source documents ■ Writing for understanding ■ Will require work outside class |
| <p>Day Two</p> <p>Why did the Industrial Revolution begin in England?</p> <p>Activity One, cont.</p> <ul style="list-style-type: none"> ■ Complete research topics ■ Compile class chart | <p>Day Six</p> <p>Life in a Factory Town</p> <p>Activity Three, cont.</p> <ul style="list-style-type: none"> ■ Final draft of letters ■ Share with small groups |
| <p>Day Three</p> <p>Activity Two</p> <ul style="list-style-type: none"> ■ Primary source documents ■ Jigsaw groups share information ■ Students compile findings | <p>Day Seven</p> <p>Assessment</p> <p>Activity Four</p> <ul style="list-style-type: none"> ■ Test, matrix format ■ Act It Out |
| <p>Day Four</p> <p>A Look at Real People</p> <ul style="list-style-type: none"> ■ Groups refine summary working conditions of individual health | <p>Day Eight</p> <p>Ties to Today</p> <p>Activity Five</p> <ul style="list-style-type: none"> ■ Current events ■ Venn diagram |

History-Social Science Appendix 2

Name: _____ Date: _____

Why did the Industrial Revolution Begin in England?

| Element | List Reasons | Design Symbol for Reason |
|---------------------|---------------------|---------------------------------|
| Geographical | | |
| Economic | | |
| Political | | |
| Social | | |
| Special | | |

History-Social Science Appendix 3

Name: _____ Date: _____

A Look at Real People

| Person | Working Conditions | Effects of Health |
|--------------------------|---------------------------|--------------------------|
| Joshua Drake | | |
| Matthew Crabtree | | |
| John Hall | | |
| Elizabeth Bentley | | |
| Peter Smart | | |

History-Social Science Appendix 4

The Life of the Industrial Worker in 19th Century England

http://ab.edu/~delcol_1/worker.html

The material below was reprinted from a history textbook, *Readings in European History Since 1814*, edited by Jonathan F. Scott and Alexander Baltzly, published by Appleton-Century-Crofts Inc. in 1930. The original sources of the materials are listed in footnotes in the book. These are bracketed after each subject heading. The explanatory notes between sections are by Scott and Baltzly; the links were added.

In 1832 Michael Sadler secured a **parliamentary** investigation of conditions in the **textile factories** and he sat as chairman on the committee. The evidence printed here is taken from the large body published in the committee's report and is representative rather than exceptional. It will be observed that the questions are frequently leading; this reflects Sadler's knowledge of the sort of information that the committee was to hear and his purpose of bringing it out. This report stands out as one of the three great reports on the life of the industrial class—the two others being that of the Ashley Commission on the mines and Chadwick's report on sanitary problems. The immediate effect of the investigation and the report was the passage of the Factory Act of 1833 limiting hours of employment for women and **children** in textile work.

Peter Smart, called in and examined:

You say you were locked up night and day?

—*Yes.*

Do the children ever attempt to run away?

—*Very often.*

Were they pursued and brought back again?

—*Yes, the overseer pursued them, and brought them back.*

Did you ever attempt to run away?

—*Yes, I ran away twice.*

And you were brought back?

—*Yes; and I was sent up to the master's loft, and thrashed with a whip for running away.*

Were you bound to this man?

—*Yes, for six years.*

By whom were you bound?

—*My mother got 15s. for the six years.*

Do you know whether the children were, in point of fact, compelled to stop during the whole time for which they were engaged?

—*Yes, they were.*

By law?

—*I cannot say by law; but they were compelled by the master; I never saw any law used there but the law of their own hands.*

To what mill did you next go?

—*To Mr. Webster's, at Battus Den, within eleven miles of Dundee.*

In what situation did you act there?

—*I acted as overseer.*

At 17 years of age?

—*Yes.*

Did you inflict the same punishment that you yourself had experienced?

—*I went as an overseer; not as a slave, but as a slave-driver.*

What were the hours of labour in that mill?

—*My master told me that I had to produce a certain quantity of yarn; the hours were at that time fourteen. I said that I was not able to produce the quantity of yarn that was required. I told him if he took the timepiece out of the mill I would produce that quantity, and after that time I found no difficulty in producing the quantity.*

How long have you worked per day in order to produce the quantity your master required?

—*I have wrought nineteen hours.*

Was this a water-mill?

—*Yes, water and steam both.*

To what time have you worked?

—*I have seen the mill going till it was past 12 o'clock on the Saturday night.*

So that the mill was still working on the Sabbath morning?

—*Yes.*

Were the workmen paid by the piece, or by the day?

—*No, all had stated wages.*

Did not that almost compel you to use great severity to the hands then under you?

—*Yes; I was compelled often to beat them, in order to get them to attend to their work, from their being over-wrought.*

Were not the children exceedingly fatigued at that time?

—*Yes, exceedingly fatigued.*

Were the children bound in the same way in that mill?

—*No; they were bound from one year's end to another, for twelve months.*

Did you keep the hands locked up in the same way in that mill?

—*Yes, we locked up the mill; but we did not lock the **bothy**.*

Did you find that the children were unable to pursue their labour properly to that extent?

—*Yes; they have been brought to that condition, that I have gone and fetched up the doctor to them, to see what was the matter with them, and to know whether they were able to rise or not be able to rise; they were not at all able to rise; we have had great difficulty in getting them up.*

When that was the case, how long have they been in bed, generally speaking?

—*Perhaps not above four or five hours in their bed.*

Joshua Drake, called in and examined:

You say you would prefer moderate labour and lower wages. Are you pretty comfortable upon your present wages?

—*I have no wages, but two days a week at present. But when I am working at some jobs we can make a little, and at others we do very poorly.*

When a child gets 3s. a week, does that go much towards its subsistence?

—*No, it will not keep it as it should do.*

When they got 6 or 7 when they were pieceners, if they reduced the hours of labor, would they not get less?

—*They would get a halfpenny a day less, but I would rather have less wages and less work.*

Do you receive any parish assistance?

—*No.*

Why do you allow your children to go to work at those places where they are ill-treated or over-worked?

—*Necessity compels a man that has children to let them work.*

Then you would not allow your children to go to those factories under the present system, if it was not from necessity?

—*No.*

Supposing there was a law passed to limit the hours of labour to eight hours a day, or something of that sort, of course you are aware that a manufacturer could not afford to pay them the same wages?

—*No, I do not suppose that they would, but at the same time I would rather have it, and I believe that it would bring me into employ; and if I lost 5 a day from my children's work, and I got half-a-crown myself, it would be better.*

How would it get you into employ?

—*By finding more employment at the machines, and work being more regularly spread abroad, and divided amongst the people at large. One man is now regularly turned off into the street, whilst another man is running day and night.*

You mean to say, that if the manufacturers were to limit the hours of labour, they would employ more people?

—*Yes.*

Mr. Matthew Crabtree, called in and examined:

What age are you?

—*Twenty two.*

What is your occupation?

—*A blanket manufacturer.*

Have you ever been employed in a factory?

—*Yes.*

At what age did you first go to work in one?

—*Eight.*

How long did you continue in that occupation?

—*Four years.*

Will you state the hours of labor at the period when you first went to the factory, in ordinary times?

—*From 6 in the morning to 8 at night.*

Fourteen hours?

—*Yes.*

With what intervals for refreshment and rest?

—*An hour at noon.*

When trade was brisk what were your hours?

—*From 5 in the morning to 9 in the evening.*

Sixteen hours?

—*Yes.*

With what intervals at dinner?

—*An hour.*

How far did you live from the mill?

—*About two miles.*

Was there any time allowed for you to get your breakfast in the mill?

—*No.*

Did you take it before you left your home?

—*Generally.*

During those long hours of labour could you be punctual; how did you awake?

—*I seldom did awake spontaneously; I was most generally awoke or lifted out of bed, sometimes asleep, by my parents.*

Were you always in time?

—*No.*

What was the consequence if you had been too late?

—*I was most commonly beaten.*

Severely?

—*Very severely, I thought.*

In those mills was chastisement towards the latter part of the day going on perpetually?

—*Perpetually.*

So that you can hardly be in a mill without hearing constant crying?

—*Never a hour, I believe.*

Do you think that if the overlooker were naturally a humane person it would still be found necessary for him to beat the children, in order to keep up their attention and vigilance at the termination of those extraordinary days of labor?

—*Yes; the machine turns off a regular quantity of cardings, and of course, they must keep as regularly to their work the whole of the day. They must keep up with the machine or be found fault with, he spurs the children to keep up, but that which he commonly resorts to is to strap them when they become drowsy.*

At the time when you were beaten for not keeping up with your work, were you anxious to have done it if you possibly could?

—*Yes; the dread of being beaten if we could not keep up with our work was a sufficient impulse to keep us to it if we could.*

When you got home at night after this labor, did you feel much fatigued?

—*Very much so.*

Had you any time to be with your parents, and to receive instruction from them?

—*No.*

What did you do?

—*All that we did when we got home was to get the little bit of supper that was provided for us and go to bed immediately. If the supper had not been ready directly, we should have gone to sleep while it was preparing.*

Did you not, as a child, feel it a very grievous hardship to be roused so soon in the morning?

—*I did.*

Were the rest of the children similarly circumstanced?

—*Yes, all of them; but they were not all of them so far from their work as I was.*

And if you had been too late, you were under apprehension of being cruelly beaten?

—*I generally was beaten when I happened to be too late and when I got up in the morning the apprehension of that was so great, that I used to run, and cry all the way as I went to the mill.*

Mr. John Hall, called in and examined:

Will you describe to the Committee the position in which the children stand to piece in a worsted mill, as it may serve to explain the number and severity of those cases of distortion which occur?

—*At the top to the spindle there is a fly goes across, and the child takes hold of the fly by the ball of his left hand, and he throws the left shoulder up and the right knee inward; he has the thread to get with the right hand, and he has to stoop his head down to see what he is doing; they throw the right knee inward in that way, and all the children I have seen, that bend in the right knee. I knew a family, the whole of whom were bent outwards as a family complaint, and one of those boys was sent to a worsted-mill, and first he became straight in his right knee, and then he became crooked in it the other way.*

Elizabeth Bentley, called in and examined:

What age are you?

—*Twenty-three.*

Where do you live?

—*At Leeds.*

What time did you begin to work at a factory?

—*When I was six years old.*

At whose factory did you work?

—*Mr. Busk's.*

What kind of mill was it?

—*Flax-mill.*

What was your business in that mill?

—*I was a little doffer.*

What were your hours of labor in that mill?

—*From five in the morning till nine at night, when they were thronged.*

For how long a time together have you worked that excessive length of time?

—*For about half a year.*

What were your usual hours when you were not so thronged?

—*From six in the morning till seven at night.*

What time was allowed for your meals?

—*Forty minutes at noon.*

Had you any time to get your breakfast or drinking?

—*No, we got it as we could.*

And when your work was bad, you had hardly any time to eat it at all?

—*No; we were obliged to leave it or take it home, and when we did not take it, the overlooker took it, and gave it to his pigs.*

Do you consider doffing a laborious employment?

—*Yes.*

Explain what it is you had to do?

—*When the frames were full, they have to stop the frames, and take the flyers off, and take the full bobbins off, and carry them to the roller; and then put empty ones on, and set the frames going again.*

Does that keep you constantly on your feet?

—*Yes, there are so many frames, and they run so quick.*

Your labour is very excessive?

—*Yes; you have not time for any thing.*

Suppose you flagged a little, or were too late, what would they do?

—*Strap us.*

Are they in the habit of strapping those who are last in doffing?

—*Yes.*

Constantly?

—*Yes.*

Girls as well as boys?

—*Yes.*

Have you ever been strapped?

—*Yes.*

Severely?

—*Yes.*

Could you eat your food well in that factory?

—*No, indeed I had not much to eat, and the little I had I could not eat it, my appetite was so poor, and being covered with dust; and it was no use to take it home, I could not eat it, and the overlooker took it, and gave it to the pigs.*

You are speaking of the breakfast?

—*Yes.*

How far had you to go for dinner?

—*We could not go home to dinner.*

Where did you dine?

—*In the mill.*

Did you live far from the mill?

—*Yes, two miles.*

Had you a clock?

—*No, we had not.*

Supposing you had not been in time enough in the morning at these mills, what would have been the consequence?

—*We should have been quartered.*

What do you mean by that?

—*If we were a quarter of an hour too late, they would take off half an hour; we only got a penny an hour, and they would take a halfpenny more.*

The fine was much more considerable than the loss of time?

—*Yes.*

Were you also beaten for being too late?

—*No, I was never beaten myself, I have seen the boys beaten for being too late.*

Were you generally there in time?

—*Yes; my mother had been up at four o'clock in the morning, and at two o'clock in the morning; the colliers used to go to their work about three or four o'clock, and when she heard them stirring she has got up out of her warm bed, and gone out and asked them the time; and I would sometimes been at Hunslet Car at two o'clock in the morning, when it was streaming down with rain, and we have had to stay until the mill was opened.*

History-Social Science Appendix 5**James Kay: The Moral and Physical Condition of the Working Classes . . . in Manchester (1832)**

From James Phillips Kay, *The Moral and Physical Condition of the Working Classes Employed in the Cotton Manufacture in Manchester* (London: Ridge way, 1832), pp.6–12, 19, 25–27, 42–43, 49, 55–56, 71–72.

The township of Manchester chiefly consists of dense masses of houses, inhabited by the population engaged in the great manufactories of the cotton trade. Some of the central divisions are occupied by warehouses and shops, and a few streets by the dwellings of some of the more wealthy inhabitants; but the opulent merchants chiefly reside in the country, and even the superior servants of their establishments inhabit the suburban (sic) townships. Manchester, properly so called, is chiefly inhabited by shopkeepers and the laboring classes. Those districts where the poor dwell are of very recent origin. The rapid growth of the cotton manufacture has attracted hither operatives from every part of the kingdom, and Ireland has poured forth the most destitute of her hordes to supply the constantly increasing demand for labor.

This immigration has been, in one important respect, a serious evil. The Irish have taught the laboring classes of this country a pernicious lesson. The system of cattier farming, the demoralization and barbarism of the people, and the general use of the potato as the chief article of food, have encouraged the population in Ireland more rapidly than the available means of subsistence have increased. Debased alike by ignorance and pauperism, they have discovered, with the savaged, what is the minimum of the means of life, upon which existence may be prolonged. They have taught this fatal secret to the population of this country. . . . Instructed in the fatal secret of subsisting on what is barely necessary to life, the laboring classes have ceased to entertain a laudable pride in furnishing their houses, and in multiplying the decent comforts which minister to happiness. What is superfluous to the mere exigencies of nature, is too often expended at the tavern/and for the provision of old age and infirmity, they too frequently trust either to charity, to the support of their children, or to the protection of the Poor Laws.

When the example is considered in connection with the unremitting labor of the whole population engaged in the various branches of the cotton manufacture, our wonder will be less excited by their fatal demoralization. Prolonged and exhausting labor, continued from day to day, and from year to year, is not calculated to develop the intellectual or moral faculties of man. The dull routine of a ceaseless drudgery, in which the same mechanical process is incessantly repeated, resembles the torment of Sisyphus—the toil, like the rock, recoils perpetually on the wearied operative. The mind gathers neither stores nor strength from the constant extension and retraction of the same muscles. The intellect slumbers in supine inertness; but the grosser parts of nature attain a rank development.

To condemn man to such severity of toil is, in some measure, to cultivate in him the habits of an animal. He becomes reckless. He disregards the distinguishing appetites and habits of his species. He neglects the comforts and delicacies of life. He lives in squalid wretchedness, on meager food, and expends his superfluous gains on debauchery.

The population employed in the cotton factories rises at five o'clock in the morning,

works in the mills from six till eight o'clock, and returns home for half an hour to forty minutes from breakfast. This meal generally consists of tea or coffee with a little bread. Oatmeal porridge is sometimes, but of late rarely used, and chiefly by the men; but the stimulus of tea is preferred, and especially by the women. The tea is almost always of a bad, and sometimes of a deleterious quality, the infusion is weak, and little or no milk is added.

The operatives return to the mills and workshops until twelve o'clock, when an hour is allowed for dinner. Amongst those who obtain the lowest rates of wages this meal generally consists of boiled potatoes. The mess of potatoes is put into one large dish; melted lard and butter are poured upon them, and a few pieces of fried fat bacon are sometimes mingled with them, and but seldom a little meat. Those who obtain better wages, or families whose aggregate income is larger, add a greater proportion of animal food to this meal, at least three times a week; but the quantity consumed by the laboring population is not great. The family sits round the table, and each rapidly appropriates his portion on a plate, or, they all plunge their spoons into the dish, and with an animal eagerness satisfy the cravings of their appetite. At the expiration of the hour, they are all again employed in the workshops or mills, where they continue until seven o'clock or a later hour, when they generally again indulge in the use of tea, often mingled with spirits accompanied by a little bread. Oatmeal or potatoes are however taken by some a second time in the evening.

The comparatively innutritious qualities of these articles of diet are most evident. We are, however, by no means prepared to say that an individual living in a healthy atmosphere, and engaged in active employment in the open air, would not be able to continue protracted and severe labor, without any suffering, whilst nourished by this food But the population nourished on this ailment is crowded into one dense mass, in cottages separated by narrow, unpaved, and almost pestilential streets; in an atmosphere loaded with the smoke and exhalations of a large manufacturing city. The operatives are congregated in rooms and workshops during twelve hours in the day, in an enervating, heated atmosphere, which is frequently loaded with dust or filaments of cotton, and impure from constant respiration, or from other causes. They are drudges who watch the movements, and assist the operations, of a mighty material force, which toils with an energy ever unconscious of fatigue. The persevering labor of the operative must rival the mathematical precision, the incessant motion, and the exhaustless power of the machine

The artisan has neither moral dignity nor intellectual nor organic strength to resist the seductions of appetite. His wife and children, too frequently subjected to the same process, are unable to cheer his remaining moments of leisure. Domestic economy is neglected, domestic comforts are unknown. A meal of the coarsest food is prepared with heedless haste, and devoured with equal precipitation. Home has no other relation to him than that of shelter, few pleasures are there—it chiefly presents to him a scene of physical exhaustion, from which he is glad to escape. Himself impotent to all the distinguishing aims of his species, he sinks into sensual sloth, or revels in more degrading licentiousness. His house is ill-furnished, uncleanly, often ill ventilated, perhaps damp; his food, through want of forethought and domestic economy, is meager and innutritious; he is debilitated and hypochondriacal, and falls the victim of dissipation.

These artisans are frequently subject to disease We cannot wonder that the wretched victim invited by those haunts of misery and crime, the gin shop and the tavern, as he passes to his daily labour, should endeavor to cheat his sufferings of a few moments, by the false excitement procured by ardent spirits; or that the exhausted artisan, driven by ennui and discomfort from his squalid home, should strive, in the delirious dreams of a continued

debauch, to forget the remembrance of his reckless improvidence, of the destitution, hunger, and uninterrupted toil, which threaten to destroy the remaining energies of his enfeebled constitution

Some idea of the want of cleanliness prevalent in their habitations, may be obtained from the report of the number of houses requiring white-washing; but this column fails to indicate their gross neglect of order, and absolute filth. Much less can we obtain satisfactory statistical results concerning the want of furniture, especially of bedding, and of food, clothing, and fuel. In these respects, the habitations of the Irish are the most destitute. They can scarcely be said to be furnished. They contain one or two chairs, a mean table, the most scanty culinary apparatus, and one or two beds, loathsome with filth. A whole family is sometimes accommodated in a single bed, and sometimes a heap of filthy straw and a covering of old sacking hide them in one undistinguished heap, debased alike by penury, want of economy, and dissolute habits. Frequently, the inspectors found two or more families crowded into one small house, containing only two apartments, in one of which they slept, and another in which they ate; and often more than one family lived in a damp cellar, containing only one room, in whose pestilential atmosphere from twelve to sixteen persons were crowded. To these fertile sources of disease were sometimes added the keeping of pigs and other animals in the house, with other nuisances of the most revolting character

The houses of the poor . . . are too generally built back to back, having therefore only one outlet, no yard, no privy, and no receptacle for refuse. Consequently the narrow, unpaved streets, in which mud and water stagnate, become the common receptacle of offal and ordure These districts are inhabited by a turbulent population, which, rendered reckless by dissipation and want—misled by the secret intrigues, are excited by the inflammatory harangues of demagogues, has frequently committed daring assaults on the liberty of the more peaceful portions of the working classes, and the most frightful devastations on the property of their masters. Machines have been broken, and factories gutted and burned at mid-day, and the riotous crowd has dispersed ere the insufficient body of police arrived at the scene of disturbance The police form, in fact, so weak a screen against the power of the mob, that popular violence is now, in almost every instance, controlled by the presence of a military force.

The wages obtained by operatives in the various branches of the cotton manufacture are, in general, such, as with the exercise of that economy without which wealth itself is wasted, would be sufficient to provide them with all the decent comforts of life the average wage of all persons employed (young and old) being from nine to twelve shillings per week. Their means are consumed by vice and improvidence. But the wages of certain classes are exceedingly meager. The introduction of the power loom, though ultimately destined to be productive of the greatest general benefits, has, in the present restricted state of commerce, occasioned some temporary embarrassment, by diminishing the demand for certain kinds of labor, and, consequently, their price. The hand-loom weavers, existing in the state of transition, still continue a very extensive class, and though they labor fourteen hours and upwards daily, earn only from five to seven shillings per week

With unfeigned regret, we . . . constrained to add, that the standard of morality is exceedingly debased, and that religious observances are neglected amongst the operative population of Manchester.

The children are often neglected by their parents. The early age at which girls are admitted into the factories, prevents their acquiring much knowledge of domestic economy; and even supposing them to have had accidental opportunities of making this acquisition, the

extent to which women are employed in the mills, does not, even after marriage, permit the general application of its principles. The infant is the victim of the system; it has not lived long, ere it is abandoned to the care of a hireling or neighbor, whilst its mother pursues her accustomed toil. Sometimes a little girl has care of the child, or even of two or three collected from neighboring houses. Thus abandoned to one whose sympathies are not interested in its welfare, or whose time is too often also occupied in household drudgery, the child is ill-fed, dirty, ill clothed, exposed to cold and neglect, and, in consequence, more than one-half of the offspring of the poor (as may be proved by the bills of mortality of the town) die before they have completed their fifth year

The increase of the manufacturing establishments, and the consequent colonization of the district, have been exceedingly more rapid than the growth of its civic institutions. The eager antagonization of commercial enterprise, has absorbed the attention, and concentrated the energies, of every member of the community. In this strife, the remote influence of arrangements has sometimes been neglected, not from the want of humanity, but from the pressure of occupation, and the deficiency of time

Distrust of the capitalists has long been sown in the minds of the working classes — separation has succeeded to suspicion, and many causes have tended to widen the gulf over which the golden chain of charity seldom extends. We would not have this so. The contest, thus engendered, too often assumes an appalling aspect. Capital is but accumulated labor: their strife is unnatural. Greed does not become the opulent; nor does turbulence the poor. The general combinations of workmen to protect the price of labor are ultimately destined to have a beneficial influence on trade, by the destruction of partial monopolies and petty oppressions, but in these contests the poisonous shafts of personal malice should not be launched

If the higher classes are unwilling to diffuse intelligence among the lower, those exist who are ever ready to take advantage of their ignorance; if they will not seek their confidence, others will excite their distrust; if they will not endeavor to promote domestic comfort, virtue, and knowledge among them, their misery, vice, and prejudice will prove volcanic elements, by whose explosive violence the structure of society may be destroyed

* cattier farming: a custom whereby a landlord rented small plots for a year to the tenant farmers who placed the highest bids.

History-Social Science Appendix 6**Rubric Sample: Letter from Manchester, 1832****5 Exceptional Letter**

Letter meets all standard requirements as well as those listed below:

- Reflects outside research (includes historic, scientific, or social information about the Industrial Revolution and the relationship to human health issues);
- Has no more than one spelling mistake;
- Explains the causes of the Industrial Revolution and the reasons it prospered in England, in no fewer than five sentences.

4 Strong Letter

Letter meets the standard requirements as well as those listed below:

- Explains the causes of the Industrial Revolution and its impact on human health issues;
- Describes homes and the workplace;
- Includes a diagram related to the topic;
- Has no more than three spelling mistakes.

3 Standard Letter

Letter meets all of these requirements:

- Describes at least one cause of the Industrial Revolution;
- Contains one reason it prospered in England;
- Lists two ways the Industrial Revolution impacted human health;
- Describes three aspects of daily life of the factory workers;
- Writes the letter to look authentic;
- Includes a map related to the topic;
- Includes personal feelings about working and living conditions as well as the impact on human health;
- Contains no more than five spelling errors;
- Turn the letter in on time with rough draft and evidence of spelling check.

2 Substandard Letter

Letter meets most of the standard requirements, but is missing a few:

- May not look authentic;
- May not be historically accurate in one or more ways;
- May not include a map, information causes of Industrial Revolution or health issue;
- May not have a rough draft or evidence of spell checking;
- May not have been turned in on time.

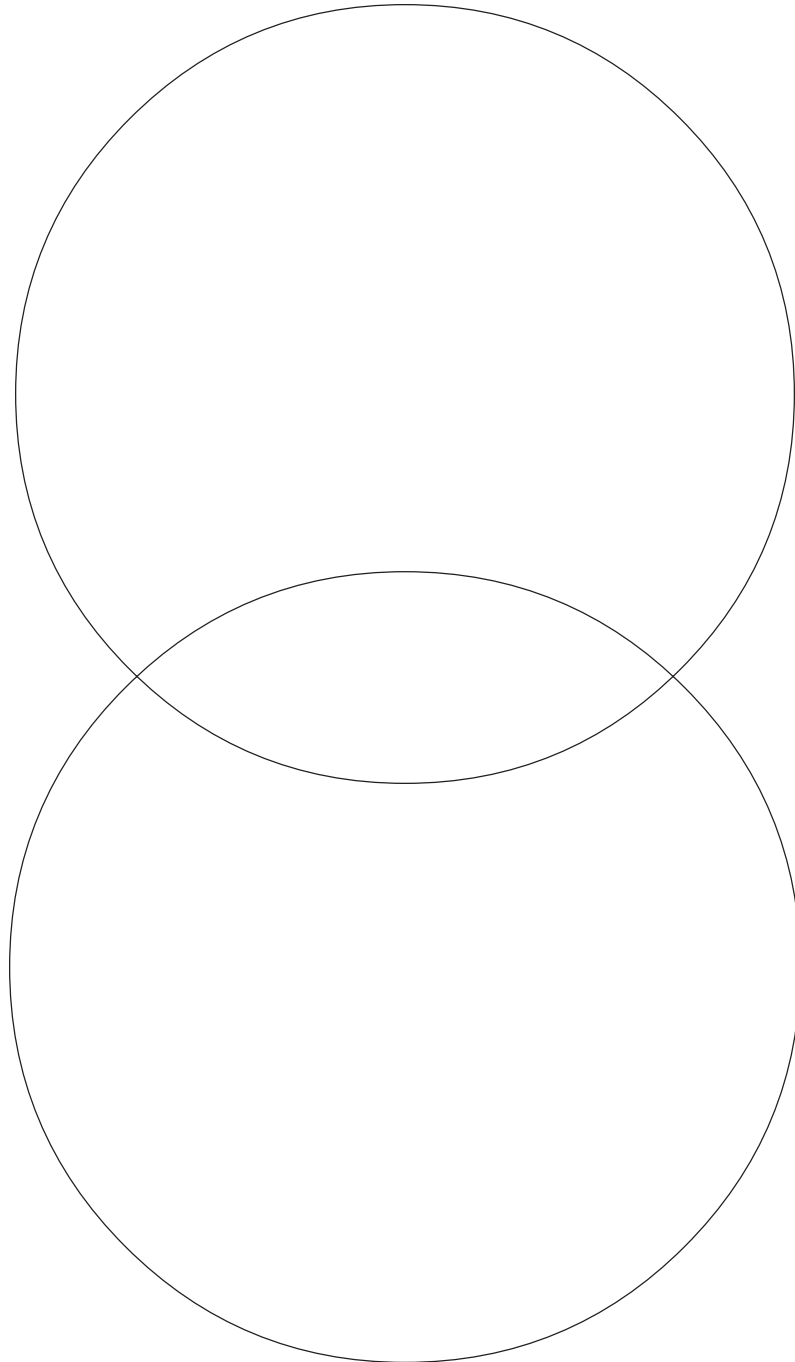
1 Limited or No Letter

Letter does not meet most of the requirements stated.

History-Social Science Appendix 7

Venn Diagram

Name: _____ Date: _____



History-Social Science Appendix 8

Beanie Baby Manufacturing Facts*By the Associated Press*From the *Los Angeles Times*, Wednesday, May 20, 1998

Are those cuddly, plush Beanie Babies made by children themselves in sweat-shops overseas? Nobody's saying. While most of their tags say handmade in China, little is known about the manufacturing of the wildly popular collectible toy.

Does the producer, Ty Inc. of Oak Brook, Illinois have a code of conduct for how its products are manufactured overseas? Does it regularly address child labor practices, wages and benefits, working hours and health and safety?

Ty officials have not commented. But such issues have been steadily catching public attention, forcing corporate America and government agencies to take notice.

"I've had no negative or positive reports on Ty, although there have been numerous inquiries from concerned consumers," said Shareen Hertel, director of international corporate research for the Council on Economic priorities, a New York-based watchdog group. "They're not on the radar screen." Companies, particularly toy and apparel makers, must control costs to keep retail prices down and profits up. They often contract out to the lowest manufacturing bidder, many times overseas, where labor costs are comparatively lower.

Most companies have a code of ethics, which means they've agreed to abide by local laws, and an increasing number have been instituting codes of conduct, which deal with issues such (as) child labor abroad, according to Aron Cramer, vice-president for business and human rights for Business for Social Responsibility in San Francisco. Cramer said he, too, has heard no reports on Beanie Baby production. However, he said, China has some of the strictest labor laws among developing nations. He noted that the minimum work age is sixteen years and that China has a 36-hour limit on overtime hours each week.

History-Social Science Appendix 9

Act-It-Out

Directions and Rubric

Your group has 10 minutes to prepare a 2–3 minute “Act-It-Out” depicting various facets of the Industrial Revolution.

Standard Assessment

Groups of 4–5 students will assume the role of working family members and discuss their living conditions, work conditions, available food, health problems and their causes.

Challenge Assessment

Groups of 4–5 students will assume the role of Industrialists presenting a panel discussion to fellow Industrialists advising them how to avoid some of the living, working and health problems faced in English factory towns and still maximize profits at the same time.

Rubric for “Act-It-Out”

Names: _____

| | Points Possible | Points Earned |
|--|------------------------|----------------------|
| ■ Were all group members on task as they prepared for the “Act-It-Out”? | 1 | _____ |
| ■ Were all the historical points addressed accurately? — Living conditions — Working conditions — Available food — Health problems | 5 | _____ |
| ■ Did all members of the group equally participate in the “Act-It-Out”? | 1 | _____ |
| ■ Did group members use voice and positioning of their bodies to dramatically represent the serious mood of the situation? | 2 | _____ |
| ■ Was the “Act-It-Out” 2–3 minutes long? | 1 | _____ |
| Total Points | 10 | _____ |

History-Social Science Appendix 10

Industrial Revolution

Standardized Assessment Activity

Name: _____ Date: _____

1. During the Industrial Revolution in Britain:
 - A. Schooling for children was important.
 - B. Good working conditions were common.
 - C. Cities grew rapidly.
 - D. Cities were safe and clean.

2. Causes of the Industrial Revolution include:
 - A. Water power.
 - B. Farming methods.
 - C. New towns.
 - D. More money.

3. One of the new farming methods discovered during the 1700s was:
 - A. Crop rotation.
 - B. Irrigation.
 - C. Chemical fertilizer.
 - D. Dry farming.

4. An invention that increased farm production was the:
 - A. Mechanical plow.
 - B. Potato harvester.
 - C. Seed drill.
 - D. Soil disc.

5. At the time of the Industrial Revolution, the population of England:
 - A. Decreased rapidly.
 - B. Stayed stable.
 - C. Was not counted.
 - D. Grew larger.

6. England was a good place for industry to thrive at this time because:
 - A. No wars were fought on English soil.
 - B. The kings were wiser.
 - C. Parliament gave industry bonuses.
 - D. Labor unions were easy to deal with.

7. Speaker A: After working in the mill from 6 a.m. to 8 a.m., we return home for a breakfast which consists of tea or coffee with a little bread.

Speaker B: At noon we're allowed an hour for dinner. Our meal is usually potatoes with little pieces of fried fat bacon.

Speaker C: The workday ends about 7 p.m. when we have tea and bread. Sometimes the tea is mixed with spirits.

Speaker D: For dinner in the evening we usually have more potatoes or some oatmeal.

From reading this selection, you can tell that:

- A. Food was plentiful.
- B. Mill owners were generous.
- C. Malnutrition effected people’s health.
- D. People drank too much alcohol.

8. “The inspectors found two or more families crowded into one small house, containing only two apartments, in one of which they slept, and another in which they ate; and often more than one family lived in a damp cellar, containing only one room, in whose pestilential atmosphere from twelve to sixteen persons were crowded. To these fertile sources of disease, sometimes pigs and other animals were kept in the house.”

What point is being made in this selection?

- A. Houses were small.
- B. Poverty was bad.
- C. Overcrowding caused disease to spread.
- D. Barns were needed.

9. Children often worked in the mills:

- A. On Saturday.
- B. Mornings only.
- C. 16–18 hours a day.
- D. 8 hours a day.

Growth of Seven British Cities, 1685–1881

| City | 1685 | 1760 | 1891 |
|------------|--------|---------|---------|
| Liverpool | 4,000 | 35,000 | 555,425 |
| Manchester | 6,000 | 45,000 | 393,676 |
| Birmingham | 4,000 | 30,000 | 400,757 |
| Leeds | 7,000 | ----- | 309,126 |
| Sheffield | 4,000 | 20,000 | 284,410 |
| Bristol | 29,000 | 100,000 | 206,503 |
| Nottingham | 8,000 | 17,000 | 111,631 |

10. Which city grew the least from 1685 to 1760?

- A. Leeds
- B. Sheffield
- C. Bristol
- D. Nottingham

11. Which city grew slightly over 1000% between 1685 and 1881?
 - A. Birmingham
 - B. Leeds
 - C. Sheffield
 - D. Bristol

12. Which city grew slightly over 100% from 1760 to 1881?
 - A. Nottingham
 - B. Bristol
 - C. Sheffield
 - D. Leeds

13. Because of its location as a port, mill city and railway connection, this was the largest City in 1881:
 - A. Leeds
 - B. Birmingham
 - C. Manchester
 - D. Liverpool

Sarah Gooder, Age 8

"I go to Sunday Schools and read *Reading Made Easy*. I know letters and can read little words. They teach me to read and to pray. I can recite the Lord's Prayer with only a few mistakes."

Patience Kershaw, Age 15

I go to Sunday Schools, but I cannot read or write My father has been dead about a year; my mother is living and has 10 children from age 30 to age 4."

14. The above readings reveal:
 - A. Sunday Schools were where poor children could be educated.
 - B. These children had low intelligence.
 - C. All families were large.
 - D. Most parents died young.

"The gin shop and the tavern he passes each day endeavor to cheat his sufferings of a few moments, by the false excitement procured by ardent spirits."

15. This reading indicates that:
 - A. There were many places to drink alcohol.
 - B. People drank to escape the pain of overwork.
 - C. People were overworked.
 - D. There was no better entertainment.

16. Elizabeth Bentley and others testified before the Sadler Commission. The result of this was:
 - A. Factory Act of 1833.
 - B. Reforms in coal mining.
 - C. 8-hour day.
 - D. Extra pay for extra work.

Standardized Test Format

Answer Key

1. C
2. B
3. A
4. A
5. D
6. A
7. C
8. C
9. C
10. D
11. A
12. B
13. D
14. A
15. B
16. A

Science Activities

Science Activity #1

Peppered Moths of the Industrial Revolution: Natural Selection

In a series of activities, students will observe how differences affect populations by investigating the documented peppered moth studies from England during the Industrial Revolution. The activities will look critically at research on this particular species of moth as well as take students through a simulation to determine how color and predation affect natural selection.

Rationale

Individual organisms have differences. Sometimes the difference can be seen, such as coloration of hair, fur, or wings. The difference may be a variation within a single cell, a mutation, deletion, or damaged chromosome. An internal variation may contribute to an external physical difference. Data obtained from these activities can be used in the culminating project.

Basic Health Services Connection

This activity is foundational to student understanding of differences brought about by environmental factors. Subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

Science: Evolution 7 & 8

Objectives

The student will:

- Investigate effects of Industrial Revolution on population of peppered moths in England;
- Critically interpret research and determine sources of experimental errors and variables;
- Observe how color and predation affect natural selection;
- Study the effect of natural selection on the camouflage adaptation of a hypothetical organism living in different environments;
- Demonstrate how a mutation might improve an organisms chance of survival in a new and/or changing environment.

Process

The student will:

- Read and analyze historical readings and scientific data;
- Examine information gathered from textbooks, technical readings, video notes, Internet, etc.;
- Visualize how organisms change in response to their environment;
- Simulate peppered moth studies from the Industrial Revolution, analyze scientific data;
- Compare and contrast differences in organisms and the environment in which they live;
- Study the effect of natural selection on the camouflage adaptation of hypothetical organisms (“paper critters”) living in different environments.*

Assessment

Each activity contains its own assessment component.

Bibliography/Resources

- Biology textbook;
- Internet;
- BSCS Classic Inquiries Videodisc (800) 228-8854

*Refer to Science Appendix 1 following this section.

Science Activity #2

Environmental Causes and Genetic Disorders

Students collect information related to environmental conditions that may cause genetic mutations.

Rationale

To understand the role that genetic disorders play in human physical differences, students need to differentiate among a variety of genetic disorders. Students will investigate the environmental hazards that can cause genetic mutations and the resulting genetic disorders. This activity should be completed in coordination with the language arts research process for the culminating activity.

Basic Health Services Connection

This activity is foundational to student understanding of differences brought about by environmental factors. Subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

Science: Evolution 7 & 8

Objectives

The student will:

- Identify causes of genetic mutations and the resulting genetic disorders;
- Analyze data and prepare an information board.

Process

The student will:

- Gather data using library, Internet, medical research library sources;
- Analyze and process data to create an Information Board that identifies:
 - ◆ Specific genetic mutation;
 - Causes of the genetic mutation;
 - Classic symptoms or characteristics that lead to the diagnosis of the genetic disorders;
- Create a class list of environmental causes and their resulting genetic disorders. This list will help generate ideas for the culminating project and Science Activity 3.

Assessment

- Student presentation of information to classmates and discussion of class list.

Bibliography/Resources

- Local March of Dimes Foundation pamphlets (various types).
- March of Dimes Birth Defect Foundation, 1275 Mamaroneck Ave, White Plains, NY 10605.
- National Institute of Health (NIH)
- World Health Organization (WHO)
- Center for Disease Control (CDC)
- American Medical Association (AMA)

*Refer to Reference Section at the end of the project.

Science Activity #3

Genes and the Environment: A Scientific Inquiry

Student teams research, design and complete an experiment that will determine the effect of environmental factors on the growth and development of normal and mutant plants.

Rationale

Students will research and identify conditions that can be inherited from damaged genetic materials to understand the role that environment plays in genetic disorders.

Basic Health Services Connection

This activity is foundational to student understanding of differences brought about by environmental factors. Subsequent research activities will be greatly enhanced by this foundation.

Standards Addressed

Science: Ecology 6

Objective

The student will:

- Answer this question or develop an environment/mutation related question of their own: “What effect do environmental factors have on a living organism?”
- Research/examine environmental factors affecting plant growth/development and the influence those factors have on gene expression (use to complete background information);
- Use knowledge of the scientific method to design an experiment that examines the effect of environmental factors on plant growth and development;
- Publish a laboratory report including observations and data analyzed for drawing conclusion.

Process

The student will:

- Participate in a teacher-facilitated discussion for the purpose of linking activities #1 and #2 as well as to link to the culminating project:
 1. What are some causes of genetic disorders?
 2. What types of cancer are there?
 3. What causes cancer?
- Develop an additional question;
- Research background information on chosen topic for laboratory design; report information;
- Design an experiment utilizing scientific method model;
- Carry out the experiment, contribute to class discussion and draw conclusions (mini-symposium could be held at teacher discretion);
- Publish findings and data in a formal laboratory report.*

Assessment

- Discussion evaluation;
- Actual lab for scientific method understanding and procedures including data gathering and recording;
- Periodic progress checks on 1) experiment design 2) information search 3) final report;
- Scientific presentation of findings including visual aids, etc.;
- Use rubrics for “Genes and the Environment-A Laboratory Inquiry”, “Formal Laboratory Publication/Product Rubric” and “Formal Laboratory Presentation Rubric.”**

* Refer to Science Appendix 2 following this section.

** Refer to Assessment section at the end of the project.

Science

Appendix

The Case of the Mysterious Moths
Parts 1-3

A Natural Selection Simulation:
Critter Camouflage

Genes and the Environment:
Classroom Inquiry

Science Appendix 1**Student Simulation Lab**

Name: _____ Date: _____ Period: _____

The Case of the Mysterious Moths: Part 1**Background Information**

Prior to the Industrial Revolution, the trees in the countryside around England were light grayish-green due to the presence of lichens on their trunks. The peppered moths living in the area were colored light with dark spots. Their coloration served as protective camouflage against predators, including birds. As the Industrial Revolution progressed, coal burning for heat and factories produced soot that covered the cities and the trees, turning the tree trunks black. Over a period of about 50 years, a change in the peppered moth population took place.

During this “dry lab” investigation, you will examine scientific data collected over the course of 10 years. As a scientist, you will observe the effects of “industrial melanism”—the adaptation of an organism in response to a type of industrial pollution. After evaluating the data, you will determine the relationship between the environmental changes and the color variation of *Biston betularia*, the peppered moth, by utilizing actual research data to graph and interpret the effects and environmental adaptation.

Objective

Investigate how the Industrial Revolution affected the population of peppered moths in England. The residents of England, where industrial pollution has covered the tree trunks with soot, want to eliminate/restrict the pollution. If they do so, can the light peppered moth population be reestablished?

Key Terms

| | | |
|-----------------------|-------------------|------------|
| industrial melanism | natural selection | survival |
| environmental change | melanin | camouflage |
| adaptation | mutation | genes |
| Industrial Revolution | population | |

Materials

■peppered moth research data ■graph paper ■2 colored pencils

Procedure

- Compare the numbers of each variety of peppered moth by graphing the data in Figure 1;
- Using graph paper, construct a bar graph and at least one other type of graph (line, pie chart, etc.). Be sure to title your graphs and label the years of the study and the number of moths captured. Use different colors of pencils to indicate the type of moth (light or dark). Remember to include a key code to your graph;
- Analyze the graph and come to a conclusion about the population of peppered moths in the area of England where the sampling occurred.

Answer all questions on a separate sheet of paper:

- Which variety of moth had an increase in population over the ten years? What would you attribute this to?
- If the bark of the trees is light and light-speckled moths land there, what do you think will happen?
- If the bark of the trees is dark and light-speckled moths land there, what do you think will happen?
- Explain one potential reason for the decrease in the number of light-speckled moths.
- Explain one potential reason for the increase in the number of dark-peppered moths.
- How could the people in England increase the number of original light-speckled moths?
- What could be done to return the environment of the moths to its original state?
- What effect would cleaning up the environment, stopping the pollution, have on the moth population?
- Write a one-paragraph lab learning log.

Figure 1: Peppered Moth over a 10-Year Period

What is happening to the peppered moths?

| Year | Number of Light Moths Captured | Number of Dark Moths Captured |
|------|--------------------------------|-------------------------------|
| 1 | 556 | 64 |
| 2 | 537 | 112 |
| 3 | 484 | 198 |
| 4 | 392 | 210 |
| 5 | 246 | 281 |
| 6 | 225 | 357 |
| 7 | 193 | 412 |
| 8 | 147 | 503 |
| 9 | 84 | 594 |
| 10 | 56 | 638 |

Data Obtained from: <http://www.cci.unl.edu/calculators/activities/middle/moth.html>

Activity Developed by:

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Student Sheet

Name: _____ Date: _____ Period: _____

The Case of the Mysterious Moths: Part 2

You have already learned about the specific scientific information regarding the case of *Biston betularia* from reading and reflecting on ***The Case of the Mysterious Moths, Part 1***. Recall that the evidence of natural selection involved a moth known as *Biston betularia*, also known as the peppered moth. There are two varieties of peppered moths—one light (light body color with black spots) and one dark (black body color with few white spots). Prior to the Industrial Revolution in England, the light peppered moths were most common. During the day, these moths would often be found in trees covered by light-colored speckled lichens. Scientists believe that the moth's light color helped to camouflage them from predatory birds.

Occasionally, a few moths had a genetic mutation that caused them to be primarily black (scientists call them melanistic {melano= black}). The occurrence of dark-colored peppered moths was very rare. Black moths resting on the light-colored lichens are not well camouflaged, and therefore easy prey for moth-eating birds. Thus, the melanistic moths were unable to reproduce and pass on their genes for their black coloration. Over the next hundred years scientists observed an increasing number of dark moths relative to light moths near the cities. Why? Read on to learn more about this phenomenon.

In the 1800's, with the Industrial Revolution, many factories and homes in British cities began to burn coal. People were using coal to produce heat and to power all the newly invented machines. The burning of coal creates a lot of black soot and pollution. The lichens on the trees were very sensitive to the pollution and began to die as a result of the sulfur dioxide emissions from the burning of coal and factories. As the soot settled on the cities, it turned many things, including the tree trunks, black. This change in the environment enabled the rare black moths to be well-camouflaged; therefore, they were able to live long enough to reproduce and pass on their genes for the dark coloration. Meanwhile, the light-colored moths were easily spotted and gobbled up by the birds. Research completed in the early 1900s showed the light-speckled moths were still predominant in the country area; however, in the cities they were almost non-existent. Nearly all the moths in the city were of the dark variety. According to research, in 1848 the dark moths comprised 1% of the entire moth population. By 1959, the dark moths comprised approximately 90% of the population!

In the 1950's, an English scientist, H.B. Kettlewell, tested the hypothesis that the difference in numbers of light and dark peppered moths was due to natural selection. He marked, released, and then recaptured a number of peppered moths in the country and near a city. In his experiment, Kettlewell assumed that the numbers of moths of the light and dark varieties he recaptured indicated their relative survival rates. Figure 1 contains data indicating that the light variety of moths survived better in the country. Kettlewell inferred that the adaptation of color conferred an elective advantage to the moths. He believed that the light-colored moths were more easily seen by the predatory birds on the soot-covered trunks and that the dark variety was more easily seen on the lichen-covered trunks near the countryside. Therefore, near cities the dark moths would survive and reproduce while the light moths became a meal for the birds. In the countryside, the opposite would result.*

Recent scientific experiments, however, have raised some questions and doubts about Kettlewell's explanation. Scientists have found that the peppered moths probably do not rest on the tree trunks, but in shadows on the underside of the tree branches. If they do

in fact rest on the underside of the tree branches, the dark moths would be less visible than the light moths (whether the trees are soot-covered or lichen-covered). Scientists are questioning whether color is the main adaptation conferring a selective advantage to the light moths. Further research and experiments may help scientists come to a better understanding of the mechanism for natural selection in this case of the mysterious moths.

Figure 2: H.B. Kettlewell's Data for 1953

| Location | Number of Moths Released/Recaptured | Number of Dark-Colored Moths | Number of Light-Colored Moths |
|---------------------------------|-------------------------------------|------------------------------|-------------------------------|
| Unpolluted Countryside (Dorset) | Released | 469 | 473 |
| | Recaptured | 62 | 30 |
| Polluted City (Birmingham) | Released | 137 | 447 |
| | Recaptured | 64 | 154 |

Considering what you read in **The Case of the Mysterious Moths Part 1**, and the information above, answer these questions on a separate sheet of paper:

- How do you interpret and explain Kettlewell's data?
- What are some possible sources of experimental error in Kettlewell's experiment?
- As a scientist, how would you conduct the experiment in order to reduce the chance of introducing experimental errors?

* Researchers had observed that the light moths were breeding primarily with light moths and dark moths primarily with dark moths. Some scientists believe that potentially, the black and speckled moths could develop into separate species. Eventually, the people of England decided that the coal pollution may adversely affect them as well as the moths, so they cleaned things up. As the air and environment became cleaner, lichens started growing on the trees again and the speckled (lighter) moths returned in greater numbers. Both English cities and countrysides all have speckled moths that are interbreeding at random; therefore, the varieties were not separated long enough to develop into separate species.

For more information on the peppered moths, visit these Internet sites:

- How Kettlewell found Darwin's missing evidence in the British Peppered Moth by Chris Young <http://genbio.cbs.umn.edu/1201/Peppmoth.html>;
- Kettlewell's Studies of Industrial Melanism in the Peppered Moth, *Biston betularia* <http://www.public.instate.edu/~rudge/proposal.html#four>.

Activity Developed by:

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The Case of the Mysterious Moths: Part 3

A Natural Selection Simulation

Background Information

In any population, some individuals reproduce, and some do not. Some individuals will have more young that survive than others. Some, but not all, of the characteristics that enable an individual to be successful in reproducing are easy to see. For example, the most successful individuals are often the strongest, the best able to find food, or the best camouflaged. In the final analysis, however, conditions in the environment are what determine which individuals will be the most successful. Thus, the environment “selects” some individuals over others to produce the next generation. This process is often called natural selection.

This activity will give you a chance to see how color and predation affect natural selection. Many of the members of your class will act as “predators.” These predators will capture and remove (“eat”) a make-believe “prey,” the peppered moths, from a make-believe environment. You will work in groups of four. Your job title and role is outlined below.

Materials

- Containers labeled:
 1. Environmental Chamber
 2. Stomach
 3. Breeding Chamber for Light Moths (plastic beakers or paper cups)
 4. Breeding Chamber for Dark Moths (plastic beakers or paper cups)
- 100 peppered moths (*Biston betularia*) of **each** variety:
 - light – punched from white construction paper
 - melanistic – punched from black construction paper
 - (moths should be in their separate breeding chambers)
- 1 plot of dirt (England environment/background): full sheet of brown construction paper
- 5 healthy trees (white lichen): strips of white construction paper
- 5 polluted trees (dead, black lichen): strips of black construction paper
- Mini- or medium-sized moth (butterfly) craft punch*
- Stopwatch
- Graph paper

Procedure

You will work in groups of four and assume the following roles:

Caretaker: responsible for setting up the environment and randomly distributing moths.

Makes sure the correct number of moths are put back into the Environmental Chamber;

Timekeeper: responsible for making sure that the Predators’ back is turned to the environment and for monitoring the “feeding time” at exactly 3 seconds. Makes sure the correct number of moths are put back into the Environmental Chamber;

Predator: when the Timekeeper is ready to start, the Predator will get the “go” message and begin to capture and “eat” (put into the Stomach Container) as many moths as they can in 3 seconds. Makes sure the correct number of moths are put back into the Environmental Chamber;

Data Recorder: responsible for obtaining and recording accurate data into the team’s data table.

After each “round” of feeding, the students switch roles in sequential order: Caretaker becomes Timekeeper; Timekeeper becomes Predator; Predator becomes Data Recorder; Data Recorder becomes Caretaker.

All members of the team are responsible for monitoring data collection and obtaining accurate data for their own data chart and lab write up.

Pre-1800s

In England prior to the Industrial Revolution, there were a lot of beautiful trees covered with lichens that had a light coloration to them. *Biston betularia*, also known as the peppered moth, were found in two varieties—one light (light body color with black spots) and one dark (black body color with few white spots). The light peppered moths were most common. During the day, these moths would often be found in trees covered by light colored speckled lichens. Scientists believe that the moth’s light color helped to camouflage them from predatory birds. Occasionally, a few moths had a genetic mutation which caused them to be primarily black (scientists call them melanistic {melano= black}). The occurrence of dark colored peppered moths was very rare. Black moths resting on the light-colored lichens are not well camouflaged, and therefore easy prey for moth-eating birds. Thus, the melanistic moths were unable to reproduce and pass on their genes for their black coloration.

Make a Prediction

- Which moths do you think will have the best chance to survive? Why?
- How would you describe the distribution of colors in the first generation?

Randomly place five light colored trees on the brown background (trees should not overlap). Next, place 28 light colored moths and 2 melanistic moths (black) into the Environmental Chamber and **mix them up**. Have the Caretaker randomly distribute (sprinkle) moths from the chamber onto the brown background sheet (the Predator must look away while the moths are being distributed into their environment). Any moths that do not land on a tree or on the background sheet must be put back into the Environmental Chamber and redistributed. The Timekeeper allows the Predator 3 seconds to remove as many moths as possible one by one, putting the captured moths into the container marked “stomach.” The Scorekeeper records the total number of light moths captured and the number of dark moths captured in the team’s data chart. In addition, the Scorekeeper records the number of light and dark moths surviving. Those moths that landed on the brown background paper (“the dirt”) can be put back into the Environmental Chamber for redistributing. However, since the moths were not in an ideal situation (in a tree) for mating, moths landing in the dirt **do not** reproduce. Those moths that survived on the trees reproduce. Therefore, for each light moth remaining, the Caretaker puts the original and one additional light moth into the Environmental Chamber. For each dark moth remaining, the Caretaker puts the original and one additional dark moth into the Environmental Chamber.

Mid 1800s

In the mid 1800s, many more factories and homes in British cities began to burn coal. People were using coal to produce heat and for powering all the newly invented machines. The burning of coal creates a lot of black soot and pollution. The lichens on the trees were very sensitive to the pollution and began to die as a result of the sulfur dioxide emissions from the

burning of coal and factories. As the soot settled on the cities it turned many things, including the tree trunks, black.

Make a Prediction

How do you think this change in the environment will affect the moth population? (Hint: camouflage)

Next, randomly place three (fewer light trees do to pollution) light colored trees on the brown background **and** now add two dark (black from soot—lichen are dying and turning black) trees to the environment (trees should not overlap). Have the Caretaker randomly distribute (sprinkle) moths from the chamber (**Remember:** some moths were eaten by the Predator in part 1, some survived in the dirt, but didn't reproduce, and the moths surviving on the trees were able to reproduce!) onto the brown background sheet (the Predator must look away while the moths are being distributed into their environment). Any moths that do not land on a tree or on the background sheet must be put back into the Environmental Chamber and redistributed. The Timekeeper allows the predator 3 seconds to remove as many moths as possible, one by one, putting the captured moths into the container marked "stomach." The Scorekeeper records the total number of light moths captured and the number of dark moths captured in the teams data chart. In addition, the Scorekeeper records the number of light and dark moths surviving. Those moths that landed on the brown background paper (the "dirt") can be put back into the Environmental Chamber for redistributing. However, since the moths were not in an ideal situation (in a tree) for mating, moths landing in the dirt **do not** reproduce. Those moths that survived on the trees **do** reproduce. Therefore, for each light moth remaining, the Caretaker puts the original and one additional light moth into the Environmental Chamber and for each dark moth remaining the Caretaker puts the original and one additional dark moth into the Environmental Chamber.

Mid-Late 1800s

Factories and homes in British cities are continuing to burn coal. More and more trees are turning black.

Randomly place two (even fewer light trees due to pollution) light-colored trees on the brown background **and** now add three (black from soot—lichen are continuing to die and turn black) trees to the environment (trees should not overlap). Have the Caretaker randomly distribute (sprinkle) moths from the chamber (**Remember:** some moths were eaten by the Predator in part 2, some survived in the dirt, but didn't reproduce, and the moths surviving on the trees were able to reproduce!) onto the brown background sheet. The Predator must look away while the moths are being distributed into their environment. Any moths that do not land on a tree or on the background sheet must be put back into the Environmental Chamber and redistributed. The Timekeeper allows the Predator 3 seconds to remove as many moths as possible, one by one, putting the captured moths into the container marked "stomach." The Scorekeeper records the total number of light moths captured and the number of dark moths captured into the teams' data chart. In addition, the Scorekeeper records the number of light and dark moths surviving. Those moths that landed on the brown background paper (the "dirt") can be put back into the Environmental Chamber for redistributing. However, since the moths were not in an ideal situation (in a tree) for mating, moths landing in the dirt **do not** reproduce. Those moths that survived on the trees **do** reproduce.

Therefore, for each light moth remaining, the Caretaker puts the original and one additional light moth into the Environmental Chamber and for each dark moth remaining the Caretaker puts the original and one additional dark moth into the Environmental Chamber.

Think About It:

Which variety of moths seems to be surviving the best? Why?

Early–Mid 1900s

Factories are burning tons of coal each day. The air continues to smell bad, soot gathers on the residents and their clothing, and contaminates the water. Almost all of the trees in the city are black due to the death of lichens.

Fact:

Research completed in the early 1900s showed the light-speckled moths were still predominant in the country area, however in the cities, they were almost non-existent. Nearly all the moths in the city were of the dark variety. According to research, in 1848 the dark moths comprised 1% of the entire moth population. By 1959, the dark moths comprised approximately 90% of the population!

Randomly place five dark colored trees on the brown background—all of the lichens have died and the trees are covered in soot (trees should not overlap). Have the Caretaker randomly distribute (sprinkle) moths from the chamber onto the brown background sheet—the Predator must look away while the moths are being distributed into their environment (**Remember:** some moths were eaten by the Predator in part 3, some survived in the dirt, but didn't reproduce, and the moths surviving on the trees were able to reproduce). Any moths that do not land on a tree or on the background sheet must be put back into the Environmental Chamber and redistributed. The Timekeeper allows the Predator three seconds to remove as many moths as possible one by one, putting the captured moths into the container "stomach." The Scorekeeper records the total number of light moths captured and the number of dark moths captured in the team's data chart. Finally, the Scorekeeper records the number of light and dark moths surviving.

Analysis Questions

- What preys on the peppered moths?
- If the bark of trees is dark, and the moths that rest there are light, what might happen to the moths?
- What could have caused the first few moths to change from a light variety to a dark variety?
- What caused many tree trunks in England to turn from light to dark in color?
- Over a number of years, which variety of moths increased? Why? What is the name of this type of evolutionary change?
- Explain how the speckled light colored wings of the peppered moth is an adaptation for survival in the Pre-Industrial Revolution years. Assume no pollution has occurred.
- As a Predator, does it take more or less time to find the prey individuals as you move from one generation to the next? Explain.

- Why would the darker colored peppered moths be more difficult to spot before the Industrial Revolution?
- During the Industrial Revolution, the changes in the environment seemed to be affecting the peppered moth population. What is your explanation about what was occurring?
- Darker coloration was becoming an adaptation for survival. Where did this adaptation come from? Did the moths suddenly decide it was more beneficial to have darker coloration?
- After the pollution began to get really bad, were any of the light-colored moths still present? Would light-colored moths continue to be produced? Explain.
- How do you think the moth population will be affected by new pollution laws that have been implemented as well as public concern for the environment?
- Humans have influenced the environment in a number of ways, including the peppered moths. Do you think humans are impacting the environments where other species are being affected? (Support your answer with any examples). What happens to those species that may not be able to adapt? What happens to those species that do not have a pre-existing genetic trait that would enable them to adapt and survive through environmental changes?
- How would your results differ in real life, e.g., with real birds instead of a human role player?
- Using graph paper, create graphs for each generation; the light colored tree bark **and** for the dark colored tree bark with the number of moths surviving each generation. You may want to consider placing the light and dark moth data on the same graph. This may allow for easier comparison and analysis of the data.
- In this activity, the only characteristic studied was color. In a real life situation, do you think color is the only important characteristic? If not, what may be some other characteristics?
- Write a one-page laboratory learning log on this simulation. Be sure to use the data collected from your simulation and make a conclusion concerning the population of pep

Sample Moth Data Chart

| Generation | Light Moths Captured | Dark Moths Captured | Light Moths Surviving | Dark Moths Captured |
|-------------------|----------------------|---------------------|-----------------------|---------------------|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| Team Average | | | | |
| Class Average | | | | |
| % Captured (died) | | | | |
| % Survived | | | | |

Going Further Enrichment Activity

Do the same experiment, but turn down classroom lights simulating sunset or pre-sunrise (predator’s feeding hours). Record results in a data chart; complete a one-page learning log.

Teacher Notes

Craft punches are available at craft stores. If you want to increase the size of the environment (dirt and trees) you can use the Jumbo Moth/Butterfly Craft Punch. To save classroom time, you can prepare the environment prior to the exercise. If laminated, the trees and dirt will last a long time. Moths can also be prepared ahead of time so that each “Breeding Chamber” has 100 light and 100 dark moths.

In order to ensure that all 200 moths (100 light and 100 dark) make it back into the Breeding Chamber for the next class period, you can tell students that any moths escaping their lab environments and migrating to the classroom environment (i.e., ending up on the floor, in sinks, etc.) will need to be picked up by an environmental collection agency (you) and may cost each team points. To date, no migrating moths at Florin High School!

Alternative Lab Set-ups

You can simulate the environment by using just trees, that is, have students use a sheet of white construction paper for the non-polluted forests, newspaper (classified ads work well) for the forests that are beginning to be affected by pollution, and black construction paper for forests that have been greatly affected by pollution and in which the lichens have died. In this case, you may want to change the number of moths being distributed. You could even add a new species of moth using the craft punch on the classified ads.

Adapted from Florin High School’s *Natural Selection Lab, Biology Laboratory Investigations, A Teacher’s Guide*, prepared by James Knerl of Lowell High School (1984–1985), Microsoft Encarta online lesson plans: “The Peppered Moth: Is this an example of industrial melanism?” and “Understanding Evolution,” original author unknown.

Student Sheet

Partner #1 _____ Date _____ Period _____

Partner #2 _____ Date _____ Period _____

Partner #3 _____ Date _____ Period _____

Partner #4 _____ Date _____ Period _____

A Natural Selection Simulation: Critter Camouflage**Background Information**

Research information in your text, video notes, color pages, past laboratories/investigations to construct your background information. The background information should be at least one paragraph and focus on ideas/concepts about natural selection. You may discuss what natural selection is, how it works, how the environment influences natural selection, etc. In addition, consider researching what mutations are and how they affect an organism's chance of survival in an environment. Perhaps you will also want to include information on adaptations and specific models of organisms that have actually undergone natural selection/adaptations. Be sure to properly cite your sources of information. One source **must** be the Internet.

Objectives

- Study the effect of natural selection on the camouflage adaptation of a hypothetical organism living in different environments;
- Use an artificial environment to demonstrate the concept of natural selection;
- Use additional environment(s) to demonstrate how a changing environment affects natural selection;
- Demonstrate how a mutation might improve an organism's chance of survival in a new and/or changing environment.

Focus Question

Review the objectives above and design a team focus question for this laboratory exercise.

Materials

- Different "environments" (laminated gift wrapping paper, "warm" bright floral/animal paper, "cool" light floral/animal paper in white tones; other papers can be used to represent other environments);
- 100 paper critters made using a butterfly/moth hole punch; 10 of each of the following colors: purple, brown, blue, green, pink, black, orange, red, yellow, white;
- 10 clear plastic critters;
- Critter container: small plastic beaker;
- Stomach containers: one for each team member, a small plastic beaker;
- Survival tray: clear plastic tray;
- Breeding chamber: small plastic beaker filled with "breeding" critters (extra critters of each color). Critters for this chamber are obtained from the main breeding colony on the teacher's desk.

Procedure

Part 1

You will work in groups of four. Select from the jobs below and assume the following roles:

Environmental Control Specialist: responsible for setting up the environment and randomly distributing critters. Makes sure the correct number of critters are put back into the critter container;

Timekeeper: responsible for making sure the Predator's back is turned to the environment and for monitoring the "feeding time." Makes sure the correct number of critters are put back into the critter container;

Critter Caretaker: responsible for counting critters at the beginning of the activity ensuring that 10 of each color (total of 100) are present. In addition, the Critter Caretaker is accountable for the critters at the end of the activity. Makes sure the correct number of critters are put back into the critter container;

Data Recorder: responsible for obtaining and recording accurate data into the team's data table;

Predator: When the Timekeeper is ready to start, the Predator will get the "go" message and begin to capture and "eat" (put into the stomach container) a critter. Makes sure the correct number of critters are put back into the critter container. Each team member will take a turn being the Predator.

Part 2

Assume the paper critters represent individual organisms that, if allowed, will reproduce more of their kind (color). Also assume that the "capture" (selection) of critters represents predation.

❶ First, have the Environmental Control Specialist spread the paper representing the "warm" environment on your lab station. Using the critter container, which contains 10 paper critters of each color (total of 100 critters), have the Environmental Control Specialist **mix up** the critters in the container, then randomly distribute (sprinkle) them from the chamber onto the environment. (The Predator(s) must look away while the critters are being distributed into their environment). Any critters which do not land on the environment must be put back into the critter container and then redistributed. It's OK if the critters touch, but make sure there are no clumps. **Observe the environment and construct a graph illustrating the color makeup of this first generation of paper critters.***

❷ Each member of the group must in turn pick up 20 paper critters using the following method: With the Predator looking away from the environment, the Timekeeper counts out loud to 3. Then the Timekeeper says "GO!" and allows the first Predator to immediately pick up the first critter he/she sees. The "captured" critter gets put into that Predator's stomach chamber. The Predator again turns away from the environment and repeats the process of picking the first critter seen and placing in his/her "stomach." This continues until the Predator has "captured" 20 critters.

❸ The Predator records the colors of the 20 critters they **captured** (in their stomach) in the data chart. Next, rotate roles and repeat steps 1–4 three more times (each Predator takes one turn). The next Predator does the same thing until each Predator (group member) has captured 20 critters. **After Predator #2 has "eaten," construct a second graph illustrating the second generation of critters. After Predator 3 has "eaten," construct a third**

graph illustrating the third generation. After Predator#4 has “eaten,” construct a fourth graph illustrating the fourth generation.

- ④ Now, shake the remaining 20 critters off the environment and into the “survival tray.” Count and record in the data table the number of critters of each color that remains. Only the “surviving” critters can reproduce, so give each “surviving” critter four “offspring” of the same color by adding critters from the breeding chamber. If there aren’t enough of any one color, then obtain additional critters from the main breeding colony on the teacher’s desk. This will bring the total number of critters back to 100. Put the “surviving” critters and their new “offspring” in the critter container and have the Environmental Control Specialist sprinkle them onto the environment as before.
- ⑤ When you are finished with all four feedings, assist the Critter Caretaker in making sure the critter chamber is empty. Then place 10 critters of each color back into the chamber.
- ⑥ Repeat steps 1–5 using the “cool” environment.
- ⑦ Add a “mutation” into your critter population by placing 10 clear critters into the critter chamber. Repeat steps 1–5 using the “warm” environment. **Be sure to hunt down to 20 critters!** Make sure you design a data table and discuss your results in your learning log.

Enrichment Extension

Add a “mutation” into your critter population by placing 10 clear critters into the critter chamber. This time, repeat steps 1–5 using the “cool” environment. **Be sure to hunt down to 20 critters!** Make sure you design a data table and discuss results in your learning log.

Data

Construct data tables (each team member will have his/her own report) to record the contents of each predator’s stomach at the end of each feeding. It may look something like this:

Chart 1: Critter Color Eaten (found in stomach)

| Predator # | Purple | Brown | Blue | Green | Pink | Black | Orange | Red | Yellow | White |
|------------|--------|-------|------|-------|------|-------|--------|-----|--------|-------|
| 1 | | | | | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | | | | | | | |
| 4 | | | | | | | | | | |

Do you observe any unusual patterns?

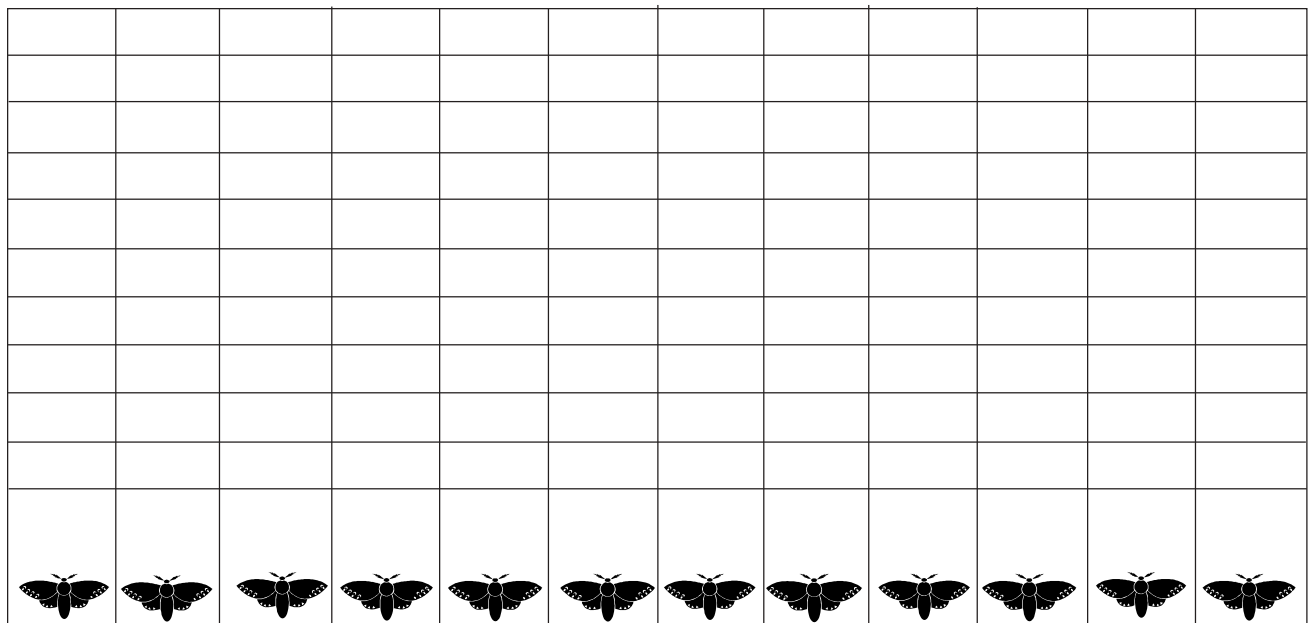
In addition to recording the critter color eaten, you will design a chart and record data for the surviving critters in the environment, at the end of each generation (after all four Predators have fed).

Chart 2: Number of Critters Remaining after Each Generation

| Critter Color | Generation 1 | Generation 2 | Generation 3 | Generation 4 |
|---------------|--------------|--------------|--------------|--------------|
| Purple | | | | |
| Brown | | | | |
| Blue | | | | |
| Green | | | | |
| Pink | | | | |
| Black | | | | |
| Orange | | | | |
| Red | | | | |
| Yellow | | | | |
| White | | | | |

Graphs 3-7 (sample)

Design bar graphs for each generation and color of critters.



Analysis of Data

In the analysis, you will use your charts/graphs to illustrate and compare your data. You will be comparing the number of critters at the end of the fourth generation in each of the environments (“warm” and “cool”). In addition, you will need to graph, analyze, and discuss the results of the mutant population. Once you have completed your graphs, analyze and discuss your data by answering the following questions:

You may take notes in the spaces below, but for your final answers, use a separate piece of paper.

- As critters in the environment pass through several generations, what changes in the population do you observe?
- Had these been real critters in the wild, what other kinds of adaptations could improve the survival chances for the critters most frequently captured and eaten?
- What adaptations contributed to the survival of the critter chosen (“eaten”) the least?
- If environments change over periods of time, what must happen to populations if they are to survive?
- Briefly, compare and contrast the results you observed in the cool environment with the results you observed in the warm environment. In other words, how did the results differ, and how were they similar?
- In a given environment, do all of the paper critters survive equally well? Explain.
- After three generations, what paper critters survived best? Why?
- After four generations, what paper critters survived best? Why?
- How would the color mix of the paper critters change if a new color flower species were to become dominant in the environment?
- What happened when the critter coloration experienced a mutation? How did the mutation in the critter population affect gene frequency?
- Use resources such as your textbook, video and research notes, previous activities, and the Internet to explain what happened to *Biston betularia* (peppered moths) in England during the Industrial Revolution. Use key terms such as natural selection, mutation(s), gene(s), melanism, environmental change, adaptation, melanin, population, survival, camouflage, etc. Underline key words as you use them.
- DDT and other pesticides are less effective today than when first introduced. Additionally, medical science is experiencing bacterial resistance to antibiotics. Explain why these statements are so.
- Lab Learning Log: Consider your knowledge about natural selection, your experience in this laboratory exercise, and the results you observed. Write a one-paragraph (minimum) learning log.

Going Further

Try this activity with Gummi Bears! You can use regular, tropical, and sour flavors that come in all sorts of colors. How do you think flavor will affect natural selection of the Gummi Bears? Research Monarch butterflies and determine if there is any evidence of natural selection in the Monarch population.

Developed by:

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Genes and the Environment: A Laboratory Inquiry

Adapted from *Woman Scientist, Past, Present and Future*

Interaction

Your mission as a scientist is to design an experiment that enables collection and analysis of data on the effect of environmental factors on a living organism.

Question/Problem

Different environmental factors can result in mutation or genetic disorders; your team will utilize various resources (encyclopedias, Internet, etc.) to develop the background section of your lab report. Be sure to cite all sources! Do **not** proceed until approved by your teacher!

Hypothesis

- Based on the Question/Problem and your background research, develop your own hypothesis based on the environmental factors you intend to use.
- Consider the following: Your team will be trying to determine to what extent any changes in the seedling are due to the plants' genes or to the environmental factors.

* Do **not** proceed until approved by your teacher!

Experiment

Your team will develop a mini proposal for your experimental procedure. Before you begin, consider the following:

- Materials needed to complete your research;
- Safety issues;
- What your team wants to find out;
- Proper laboratory procedures.

Questions to ask yourself while developing the experiment

1. What will be guiding your research?
2. To what environmental factor(s) will you expose your seeds during the experiment?
3. How long will you expose the seeds to each environmental factor?
4. For what type of changes will you be looking throughout your experiment (e.g., plant height, color change, germination, evidence of disease)?
5. How will you record the changes you observe? Will they be measurable (quantitative) or qualitative?
6. What is your control group?
7. What is your test group?
8. Consider the planting requirements of the seeds (soil, depth, light, etc.).

* Do **not** proceed until approved by your teacher!

Suggested Materials

- containers to hold plants (2-liter bottles)
- Vermiculite
- colored water
- sterile potting soil
- 20 mutant seeds
- 20 normal seeds
- marking pen
- labeling tape
- water bottles
- camera
- toaster oven
- microwave
- UV light
- freezer
- refrigerator
- ruler
- safety goggles
- aprons
- gloves
- hot pads

Science Appendix 2a

Sample Peer Evaluation

Genes and the Environment: A Laboratory Inquiry

- 5 3 1 Is the research question clearly stated?

- 5 3 1 Does the hypothesis relate to the question and experimental procedure?

- 5 3 1 Does the background include information that relates to the research question?

- 5 3 1 Is the proposed laboratory research set up in a logical sequence of activities?

- 5 3 1 Are the necessary materials to perform the laboratory stated?

- 5 3 1 Are safety concerns considered in the experimental procedure?

- 5 3 1 Does the proposal include what type of observations will be made and how data will be collected, recorded, and analyzed?

- 5 3 1 Does the proposal consider a control and a variable group in the laboratory procedure? Are the groups large enough to draw conclusions?

- 5 3 1 Is the information about how long and to what environmental factor(s) the seeds will be exposed included in the proposal?

- 5 3 1 Have the seeds growth requirements (soil depth, light needs, germination rate, etc.) been addressed?

Total points _____/50 points

Science Appendix 2b

Formal Laboratory Publication/Product Rubric

- Cover page includes: title, graphic(s), names of scientists/researchers, publication date;
- Purpose/question is in a complete sentence and clearly stated;
- Background research: has been thoroughly researched and published in the team member's own words, using details and information relevant to individual proposal. Resources used have been properly cited;
- Experimental procedure: written using proper experimental format, is understandable and logical, and considers materials as well as safety requirements;
- Experimental procedure:
 - ◆ A comprehensive list of materials is included
 - ◆ Safety concerns are addressed
 - ◆ Step-by-step procedure is included
 - ◆ Controls and variables are identified
 - ◆ Data to be collected and analyzed clearly stated
 - ◆ Charts, graphs, tables are used to organize data;
- Conclusion: contains a summary of:
 - ◆ The entire laboratory procedure
 - ◆ An analysis of data
 - ◆ Answers to purpose/question
 - ◆ Background information
 - ◆ The data/results
 - ◆ An analysis to support the conclusion

Science Appendix 2c

Formal Laboratory Presentation Rubric

- Research scientists communicate clearly to the audience. The presentation is understandable, well-organized, and creative. The presenters are confident and utilize audio-visual aids to enhance their presentation;
- Audio-visual aids (charts, pictures, demonstrations, graphs, objects, handouts, etc.) are organized, color enhanced and easy to understand;
- Each team member demonstrates thorough and accurate knowledge of the entire laboratory project, including the initial question, hypothesis, background, experimental procedure, data/results, and conclusion;
- Team refers to resources they may have used to document their report information and visual aids;
- The presentation is accurate and includes a precise analysis of data/results;
- Presentation style is polished, evenly paced and professional. Presenters use appropriate levels of voice and eye contact with the audience;
- Presenters honor time requirements;
- The team members were able to answer audience questions thoroughly and accurately.

Mathematics

Activity

Mathematics Activity

Individual Differences: Moth Data

Students will make scatter-plots and develop the idea of a median/median line using Algebra I skills. The data used comes from the science section of this project. This activity is designed to lead to an analysis of non-linear data in the next section.

Rationale

Data Analysis is an important part of technically-based careers in today's economy, and certainly Health Services are no exception. The most important goal of the math activity is to get students used to dealing with data. They will be expected to make careful scatter-plots of data provided and then use some Pre-Algebra and Algebra I skills to analyze trends and describe mathematically the nature of change.

Basic Health Services Connection

This activity is foundational to skill development in data collection. As the health services industry is highly technical, the ability to analyze data is crucial to all careers in the industry.

Standards Addressed

Math: Algebra 1 5.0, 6.0, 7.0, 9.0, 16.0, 17.0, 18.0

Objectives

The student will:

- Make scatter-plots;
- Develop algebra skills using the median/median line idea.

Process

In the science section of this project, the student will study an experiment that measured increases and decreases in the population of a moth known as *Biston betularia*. The data given are found in the table shown below.

| Year | Light Moths Captured | Dark Moths Captured |
|------|----------------------|---------------------|
| 1 | 556 | 64 |
| 2 | 537 | 112 |
| 3 | 484 | 198 |
| 4 | 392 | 210 |
| 5 | 246 | 281 |
| 6 | 225 | 357 |
| 7 | 193 | 412 |
| 8 | 147 | 503 |
| 9 | 84 | 594 |
| 10 | 56 | 638 |

This data, collected over a ten-year period, shows a decrease in light colored moths caused, hypothetically, by their being more easily seen against dark, soot-covered trees near industrial centers. The table also shows an increase in the population of darker moths of the same species. Those numbers increase over time for the opposite reason. Their natural predators, mostly birds, find them harder to spot, so the dark moths have more opportunity to reproduce offspring of the same coloration.

In the series of exercises found in the appendix, students will examine the data closely, making careful graphs and utilizing math skills to analyze patterns that may be contained in the raw data. The data analysis skills developed are used in a variety of occupations where analysis and prediction are important.

Assessment

Completed written question guide

Bibliography/Resources

- Data collected from medical studies of physical difference researched (scientific journals);
- Challenge Standards for Student Success;
- Textbook references.

Refer to Math Appendix 1 & 2 following this section.

Mathematics

Appendix

Individual Differences: Moth Data

(Part 1)

(Part 2)

T1—82/83 Activities

Individual Differences: Moth Data

Part One

The emphasis throughout this work is not on absolute accuracy, but rather on an understanding of basic ideas of slope and change, practice on skills from Pre-Algebra and Algebra 1, and an overall appreciation of the uses of two-variable data analysis.

- Be sure that the year is on the x -axis. A discussion of dependent vs. independent variables and domain and range is appropriate;
- Results for the sum of residuals will depend on the scale of the graph. When I used 1" units for the year and 1" units = 100 moths, I got a slightly smaller residual for points 2 and 9. Both were around a total of 7 cm at this scale. The use of a cm scale will greatly simplify the addition process. If a group or an individual wants to offer a better pair, namely a pair they think will have a smaller residual sum, let them try;
- The number of possible lines is related to the triangular numbers: $1, 3, 6, \dots, n(n+1)/2$. Since this sequence starts with 0, the general term is $n(n-1)/2$. The number of possible unique handshakes in a group follows this same rule;
- For points 1 and 10:

$$m = (556-56)/(1-10) = -56$$

$$b = 612$$

$$y = -56x + 612$$
- For points 2 and 9:

$$y = -65x + 666$$

Students need to understand and be able to write about what the numbers in these equations mean. In the first example, the slope tells us that the number of captured moths decreased by about 56 moths per year over the ten-year interval.

Part Two

- Be sure to emphasize that we slide the line straight down vertically, toward the middle point;
- For the 1st and 3rd points:

$$m = (556-84)/(1-9) = -59$$

$$b = 556 - (59)(1) = 615$$

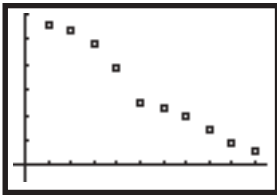
$$y = -59x + 615$$
- As shown in Figure 5, the predicted value $y(5) = 320$ and the measured value from the table is 246 as shown in Figure 4. The difference is 74, and one-third of that is about 25. You can use more significant figures if you choose. The median/median line is therefore $y = -59x + 590$. Figure 6 shows the m/m/ line with full calculator accuracy;
- The model above predicts $y(3) = 413$, off by about 70 moths;
- Solving $-59x + 590 = 0$ gives $x = 10$ years;
- The model predicts that $y(15)$ will be -295 , clearly an impossibility. It will be important to make a point about the dangers of extrapolation. Stress caution in making predictions outside the data range;

- This exercise asks students to combine the ideas in the previous sections and apply them to the full data set;
- Remind them that median means middle. The points here, 10 of them, should be grouped 3-4-3. The first and third summary points are the data point (2,537) and (9,84) respectively. The middle summary point will be (5.5,235.5), the point halfway between 5 and 6 for its median x and halfway between 246 and 225 for its median y;
- The m/m equation for light moths is $y = -64.7x + 641$ using two significant figures and $y = 68.9x - 37$ for the increasing population of dark moths;
- The two lines cross just past $x = 5$ where y is about 313. The data table shows the two populations being equal sometime between years 5 and 6;
- The TI-82/83 graphing calculator will perform these calculations for stored lists using applications in the stat-calc menu.

In the following series of exercises, you will be asked to examine the data closely, to make careful graphs and to utilize math skills to analyze patterns that may be contained in the raw data. The data analysis skills you will develop are used in a variety of occupations where analysis and prediction are important.

Part One

Figure 1



A. Make a careful scatter-plot of the data for the number of light moths captured vs. the year. Make the graph large enough so that there is room to make notes on it, at least one-half page. Your graph should look something like the calculator screen seen in figure 1, but it should include labels for the axes.

When your graph is complete, try the following experiment. Using a ruler or other straight-edge as a guide, make several imaginary lines on your graph connecting pairs of points, and as you do, try to decide which of the lines fit the data best. You are looking for the line that comes closest to all of the data points. This “line of best fit” is important because people who work with data frequently want to represent the data with an equation that can be used to fill gaps and make estimates of past and future behavior.

B. Try the following experiment, working in a group to share the job. Using points 1 and 10 and points 2 and 9, make very light lines on your graph and make the following measurements with a centimeter ruler. Find the vertical distances from the line you drew to each of the data points and add them. These distances you are measuring are called residuals, and two of them should be zero. Why? We are concerned only with the size, not their sign, so take their absolute value when you add them. Does it seem right that the line with the smallest sum of residuals comes closest to all the points? You may even select two other points that you think would be better and experiment with them.

Figure 2

| Number of Points | Possible Lines |
|------------------|----------------|
| 1 | 0 |
| 2 | 1 |
| 3 | 3 |
| 4 | |
| 5 | |
| 6 | |
| n | |

C. Since no one line passes through all the points, can you figure out how many possible lines there are through a group of points taken two at a time? To help answer this question, work alone or in groups to fill in the table in figure 2. As you work, look for a pattern to help make faster progress, and note how rapidly the number of possible lines increase. The formula for the general case, the last entry, may take some careful thought and a class discussion.

D. Next, find an equation for the line of “best fit” chose in part b. You have heard more than once that “two points determine a line”, so let’s take the two points your group found had the smallest residual sum and find the algebraic equation of the line that passes through them. You will have to find the slope and y-intercept of the line to write it in slope-intercept form ($y = mx + b$). Explain, in a complete sentence, what the slope of the line represents for this data. Again, in writing,

explain what the x and y intercepts of this graph represent. These intercepts are actually not very interesting in this data set, but in other applications they are frequently very important.

So far, you have been finding the linear models by comparing the lines that go through two of the data points to find the one with the smallest sum of residuals. This is frequently a lot of work. There are at least two other methods for determining a line of best fit. One of them, called the median/median line, can be done using the algebraic skills you now have, while the other, called the regression line, will have to wait until you learn more advanced algebra.

Part Two

The process of using two points at a time to find a “best” line has the additional drawback of being relatively slow, and, as you have seen, involves a great deal of work. The factors involved—slope, intercept, dependence, and comparison of residuals—are very important, but we need to look for an easier way to find a good line of fit for making models. In the 1950s a statistician named John Tukey developed a method for finding what he and others have called the median/median line. You will use some of the data in the last table to learn the median/median line method.

Figure 3

| Year | Light Moths Captured |
|------|----------------------|
| 1 | 556 |
| 5 | 246 |
| 9 | 84 |

A. You will use the data for the first, fifth, and ninth years in the moth capture experiment in this example. Start by making a scatter-plot of just these three points. Make sure that the year is on the horizontal axis. It should look like figure 4. below. Put a straightedge on the first and last data points and notice that the middle data point, for year 5, is below the line from year 1 to year 9. Simply slide the straightedge one-third of the way down toward the middle point.

The result, if you trace lightly along the straightedge, is the median/median (m/m) line.

B. To find the equation of this line you will use some algebra. You should be getting good at finding the equation of a line through two given points, which is your first step. First, find the equation of the line through the points (1, 556) and (9, 84) shown in figure 5. Next, into this equation substitute $x= 5$, the x value at the middle point, and find what moth count is predicted. Then, find the difference between the observed (table) and this predicted value of y. This is the residual at the middle point. Divide this difference by 3, and, since the middle point is below the line, subtract the result from the old y-intercept. This last step has the effect of lowering the line to the desired level in figure 6.

Figure 4

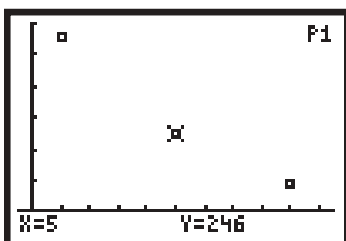


Figure 5

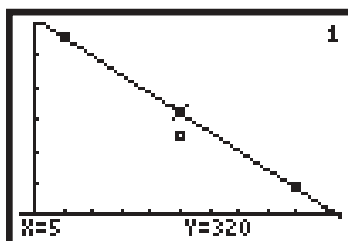
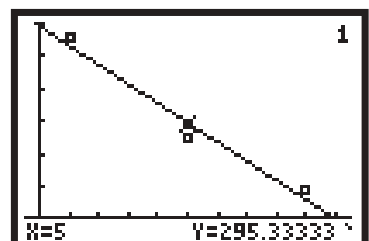


Figure 6



What does the m/m model predict for year three? How close is this to the table value? When does the m/m line predict that all the light colored moths will have disappeared? What is the predicted count for year 15? Does that make any sense?

D. This example was made easier by the fact that you had only three data points in your table. The general method, when there are more data points, is to group the data into three regions, and to represent the data in each region by a single point, called the summary point. From there the method proceeds as before, as if the three summary points were your three data points. Here is a general outline of the method for larger samples:

- ① Separate the data into three groups of equal size according to their x coordinate. If the groups are not equal, make them symmetrical. (3-4-3, or 4-3-4 for example)
- ② Find the summary point in each of the three regions. Use the median x and median y values in each group.
- ③ Find the equation of the line through the two outside summary points. Call this line L.
- ④ After finding the difference between the actual value and the predicted value for the middle summary point, shift line L vertically one-third of the way toward the middle summary point.
- ⑤ Adjust the y-intercept of L to reflect this shift. The result is the equation for the median/median line.

This operation will be more understandable as you work through an analysis of some real data. Review the steps in the table above before going on.

E. Use the complete data set given at the start of this exercise and find the equations for the m/m lines for the decreasing light moth count and the increasing light moth count. Test the models you find against a few data points from the table. Where do your two lines intersect? What is the significance of that point of intersection? Does the data in the table support your answer for the point of intersection?

F. If you or the class have access to a graphing calculator, check your work against the work of the calculator. It can find the m/m line if you give it two lists of data and use the stat-calc menu. See if your answers agree with that of the calculator. Remember that you may have rounded off answers during your calculations, so you may not agree exactly.

We have experimented here with a linear model for our data because it seemed to fit fairly well, but as you move on into more advanced math classes you will study other non-linear data models and apply them in situations where the data does not seem to fall near a straight line.

Math Appendix 2

Teacher Notes

T1-82/83 Activities: Moth Data

Iteration, the act of repeating a process over and over, has taken on a new ease and importance because of the TI 82/83 answer key. Applied to a series of well-formed commands linked by colons, iteration can be used by students and teachers to create simple exploratory “programs” without ever leaving the home screen. These programs have many virtues, including their ease of creation and modification and the simplicity with which they can be interrupted and resumed after examining a stat plot of partial results.

The activities in the math portion of this project focus on linear and geometric data patterns. The assumption, for the sake of the math to be studied, is that the moth data can be modeled by a linear function, but other models are possible as well. We certainly might expect growth or decay patterns to be exponential and display a geometric form, and the calculator makes such investigations very manageable.

The linear sequence is distinguished by common differences between equally spaced terms, while the terms of a geometric sequence have a common ratio. Following are several of what I call “home screen programs” which can be used to experiment with data.

Figure 1

```

0→N:556→M:50→K:C
1rList L1,L2
Done
N+1→N:N→L1(N):M→
L2(N):M-K→M:(N+1
,M)
(2 506)
    
```

The three figures at the left illustrate the basic idea behind a home screen program (hsp). The first two lines in figure 1 set N to zero (it will be used as a counter) and start the number of moths, M, at 556. Next we store 50 in K. K represents the common difference, and we would expect to change it from trial to trial. Clearing lists 1 and 2 gives us a place to store the data we collect. Press the enter key to execute this series of commands.

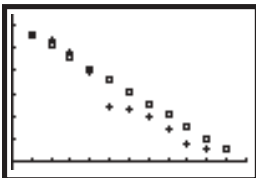
Figure 2

```

(2 506)
(3 456)
(4 406)
(5 356)
(6 306)
(7 256)
(8 206)
    
```

The next two plus lines increment N, starting it at 1 and storing it into List 1 in position N. M, the moth count, is stored into List 2 in position N, and then we subtract K moths from the current count and put that into M. The final command, {N+ 1, M}, simply causes the calculator to show the current ordered pair. Now, repeatedly pushing the enter key generates the sequence seen in figure 2. Notice the common difference being applied.

Figure 3



Finally, since the data has been stored in Lists 1 and 2, we can hit the zoom stat key to see a scatter-plot of the current results. The graph in figure 3 shows the actual light moth data as crosses and the model data as boxes for comparison.

Note that two “2nd enter” commands return the initial two lines for modification, and two more “2nd enters” brings us to a point where we can repeat the experiment with perhaps a new value for k.

Figure 4

```

0→N:556→M:.8→K:C
lrList L4,L5
Done
N+1→N:N→L4(N):M→
L5(N):K*M→M:(N+1
)M
(2 444.8)
    
```

Let's consider another example, this time modeling a decreasing geometric pattern. The same basic idea is used here with one big change that comes from using K to multiply at each step. The initial value of K in this example is set to .8, but you should feel free to experiment to find the K which produces the closest match to the given moth data.

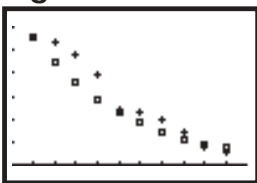
Figure 5

```

(5 227.7376)
(6 182.19008)
(7 145.752064)
(8 116.6016512)
(9 93.28132096)
(10 74.62505677)
(11 59.70004541)
    
```

Note how easy it is to convert the previous example to this new format. The "2nd enter" command returns old lines of code for minor editing, and we are off and running with a new model.

Figure 6



The results are seen in figure 6, where again the actual data is plotted with crosses and the new calculated results are boxes. This model actually seems more natural for this application. We expect the change in population to depend on the current population.

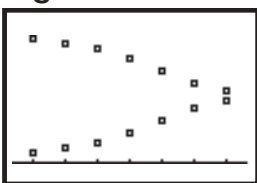
Figure 7

```

0→N:.95→P:.5→K:C
lrList L4,L5,L6
Done
N+1→N:N→L4(N):P-
KP(1-P)→P:P→L5(N
):1-P→L6(N):roun
d(N,P,1-P),2)
    
```

The last example is slightly more complicated, probably not applicable for most classes, but it shows the power of the process. The "hsp" shown here is designed to model logistic growth in which the change in the population depends on both the current population and the carrying capacity of the environment.

Figure 8



Here we are using a maximum population of 1 and looking at the current population as a decimal part of the maximum. K is an experimentally determined constant that is a characteristic of the interaction of the species and its environment. We are plotting both P and 1-P, and in a way it models the relationship between the light and the dark moths in the experiment.

Figure 9

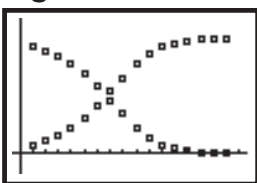


Figure 8 shows the first seven iterations when two stat plots have been set-up. It is an easy feature of this process that we can simply quit back to the home screen and collect more data. The final figure takes us to the extinction of one species and the domination of the other.

This home screen process creates many opportunities for experimentation. Go for it!

Health Careers Activities

Health Careers Activity #1

Physically Challenging Experience

Conduct a “physically challenging experience” for each student during the school day.

Rationale

To fully understand how physical differences can create challenges for individuals, as well as the plight of the physically challenged, students need to experience these challenges first-hand. First, the teacher should lead a class discussion on students’ feelings of independence (i.e., what makes them feel independent). Then create the environment for this experience. This can be used simply as foundational knowledge for the culminating activity or can actually be incorporated into the exhibition format.

Basic Health Services Connection

This activity highlights physical differences and the responses these differences evoke. During this activity, students will gain an appreciation for the difficulties that face individuals with physical challenges and may discover career connections that might otherwise not have been apparent.

Standards Addressed

Health Careers Core: Safety 3, Communication and Decision Making 4

Objective

The student will:

- Gain an appreciation of the physical challenges facing those who have a handicapping difference.

Process

The student will:

- Participate in discussion regarding the “physically challenged experience” including necessary teacher-provided equipment and directions;
- Role play the “given” physical challenge for an entire school day;
- Share his/her experience with classmates in an oral report.

Assessment

- Participation in the activity;
- Oral report.

Bibliography/Resources

- Americans with Disabilities Act (ADA);
- OSHA/Cal OSHA.

Health Careers Activity #2

Handicap Access

Investigation of three public buildings for handicap access, and describe both the situation and any modifications or lack thereof.

Rationale

To fully understand how physical differences are part of the human experience, students need to understand the problems these differences may create and the possible solutions present in modern society. The teacher will conduct a classroom discussion on the Americans with Disabilities Act (ADA) and how this impacts public buildings—specifically, necessary structural modifications. The students will then collect ADA materials that can be used as displays or reference materials for the culminating activity.

Basic Health Services Connection

This activity highlights physical differences and the responses these differences evoke. During this activity, students will gain an appreciation for the difficulties that face individuals with physical challenges and may discover career connections that might otherwise not have been apparent.

Standards Addressed

Health Careers Core: Safety 3, Ethical and Legal Responsibility 6

Objectives

The student will:

- Understand how access for people with disabilities either assists or limits independence;
- Understand how advanced technology has impacted the challenges associated with physical differences.

Process

The student will:

- Prepare, in class, a checklist that will assist in observing mandated ADA modifications in public buildings;
- Prepare a plan for a visit to a public facility. Teachers could model observation skills using the check list by leading students on an observational walk through their school;
- Prepare, in class, a community map identifying public buildings;
- Visit a public building of their choice on his/her own time and observe ADA modifications or the lack thereof;
- Prepare a written report of observations and share with the class.

Assessment

- Written report;
- Oral presentation.

Bibliography/Resources

- Library;
- Internet;
- March of Dimes;
- Medical research libraries.

Health Careers Activity #3

Employment Opportunities

Identify the best employment opportunities in the health care industry in regards to particular physical challenges.

Rationale

Part of the human experience relating to physical differences is the opportunity to be gainfully employed. The student needs to have some understanding of the plight of the physically challenged when facing the employment arena. This activity will serve as reference knowledge for the culminating activity.

Basic Health Services Connection

This activity clearly addresses the actual career connections for those who have physical challenges created by their differences.

Standards Addressed

Health Careers Core: Communication and Decision Making 4, Ethical and Legal Responsibility 6

Objective

The student will:

- Understand that there are employment opportunities for individuals with physical challenges in the health-care industry.

Process

The student will:

- Select a physically challenging condition, and research (either individually or in small groups) the specific health careers options;
- Present to the large group three to four different employment opportunities for the physically challenged in the health services industry;
- Include findings in the culminating activity exhibit.

Assessment

- Oral report; exposition; presentation.

Bibliography

- American with Disabilities ACT (ADA);
- *Preparing Students with Disabilities for Careers in Health Care* (available through the Health Careers Resource Consortium);
- Employment agencies;
- Human Resource department of health care facilities;
- Labor Market Information (LMI) through Economic Development Department (EDD).

References

Genetic Disorders to Research

Sources for Investigation - Health Organizations

Toll Free Hot Lines

Environmental Agency Resources

Science Resources

Genetic Disorders to Research

Achondroplasia (dwarfism)

Albinism

Amyotrophic Lateral Sclerosis (ALS/Lou Gehrig's Disease)

Cerebral Palsy

Cleft Palate/Lip

Duchenne Muscular Dystrophy

Epidermolysis

Marfan Syndrome

Multiple Sclerosis

Neurofibromatosis

Osteogenesis Imperfecta

Parkinson's Disease

Polydactyly

Progeria

Scleroderma

Spina Bifida

Note: This is a partial list of genetic disorders that manipulate physical conditions.

Sources for Investigation Health Organizations

American Social Health Association
P.O. Box 13827
Research Triangle Park, NC 27709
(919) 361-8400

Muscular Dystrophy Association
810 Seventh Avenue
New York, NY 10019
(212) 586-0808

Amyotrophic Lateral Sclerosis Association
21021 Ventura Boulevard, Suite 321
Woodland Hills, CA 91364

United Cerebral Palsy Association
66 East 34th Street
New York, NY 10016

Arthritis Foundation
1314 Spring Street
Atlanta, GA 30309
1-800-283-7800

Office of Communication
National Human Genome Research Institute
(301) 402-0911

National Genetics Foundation
555 West 57th Street
New York, NY 10019

National Multiple Sclerosis Society
205 East 42nd Street
New York, NY 10017-5706

National Organization for Rare Disorder
P.O. Box 8923
New Fairfield, CT 06812
(203) 746-6518

March of Dimes
1275 Mamaroneck Avenue
White Plains, NY 10605

National ALS Foundation
185 Madison Avenue
New York, NY 10019

Toll-free Hot Lines

| | | | |
|---|----------------|--|----------------|
| AIDS | 1-800-624-2377 | Parkinson's | 1-800-327-4545 |
| Ala (alcoholic support) | 1-800-322-5525 | Sickle Cell Anemia | 1-800-421-8453 |
| Alliance of Genetic Support Groups | 1-800-336-4363 | Self-Help | 1-800-922-9234 |
| Alzheimer's | 1-800-272-3900 | Every effort has been made to ensure the accuracy of these numbers. However, they are subject to change. | |
| American Cancer Society | 1-800-ACS-2345 | | |
| American Diabetes | 1-800-232-3472 | | |
| American Heart | 1-800-AHAUSAI | | |
| American Kidney | 1-800-638-8299 | | |
| Arthritis | 1-800-283-7800 | | |
| Blind Council | 1-800-424-8666 | | |
| Cancer | 1-800-422-6237 | | |
| Cooley's Anemia | 1-800-221-3571 | | |
| Cystic Fibrosis Foundation | 1-800-fightcf | | |
| Down Syndrome | 1-800-221-4602 | | |
| Epilepsy | 1-800-332-1000 | | |
| Huntington's | 1-800-345-4372 | | |
| Lung | 1-800-222-LUNG | | |
| Multiple Sclerosis | 1-800-624-8236 | | |
| Muscular Dystrophy | 1-800-223-6333 | | |
| National Cancer Institute Cancer Information Center | 1-800-4cancer | | |

Environmental Agency Resources

Natural Resources Defense Council
40 West 20th Street
New York, NY 10011

Environmental Defense Fund
1616 P Street NW, Suite 150
Washington, D.C. 20036

Citizens for a Better Environment
33 East Congress, Suite 523
Chicago, IL 60605

Rocky Mountain Institute
1739 Snowmass Creek Road
Snowmass, CO 81654

World Resources Institute
1735 New York Avenue NW
Washington, D.C. 20037

World Wildlife Fund
1735 24th Street NW
Washington, D.C. 20037

Science Resources

- “A Question of Genes,” PBS video publication <http://www.pbs.org/gene/>
- “Race for the Double Helix,” (800) 435-5685, Extension 30 Item #TL2101 \$84.95
- “The Family Doctor” (CDROM), One Athenacum Street, Cambridge, MA 02142 (800) 845-8692
- “A Science Odyssey,” (800) 828-4PBS
- “The Secret of Life” (Videocassettes), Eight Videos \$695 WGBH Collection, P.O. Box 2053, Princeton, NJ 08543 (800) 828-WGBH
- “For Love of Science,” 1989 J. Weston Walch, Publisher
- “Barbara Mc Clintock: She Discovered “Jumping” Genes” *Adventures in Science*, Science Gazette
- “At Long Last – A Nobel for a Loner” Gina Maranto, *Discover Magazine* December, 1983
- Video Discovery Laser Discs, (800) 548-3472

Assessment

Rubrics for Culminating Project

Report of Information

Autobiographical Incident

Speculation About Causes or Effects

Interpretation

Scoring Criteria for Group Presentation

Group Performance Scoring Guide

Group Work Rubric

Assessment Sheet (for presentations & content)

Criteria for Magazine/Video Presentation

Report of Information Sample Rubric

| Criteria | 6 Exemplary Writing Performance | 5 Commendable Writing Performance | 4 Capable Writing Performance | 3 Fair Writing Performance | 2 Limited Writing Performance | 1 Minimal Writing Performance |
|--|---|--|---|--|--|--|
| <p style="text-align: center;">Focus</p> <p>Staying on topic; Providing perspective; maintaining a point of view.</p> | Well-defined; determines points for elaboration; original or insightful perspectives. | Well-defined; less insightful perspective. | Fairly clear; generally maintained throughout; somewhat predictable. | Identifies topic or subject; generally stays on topic; attitude/point of view may be difficult to discern. | May be no more than a simple statement. | May be no more than an indication of a topic. |
| <p style="text-align: center;">Presentation of Information</p> <p>Strategies may include: using a personal anecdote; creating a scenario; naming/describing qualities; supporting a claim or assertion; describing activities; comparing/contrasting; examining the history; narrating a process; creating images or analogies; providing details; explaining benefits; outlining requirements.</p> | Wealth of specific, relevant and interesting information; appropriately selected facts, details, examples, anecdotes, explanation, and description; depth and comprehensiveness; uses appropriate strategies. | Useful, specific, well-developed information; relevant facts, details, examples; subject presented in detail; less depth and comprehensiveness than a 6. | Adequate amount; may not be well integrated; may be somewhat general; may not be relevant or appropriate. | Less information; may rely on generalization, opinion or evaluation rather than specific information; not enough information to characterize the subject; may only list; may include irrelevant information. | Information may be random, disconnected, unfocused; may lack specific details; may contain only specific details without organization, development or focus. | Very little information provided; rarely includes details; often only opinions or evaluations. |
| <p style="text-align: center;">Organization</p> <p>Organizational pattern may be: chronological, historical, specific to general, general to specific, causal, sequential.</p> | Structure appropriate to topic and audience; each section clearly and logically linked to what precedes and follows; satisfying, sometimes has a memorable, conclusion. | Well organized; begins and ends effectively; coherent; has a clear direction and logical structure. | Has structure; Information arranged in logical order; focus may waver. | Usually stays on topic; focus may shift; information may be randomly presented; may rely on prompt for organization plan; may have irrelevant details, digressions or repetitions. | Little evidence of coherent pattern; little sense of progression; may rely on prompt. | Poorly organized; sometimes incoherent; may be too brief to reveal pattern. |
| <p style="text-align: center;">Authority</p> | Knowledgeable and in command of detail; engaged and committed; expertise and unusual insight. | Knowledgeable, may display less command of subject; engaged by subject; interested in readers. | Knowledgeable; may seem eager to inform; less depth and/or comprehensiveness. | May be perfunctory; little awareness of the reader; may rely on opinions rather than information. | Lacks interest or self-confidence in informing; may express unsupported claims of authority. | Little or no awareness of the subject; no interest in informing reader. |
| <p style="text-align: center;">Style</p> <p>Diction, sentence structure.</p> | Precise, varied, appropriate use of language; exceptional control of sentence structure. | Precise, varied and appropriate use of language; less range; considerable control of sentence structure. | Conventional and predictable language; control of most conventional sentence structure. | Fairly appropriate language; word choice may be imprecise; basic control of sentence structure. | Word choice may be inappropriate; limited sentence control. | Limited vocabulary; simple sentences with little control. |

Autobiographical Incident Sample Rubric

| Criteria | 6 Exemplary Writing Performance | 5 Commendable Writing Performance | 4 Capable Writing Performance | 3 Fair Writing Performance | 2 Limited Writing Performance | 1 Minimal Writing Performance |
|--|---|---|---|--|---|--|
| Incident Strategies: specific actions; sensory details; dialogue; interior monologue; pacing; suspense, compare/contrast; feelings | Compelling and satisfying realization of one well-told incident; effective use of strategies. | Engaging and coherent incident; more predictable, less focused; strategies not as effective or varied. | Well-told incident; moderately developed; may have digressions; lapses in coherence or momentum; limited range of strategies. | Relates an incident or a series of events; competently told narrative; minimally developed; flat, quickly sketched but generally coherent; few strategies. | Incident may be general or fragmentary; may list undeveloped events; brief or rambling. | No incident related, or vague reference to an incident; reader has to infer incident; focus may be on others rather than self. |
| Context | Writer orients readers, providing context or background for the central incident; well chosen and relevant details; skillful balance among incident, context, and significance. | Orients reader less effectively than a 6; context does not dominate the essay; appropriate balance among incident, context, and significance; some well-chosen details. | Adequate to orient readers to the incident; balance among incident, context, and significance may be awkward. | Incident, context, and significance out of balance; generalizing or philosophizing; minimal orientation. | Limited; missing; context may dominate. | Very limited; context missing. |
| Significance | Writer implies or states personal significance of the incident in a well integrated way; insightful. | Writer implies or states personal significance of incident but not as insightful as in a 6. | Implied or stated; may be predictable or just added to the end. | Implied or stated in a limited way; insights may be predictable, superficial, or illogical. | Little or no statement of attitude or impact; insights missing or superficial. | Significance may be absent; may dominate entire essay. |
| Coherence & Style | Clear and coherent; exceptional control of sentence structure; precise, imaginative, appropriate use of language. | Coherent, but without smoothness of 6; sustained control of sentence structure; Appropriate use of language. | Predictable patterns; sustained control of sentence structure; somewhat conventional and predictable language. | Lapses in coherence; basic control of simple sentences; may rely on general rather than specific language. | May lack coherence; lapses in sentence control; may have inappropriate word choices. | Little connection between sentences and ideas; frequent lapses in sentence control; word choice may be confusing. |

Speculation about Causes or Effects Sample Rubric

| Criteria | 6 Exemplary Writing Performance | 5 Commendable Writing Performance | 4 Capable Writing Performance | 3 Fair Writing Performance | 2 Limited Writing Performance | 1 Minimal Writing Performance |
|--|--|--|---|--|---|--|
| Presenting the Situation | Clearly defined, focused; limits occasion appropriately; presented fully/precisely, but does not dominate; writer authority clearly evident by demonstration of broad knowledge/clear understanding. | Limits and focuses on occasion; does not dominate; sense of confidence and authority maintained. | Adequate to orient readers; may dominate, but offers explicit speculation; may lack detail and specificity; writer's authority not always evident. | May be brief; may dominate; limited use of strategies; may not clearly establish boundaries of situation; may not acknowledge readers. | Minimal understanding of situation; may not establish focus; may dominate to exclusion of speculation; may be omitted. | May be no situation; very brief; devoid of concreteness; unfocused. |
| Logic & Relevance: Causes/ Effects Possible Strategies: "What if" patterns to show relationship between conjectures and situation; building succession of causes or effects; controlling organization sequence i.e., least to most important, concrete to abstract, personal to societal. | Establishes, maintains, and develops plausible relationship between situation/proposed cause/effect; Imaginative, inventive argument; multiple perspectives; writer acknowledges possible questions/objectives of readers; convinces readers speculations are plausible/appropriate. | Linked naturally to situation; conjectures persuasively; reaches beyond obvious statements to speculations that are not entirely predictable; awareness of audience; reveals direction and purpose; develops relationship between occasion and speculations. | Connection between situation and causes or effects established; may be logical but predictable; cause and effect appropriate; some reader acknowledgement; thoughtful, but not inventive. | Speculations at least tangentially relevant; causes and effects may be listed rather than developed; one cause or effect may be minimally developed; may meander; speculations may be obvious, superficial; little conscious reader awareness. | Speculation may be brief, meandering, unfocused; little connection between situation and speculations; speculations may seem illogical or unrelated to situation. | Brief; superficial; no connection between situation and causes or effects; difficult to identify or understand. |
| Elaboration of Argument Varied strategies, including:citing facts, opinions, projections, citing personal observations and experience; elaborating on possibilities arising from proposed causes or effects; giving analogous situations; considering hidden/obvious causes/ effects; considering and refuting counterarguments. | Substantial; convincing; carefully chosen evidence; logical; relevant; precise, explicit detail. | Extended; convincing; logical; relevant. | Sufficient; less persuasive; may not show a consistent relationship between situation and causes or effects; possibly some irrelevant details; exhibits understanding of situation and exploration of possible causes or effects. | Lacks consistency in development of detail; may list, with minimal development; may give prior explanation of a cause or effect. | Little elaboration; may merely list; some irrelevant or unconnected details; may be very brief or generalized ramblings. | Little or no elaboration; speculation not argued; often incoherent. |
| Coherence & Style | Clear and logical coherence; sentence structure exceptional; precise, imaginative; appropriate use of language. | Coherent/logical; without smoothness of 6; sustained control of sentence structure; precise and appropriate use of language. | Predictable patterns; sustained control of sentence structure, but somewhat conventional and predictable language. | Lapses in logic and coherence; basic control of simple sentences. | Lapses in logic and coherence; basic control of simple sentences. | Little logical connection between sentences/ ideas; frequent lapses in sentence control, resulting in confusion. |

Interpretation Sample Rubric

| Criteria | 6 Exemplary Writing Performance | 5 Commendable Writing Performance | 4 Capable Writing Performance | 3 Fair Writing Performance | 2 Limited Writing Performance | 1 Minimal Writing Performance |
|------------------------------|--|--|---|--|--|---|
| Point of Departure | Orients reader; provides context; purposeful opening, often forecasting direction of essay; clearly establishes claim(s) and direction. | Provides context with appropriate amount of background information; reaches a clear focus; makes at least one claim. | Identifies the subject and orients reader adequately; usually makes at least one claim about the subject; may begin unsteadily, but reaches a focus or a point. | May introduce subject perfunctorily or simply identify subject. | Provides brief, unfocused opening. | Context may be missing, abrupt, or confusing. |
| Claims | Presents unusually perceptive claims; claim may be unexpected or contrary to predictable interpretation. | Presents claims clearly; makes perceptive claims; claims specifically relate to text. | Makes at least one clear, but sometimes predictable claim. | Obvious or only tangentially related. | May make no interpretive claims, or may be too broad, general, obvious, or contradictory. | Fails to present interpretive claims. |
| Evidence | Provides various kinds of concrete evidence from text; amasses substantive relevant evidence to support claims. | Includes enough convincing evidence to support claims; goes beyond mere summary; constructs persuasive interpretation. | Provides adequate though predictable evidence; supports at least 1 claim with evidence from text; may rely on generalization or summary. | May have some irrelevancies, digression or repetition; may summarize rather than offer concrete evidence. | Little, if any, relevant evidence; may rely primarily on summary or generalization; may respond in non-interpretive ways. | Presents neither specific support nor personal reactions; writes on topic but does not refer to a text; may merely summarize. |
| Stance | Tone of authority; advances logically to conclusion; acknowledges alternative interpretation; persuades reader that interpretation is reasonable and can be validated by the text. | Interprets authoritatively, but less compelling than a 6 essay; clearly understands how to justify an interpretation; may acknowledge alternative interpretations. | Knows how to justify an interpretation, but may withhold claim until end; may make an impressive claim but not amass enough relevant evidence; may not connect series of interpretive claims. | Little awareness of reader's needs; attempts, but does not integrate features in a balanced, convincing way. | May lack logical development and coherence; lapses in sentence control; undeveloped or disconnected ideas; word choice may be inappropriate. | Responds to prompt but does not show evidence of interpretation. |
| Coherence & Style | Clear and logical; precise; imaginative; appropriate use of language; shows exceptional control of sentence structure; maintains connections among ideas. | Clear direction, focus and logic; may lack the smoothness of a 6; sustained control of sentence structure; precise and appropriate use of language. | May fall into a predictable pattern; occasional flaws in logic, lapses in organization, or changes in direction; conventional, predictable language; sustained control of sentence structure. | Lapses in logic and coherence; basic control of simple sentences; general rather than specific language. | May lack logical development and coherence; lapses in sentence control; undeveloped or disconnected ideas; word choice may be inappropriate. | Lacks coherence; usually but not always unacceptably brief; little logical connection between sentences and ideas; frequent lapses in sentence control, resulting in confusion. |

Scoring Guide for Group Presentation Sample Rubric

| | Scoring Criteria | Exceptional 4 | Accomplished 3 | Competent 2 | Developing 1 |
|--|---|---|--|--|---|
| G r o u p | Organization Introduction/ conclusion; Separation of ideas; Clear, logical order; Transitions; Internal summaries | Introduction atten- tion-getting, memora- ble, appropriate; clear separation of balanced ideas; signposts; paral- lel structure evident; complete summaries separating ideas; link- ages set up progres- sion; clarified ideas when needed; internal summaries used to en- rich discussion | Introduction atten- tion-getting, clear; ideas are separate, not necessarily balanced/ clear; reasonable order in presenting ideas; short separation of ideas; linkages are ob- vious; summaries used mechanically; clarifies some idea | Introduction evident; main ideas of topic covered; order evident; transitions are simple in structure; summa- ries occasionally used | Unclear/undeveloped introduction/conclu- sion; incomplete cov- erage of ideas; some order evident; few transitions; summa- ries rarely used |
| G r o u p | Research Factual information; Interviews; Validity of sources; Breadth of sources | Uses information that is relevant, authorita- tive, clear, timely, pre- cise; sources reflect audience analysis; multiple authoritative and specialized sourc- es used; recognizes bi- ases of sources; in depth, thorough re- search; comprehensive sources; all viewpoints considered | Often uses informa- tion that is relevant, authoritative, clear, timely, precise; multi- ple sources used; relies on a variety of outside sources; is aware of some resources; vari- ety of sources; view- points varied | Use of information is generalized; more opinions and own be- liefs relied upon; Some sources used; uses pop- ular, easily obtainable material; cross-section of materials used | Uses preponderance of opinions and own beliefs; some facts; limited range of sources used; uses bi- ased or unreliable sources; limited view- points |
| G r o u p | Cooperation Balanced participation; Courtesy; Listening/ responding; Staying on topic | All members partici- pate equally; expres- sion/acceptance/en- couragement of diver- gent opinions; pro- nounced display of re- spect for opinions/po- sitions of others, rec- ognition of others' feelings; active, critical listeners, encourage meaningful feedback of discussants; all re- marks precise and relevant | All members encour- aged to participate; ex- pression of a variety of viewpoints; shows re- spect for positions/ opinions of others; have empathy for all members; attentive lis- teners; give meaning- ful feedback; remarks pertain to topic | All members contrib- ute ideas; variety of viewpoints may be ex- pressed; acknowledges rights of others to ex- press viewpoints; re- spectful, polite listen- ers; give some feed- back; most re-marks relevant | Unequal contribu- tions by members; in- formation may be one-sided; exhibit some lack of under- standing for others' rights; passive listen- ers; feedback lacking or inappropriate; many remarks digressive |
| I n d i v i d u a l | Speaker Use of facts and ideas; Participation/ response; Delivery; Cooperation with group | Comments are support- ed with empirical data; eager participant; com- ments reflect indepth understanding; fluent; audience impetus; Ver- bally and nonverbally commanding; inspires discussion; diplomatic; attempts to elicit opin- ions from more reti- cent participants | Uses outside sources to support comments; enthusiastic partici- pant; comments re- flect knowledgeable understanding; smooth, enthusiastic, audience-directed de- livery; encourages dis- cussion; senses dy- namics of group; tactful | Some outside infor- mation cited to sup- port comments; active participant; comments indicate reasonable understanding; clear proficient delivery; re- lated to audience; gen- erates discussions; in- teracts with group | Limited use of out- side data to support statements; occasion- al participant; com- ments indicate limit- ed understanding; de- livery understand- able, adequate; aware of audience; cooper- ates in discussion; in- teracts passively with group |

Group Performance

Sample Scoring Guide

6

- Conveys text insightfully;
- Presentation well articulated, audible, expressive and theatrically interesting;
- All performers participate and show confidence in material.

5

- Conveys text effectively;
- Presentation is clearly audible, somewhat expressive and visually interesting;
- All performers participate.

4

- Conveys text adequately;
- Presentation is audible, lacks expressiveness;
- Most performers participate.

3

- Conveys a basic understanding of text;
- Presentation is simplistic, but adequate;
- Some performers participate.

2

- Conveys a limited understanding of the text;
- Presentation is inadequate and inaudible at times;
- Participants are unorganized.

1

- Conveys little or no understanding of the text;
- Presentation is difficult to understand;
- Participants are playing around and unfocused.

Group Work

Sample Rubric

5 Exceptional Group

- Each person enthusiastically participates in discussions and energetically manipulates materials;
- Each group member plays assigned roles and follows all group norms;
- Each group member spends 100% of the time on task;
- Activities and tasks are completed and understood by all.

4 Commendable Group

- Each person participates in the discussion and manipulates materials;
- Most group members play assigned roles and follow group norms;
- Each group member spends most of the time on task;
- Activities and tasks are completed and understood.

3 Capable Group

- Each group member spends some time talking on task and some time manipulating materials;
- Some group members play assigned roles and follow most group norms;
- Each group member spends most of the time on task;
- Activities and tasks are mostly completed.

2 Developing Group

- Most group members talk on task and manipulate materials;
- A few group members play assigned roles and follow some group norms;
- Each group member spends some time on task;
- Activities and tasks may not be completed.

1 Limited Group

- Some group members talk on task and manipulate materials;
- Few, if any, group members play assigned roles and group norms are not followed;
- Very little time spent on task;
- Activities and tasks are probably not completed.

Name: _____ **Period:** _____

Title of Presentation: _____

Presentation Assessment Sheet

- 0 Quality absent**
- 1 Some evidence reflecting emerging skill**
- 2 Growth and development reflected in work**
- 3 Well developed skills reflected in work**
- 4 Mature skill; exceptional**

| Content | Comments | | | | | |
|--|-----------------|----------|----------|----------|----------|----------|
| Clarity of Purpose (10 points) | | 0 | 1 | 2 | 3 | 4 |
| Informative (30 points) | | | | | | |
| Clearly Presented | | 0 | 1 | 2 | 3 | 4 |
| Level of Details | | 0 | 1 | 2 | 3 | 4 |
| Thoroughness | | 0 | 1 | 2 | 3 | 4 |
| Able to Answer Questions | | 0 | 1 | 2 | 3 | 4 |
| Demonstration of Knowledge and Understanding | | 0 | 1 | 2 | 3 | 4 |
| Overall Content | | 0 | 1 | 2 | 3 | 4 |
| | | | | | | |
| Presentation | | | | | | |
| Organized (10 points) | | 0 | 1 | 2 | 3 | 4 |
| Well Rehearsed (10 points) | | | | | | |
| Smooth Transitions | | 0 | 1 | 2 | 3 | 4 |
| Eye Contact | | 0 | 1 | 2 | 3 | 4 |
| Clarity (can be heard) (10 points) | | 0 | 1 | 2 | 3 | 4 |
| Creativity/Originality (10 points) | | 0 | 1 | 2 | 3 | 4 |
| Enthusiastic About Topic (10 points) | | 0 | 1 | 2 | 3 | 4 |
| Collaboration (10 points) | | | | | | |
| Evidence of collaboration | | 0 | 1 | 2 | 3 | 4 |
| Initiative in preparation | | 0 | 1 | 2 | 3 | 4 |
| Overall Presentation | | 0 | 1 | 2 | 3 | 4 |

Magazine/Video Presentation Criteria

Directions

After your presentation, write personal reflections about how well you think you achieved each of the following criteria:

- ❶ Lacking
- ❷ Somewhat Lacking
- ❸ Accomplished Occasionally
- ❹ Somewhat Accomplished
- ❺ Accomplished Throughout

Must be informative:

- There must be **substance** to the presentation;
- You must demonstrate the knowledge that you have gained from your research.

Must be organized:

- Must be rehearsed (everyone knows what he/she is doing);
- Set-up is quick and efficient (you are not figuring things out on the day of presentation);
- Introductory comments are made at the beginning of the video/magazine presentation.

Video/magazine must be close to professional:

- Can be **seen and heard** (Use microphone if possible);
- Audio is clear (audience can hear the video without interference);
- Use HyperStudio or editing equipment if possible.

Presentation is rehearsed:

- Delivery is smooth;
- Doesn't appear that you "threw it together" at the last minute.

Audience is considered:

- Your audience can see/hear you and the video or magazine presentation.

You can answer questions at the end:

- You are prepared to provide clear and concise answers about content as well as process.