Women in Modern Medical (History) Herstory

Controlling Question for Culminating Activity:

Have women's achievements in medicine/science contributed to the changing status of women in modern United States society?

Interdisciplinary Curriculum Project

Suggested for
11th 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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Executive Order 11375*: In 1967, President Lyndon Johnson broadened affirmative action by including gender as one of the categories that employers holding federal contracts were prohibited from discriminating against. In signing Executive order 11375, Johnson added sex to race, color, religion, and national origin.*

Women in Modern Medical (History) Herstory

Controlling Question for Unit

Have women's achievements in medicine/science contributed to the changing status of women in modern United States society?

Culminating Activity

Students will identify key women in medicine/science, analyze their contributions and how they may have changed the role and status of women in modern United States society, and then develop a magazine to encapsulate their findings.

Project Goal

As students familiarize themselves with women who have contributed to the fields of science and medicine, they will come to their own conclusions regarding the evolution of equality for women in the United States since World War I.

Contents

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

Women in Modern Medical (History) Herstory

Have women's achievements in medicine/science contributed to the changing status of women in modern U.S. society?

Process Standards

Resources Interpersonal
Information Systems Technology

Content Standards

Science

- research a woman
- writing biography
- produce articles & magazine
- Timeline
- Jumping Genes
- Day in the Life

Math

- Sleeping Like a Baby
- Working Mothers
- research a Woman
- produce articles & magazine
- Timeline

Language Arts

- research a woman
- writing biography
- magazine articles
- writing, drawing, advertising
- Timeline
- literature view/ review/evaluate
- writing feature article
- magazine ads

History

- research early women's victories
- oral history
- research a woman
- magazine articles
- writing, drawing, advertising
- Timeline

Health Careers

- research a woman
- writing biography
- magazine articles
- writing, drawing, advertising
- Timeline
- Jumping Genes
- Day in the Life

TIME

Interdisciplinary Culminating Project

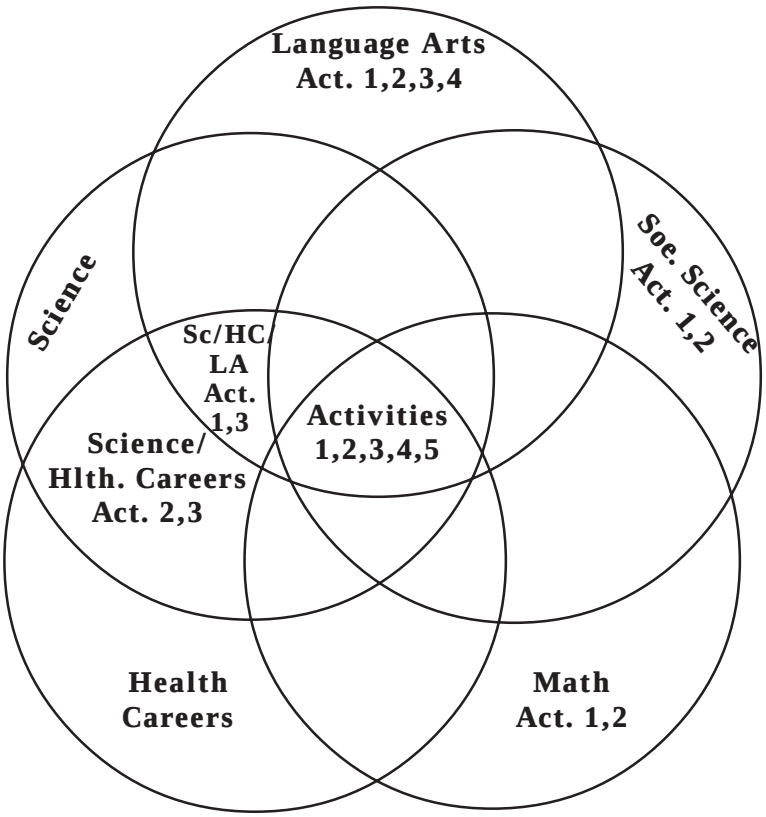
Prepare and distribute a magazine featuring women's achievements and their changing role in medicine/science.

Interdisciplinary Assessment

Magazine scoring guide designed by an integrated teacher team in conjuction with students

Integration of Subject Area Activities

Women in Modern Medical (History) Herstory



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.

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 Associatio—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

Student Handout

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

1. **Socioeconomic:** Students will know the relationships of various health care systems.
4. **Communication and decision making:** Students will know how to use critical and creative thinking, logical reasoning and problem-solving skills using various methods.
5. **Ethical and Legal Responsibilities:** Students will know ethical considerations, legal constraints, and professional codes affecting health care delivery systems.
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

11.5: Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.

11.5.4: Analyze the passage of the Nineteenth Amendment and the changing role of women in society.

11.7: Students analyze America's participation in World War II.

11.7.5: Discuss the constitutional issues and impact of events on the U.S. home front, including the internment of Japanese Americans (e.g. *Fred Korematsu v. United States of America)* and the restrictions on German and Italian resident aliens; the response of the administration to Hitler's atrocities against Jews and other groups; the roles of women in military production; the roles and growing political demands of African Americans.

11.7.6: Describe major developments in aviation, weaponry, communication, and medicine and the war's impact on the location of American industry and use of resources.

11.8: Students analyze the economic boom and social transformation of post-World War II America.

11.8.7. Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.

11.10: Students analyze the development of federal civil rights and voting rights.

11.10.7. Analyze the women's rights movement from the era of Elizabeth Stanton and Susan Anthony and the passage of the Nineteenth Amendment to the movement launched in the 1960s, including differing perspectives on the roles of women.

11.11: Students analyze the major social problems and domestic policy issues in contemporary American society.

11.11.3. Describe the changing roles of women in society as reflected in the entry of more women into the labor force and the changing family structure.

Historical and Social Sciences Analysis Skills

Historical Research, Evidence, and Point of View

4. Students construct and test hypotheses; collect, evaluate and employ information from

multiple primary and secondary sources; and apply it in oral and written presentations.

Historical Interpretation

1. Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.

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.

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, 11–12

Reading

Reading 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 themes.

Writing

Writing 1.0 Writing Strategies

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

1.1. Demonstrate an understanding of the elements of discourse when completing narrative, expository, persuasive, or descriptive writing assignments.

1.5. Use language in natural, fresh, and vivid ways to establish a specific tone.

1.6. Develop presentations by using clear research questions and creative and critical research strategies.

1.7. Use systematic strategies to organize and record information.

2.0 Writing Applications (Genres and Their Characteristics)

Students combine the rhetorical strategies of narration, exposition, persuasion, and description to produce texts of at least 1,500 words each. Student writing demonstrates a command of standard American English and the research, organizational, and drafting strategies outlined in Writing Standard 1.0.

Listening and Speaking

Listening and Speaking Strategies

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

Analysis and Evaluation of Oral and Media Communications

1.14. Analyze the techniques used in media messages for a particular audience and evaluate their effectiveness**.**

Science Standards

Investigation and Experimentation

1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations.

Chemistry

Organic Chemistry & Biochemistry

10. The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the biochemical basis of life. As a basis for understanding this concept:

a. Students know large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.

Other Science Standards

A variety of science standards, including Cell Biology Genetics, other Chemistry standards, Physics, and Earth Science can be incorporated depending on the scientist chosen for the project.

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
The Magazine

Rationale
This page contains the basic instructions and requirements for the culminating project. The discipline in which this activity is housed is a decision to be made during the teaching team's planning process. The English/Language Arts class is a natural choice, but not necessarily optimal for all teams. Using the knowledge gained from activities in all disciplines, students will create a magazine featuring the changing roles of women in the United States during modern history, in the context of health care. Additionally, they will give oral reports promoting the magazine. The magazine will be available through a variety of media, e.g., print, CD-ROM, video, Web site.

Objective
To design and publish a magazine with the purpose of providing information on the changing roles of women in science and health careers in the United States since World War I.

General Instructions
- Work in cooperative groups;
- Designate responsibilities of each individual in the group, e.g., Editor, Typist, Graphic Artist, Reporter, Writer, Reseacher;
- Discuss content and design of magazine;
- Appoint a Taskmaster whose job is to make sure everyone performs their assigned task(s) on time.

Specific Requirements
- Create a logo and magazine title;
- Provide publication information, e.g., Table of Contents, credits, etc.;
- Each student will contribute one of the following: biographical article, report of information, feature article, book or film review, ad;
- Design a marketing strategy for class presentation with a poster and other writings (See Language Arts #5).

Assessment
Integrated teaching team assessment using a team-developed scoring guide; sample scoring guide has been provided, or the team may develop its own guide.

Culminating Project

Interdisciplinary Activities

Culminating Project Activity #1

Research a Woman in Science or Medicine

Research of a twentieth century or current woman who has made an important contribution to the field of science/medicine.

Rationale

Social transformation is a recurring theme in U. S. History. In this project, students will explore women's contributions to science/medicine and will evaluate these achievements in respect to the theme of social transformation related to women's role and status in modern United States society.

Basic Health Services Connection

This culminating project highlights the remarkable contributions that woman in the 20th century have made in the field of science/medicine. During this research, students will discover career connections that may otherwise not have been apparent.

Standards Addressed

English-Language Arts: Research 1.3–1.8

Health Careers: Socioeconomic 1; Communication & Decision making 4

History-Social Science: 11.5.4, 11.7.5, 11.8.7, 11.10.7, 11.11.3

Science: Investigation & Experimentation; every discipline for which research topics are selected (e.g., physics, chemistry)

Objectives

The student will:

- Conduct research on a 20th Century woman of science or medicine;
- Understand this woman in historical context;
- Investigate her scientific/medical contribution;
- Explore the impact of her achievements;
- Use data and/or graphs to analyze trends.

Assessment

Teachers and students will evaluate whether the research meets the objectives and how to utilize the research in a magazine format.

Culminating Project Activity #2

The Magazine

Produce a magazine (in virtual, electronic, or document format) as a class or in small groups.

Rationale

Students share their understanding of women's roles and contributions in health care and women's improved status since the beginning of the twentieth century.

Basic Health Services Connection

This culminating project highlights the remarkable contributions that woman in the 20th century have made in the field of science/medicine. During the magazine development, students will not only discover careers in the health-care arena, but also will gain interpersonal skills important for success in any career.

Standards Addressed

English-Language Arts: Writing 1.4, 1.5

History-Social Science: 11.5.4,11.7.5, 11.8.7, 11.10.7, 11.11.3

Science: Investigation & Experimentation; every discipline for which research topics are selected (e.g., physics, chemistry)

Objectives

The student will:

- Apply research to a magazine format (in virtual, electronic, or document format);
- Provide information regarding women's contributions to the field of science/medicine;
- Provide information on the changing roles of women in health careers in the United States in modern history.

Process

The teacher will:

- Discuss content and design of a magazine;
- Help students form cooperative groups and designate individual group member responsibilities (editor, typists, graphic artists, reporters, editorial writer, etc.)

The student will:

- Create a logo and magazine title;
- Contribute one major article: biographical, feature story, report of information, editorial, book or film review;
- Include scientific and medical understanding of the work as well as mathematical trends;
- Design a plan for disseminating the magazine to the school and community at large.

Assessment

The teacher team will assess the completed magazine using a team-developed scoring guide.*

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

Culminating Project Activity #3

Magazine Articles

The class will write major articles for the magazine.

Rationale

Students are introduced to a variety of writing genres necessary for the production of a magazine.

Basic Health Services Connection

This culminating project highlights the remarkable contributions that woman in the 20th century have made in the field of science/medicine. The development of the magazine requires certain basic skills for its completion.

Standards Addressed

English-Language Arts: Writing 1.0–1.9; Writing Applications 2.0–2.6

Math (Algebra 1): 5.0, 6.0, 7.0,16.0, 17.0, 18.0

Science: Investigation & Experimentation; every discipline for which research topics are selected (e.g., physics, chemistry)

Objective

The student will use the research completed in Activity #2 to write articles for the magazine.

Process

The student will:

- Practice the basic techniques for writing narrative, persuasion, and evaluation in a series of writing workshops;
- Explore which techniques are best suited for sharing their research;
- Select a genre for sharing their research;
- Use the writing process to produce a final magazine article;
- Use desktop publishing skills to format the article in magazine style;
- Write an informational (feature) story (See Language Arts Activity #3);
- Incorporate scientific and medical understandings of the actual work involved;
- Display the trends using mathematical processes.

Assessment

Collaborative student/teacher evaluation utilizing a rubric developed by the interdisciplinary teacher team and/or the student team.

Culminating Project Activity #4

Writing, Drawing and Advertising

Create advice columns, short stories and poetry and/or develop political cartoons, advertising, comic strips, biographical materials or enactment insights that relate to the theme of the magazine.

Rationale

Focusing on individual student talents and interests, students will create the smaller components necessary for the production of a magazine.

Basic Health Services Connection

The development of the magazine requires certain basic skills for its completion.

Standards Addressed

English-Language Arts: Writing 1.0, 2.0; Listening & Speaking 1.0

History-Social Science: 11.5.4, 11.7.5, 11.8.7, 11.10.7, 11.11.3

Science: Investigation & Experimentation; every discipline for which research topics are selected (e.g., physics, chemistry)

Objectives

The student will:

- Collaborate with others;
- Utilize special talents and interests;
- Synthesize research and present it in a variety of formats.

Process

The teacher will:

- Brainstorm with the class regarding the components of a magazine;
- Facilitate the writing/production process.

The students will:

Collaborate to produce the magazine.

Assessment

Writing rubrics as student/teacher developed criteria

Bibliography / Resources

The St. Martin's Guide To Writing, Rise B. Axelrod and Charles Cooper

School-To-Work. A Student Handbook, Sebranek, Meyer, Kemper and Van Rys

How To Build A Long Lasting Fire: Writing Poems from Your Life, Carol Morrison, NTC Publishing Group, Lincolnwood, Illinois, USA 1997

Poemcrazy: freeing your life with words, Susan G. Wooldridge, Clarkson N. Potter, Inc., New York, New York, 1996

Articles from *Language Awareness* edited by Paul Escholz, Alfred Rosa, and Virginia Clark, St. Martin's Press, 6th Edition:

"Advertising Fifteen Basic Appeals" by Jib Fowles

"The Language of Advertising Claims" by Jeffrey Schrank

"The Hard Sale" by Ron Rosenbaum

Outlooks and Insights, edited by Paul Escholz and Alfred Rosa, St. Martin's Press, 6th Edition:

"How Not To Be Bamboozled" by Donna Woolfolk.

Culminating Project Activity #5

Somewhere in Time

As students research the major contributions of women in science and medicine, they build a timeline for their magazine that pinpoints the key events that led to civil rights victories for women in modern history.

Rationale

A timeline provides students with an historical context for the changing role of modern historical women in the United States.

Basic Health Services Connection

This culminating project activity highlights in a visual manner the remarkable contributions that woman in the 20th century have made in the field of science/medicine. This stimulates a variety of learning styles in the process of gaining awareness.

Standards Addressed

Health Careers: Socioeconomic 1

History-Social Science: U. S. History & Geography 11.5.4; Historical Interpretation 1

Science: Investigation & Experimentation; every discipline for which research topics are selected (e.g., physics, chemistry)

Objectives

The student will:

- Develop an understanding of the contribution women in the United States have made in science and medicine during modern history.
- Identify the key events in modern U.S. history that have led to greater opportunity for women, specifically in science and medicine.

Process

The student will:

- Use data from the research on an individual woman scientist to construct a timeline;
- Determine key events in the civil rights of women;
- Analyze the timeline for patterns that led to increased opportunities for women in general, and specifically for women in science and medicine;
- Represent these patterns graphically on the timeline;
- Develop the layout of the timeline to be used in their magazine;
- Use the timeline to provide an historical context for individual women in science and medicine that students research.

The teacher will:

Divide responsibilities for development of the timeline among subject areas. Responsibilities might include:

1. Research an individual woman in science and/or medicine;

2. Identify key events in modern history that provide increased opportunities for women;
3. Analyze historical patterns represented on the timeline;
4. Determine how the timeline will be formatted and utilized in the magazine.

Assessment of Process

- The teacher will check the progress of the students as they research and develop the timeline;
- The students will assess their own progress at various times during their research, both in student groups and with the teacher.

Final Assessment

The final assessment of the timeline will occur when the magazine is evaluated.

Suggested Bibliography / Resources

Textbooks

Internet

Scholastic Timelines: The United States in the Twentieth Century, by David Kubel

The Usborne Book of Scientists from Archimedes to Einstein, 1992 (Usborne)

Women of Science: Righting the Record, 1990 (Indiana University)

Portraits for Classroom Bulletin Boards, 1992 (Dale Seymour Publications)

American Profiles: Women Scientists, 1991 (Facts on File)

Marie Curie, Brave Scientist, 1983 (Troll Associates)

*Elizabeth Blackwell, The First Woman Doctor,*1982 (Troll Associates)

The Story of Rachel Carson and the Environmental Movement, 1990 (Children' Press)

Who's Who in American Science

Scientific Journals

Personal Interviews of Women

Culminating Project Activity #6

Breaking News: By Women and for Women

Interview or gather data continuing to write articles in the magazine on the status of women **today.** The article may be a current medical woman's contribution or an issue/need that women should recognize and implement.

Introduction

You researched and perhaps witnessed the improved status of women in history. You have documented their progress through scientific and medical breakthroughs in spite of obstacles they have had to overcome. Often they have not been allowed formal credit for their work or to call attention to themselves, apply for patents or money, or push for medical research relating to women's health and well-being. Generally speaking, women's accomplishments have been denied, concealed, or ignored. Often it took women's insights and contributions before women's health issues were addressed and female health status was improved. What are improvements and concerns for women in today's medical arena?

Rationale

Students will understand the current status of women and provide a relevant women's resource through updates in the magazine for their own health and/or for medical professionals.

Objective

The student will relate his/her knowledge of the evolution of women's medical/science status to current careers and health issues improvements.

Process

The student will analyze the current status of women by:

- Gathering data from interviews, newspapers, magazines, Web sites that reveal women's contributions;
- Using information from interviews, newspapers, magazines, Web sites on concerns or issues that women need to undertake for themselves (research needed, sparse services , education and counseling for empowerment, insurance coverage for testing such as mammography and bone density);
- Using the question sheet as a guide;
- Exploring the impact or need of a contribution;
- Using data and/or graphs to analyze trends;
- Continuing to post reports in the magazine of the breaking women's medical news showing accomplishments (both careers and issues).

Assessment

Rubrics for the magazine articles

Questions

Choose from the following questions to illustrate the present-day status of women in medicine or science research.

1. What careers have recently opened up to women?

2. What opportunities remain in demand that opened up in the history you studied?

3. What are the working conditions of these careers? Have these conditions changed? Are they different for women than for men?

4. What impact do these careers have on women physically and emotionally (for example, prestige)?

5. Are these careers desirable? For what reason?

6. How does gender affect patient relationships?

7. What needs to be changed for women? How can one be pro-active for the cause?

8. What in history can be used for a current health career-related cause?

9. What are women currently producing in research or medicine?

10. What research topics have been overlooked that are currently needed for women's health? (e.g., birth control, child delivery, breastfeeding, osteoporosis, diet, hormonal interactions with the heart and general body chemistry)

11. What image is being portrayed of health careers that women can pursue?

12. What money and services are being provided for educating women how to take control of their own bodies? Is it enough?

13. Are women being used for current clinical pharmaceutical trials or are doctors prescribing drugs without knowing how they will react on women?

14. Is there enough money to fund research on topics and clinical trials that are important for women?

15. Is there research that can be pursued for men that would free women of total traditional one-sided responsibilities? (e.g., some birth defects from the father are being unveiled; birth control research has previously been for women only).

English-Language Arts Activities

English-Language Arts Activity #1

Literature

Read an essay, short story, or excerpt from a longer piece of literature that deals with women in health careers during modern history.

Rationale

Literature contains a variety of accounts regarding the impact women have had on health care in modern history. Students must have the opportunity to expand their knowledge through exposure to appropriate literature.

Basic Health Services Connection

This activity is contains both a research component and a skill-building component.

Standards Addressed

English-Language Arts: Reading 3.0, Listening 1.0, Speaking 2.0

Objectives

The student will:

- Read literature to create awareness of women in health care;
- Demonstrate new understanding gained from literature.

Process

The student will:

- Complete a "Quick Write" as an "into" strategy about what comes to mind when hearing the words "doctor" or "surgeon"; discuss perceptions in pairs and/or small groups;
- Create a class inquiry chart: what we know about women in health care in modern history, what we would like to know, and other questions about the topic ("Hot Topic");
- Read assigned literature selection;
- Keep a response log of the reading;
- Discuss response logs/literature in small groups;
- Make a presentation about literature focusing on the roles of women in health care;
- Return to the inquiry chart, after the various presentations, and add new inquiries as well as revise the "What we know…" section. *

Assessment

- Completion and discussion of response logs;
- Evaluation of student presentations utilizing a teacher- and/or student-generated rubric.

Bibliography / Resources

"Shaman" chapter from *Woman Warrior* by Maxine Hong Kingston

Raisin in the Sun (excerpt about desire to be a doctor) by Loretta Lansbury

The Remarkable Lives of 100 Women Healers and Scientists, (20th Century Women) by Brooke Bailey

Healers and Researchers: Physicians, Biologists, Social Scientists (Remarkable Women, Past and Present) by Judy Mc Clure

*Refer to Language Arts Appendix 1 following this section for strategy description.

English-Language Arts Activity #2

Viewing / Reviewing / Evaluative Writing

View a documentary or commercial film/T.V. video.* Read a book or attend a play, and then write a review for the culminating magazine project.

Rationale

Documentary and commercial films, T.V./videos, dramas, and books reflect the roles as well as society's perceptions of women in society and in the health-care industry. Reviewing these genres will heighten students' personal awareness and develop evaluative skills.

Basic Health Services Connection

This activity is contains both a research component and a skill-building component.

Standards Addressed

English-Language Arts: Reading 2.0, 3.0, Listening & Speaking 1.4, Writing 2.0

Objectives

The student will:

- Gain an understanding of women in the health-care industry;
- Discuss and compare criteria for what makes a good documentary film, commercial film, book, and play;
- Write a review of a book, film, or play.

Process

The student will:

- Brainstorm a list of books and/or documentary or commercial films available (with the appropriate rating) to view in class or at home;
- Research any local plays that might focus on the project theme;
- View a video or a play, or read a book individually or in small groups;
- Record notes while viewing or reading, noting roles of women in the selected genres;*
- Discuss how well the film, book, or play met the generated criteria;
- Write an evaluative essay, using the writing process, in the form of a book review or film review.

Assessment

Completion of Evaluative Writing rubric.

Bibliography / Resources

Race of the Double Helix (book) and the film, "Double Helix"

Miss Evers Boy (play and film/video)

**Refer to Language Arts Appendix 2 & 3 following this section for strategy descriptions.*

English-Language Arts Activity #3

Write a Magazine Feature Article

Write a magazine feature article about the changing roles of women in health careers.

Rationale

Students need prior experience in different writing techniques, e.g., poetry, personal accounts, description, etc.

Basic Health Services Connection

This activity is contains both a research component and a skill-building component. Both are necessary to develop a high-quality product.

Standards Addressed

English-Language Arts: Writing 1.0, 1.1

Objectives

The student will:

- Develop an understanding of the criteria of a magazine feature article;
- Write a feature article for culminating magazine project.

Process

The student will:

- Brainstorm and select a topic to research for the magazine feature article;
- Conduct research using the library, Internet, interview to gather information about the feature topic;*
- Use the writing process and the MLA or AP documentation to write a feature article for the culminating magazine project.

Assessment

Utilize the feature article scoring guide (students must revise until the feature article has a five or six in the scoring guide).**

Bibliography / Resources:

Internet
Library
Selected magazines to demonstrate formats and components

See Culminating Project description.

* Refer to Language Arts Appendix 4 following this section.

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

English-Language Arts Activity #4

Creating Creative Magazine Ads and Articles

Students write creative pieces for the magazine to illustrate the changing roles of women in health careers.

Rationale

Students develop an understanding of the variety of articles necessary for the production of a magazine.

Basic Health Services Connection

This activity is contains both a research component and a skill-building component. Both are necessary to develop a high-quality product.

Standards Addressed

English-Language Arts: Writing 1.0, 1.1, 2.0

Objectives

The student will:

- Practice writing techniques to explore and present their research;
- Revise, edit and format.

Process

The teacher will:

- Introduce students to some of the techniques used in magazines to persuade, e.g., slogans, bandwagon, etc.;
- Distribute magazine ads featuring women.

The student will:

Choose various types of writing according to interest and subject area: advice column, fiction, poetry, personal account, comic strip, editorial, interview.

Assessment

Utilize student- and/or teacher-generated rubric.

Bibliography / Resources

Articles from *Language Awareness* edited by Paul Escholz, Alfred Rosa, and Virginia Clark, St. Martin's Press, 6th Edition:

"*Advertising Fifteen Basic Appeals*" by Jib Fowles

"*The Language of Advertising Claims*" by Jeffrey Schrank

"*The Hard Sale*" by Ron Rosenbaum

"*How Not to be Bamboozled*" by Donna Woolfolk Cross from *Outlooks and Insights,* edited by Paul Escholz and Alfred Rosa, St. Martin's Press, 4th Edition.

English-Language Arts Appendix

Hot Topic

Video Review Guide

Notable Scenes

Feature Story

English-Language Arts Appendix 1

Name _____

Hot Topic

What I Know	What I Think
What I Wonder	**What I Wish**

What I Know Now (What I Learned)	What I Want to Know More About
How Can This Be Useful?	**Comments / Notes**

English-Language Arts Appendix 2

Student Name_____

Video Title_____

Video Review Guide

What do you think the video is about based on the title? Prewrite.	**What did you find interesting?**
What did you learn?	**What did you already know?**

What was the video about? Summarize.	What would you like to know more about?
How can you use the information from the video?	Comments / Notes

English-Language Arts Appendix 3

Notable Scenes

After/during the viewing of the video, select scenes from the video that:

- Add to the students' understanding of women in the health-care industry
- Meet or fail to meet the criteria this class has established for this kind of video

English-Language Arts Appendix 4

What Makes a Feature Story?

A feature story is:

- **based on thorough research that looks at all points of view regarding an issue**
- **interesting**
- **report writing that identifies all of the important facets of an issue**
- **informative**
- **a piece of writing that evolves out of the research that the writer discovers as he/she researches a topic**

A feature story is not:

- **a slanted story, presenting only one point of view**
- **the writer's opinion of an issue**

History-Social Science Activities

History-Social Science Activity #1

Research Early Women's Victory

Pairs and triads will research one of the early women's victories and present it to the group.

Rationale

Students will familiarize themselves with Women's Rights victories in the 1900s.

Basic Health Services Connection

This activity is a background research activity to development the technical skills necessary to narrow the field of research to the health services arena.

Standards Addressed

History-Social Science: 11.5.4, 11.7.5, 11.10.7

Objectives

The student will:

- Demonstrate understanding of early victories in the struggle for women's equality;
- Link these struggles to later victories.

Process

The teacher will:

- Provide students with a list of Women's Rights victories, 1920 to 1970, from the ACLU http://www.aclu.org
- Ask students to present a mini lesson to the class illustrating an issue and outlining its impact.

The student will:

- In pairs or triads, select one of the "Victories";
- Illustrate the issue and chart its impact;
- Engage in a debate lining up the issues in order of importance (obviously there is no right or wrong way to do this) and give rationale for their movement of issues to various levels of importance;
- Assume the role of a law clerk working for a firm that has just taken on a women's right case and find recent cases, laws, etc. to support that case.
- Take a victory from 1979 to the present and link it to previously gained rights.

Assessment

Students, as law clerks, will present findings in a written summary of previous cases that support one of the modern victories. Assess using Rubric for Assessing a Simulation.*

*Refer to History-Social Science Appendix 1 & 2 following this section.

History-Social Science Activity #2

Oral History

Conduct interviews with people who can relate their experiences about the changing roles and rights of women, particularly in the arena of health care, and then transcribe them to create an authentic historical document.

Rationale

Up to this point, students have learned the **big picture** regarding the history of women's rights. This activity utilizes historical concepts to link students to their community by conducting oral interviews with local citizens who have lived through the changes that occurred during a particular era. Certain guidelines must be followed to help authenticate the document and give it historical significance.

Standards Addressed

History-Social Science: 11.5.4, 11.7.5, 11.8.7, 11.10.7, 11.11.3

Basic Health Services Connection

This activity is contains a research component necessary to develop an authentic document about the changing roles of women in science/medicine.

Objective

The student will learn how to create a working historical document.

Process

The student will:

- Prepare for the interview, make sure the interviewee has been contacted, an appointment has been made, and a period of approximately two hours has been cleared.
- Decide how the information will be gathered—pen and pencil, a cassette recorder or a camcorder. Make sure there are backup energy supplies.
- Make sure all questions have been prepared in advance. Questions should be open-ended. The interview session should not be a conversation. Rather, the interviewee should be allowed to monologue, with the interviewer being as unobtrusive as possible. The location should be a quiet one that will allow for as few interruptions as possible.
- Cover three general sections of information:

❶ First, clearly establish identities of the interviewer and the interviewee:

Interviewer (collect prior to actual interview)

1. name
2. address
3. city, state
4. date of interview
5. location of interview

Interviewee

1. full name
2. address
3. city, state, country
4. phone number
5. birth date
6. place of birth
7. names and birthdates of brothers and sisters
8. overall physical condition

❷ Second, **background information** should be collected to allow placement of the individual in historical context. The interviewer will want to **choose** which of the following topics to cover. The interviewer is by no means restricted to these and will want to ask follow-up questions when the opportunity presents itself:

Parents

1. parents' names
2. residence
3. occupation
4. family life with parents

Childhood Days

1. games played
2. holidays
3. mischief and pranks
4. punishments
5. responsibilities, chores around the house

School Days

1. name and location of schools attended
2. teachers remembered
3. school activities
4. subjects taken

Religion

1. church affiliation
2. church activities
3. recollection of clergyman

Courtship-Marriage

1. rules of courtship
2. wedding

Profession/Occupation

1. type of career
2. career opportunities for women
3. status of women working outside of the home

Military Career

1. enlisted/drafted
2. branch of service

3. years served
4. wars fought/action seen
5. any other military experiences

Household Remedies
1. Medicines and oral cures
2. Old wives' tales
3. First aid and physical/mechanical care

Health Care Available
1. Child birth and child care
2. Facilities
3. Types of care givers

Women in Health Careers
1. During war
2. At home
3. Training
4. Conditions

Community Activities
1. committee positions
2. political positions
3. volunteer services

Social Life
1. weddings
2. funerals
3. parties (picnic, lawn, beach)
4. state/county fairs
5. circuses, carnivals

Hobbies/Sports
1. fishing
2. baseball
3. others

Storms/Disasters
1. when
2. where

Fashions
1. men
2. women
3. children

Transportation
1. auto
2. public
3. other

Business Operation
1. what kind of business
2. length of operation
3. failures
4. ranching/farming

Preparation of Food
1. refrigeration
2. canning, drying
3. gardening, butchering
4. purchasing of food

Others
1. describe race relations
2. describe role of women

❸ Finally, the last part of the interview should cover the **long-range effects** of the period and the particular topic being researched. For example:

"How did you feel about President _____ at the time?"

"Do you think this could ever happen again?"

"Are women more valued now than they were then?"

This is an essential part of the interview and **questions should be developed together** as a group or a class. The final product should be the transcription of the interview.

* Refer to History-Social Science Appendix 3 following this section.

History-Social Science Appendix

Highlights of the ACLU's Record on Women's Rights and Reproductive Freedom

ACLU Women's Rights Victories: 1971–1994

Rubric for Oral Interview

History-Social Science Appendix 1

Highlights of the ACLU's Record on Women's Rights and Reproductive Freedom

1920–1970

http://www.aclu.org/issues/women/womhist.html

1920s. The ACLU successfully appealed the obscenity conviction of one of its founding mothers, suffragist and sex educator Mary Ware Dennett. Her offense: the distribution of her pamphlet, "The Sex Side of Life," a sex education primer for adolescents. At that time, a mother could not legally mail a letter to her daughter teaching her how to use birth control. A high school teacher would feel obliged to close the window shades during a class about human reproduction. At one time, a 57-year-old grandmother was convicted on criminal charges for sending a sex education pamphlet through the United States Post Office.This was the United States in 1929. Mary Ware Dennett stood firm on the principle that contraceptive information should be available to all—men and women, rich and poor.

1937. The ACLU fought for the right of Connecticut schoolteachers on maternity leave to be reinstated in their jobs following the birth of a child. At this time also, the federal court ruled that new clinical information regarding birth control was not obscenity and mailing contraceptive information intended for use by physicians would no longer be illegal.

1940s. The ACLU established a Committee on Discrimination Against Women in Employment (renamed the Committee on Women's Rights) to advocate for legislation guaranteeing equal pay for equal work and opposition to laws prohibiting the use of contraceptives and the distribution of birth control information. In 1942, the American Birth Control League changed its name to Planned Parenthood Federation of America, feeling that the name would be more accepted by the public.

1950s. The ACLU lobbied to secure tax deductions for childcare, arguing that providing such deductions to married couples only if the husband was incapable of self-support constituted "a denial of civil liberties to women." Margaret Chase Smith of Maine became the first woman to be elected to both the House of Representatives and the Senate. She was a consistent supporter of the National Institutes of Health and became known as the Conscience of the Senate.

1964. The ACLU organized the first campaign to repeal New York's abortion law. Attitudes about women and women's roles had been given a new perspective by Betty Friedan in her 1963 book, *The Feminine Mystique*.

1965. The ACLU filed a friend of the court brief in the landmark case of Griswold v. Connecticut, in which the Supreme Court struck down a state prohibition against the prescription, sale or use of contraceptives, even for married couples. Earlier, in 1960, the Food and Drug Administration approved oral contraceptives.

1966. The ACLU won a major legal victory in White v. Cook, a challenge to Alabama's exclusion of women from criminal juries. In 1966, the National Organization for Women was founded. It set out to gain rights for women in much the same way that the NAACP fought for civil rights.

1967. The ACLU's National Board affirmed a woman's constitutional right to abortion and called for the repeal of all criminal abortion laws. President Lyndon Johnson also signed executive order 11375 stating that persons could not be discriminated against because of sex, race, color, religion, or national origin.

1970. The ACLU was instrumental in persuading New York State to repeal all statutory restrictions on abortion, the first such action in the country by a state legislature. The ACLU National Board voted to support the Equal Rights Amendment arguing, "Since the 14th Amendment has been available to the Supreme Court for 102 years and still has not been applied against sex discrimination, the ACLU believes it is time to fashion a new method . . . designed specifically to end discrimination against women . . . ." *Ms.* magazine was first published in 1971 by Gloria Steinem in an effort to inform American women about the women's rights movement.

What Every American Should Know about Women's History by Christine Lunardini, Ph.D. Adams Media Corporation, Holbrook, Massachusetts, 1997

History-Social Science Appendix 2

ACLU Women's Rights Victories

1971–1994

http://www.aclu.org/issues/women/victorywo.html

1971. The U.S. Supreme Court for the first time invalidated a state law that discriminated on the basis of sex.

1973 . The U.S. Supreme Court declared that Social Security coverage must extend equally to the survivors of working women and men.

1973. The Supreme Court declared unconstitutional the government's practice of granting benefits to all married men serving in the armed forces, but not to servicewomen unless they could prove that they provided three fourths of the family's support.

1975. The Supreme Court ruled unconstitutional a state regulation denying pregnant women unemployment compensation.

1978. The Supreme Court declared illegal an entrenched practice of our nation's insurance companies, which used sex as a factor determining premium rates for a wide range of insurance benefits. The practice affected millions of women, and was especially harmful to elderly women.

1982. The Supreme Court declared illegal Mississippi's maintenance of female-only nursing schools on the grounds that no such facility was provided for men, and because it perpetuated the stereotypical view of nursing as "women's work."

1983. American Cyanamid settled, before trial, a 1979 suit brought against its policy of excluding all fertile women from certain positions that exposed them to toxic substances unless they provided proof of sterilization, and demoting or transferring women who refused to be sterilized.

1984. The thousands of working women insured be TIAA-CREF won a change in its sex-based annuity plans, which had required that women contribute the same amount of money as men, but recoup less money upon retirement.

1986. The Eleventh Circuit invalidated a trucking company's over-the-road driving experience requirement that operated to exclude women from truck driving jobs.

1988. A Pennsylvania appellate court invalidated, under the state's ERA, a law that authorized gender-based insurance rates. The Commonwealth Supreme Court affirmed in 1989.

1989. The Federal District Court in New York enjoined The New York State Educated Reportment of relying solely on the Scholastic Aptitude Test (SAT) in the award of state merit scholarships on the grounds that the test discriminates on the basis of gender.

1991. In the "most important sex discrimination case in 25 years," the Supreme Court ruled in UAW v. Johnson Controls that employers cannot bar all fertile women from workplaces where they might be exposed to toxic substances. Employers must make the workplace safe for all workers.

History-Social Science Appendix 3

Interview Rubric

	Awesome	Acceptable	Minimal	Unacceptable
Preparation	At least 10 clear and easy-to-understand questions that prompt interviewee to give you the information you seek. Make sure questions require more than yes/no responses.	At least 8 clear and easy-to-understand questions that prompt interviewee to give you the information you seek.	At least 7 clear and easy-to-understand questions that prompt interviewee to give you the information you seek.	Questions are not always clear; information rambles.
Organization	Introduce interviewee and clearly describe research project. Ask interviewee for permission to share information with others. Refocus interviewee if he/she strays from the topic.	Introduce interviewee and describe research project. Ask interviewee for permission to share information with others. Attempt to refocus interviewee if he/she strays from the topic.	Introduce interviewee and describe research project. Ask interviewee for permission to share information with others.	Introduction of interviewee and request for permission to share information are omitted or unclear.
Content	Answers to questions paint a picture of a specific time and place in history laced with personal anecdotes and interpretations. Questions lead interviewee to share firsthand information. Interviewer skillfully asks follow-up questions.	Answers to questions paint a picture of a specific time and place in history laced with personal anecdotes and interpretations. Questions lead interviewee to share firsthand information.	Answers to questions paint a picture of a specific time and place in history.	Answers and questions do not paint a specific picture.
Presentation	Tape is clear with long pauses edited out. Interviewer enthusiasm is evident. Listener gains new insights into another place and time.	Tape is clear with long pauses edited out. Interviewer enthusiasm is evident.	Tape is usually clear with long pauses edited out.	Tape is unclear; long pauses are left in.

Mathematics Activities

Math Activity #1

Sleeping Like a Baby

Students are given a table of average sleep times as a function of age. They review some basic math skills to complete the table, and then make a scatter-plot of the data to view the overall pattern. Students will construct another scatter-plot of a linear subset of the data, investigate and explain its slope, and make some conjectures about extensions of the data. Finally, they will have the chance to use some of their own data to work on a similar problem. The teacher note page contains suggestions.*

Rationale

Data analysis is an important part of technically based careers in today's economy, and careers in health are no exception. The most important goal of the math work found in this activity is to get students used to dealing with data. Students will be expected to make careful scatter-plots of data provided, and then use some Pre-Algebra and Algebra 1 skills to analyze trends and describe mathematically the nature of change.

Standards Addressed

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

Basic Health Services Connection

This activity is designed to provide technical background and the practice necessary to develop skill in reading and analyzing propaganda. This skill is vital in the development of a high-quality culminating project.

Objectives

The student will:

- Use the mathematical ideas of dispersion of data to summarize and communicate information from data;
- Construct and draw inferences using charts, tables, and graphs that summarize data.

Process

The student will:

- Utilize information from student page;*
- Complete a scatter plot to view overall pattern;
- Construct a second scatter plot using data from student page;
- Investigate, explain, and make conjectures regarding extensions of the data;
- Construct a third scatter plot using student's own data.

Assessment

- Presentation of data analysis.

Bibliography / Resources

- Textbook
- Teacher Notes*

*Refer to Mathematics Appendix 1 & 2 following this section.

Math Activity #2

Working Mothers

From the table of data provided on the student page regarding working mothers, students will graph both sets of data individually and on the same graph make comparisons and predictions about the trends. Students should look at the entire set of data as a whole, as well as look at segments or key points to investigate how data can be manipulated to represent various opinions. The teacher note page has suggestions for student work.*

Rationale

Statistical methods are used to organize, analyze, display, and draw conclusions about the data collected. The student will make comparisons and predictions about the trends of working mothers with children under age 3 and those with children under age 6 from data reported in the *Los Angeles Times* on May 11, 1998.

Standards Addressed

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

Basic Health Services Connection

This activity is designed to provide technical background and the practice necessary to develop skill in reading and analyzing propaganda. This skill is vital in the development of a high-quality culminating project.

Objectives

The student will:

- Use the mathematical ideas of dispersion of data and measures of central tendency to summarize and communicate information from data;
- Construct and draw inferences using charts, tables, and graphs that summarize data.

Process

The student will:

- Use the data provided on the student data page;*
- Create a scatter-plot and find the line of best fit to predict future trends for each data set;
- Use a median/median line to predict in a different way;
- Experiment with using various key points to predict trends;
- Look at the data sets together on the same graph to make a comparison;
- Compare results with others to see how conclusions can vary;
- Look at issues in society that may have influenced the data; design and present data graphically and in writing to communicate the information.

*Refer to Mathematics Appendix 3 following this section.

Mathematics Appendix

Sleeping Like a Baby

Sleeping Time

Working Mothers

Math Appendix 1

Sleeping Like a Baby

Age	Nighttime Sleeping Hours	Daytime Sleeping Hours	Total Sleeping Hours	Percent of Time Spent Sleeping
1 week	8.5	8		
1 month	8.5	7		
3 months	10	5		
6 months	11	3.5		
9 months	11	3		
1 year	11.75	2		
18 months	11.75	1.75		
2 years	11.75	1.25		
3 years	11	1		
4 years			11.5	
5 years			11	
6 years			10.75	
7 years			10.5	
8 years			10.25	
9 years			10	
10 years			9.75	
11 years			9.5	
12 years			9.25	
13 years			9.25	
14 years			9	
15 years			8.75	
16 years			8.5	
17 years			8.25	
18 years			8.25	

Math Appendix 1a **Student Page**

Sleeping Like a Baby

Source: Children's Hospital of Orange County, printed in the *Los Angeles Times*

The information in the table on the previous page comes from an article on sleep published in the *Los Angeles Times*. It presents data for a large number of children compiled by the Children's Hospital of Orange County. These are averages; we would expect some children to sleep more and some less.

Start by completing **Total Sleeping Hours** and **Percent of Time Spent Sleeping** columns in the table.

- About what **fraction** of the day do newborn babies spend sleeping according to the table?
- By the time children grow to 18 years, about what **fraction** of the time is spent sleeping?
- How old are children when they sleep about one-half of the day?

Make a scatter-plot, a graph showing the individual points of the data for **Total Sleeping Hours vs. Age**. You will have to plan so that all the data fits on a single graph. Discuss with your group how to express all the ages in the same units, probably years. Ask yourself, what part of a year is one week? You will also need to decide which variable, age or sleep time, belongs on the *x*-axis. We call that variable the "independent variable" and say that the other "depends" on it. The "dependent" variable belongs on the *y*-axis. Do not try to connect the data points; just visualize a smooth curve that would run through all the points.

What would happen to the curve if we collected data for adults and extended the data out over the whole human lifetime?

Age in Years	Total Sleeping Hours
5	11
8	10.25
11	9.5
14	9
17	8.25

What immediate difference do you see between the two graphs?

Looking back at the graph, you can see that the data from ages 5–12 lies nearly on a straight line. It is not nearly as curved as the data from birth to age 5.

Can you find one line that goes exactly through the five data points?

If you made some careful trials at finding one line that passed through all five points, you should conclude that none works exactly. Draw a light pencil line on the graph that passes through the first and last points. It misses the three middle points, but not by much. Using the table, answer the following two questions:

❶ How much does the age change as a child grows from 5 to 17 years?

❷ How much does the average sleep requirement change during that same period?

Carefully divide the change in sleep required by the change in age. Note that the change in sleep required is a negative number—it gets smaller as age gets larger. We are finding the vertical change divided by the horizontal change, a very important algebraic quantity called "slope." You may already have used the word slope in an algebra class. It is the ratio of rise to run, or the change in *y* divided by the change in *x*.

❶ What are the units of the slope in this problem? That is, what are we dividing by what?

❷ In your own words, explain what the slope means in this situation.

❸ Again, in your own words, explain why the slope is negative in this situation.

Finally, look back at the first graph you made. Draw a light line through the data points (5,11) and (17,8.25) and extend it back to the *y*-axis where age equals zero. Where does that line cross the *y*-axis?

Your answer should be about twelve hours for this *y*-intercept, much less than the 16.5 hours of sleep found in the table. It is important to realize that our linear model only works for a portion of the data. If you or the class have access to a graphing calculator, you can check the your work by experimenting with an equation in the y = menu. Use the slope and *y*-intercept you found and see how close the result comes to the two points. If we looked at the data from ages 30 to 50, what do you think the slope might be? Why?

The tablebelow is similar to the one we looked at on the first page of this exercise. This data comes from a standard graph used by most pediatricians. It lists the median weight for males up to six years old. Try to find and fill in the missing data in the column for average heights. Make a table similar to this one for data on females.

Age	**Weight(lb.)**	**Height**
0	7	
3 months	14	
6 months	18	
9 months	21.2	
1 year	23	
18 months	26	
2 years	28.5	
3 years	33.2	
4 years	37.7	
5 years	42	
6 years	46	

❶ Make four separate scatter-plots, one for each set of data. In each case, notice that the data is somewhat linear from age two to age six. This is relatively true for the age versus weight comparisons.

❷ In each case, find the slope of the lines connecting the two- and six year-old values.

❸ Explain in writing the meaning of this statistic.

Math Appendix 2 **Teacher's Notes for Use with Sleeping Like a Baby**

Sleeping Time

The math activities in this section offer a chance for some review of fractions, decimals, and percent concepts in filling out the initial table of sleep data. This is a good opportunity to discuss accuracy as it relates to information from measured data.

Newborns sleep about 2/3 of the time. You or some students may want to use 16.5/24 and simplify that to 33/48. Keep in mind that this data is rounded to the nearest 15 minutes.

At 3 years of age the sleep requirement is about 12 hours or ½ of the day. At 18 years, we require about 1/3 of the time.

There should be discussion about the difference between independent and dependent variables as students lay out the first graph. They will need time to work out the conversions of weeks and months into years. One week is 1/52 or 0.0192 years, while one month is 1/12 or 0.0833 years.

If the data were collected and extended, it would continue to fall, perhaps only slightly, with a rise again toward the onset of old age.

The new graph is more nearly linear. There is no one line that contains all five of the data points.

The goal in the last graph is to calculate and explain the meaning of slope in this example. The slope is (11-8.25) ÷ (5-17) = -0.229 hours per year or –13.75 minutes per year. The slope tells us that, on average, the sleep requirement decreases about 14 minutes each year over this age span. It is negative because the sleep requirement decreases.

The results will vary according to the data sets found or provided. If you like the idea, you could have students bring in as much height versus age by gender data as they can collect and plot it on a large graph in the classroom. There will certainly be an excess of data from school age friends, but if enough students collect information from infants, adults, and elderly friends and relatives, they will begin to see the pattern of dispersion around the mean values. It makes a striking image if the class gets enough data.

Math Appendix 3 **Student Page**

Working Mothers

The table provided below was taken from an article in the *Los Angeles Times* published on May 11, 1998. The article reports statistics on the percentages of working mothers with children under the age of three compared to those with children under the age of six.

Part 1

❶ Plot each set of data on its own graph using appropriate scales. For each graph, find the following:
- Line of best fit
- Median/median line

❷ Experiment using various groups of points to find the best estimate of future trends:
- What line best fits the data? Justify your answer.
- Make a prediction of what you would expect to see in the future. Compare your results with others in the class.

❸ Now, plot both sets of data on the same graph. What do the two graphs tell you? What could contribute to their similarities or differences?

Year	Children Under 3	Children Under 6	Year	Children Under 3	Children Under 6
1997	61.8%	65.0%	1985	49.5%	53.5%
1996	59.0%	62.3%	1984	47.7%	52.1%
1995	58.7%	62.3%	1983	46.0%	50.5%
1994	57.1%	60.3%	1982	45.6%	49.9%
1993	53.9%	57.9%	1981	44.3%	48.9%
1992	54.5%	58.0%	1980	41.9%	46.8%
1991	54.5%	58.4%	1979	40.9%	45.4%
1990	53.6%	58.2%	1978	39.1%	43.7%
1989	52.4%	56.7%	1977	35.1%	40.9%
1988	52.4%	56.1%	1976	33.8%	39.8%
1987	52.9%	56.7%	1975	34.1%	38.8%
1986	50.8%	54.4%			

Source: U.S. Bureau of Labor Statistics

Part 2:

Prepare a presentation of your conclusions and predictions. This should include tables and graphs as well as any supporting materials to justify your opinion. Show the calculation details.

Math Appendix 3a **Teacher Notes**

Working Mothers

This activity would work very well as a small group assignment. The following are given as suggestions to guide students:

- A graphing calculator is helpful for examining the data. Students can experiment with entering various equations for a line of best fit.
- The regression feature of the calculator can also be used for more exact equations.
- The median/median line can be found by dividing the data into groups of 8-7-8 and calculating three summary points or averages of both the *x* and *y* values for each point.
- Students can also experiment with finding the slope between various points on the graph to determine an overall pattern of data increase/decrease.
- Each student/group may be assigned a different method or point to vary the conclusions.
- Colored pencils can be used in Part 1 to make a distinction between the two data sets.
- Assessment can be either class presentations of results or a written report turned in to the teacher as time in your schedule permits.
- Students can find additional data sets from print or Internet research for further study.

Science / Health Careers / Language Arts Activities

Science/Health Careers/Language Arts Activity #1

Writing a Biography

Students research a woman scientist and/or medical professional in the United States during modern history and then write her biography.

Rationale

Through research, students will begin to understand the significant contributions women have made in science and in medicine.

Standards Addressed

Health Careers: Communicating & Decision Making 4

English-Language Arts: Writing 1.0, 2.0; Reading 3.0

Science: Investigation & Experimentation; every discipline for which research topics are selected (e.g., Chemistry, Physics)

Basic Health Services Connection

This culminating project highlights the remarkable contributions that woman in the 20th century have made in the field of science/medicine. During this research, students will discover career connections that may otherwise not have been apparent.

Objectives

The student will:

- Research the life of a woman in science and/or in medicine;
- Understand the "science" of her contributions;
- Determine how historical events influenced the opportunities available to women during modern history;
- Develop an awareness of the problem solving skills of scientists and the scientific method;
- Understand how to write an interesting/creative biography (see Barbara McClintock "Letter of Introduction").*

Process

The student will:

- Select a woman scientist who has made significant contributions to the field of science and/or medicine to research;*
- Write a biography for the magazine.

Assessment

The student will:

- Use a rubric to evaluate and revise each biography to be used in the magazine.

The teachers in Science, English-Language Arts and Health Careers will:

- Evaluate the depth of the student's research and the quality of the writing;
- Assess the student's understanding of the "science" of the woman's contribution.

*Refer to Science, Health Careers, Language Arts Appendix 1,2,3 following this section.

Science / Health Careers / Language Arts Activity #2

Jumping Genes

Students act out transposition—the process of genes jumping—discovered by Dr. Barbara McClintock.

Rationale

Dr. McClintock is a role model in science and medical research. Students need to understand how her knowledge of jumping genes transformed our medical understanding of the human expression of genes (such as disorders) as well as bacterial expression (such as antibiotic resistance), and how her research has enabled biotechnology to perform for medicine.

Standards Addressed

Science: Investigation & Experimentation 1; Chemistry: Organic Chemistry & Biochemistry 10a; Biology/Life Science: Cell Biology 1 h, Genetics 4c, 5a, 5e

Basic Health Services Connection

The culminating project highlights the remarkable contributions that a particular woman in the 20th century made in the field of science/medicine. During this research, students will discover career connections that may otherwise not have been apparent.

Objectives

The student will:

- Understand the process of transposition;
- Utilize medical conditions to apply McClintock's principles.

Process

Genes that Code for Colors

The student will:

- Be assigned parts (colors). Students can become purple, pink, yellow, black, white;
- Line up as a chromosome and hold up color cards (Let the arrangement be creative.);
- Yell their color or wave their color sign until they are silenced from expressing the color.

Ds gene (Dissociator Gene)

The student will:

- Jump from one area of the "people chromosome" where it lands beside one of the genes that codes for color and turns it off. In other words, it reinserts itself further along the chromosome and inactivates the neighboring gene.

Ac gene (Activator gene)

The student will:

- Signal (yell) for the Ds gene to transpose itself (jump along the length of a chromosome).

Other skits using the jumping genes

The student will:

Act out jumping genes:

- that gives disease-causing bacterial antibiotic resistance;
- in bacteria stopping the production of enzymes;
- that turns normal cells into cancer;
- that stops producing particular types of brain cells after a fetus is developed;
- that might be able to move from antibiotic resistant bacteria in meat to human DNA.

Assessment

Evaluate how well students understand transposition by using the rubric.*

Adapted from:

1. *Barbara Mc Clintock, Pioneer of Modern Genetics,* both the student notebook and teacher's resource book as well as the video from IMG
2. Gardner, April L., "Barbara McClintock, Geneticist 1902-1992," University of Northern Colorado: Greeley, Colorado

* Refer to Science, Health Careers, Language Arts Appendix 5 following this section and the Assessment Appendix at the end of the project.

Science/Health Careers/Language Arts Activity #3

Day in the Life

Role play a day in the life of the woman in science and/or in medicine that the students have researched exhibiting the active scientific method used and/or the medical processes.

Rationale

Students will understand the significant contributions and processes women have made in science and medicine by developing a role-play of one woman's work.

Standards Addressed

Science: Investigation & Experimentation; every discipline for which research topics are selected (e.g., Chemistry, Physics)

Basic Health Services Connection

This activity highlights contributions that woman in the 20th century have made in the field of science/medicine and will enrich the background understanding of the student.

Objectives

The student will:

- Understand the "science" and "medicine" of the woman's contributions;
- Participate in a demonstration or a skit, in character and with props, displaying accomplishments and procedures;
- Use the problem-solving skills of science and medicine as depicted for the chosen woman.

Process

The student will:

- Become the scientist studied, "dressing the part" in relation to the life and times;
- Conduct a demonstration or laboratory experiment, in a short skit (5–15 minutes) of their chosen woman, that relates her major contribution to science and/or medicine;
- Present props or have equipment available to solicit participation from members of other teams (discussion of life scenarios, scientific method or lab experiments conducted);
- Submit a list of needed lab materials in advance of the presentation date;
- Field questions from the class on how the student, as the scientist, sees the changing image of women scientists, what biases there are, what factors influence how one becomes a scientist, the thinking behind the process of the science/medical methods used;
- Express in the magazine, the depth of their being and the scientific/medical thought crystallized from the enactment.

Assessment

Students evaluate their own projects by filling out "Notes and Evaluation Form," (referring to the rubric). Each student will fill out this form for the students' presentations that they view (2 Appendices). Teachers score the presentation rubric for each student.*

* Refer to the Science/Health Careers/Language Arts Appendix 4,5,6 following this section.

Science / Health Careers
Extended Activities on Transposition

Rationale
Advanced students, or students who are involved with Dr. McClintock's research, will benefit from further study.

Extended Activities on Transposition
❶ Dr. McClintock's observations and reasoning came from corn. Ears of Indian corn (maize) from a dihybrid cross can be obtained from most scientific supply houses. Students may do a lab by counting the various colors (purple is dominant to yellow) and textures (smooth is dominant to wrinkled). They complete the classical Mendelian genetics for what they expect for the corn by building a Punnett square for purple smooth, purple wrinkled, yellow smooth, yellow wrinkled. Run a Chi-square value (math section biotech unit) by inputting numbers from each of the four expected phenotypes and the actual observed number counts.

❷ Wisconsin fast plants (from Carolina Biologicals) can also be used in a similar manner, but students may fertilize and grow their own first filial generation in fast order (40 days from seed to mature plant).

❸ For advanced students in chemistry, AP Biology, Anatomy/Physiology, there is an excellent series dealing with the following topics:*

1. What is a transposon?
2. What do you know about DNA structure?
3. Thinking about transposons

❹ Research the current work that scientists are doing on transposases (the enzyme necessary for transposition), DNA structure or medical applications of the transposition knowledge. Plan an activity around the current medical research topic.

Standards Addressed
Science: Investigation & Experimentation 1; Organic Chemistry & Biochemistry 10a; Cell Biology 1h and Genetics 4c, 5a, 5e

Health Careers: Communication and Decision Making 4; Ethical and Legal Responsibilities 5

Resources
A video may be purchased from IMG that shows the first two extended activities and addresses women's issues and basic scientific thought.

Note: The entirety of Extended Activities 1–3 and supporting information in Appendix 7 has been adapted from the unit, "Barbara McClintock, Geneticist 1902–1992," developed by April L. Gardner, University of Northern Colorado, Greeley, Colorado.

*Refer to Science, Health Careers, Language Arts Appendix 4 following this section.

Science/Health Careers

Extended Activity #1: What Is a Transposon?

Recognize some characteristics of transposons and to learn about the effects of transposons on gene expression.

Rationale

This activity is most appropriate for an advanced or honors biology class as it assumes that students are familiar with genetics concepts such as DNA structure and base-pairing, chromosomes, genes, and crossing over and that they have a general understanding of gene expression.

Standards Addressed

Science: Investigation & Experimentation 1; Organic Chemistry & Biochemistry 10a; Cell Biology 1h and Genetics 4c, 5a, 5e

Health Careers: Communication and Decision Making 4; Ethical and Legal Responsibilities 5

Objectives

The student will:

- Explain what transposons are and typical characteristics of transposons;
- Explain how transposons can be detected in genomes;
- Note and discuss the consequences of transposition events.

Process

The teacher will:

- Provide some background about transposons (refer to Resource Sheet #1 following this description);
- Supply one copy per student or student group of the "DNA Sequences" (following page);
- Explain that the sequence given shows only the ends of a possible transposon and that the entire internal sequence is not given, since transposons are typically hundreds to thousands of base pairs long (These sequences are 'made up," but are so short that not even an entire DTR is shown; only ITRs can be found.);
- Explain that ITRs must be at least five base pairs long. (Several of the sequences include three- or four-base inverted repeated; those do not count as transposon features.);
- Pose the following questions for class discussion:
  - How can you tell when a mutation has occurred?
  - What kinds of things could have happened to the DNA when a mutation occurs?
  - Why is it important to consider the polarity (3'/5' orientation) of the DNA strands when looking for ITRs?

The student will:

- Work individually or in groups of two to four;
- "Color code" the bases to help identify inverted repeat sequences (optional);
- Answer questions on Activity #1 page.*

* Refer to Science/Health Careers/Language Arts Appendix 7, 7a-c, following this section

Science / Health Careers

Extended Activity #2: What Do You Know about DNA Structure?

Recognize some characteristics of transposons and to learn about the effects of transposons on gene expression.

Rationale

This activity is most appropriate for an advanced or honors biology class as it assumes that students are familiar with genetics concepts such as DNA structure and base-pairing, chromosomes, genes, and crossing over and that they have a general understanding of gene expression.

Standards Addressed

Science: Chemistry; Organic Chemistry & Biochemistry 10a

Objectives

The student will:

- Explain what transposons are and typical characteristics of transposons;
- Explain how transposons can be detected in genomes;
- Note and discuss the consequences of transposition events.

Process

The teacher will:

- Provide 12 paper clips in each of 4 different colors for each group of students;
- Provide the following question for class discussion:
  What part of the transposon does the “stem” region represent?

The student will:

- Work in groups of two to four students;
- Discover and prepare paper clip models of the structures explained in Resource Sheet #2, DNA;*
- Complete Activity #2;**
- Participate in class discussion of questions.

*Refer to Science, Health Careers, Language Arts Appendix 7d following this section.
**Refer to Science, Health Careers, Language Arts Appendix 7e-f following this section.

Science / Health Careers

Extended Activity #3: Thinking about Transposons

Recognize some characteristics of transposons and to learn about the effects of transposons on gene expression.

Rationale:

This activity is most appropriate for an advanced or honors biology class as it assumes that students are familiar with genetics concepts such as DNA structure and base-pairing, chromosomes, genes, and crossing over and that they have a general understanding of gene expression.

Standards Addressed

Science: Chemistry; Organic Chemistry & Biochemistry 10a

Objectives:

The student will:

- Explain what transposons are and typical characteristics of transposons;
- Explain how transposons can be detected in genomes;
- Note and discuss the consequences of transposition events.

Process

The teacher will:

- Provide reference materials on transposons (see References and Resources page following these Extended Activities);
- Facilitate class or small student group discussions utilizing the following questions:
  - Can bacteria that have normal *gal* genes use galactose as a food source? Why/why not?
  - How about those with a mutant *gal* gene?
  - How could "superbugs," bacteria that are resistant to all antibiotics used to treat the infections they cause, have come about?

The student will:

Complete Activity sheet #3: Thinking About Transposons.*

*Refer to Science, Health Careers, Language Arts Appendix 7g-h following this section.

Science / Health Careers / Language Arts Appendix

Barbara McClintock Introduction

Biographical Guide Sheet

Ideas for Writing a Biography

A Day in the Life of a Woman Scientist

Notes and Evaluation Form

Presentation Rubric

Supporting Materials for Extended Activities

Science / Health Careers / Language Arts Appendix 1 **Student Handout**

Letter of Introduction to the Class Barbara McClintock

As an example of a biographical report, you may design a mock letter that can be used to introduce a speaker.

Students:
I introduce to you Barbara McClintock, 1983 Nobel Laureate of Physiology or Medicine, the genius who gave her life efforts to eavesdropping on cells to discover how "cells make wise decisions and act upon them." Her discovery of genes turning on and off by a "jumping turn-on gene" has been the basis of medical genetic discoveries as well as current chemical research of enzymes that govern these genes.

Her toil has not been an easy one in the midst of a research community that could not accept a radical idea that challenged the central genetic dogma, much less one presented by a woman. She graduated from Cornell, received her PhD (1927) from Cornell at age25, continued there as an instructor and finally as a researcher with a fellowship. She was in the botany department because the genetics department would not accept women. She gathered dedicated students and did noteworthy research.

In 1933, she received the prestigious Guggenheim Fellowship to research in Germany, but pre-World War II was bleak and upon her return, the job market was poor and nearly impossible for a woman research scientist. Even though she was perceived as a genius, she did not have the free opportunity of men. Many men thought she had a chip on her shoulder or if they accepted her, they overlooked the fact that she was a woman (one even admitted that). A friend and supporter hired her as a genetics instructor at the University of Missouri. Even though she was successful, she knew she would lose her job when he left. That awareness led her to leave after five years (1936–42).

In 1942, she was hired for a one-year position by the Carnegie Institute at Cold Spring Harbor, NewYork, and has remained there. In 1951, McClintock presented a paper on "Jumping Genes, or Transposons" which was rejected by her peers. This experience changed her life. She said: "It was just a surprise that I couldn't communicate; it was a surprise that I was being ridiculed, or being told that I was really mad. And it required a readjustment." For 30 years, she adhered to a selfless life-style probing the genome until "modern genetics" proved her theory that moving controlling elements carried new instructions in bacteria and, with time, she was respected. In the meantime, she had become an isolationist, remaining by her honesty and adhering to her own values, solidly based on observation and the truth of her findings through the scientific method.

The world's knowledge finally caught up with Mc Clintock's thinking and she was welcomed into the nearly all men's world of Nobel Laureates.

What a pleasure for us to welcome and honor Dr. Mc Clintock, the model of true persistent scientific research despite adversity, the sage for genetic disease discoveries and an early pioneer for women in a hostile world. We will listen to your world of scientific joy and to your insights of respect for the scientist (particularly a woman) in order to attain medical progress. Let us give a hand for the Nobel Laureate Barbara McClintock.

Science / Health Careers / Language Arts Appendix 2

Biographical Guide Sheet

Student Name_____ Scientist's Name _____

Science Field/Discipline _____

Date of Birth _____ Birthplace_____ Date of Death (if applicable)_____

Describe the early life of the scientist.

Comment on:

Family (occupation/education level of the scientist's parents, siblings, spouse, children, etc.)

Hobbies (personal traits)

Formal and informal education

Work experience

Awards/Honors

Struggles/Successes

Associations with other scientists; comments regarding who influenced the scientist

Scientific research and discovery, and the significance of her work

Major contribution(s) to science/medicine and how they affect our daily life

Additional information

Science/Health Careers/Language Arts Appendix 3 Student Instructions

Ideas for Writing a Biography

Here is a list of possible ideas you might research before writing your biography on a woman in science and/or medicine.

Personal time-line for the scientist, highlighting personal and professional life.

Birth Certificate/Announcement. Create a certificate/document with appropriate information including a footprint (use a baby brother/sister's foot to print on the certificate, or a photocopy of a footprint which is cut/pasted onto the certificate or even a rubber stamp of a footprint).

Diary entry, journal entry or letter written by the person as a youth revealing information about personal life and interests.

Resume with pertinent information such as: education; work experience; professional skills; honors, awards and achievements; activities and interests, etc.

Request for proposal from the scientist. The letter must include a program description, benefits to society, and budget.

Newspaper article written on the day of the scientist's most important discovery. The artiele should include information on the discovery and/or events leading to the discovery made by the scientist. Remember, if the scientist is from the 1800s your newspaper will not have been typed on a computer and should look older (blot with tea, coffee, or spray with lemon juice and iron). This could also be in the form of a radio announcement or infomercial featuring the scientist and her work.

Televised Newscast. If your scientist is from years past ("Newscast from the Past"), you could film the clips in black/white or sepia. Also with video imaging tools such as AVID cinema and other software you can make the video look as though it is older or filmed on 16mm film.

Letter written by the scientist to a colleague which contains specific details of a current project /experiment and may ask questions of the colleague.

Letter of recommendation from the scientist's high school science teacher for college or a job interview.

Speech or article written by the scientist for a presentation at a scientific conference or publication.

E-mail or letter of introduction from the scientist to our classroom. If the scientist is no longer alive, then write the letter as if she were alive today.

Color photos (can be photocopied and colored or sketched) of the scientist working in her lab and/or on her discovery.

Scientist's research logbook (or page) showing some of the notes, comments, and scientific calculations of the scientist.

Request to a scientific supply company for equipment and supplies needed to conduct the experiments (could be in the format of an order form).

Diary or journal entry describing the struggles and challenges of being a woman in the sciences.

Wedding announcement/invitation and other personal items belonging to the scientist.

Genealogy information—family tree or family story.

Obituary including an epitaph as seen in the local newspaper or publication. This could be in the form of a news announcement and then videotaped.

Science/Health Careers/Language Arts Appendix 4 Student Instructions

A Day in the Life of a Woman Scientist

In 1903, Marie Curie was awarded a Nobel Prize in physics. This was the first time a Nobel Prize was awarded to a woman! Ever since, women have been making instrumental strides in the field of science and medicine. Women have always been involved in these fields, but you may not realize this based on the images available through the media or textbooks. Although textbooks are getting better at providing an inclusive curriculum, they often present women in such a way that their achievements in medical science may be de-emphasized (or omitted) and there is lack of connections/cohesiveness to other work done in these particular fields.

In this activity, you should tap into the experience of what it is like to be the scientist/medical professional you researched and allow the "scientist"/"medical professional" within you to emerge. Express what it is like to work in the field of men, not to be recognized, and to overcome obstacles in pursuing a scientific or medical career.

Decide on how you will portray the individual you have researched. Dress the part and be creative to present in a skit the true woman scientist or medical professional you have researched.

Have props or equipment available to conduct a demonstration or lab experiment or act out something related to the person's contribution. This should enable you to solicit participation from members of other teams. You should encourage discussion of life scenarios, guide thought of the scientific method, conduct lab experiments as a demonstration or guide class experimentation.

For example, a team researching Rosalind Franklin may produce a skit that simulates her X-ray crystallography work (which was instrumental in determining the structure of DNA) and include the actual X-ray (photocopied from book) that comes out of the device (made from cardboard boxes and spray painted to look like a machine). On the other hand, perhaps the team would decide to complete a simple DNA extraction (which relates to the field of science Franklin contributed to). Remember to submit a list of lab materials in advance of the presentation date if materials are needed.

Keep the presentation at 5 to 15 minutes. Prepare to answer questions in the living history (or the present) of your personality. Questions will include the changing image of women, what biases there are, what factors influence how you become a scientist/medical professional, and the thinking behind the scientific or medical processes of your contribution.

Science / Health Careers / Language Arts Appendix 5 **Student Handout**

Notes and Evaluation Form

Name of presenters (team)_____ & _____

1. Name of Scientist _____

2. Major contribution to science/medicine: _____

3. Timeline of date of birth, scientific contribution, death (if applicable):

4. Scientist's field of study: _____

   What do you find fascinating about this field of study? Is this a career field you would like? Why or why not?

5. What questions do you have of the scientist and her team? Write them here then ask them at the end of the presentation.

6. How would you rate the presentation? 3 2 1 0
   (circle one using the presentation rubric) Justify your scoring.

Science / Health Careers / Language Arts Appendix 6 **Student Handout**

Presentation Rubric

Advanced (3)

- Communicates clearly and effectively to an audience in a well-organized, creative, confident way, and enhances presentation with props and visual aides;
- The 3 x 5 cards (if used) do not detract from the presentation;
- Demonstrates thorough and accurate knowledge of the woman scientist;
- Presentation style is polished and professional with appropriate levels of voice and eye contact with audience;
- Meets time requirements.

Proficient (2)

- Communicates clearly to an audience with props and visual aides;
- The 3 x 5 cards (if used) may detract from the presentation;
- Accurately describes some of the knowledge and skills of the particular woman scientist;
- Presentation style incorporates appropriate level of voice and eye contact with audience;
- Meets time requirements.

Basic (1)

- The 3 x 5 cards (if used) may detract from the presentation;
- Attempts to demonstrate sufficient or accurate knowledge of the particular woman scientist;
- Presentation style is weak and unsuccessful in incorporating an appropriate level of voice and/or eye contact with the audience;
- Does not meet time requirements.

Little or No Evidence of Achievement (0)

- The props and visuals were not up to potential as an effective communicator, quality producer and/or-self directed learner;
- The product was incomplete and/or did not thoroughly describe the particular woman scientist.

Science / Health Careers / Language Arts Appendix 7 **Student Handout**

Resource Sheet #1
Transposon

Transposons are segments of DNA that are capable of moving, or transposing, from one region in a chromosome to another. Unlike previously studied genetic rearrangements, transposition depends neither on recombination between homologous DNA sequences nor on the enzymes that assist in that recombination. The so-called "illegitimate" recombination events of transposons occur at unrelated, apparently random sites.

More recent studies of transposons have revealed the following general structure:

Transposons that have been characterized in bacteria, yeast, fruit flies, and corn all have this same general structure. The transposon genes are flanked by direct terminal repeats (DTR) of several hundred bases—the DNA base sequence is repeated in the same order at either end of the transposon. (However, sometimes the terminal repeats are inverted with respect to their sequence.) The ends of the DTRs within the transposons are flanked by shorter inverted repeat sequences (ITRs) of 5 to 30 base pairs. For example, the left end may include the sequence:

5' TAGGCTATGC 3'
3' ATCCGATACG 5'

The sequence of the right end would be reversed:

5' GCATAGCCTA 3'
3' CGTATCGGAT 5'

An element is not transposable if these ITRs are not present. However, transposition also requires the activity of an enzyme known as a *transposase.* Most DTRs also include a gene for such a transposase enzyme. A gene for a protein that controls the transcription of the transposase gene (the repressor) is also usually present. A transposon, which does not include a transposase gene, will not "jump" unless another transposon that carries a functional transposase gene is also present. **Thus transposition requires that both a functional transposase gene and the ITRs are present.**

Between the flanking DTRs, a transposon may include one or more genes for other proteins. For example, most bacterial transposons studied carry one or more genes which make the bacteria resistant to specific antibiotics. Some transposons include regulatory regions of DNA (e.g., promoters). These DNA sequences may cause a nearby chromosomal gene to be expressed, that is, they will "turn on" genes.

Transposons may "jump" in several different ways. Some transpose only by replica-

tion. In this case, the original transposon remains at its site in the genome, while the new transposon inserts into another genomic site. This may interrupt another gene, causing a phenotypic change. The organism now has an additional transposon in its genome. Other transposons are excised from their site in a particular chromosome and insert into another site in the same or a different chromosome. In some cases, excision leads to breakage of the original chromosome and loss of some genes, causing a phenotypic change. In other cases, excision restores the original (pre-transposon) DNA sequence, resulting in restoration of gene function and the corresponding phenotype.

Drosophila melanogaster (fruit fly) genomes have a family of similar transposable elements called *copia* (because they were originally detected as genes that produced a copious amount of RNA). These elements are 5,000 to 8,000 base pairs long, including 276-base pair DTRs. Within the DTRs are 17-base-pair ITRs. The white-apricot eye-color phenotype is due to the insertion of a copia transposon in the white gene. Yeast DNA contains *Ty* transposable elements, which are about 6,000 base pairs long and include 334-base-pair DTRs. Some yeast strains include as many as 35 copies of the *Ty* transposon. Finally, mammals contain a family of DNA sequences known as the *Alu* family. They are flanked by directly repeating sequences, a characteristic of transposons.

Science / Health Careers / Language Arts Appendix 7a **Student Handout**

DNA Sequences
Activity #1

1

5′ A G T T C C A T C C T A A A A A G G G G G C C T A T G C T A C T A C T A A T G A C T G A G 3′
3′ G C A A G G T A G G A T T T T T C C C C G G G A T A C G A T G A T G A T T A C T G A C T C 5′

2

5′ T G T G C C A T G C T A C C A T G G C C A C C T T T G A T A C T A C T A A T T G G C A C A 3′
3′ A C A C G G T A C G A T G G T A C C G G T G G A A A C T A T G A T G A T T A A C C G T G T 5′

3

5′ A G A C T A C T A G A G A G C A C T A G A G G G C G C G A C T A G C G T C A G C T A G C T 3′
3′ T C T G A T G A T C T C T C G T G A T C T C C C G C G C T G A T C G C A G T C G A T C G A 5′

4

5′ A G T C A G G T A T C G C G A A T T A A G G C C T T A C G A C C G C G A T A T A T T A A 3′
3′ T C A G T C C A T A G C G C T T A A T T C C G G A A T G C T G G C G C T A T A T A A T T 5′

5

5′ A G T C G A T A C G T A C G A G A A G G G A C T A C C A G G C T A C T A C G C G T A G A 3′
3′ T C A G C T A T G C A T G C T C T T C C C T G A T G G T C C G A T G A T G C G C A T C T 5′

Activity #1: What Is a Transposon?

Questions to Answer:

❶ Examine the DNA sequences given below. Which one(s) do you suspect include transposons?

1

```
5′  A C T T C C A T C C T  ====================  C T A A T G A C T G A  3′
3′  T C A A G G T A G G A  ====================  G A T T A C T G A C T  5′
```

2

```
5′  T G T G C C A T G C T  ====================  T A A T T G G C A C A  3′
3′  A C A C G G T A C G A  ====================  A T T A A C C G T G T  5′
```

3

```
5′  A G A C T A C T A G A  ====================  T C A G C T A G T C T  3′
3′  T C T G A T G A T C T  ====================  A G T C G A T C A G A  5′
```

4

```
5′  G G T A T C G C G A A  ====================  G A C C G C G A T A T  3′
3′  C C A T A G C G C T T  ====================  C T G G C G C T A T A  5′
```

5

```
5′  A G T C G A T A C G T  ====================  C T A C G C G T A G A  3′
3′  T C A G C T A T G C A  ====================  G A T G C G C A T C T  5′
```

❷ Draw a box around the transposon(s) in the box above. Explain what characteristic makes you believe these represent transposons.

❸ In the box above, underline the inverted repeats of the transposon(s).

Science / Health Careers / Language Arts Appendix 7c **Teacher Page**

Activity #1: Key

1 (no inverted repeats apparent)

```
5′  A C T T C C A T C C T  ==========  C T A A T G A C T G A  3′
3′  T C A A G G T A G G A  ==========  G A T T A C T G A C T  5′
```

2

```
5′  T G T G C C A T G C T  ==========  T A A T T G G C A C A  3′
3′  A C A C G G T A C G A  ==========  A T T A A C C G T G T  5′
```

3

```
5′  A G A C T A C T A G A  ==========  T C A G C T A G T C T  3′
3′  T C T G A T G A T C T  ==========  A G T C G A T C A G A  5′
```

4

```
5′  G G T A T C G C G A A  ==========  G A C C G C G A T A T  3′
3′  C C A T A G C G C T T  ==========  C T G G C G C T A T A  5′
```

5 (no inverted repeats apparent)

```
5′  A G T C G A T A C G T  ==========  C T A C G C G T A G A  3′
3′  T C A G C T A T G C A  ==========  G A T G C G C A T C T  5′
```

Resource Sheet #2

DNA

- When DNA is heated, the hydrogen bonds that hold the two strands together are broken and the strands separate from each other.

- Typically, there are different proportions of purines and pyrimidines in the two complementary strands, which permit them to be isolated from each other using cesium chloride density gradient centrifugation. The strand with the greater proportion of purines is more dense and will form a band of DNA nearer the bottom of the centrifuge tube than the other strand.

- Each band of DNA can be removed separately, yielding purified DNA strands. If these strands are cooled, the bases will begin to form hydrogen bonds with bases within the same strand.

- Alternatively, DNA that has been heat denatured can be rapidly cooled so that base pairing can occur only within a DNA strand and not between two different strands. This is a dynamic equilibrium process; however, runs of five bases or more in a row that can hydrogen bond with each other tend to form a fairly stable structure.

- Inverted repeat sequences create such an opportunity. These DNA sequences form what are called “stem and loop” structures: the “stem” is the based-paired, double-strand region and the loop is the non-base-paired, single-strand region. Electron micrographs of such DNA sequences show these lollipop-like structures.

Science / Health Careers / Language Arts Appendix 7e **Student Handout**

Activity #2
How Is DNA Structured?

Work through the following thought experiment with your teammates:

- Suppose you take a solution of one of the transposon-containing DNA fragments from *Activity # 1* and heat it.
- You heat the solution enough that the hydrogen bonds holding the two DNA strands together break and the strands come apart.
- Next, you separate the "top" and "bottom" strands into separate solutions and then allow the separate solutions to cool down slowly.
- The single DNA strands will begin to *anneal*, or form hydrogen bonds, with complementary bases within each strand.

Simulate the above process using colored paper clips to represent DNA bases.

1. Use the paper clips and the code your teacher gives you to construct a chain for one of the strands of the transposon-containing DNA fragments from *Activity # 1*. Use as many regular metal paper clips as you want (and have available) for the internal bases represented by " = = = = ." This represents a single DNA strand after the solution has been heated and the strands came apart.

2. Now comes the tough part! As the solution cools down, the individual DNA strands will try to base pair within themselves. See if you can find regions where base pairing could occur within your DNA strand. At least five base pairs in a row must form in order to make a stable structure.

3. Connect the region of base pairing using paper clips across the region.

Questions to Answer

1. How would you describe the structure that results? Draw it below:

2. What part of the transposon does the “loop” region represent?

3. How might geneticists be able to determine whether or not there is a transposon in a particular DNA fragment?

Activity # 2
Answers to Discussion Questions

1. The structure has a stem and a loop; it looks like a lollipop.

2. The loop region is the single-strand, non-base-paired region of the DNA sequence.

3. Geneticists could heat the suspected DNA sequence to denature it into single strands, separate the strands, and allow the separated strands to cool and form base pairs. If there is a transposon, a stem and loop structure should be formed that could be observed with the help of an electron microscope and appropriate staining and preparation techniques. (Students may also suggest that they could wait to see if mutations occurred in the organism, which contains the suspected DNA region. However, they should explain how they could differentiate a mutation due to a transposon insertion or deletion from a mutation due to a single base-pair change or deletion or insertion of just a few bases.)

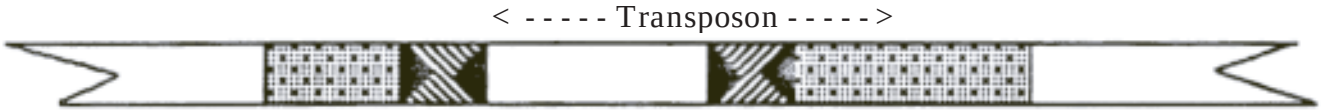
Science / Health Careers / Language Arts Appendix 7g **Student Handout**

Activity #3
Thinking About Transposons

❶ The diagram below represents part of a bacterial chromosome:

The portion labeled *gal* represents a gene that codes for the enzyme that breaks down the sugar, galactose. What would happen if a transposon (Tn) inserted itself into the *gal* gene?

❷ Suppose the transposon includes a gene that makes bacteria resistant to penicillin. How could you determine whether or not the transposon has "jumped" out of the bacterial chromosome above?



❸ Barbara McClintock noticed that chromosome rearrangements were accompanied by a change in the ability of the corn to make pigment (sometimes the pigment-making ability was lost and sometimes it was restored). Explain her observation based on what you know now about transposons.

❹ Transposons apparently are able to move to any DNA molecule, even those unrelated to the organism where they currently reside. Cattle feed often includes antibiotics to produce bigger, stronger animals. This is of growing concern to public health officials. Use what you know about transposons to explain why. What is your opinion on using antibiotics in cattle feed?

Science / Health Careers / Language Arts Appendix 7h **Teacher Page**

Activity #3
Answers to Discussion Questions

❶ Since the transposon is probably several thousand base pairs long, it is almost certain that the *gal* gene will no longer produce a functional enzyme for breaking down galactose. Thus the bacteria would no longer be able to use galactose as a food source—it would be mutant for galactose use. (Microbiologists would call this bacteria a *galactose auxotroph.*)

❷ There could be several indications of this. One is that the ability to use galactose as a food source would most likely be restored in the bacteria because the transpose would excise precisely from the gene. A second indication might be that the bacteria would no longer be resistant to penicillin. However, if the transposon inserted itself into another gene in the same bacteria (which is not unlikely), it would still be resistant to penicillin. Another way to determine this would be if restriction markers on either side of the *gal* gene are known and the size of the DNA fragment produced in the "normal" (non-transposon-containing) bacteria is known. When a transposon inserts into the gene, that fragment size will increase considerably. If it "jumps" from the gene, the smaller fragment characteristic of the normal bacterial DNA should be observed.

❸ Corn that lost the ability to form pigment may have experienced a transposon insertion into a gene for pigment. The transposon insertion would result in production of a non-functional product, like the *gal* insertion in the bacteria above. Corn that regained the ability to form pigment may have had a transposon that excised itself from a pigment-production gene and inserted itself elsewhere in the genome. Thus pigment production was restored.

❹ If cattle are constantly taking in antibiotics in their feed, the bacteria that live in their stomachs and intestines and that are resistant to the antibiotics will survive and pass the resistance trait on to their offspring. Thus many bacteria that carry antibiotic-resistant genes are excreted in cattle feces. Because antibiotic-resistant genes are often a part of bacterial transposons and because transposons can "jump" to DNA of other species, the antibiotic-resistant genes may be carried into other bacteria. Some cause disease in cattle, humans, and other organisms. Infections caused by these bacteria would be difficult to treat, since the bacteria that cause them may become resistant to antibiotics typically used.

Extended Transposon Activities

Where Do We Go from Here?

- Have students read Evelyn Fox Keller's biography of Barbara McClintock (see References and Resources) and report on it. Discuss the following questions:
  - What was unique about the way Dr. McClintock approached research problems?
  - What barriers did she face as a woman in science?
  - What things do you most admire about her?
  - What things do you least admire?

- Study other review articles about transposons. Several such references are included in References and Resources.

- If you live near a college or university, call the biology, chemistry, or biochemistry department. They should have a list of faculty members and a synopsis of their research programs. Search among the list for a woman who is doing work with transposons or other molecular genetics problems. Invite her to be a guest lecturer in your class. Students could generate a list of questions to ask her about her work. All students will enjoy this, and your female students may discover that science is a career for someone like themselves.

- If there is no university nearby, check local agricultural, pharmaceutical, or similar industries, especially if they include a research division. Again, ask for the name of a woman on staff who is working in molecular genetics and invite her to speak to your class.

- If neither of these options is available to you, your class could write to a biology department at the nearest university to discover the types of research programs in their biology department.

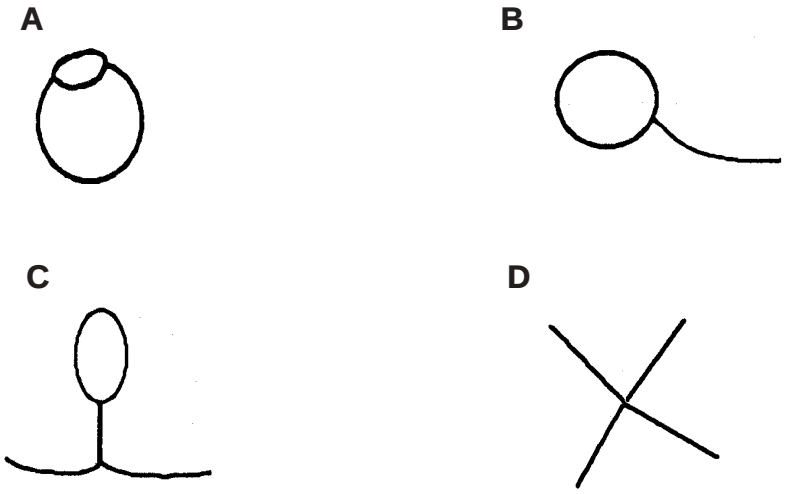
Science / Health Careers / Language Arts Appendix 7j **Teacher Page**

Extended Transposon Activities

Ideas for Assessment

- Suppose you are examining a pigment-forming trait in a species of bacteria. Normal ("wild type") bacteria form a pink pigment when they grow in colonies. Mutant bacteria are unable to form this pigment and produce creamy-white colonies. What phenomena would you expect to observe if the gene for producing this pigment is part of a transposon? Explain why.

- Examine the representations of electron micrographs of various DNA molecules in the diagram below. A thin line represents single-stranded DNA and a thick line represents double-stranded DNA. Which of the pictures shows how a segment of DNA that contains a transposon would appear? Explain.



- In addition, some of the suggestions listed in Where Do We Go from Here? may be suitable for project-type assessments for students working individually or in teams.

Science / Health Careers / Language Arts Appendix 7k

References and Resources

About Barbara McClintock

Keller, E.F. (1983). *A Feeling for the Organism*. New York: W.H. Freeman and Company.

About Women in Science

Herzenberg, C. (1986). *Women Scientists from Antiquity to the Present: An Index*. West Cornwall, CT: Locust Hill Press.

O'Hern, E.M. (1985). *Profiles of Pioneer Women Scientists.* Washington, DC: Acropolis Books.

Rossiter, M.W. (1982). *Women Scientists in America: Struggles and Strategies to 1940.* Baltimore, MD: The Johns Hopkins University Press.

About Transposons

Berg, D., & Howe, M. (eds). (1989). *Mobile DNA*. Washington, DC: American Society of Microbiology.

Caldwell, M. (1994). "Prokaryotes at the Gate." *Discover*, 15 (8), p. 45-50. (Note: This article does not discuss transposons specifically; however, it does describe how bacteria have developed resistance to many antibiotics over the last several decades, a phenomenon in part related to the ability of transposons to insert themselves into unrelated DNA sequences.)

Cohen, S.N., & Shapiro, J.A. (1980). "Transposable Genetic Elements." *Scientific American,* 242, p. 40–49.

Doring, H.P., & Starlinger, P. (1984). "Barbara McClintock's Controlling Elements: Now at the DNA Level." *Cell*, 39, p. 253–59.

Fedoroff, N.V. (1984). "Transposable Genetic Elements in Maize." *Scientific American,* 250, p. 84–98.

Resources

Women in Science and Medicine

Suggested Titles of Biographies

Science Resources

Video Resources

Women in Science Web Sites

Women in Science and Medicine

Alexander, Hattie Elizabeth	Microbiologist
Apgar, Virginia	Physician
Azzarolo, Ana Maria	Physiologist
Barton, Clara	Founder of the Red Cross
Benedict, Ruth Fulton	Social anthropologist
Bishop, Hazel Gladys	Chemist
Blackwell, Elizabeth	First American female doctor
Breckinridge, Mary	Nurse/midwife
Caldicott, Helen Broinowski	Physician/anti-nuclear activist
Carson, Rachel	Ecologist
Claire-King, Mary	Discoverer of one of breast cancer genes
Cori, Gerty Theresa Radnitz	Biochemist
Curie, Irene	Nobel Prize winner; synthesized artificial radioactive elements
Curie, Marie	Polish chemist and physicist in France, two-time Nobel Prize recipient; discovered radioactive elements such as polonium and radium in collaboration with her husband, Pierre Curie
Daly, Marie Maynard	Chemist
Elion, Gertrude Belle	Biochemist/Pharmacologist
Emeagwali, Dale	Biologist
Emerson, Ellen Russell	Ethnologist
Fletcher, Alice Cunningham	Anthropologist/ethnologist
Fossey, Dian	Anthropologist/Primatologist
Franklin, Rosalind	Crystallographer in-putting information responsible for DNA structure discovery
Gonzalez, Elma	Biologist; studies membranes and other small cell structures
Goodall, Jane	Zoologist; studied chimpanzees
Hamilton, Alice	Pathologist
Hobbs, Sucy Beaman	Dentist
Hodgkin, Dorothy	Crystallographer
Jackson, Shirley	Physicist; first black woman to earn doctorate degree from MIT
Jemison, Mae	Astronaut/physician
Kwolek, Stephanie	Chemist
Leakey, Mary	Anthropologist, pieced together bone fragments to reveal human ancestry
Levi-Montalcini, Rita	Neurologist

Logan, Myra Adele	First African American woman elected to the American College of Surgeons; analyzed, refined X-ray techniques used to detect breast tumors in women
Marquez-Magana, Leticia	Molecular biologist
McClendon, Dorothy	Biochemist
McClintock, Barbara	Geneticist, Nobel Prize winner; pioneered the idea of jumping genes
Mead, Margaret	Anthropologist; studied primitive and other cultures
Mitchell, Lucy Myers Wright	Archaeologist
Moore, Ruth Ella	Biochemist
Morgan, Ann Haven	Water ecologist
Morley, Margaret Warner	Biologist
Nightingale, Florence	Nurse
Sabin, Florence Rena	Anatomist
Sager, Ruth	Geneticist
Saubel, Katherine Siva	Ethnologist
Singer, Maxine	Geneticist
Stern, Elizabeth	Pathologist
Stevens, Nettie Maria	Biologist
Villa-Komaroff, Lydia	Biologist
Walker, Madame C. J.	First self-made woman millionaire; invented a formula for straightening and grooming hair
Wu, Chien-Shiung	Designed and carried out an experiment on subatomic particles
Yalow, Rosaly	Nobel Prize recipient; developed radio-immunoassay, a technique for identifying and measuring very small amounts of trace materials
Yalow,Rosalyn Sussman	Medical physicist
Zuniga, Martha	Biologist

Women in Physics

Burnell, Jocelyn Bell
Cladis, Patricia Elizabeth
Dolan, Louise
Gaillard, Mary Katharine
Goldhaber, Sulamith
Hanson, Gail Gulledge
Koller, Noemie Benczer
Mayer, Maria Goeppert
Quinn, Helen
Sarachik, Myriam
Sponer, Hertha

Women in Chemistry

Elion, Gertrude Belle (USA)
Fieser, Mary (USA)
Flanigen, Edith M. (USA)
Grant, Barbara (USA)
King, Reatha Clark (USA)
Lucid, Shannon W. (USA)
Noddack, Ida Tacke, 1896- (Germany)
Richards, Ellen Henrietta Swallow Richards, 1842-1911 (USA**)**

Suggested Biographies

The list below consists of a few suggested biographies from which students might gain information about the accomplishments of women while learning what constitutes a biography. Students may use encyclopedias, their history textbook, current biographies, and search engines on the Internet to increase their knowledge and find possible topics on which to write.

1. Alonso, Harriet H. *Peace as a Women's Issue: A History of the U.S. Movement for World Peace and Women's Rights.*

2. Briggs, Carole S. *Women in Space: Reaching the last Frontier.*

3. Briggs, Carole S. *At the Controls: Women in Aviation.*

4. Colman, Penny. *A Women Unafraid: The Achievements of Frances Perkins.*

5. Cullen-Dupont, Kathryn. *Elizabeth Cady Stanton and Women's Liberty.*

6. Glassman, Bruce. *Wilma Mankiller: Chief of the Cherokee Nation.*

7. Hine, Lewis. *Women at Work: One Hundred Fifty Photographs.*

8. Meadows, Jack. *The Great Scientists (The Story of Science Told by the Lives of Twelve Landmark Figures).*

9. Mac Donald, Anne L. *Feminine Ingenuity: How Women Investors Changed America.*

10. Malone, Mary. *Connie Chung: Broadcast Journalist.*

11. McGrayne, Sharon B. *Nobel Prize Women in Science: Their Lives, Struggles, and Momentous Discovery.*

12. Michelson, Maureen R. *Women and Work: In Their Own Words.*

13. Parks, Rosa. *Rosa Parks: My Bus Ride To Freedom.*

14. Peri, Teri. *Math Eguals: Biographies of Women Mathematicans and Related Activities.*

15. Peri, Teri. *Women and Numbers: Lives of Women Mathematicians Plus Discovery Activities.*

16. Pflaum, Rosalynd. *Marie Curie and Her Daughter Irene.*

17. Ruosso, Harilyn, et al. *Disabled Female, and Proud! Stories of Ten Women with Disabilities.*

18. Smith, Jessie C. *Epic Lives: One Hundred Black Women Who Made a Difference.*

19. Thompson, Mary H. *Biographies of Distinguished Women in Science.*

20. Vare, Ethlie A. *Mothers of Invention: From the Bra to the Bomb, Forgotten.*

21. Ptacek, Greg. *Women and Their Unforgettable Ideas.*

22. Veglahn, Nancy. *Women Scientists.*

23. Warren, Rebecca L. *The Scientist Within You, Volume1: Experiments.*

24. Wadsworth, Virginia. *Rachel Carson: Voices of the Earth.*

25. Weiner, Lynn Y. *From Working Girl to Working Mother: The Female Labor Force in the United States, 1820-1980.*

26. Yount, Lisa. *Contemporary Women Scientists.*

27. Yount, Lisa. *American Profiles of Black Scientists.*

Science Resources

400 Years of Women in Science

Bernstein, Leonard et al. *Multicultural Women of Science, Three Centuries of Contributions with Hands-On Experiments and Activities for 37 weeks,* People's Publishing Group (1-800-822-1080).

Brooks, Paul. *The House of Life: Rachel Carson at Work.* Boston: Houghton Mifflin, 1972.

Carson, Rachel. *Silent Spring.* Boston: Houghton Mifflin, 1962.

Clark, Eugenie. *The Lady and the Sharks.* New York: Harper & Row, 1969.

Dictionary of Scientific Biography. New York: Scribner's, 1970–1978 (a series of reference books).

Discover (magazine), December 1991.

Edeen, Susan and John. *Portraits for Classroom Bulletin Boards of Women.*

Foster, Leilam. *The Story of Rachel Carson and the Environmental Movement.* Children's Press 1990.

Haber, Louis. *Women Pioneers of Science.* New York: Harcourt Brace Jovanovich, 1979.

Hancock, Judith. *For the Love of Science* (poster set), *Scientists* (CD-Rom).

Harlan, Judith. *Sounding the Alarm: A Biography of Rachel Carson.* Minneapolis: Dillon, 1989.

History of Science, Technology and Medicine. Biographical Sources.

Index to Women of the World from Ancient to Modern Times. Westwood, Mass.: Faxon, 1970.

Kass-Simon & Patricia Farnes. *Women of Science: Righting the Record* . (1990)

Matyas, Marsha Lakes, Ph.D and Haley-Oliphant, Ann E., Ed.D. *Women Life Scientists: Past, Present and Future.* American Physiological Society (301) 530-7132, educatio@aps.fuseb.org

McClean, Lois, Ed. D and Tessmon, Richard. *Telling Our Stories: Women in Science* CD-ROM ISBN 1-993115-21-3.

Morgan, Helen and Mitchell, Maria. *First Lady of Astronomy*. Philadelphia: Westminster, 1977.

Multiculturalism in Mathematics, Science, and Technology, Reading and Activities. ISBN 0-201-29417-6.

Noble, Iris. *Contemporary Women Scientists of America*. New York: Messner, 1979.

Notable American Women: 1607–1950. Cambridge, Mass.: The Belknap Press, 1971.

Notable American Women: The Modern Period. Cambridge, Mass: The Belknap Press, 1980.

Ogilvie, Marilyn Bailey. *Women in Science: Antiquity Through the Nineteenth Century*. Cambridge, Mass.: The MIT Press, 1988.

Opfell, Olga. *The Lady Laureates: Women Who Have Won the Nobel Prize*. Metuchen, N.J.: Scarecrow, 1986.

Pflaum, Rosalynd. *Grand Obsession: Madame Curie and Her World*. New York: Doubleday, 1989.

Sayre, Anne. *Rosalind Franklin and DNA*. New York: Norton, 1975.

Scholastic Timelines: The United States in the Twentieth Century.

Scientist Poster Set. Printed by Research Triangle Institute with the assistance of The Standard Oil Company (OHIO). Developed under National Science Foundation Grant M. SED – 8114640.

Scientists. Text by Martha Nichols, Dale Seymour Publications ISBN 0-866-51-549-6.

Scientists Bulletin Board and Activity Pack, Mc Donald Publishing, ISBN 1-55708-4580

Sterling, Mary Ellen M.Ed., *Focus on Scientists.* Teacher-created materials Inc., Huntington Beach, CA, ISBN 1-55734-493-0.

The Faces of Science: African Americans in the Sciences. Louisiana State University Libraries.

Uneasy Careers and Intimate Lives: Women in Science, 1789-1979. (Edited by P.G. Abir-am and D. Outram.) New Brunswick, N.J.:Rutgers University, 1987.

Veglahn, Nancy. *American Profiles: Women Scientists.*

Who's Who In Science.

Yost, Edna. *American Women of Science.* Philadelphia: Stokes, 1943.

Yost, Edna. *Women of Modern Science*. Westport, Conn.: Greenwood, 1984.

Local health-care partners may be a good resource for women scientists.

Video Resources

"Breaking Through— as Women in Science"
Intelecom (818) 796-7300
150 East Colorado Blvd., Suite 300, Pasadena CA 91105

"Inventing the Future: African American Contributions to Scientific Discovery and Invention"
American Chemical Society 1155 16th Street, NW Washington, D. C. 20036

"Tracing the Path: African American Contributions to Chemistry in the Life Sciences"
American Chemical Society 1155 16th Street, NW Washington, D. C. 20036

Women in Science Web Sites

http://home.earthlink.net/ ~ stcarr/women_in_mathematics.html

http://www.physics.ucla.edu/ ~ cwp

http://www.cs.yale.edu/homes/tap/past-women.html

http://library.thinkquest.org/20117/

http://www.wsulibs.wsu.edu/hist-of-science/

http://www.quest.arc.nasa.gov/women/intro.html

http://www.physics.purdue.edu/wip/herstory.html

http://www.astr.ua.edu/4000WS/4000ws.html

http://www.DistinguishedWomen.com/subject/biology.html

http://www.DistinquishedWomen.com/subject/physics.html

http://www.biography.com/

http://www.almaz.com/nobel/women.html

http://www.greatwomen.org/

http://www.sacnas.org

Assessment

Rubrics for Culminating Project

Feature Story Score Guide or Rubric

Report of Information

Autobiographical Incident

Firsthand Biographical Sketch

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

Summary of Project

Story Score Guide/Rubric

6: An EXCEPTIONAL story exhibits all or most of the following:

- Lead provides fresh angle to story.
- Lead is crisp and engaging. Displays vibrant language.
- Writer's voice is lively and interesting; voice is authoritative (writes from having done much research).
- Transitions are graceful and logical. Displays solid reporting. Emphasis on 5 W's and H of journalism (what, where, when, why, who, how).
- Story is balanced. Doesn't shy from controversy, but provides balanced viewpoints.
- Government, economic, and human issues included.
- Quotes are interesting, even provocative. Supports point of story and of paragraph and clearly displays that writer has interviewed subject.
- Concludes in a satisfying way—either ties into lead or creates feeling of finish through final transition.
- Reader rarely spots convention errors (spelling, grammar, punctuation).
- Sources are documented (cited in text and at end of story).

5: A COMMENDABLE story displays all or most of the following:

- Lead is interesting but not as fresh as a 6.
- Writer's voice is authoritative. May not have sparkle of 6 but language is precise and gives sense of control. Clear that writer has completed much research. Research is documented.
- Transitions are logical and developed through reporting.
- Quotes are interesting and clearly support point of paragraph and story. Clear that writer has interviewed.
- Government, economic, and human issues included.
- Story displays balance.
- Story ends effectively.
- Reader infrequently spots errors in conventions.
- Sources are documented (cited in text and at end of story).

4. An ADEQUATE story displays all or most of the following:

- Lead is apparent, but lacks an angle.
- Writer's voice is marked by general word choice and plodding sentences.
- Story displays earnest effort researching but is predictable.
- Paragraphing clear, but transitions generalize, marked by predictable observations and/or restatement of ideas.

Notes

- Quotes are predictable and additive. Apparent that writer just asked for quote without interview.
- Story may be out of balance, approaching editorializing.
- May end abruptly.
- Reader occasionally spots errors in conventions.
- Government, economic issues mentioned but not completely explained; connections not drawn; human issues discussed.
- Sources are documented (cited in text and at end of story).

3. A story with SOME evidence of achievement displays most of the following:

- May not have a lead or lead is very simplistic.
- Writer's voice is uninvolved, marked by flat word choice and loosely
- connected sentences. Writer struggles with language. May display garbled syntax. Research seems to be lacking.
- Transitions are trite, cliché. May be "listy." May completely editorialize.
- No sense of obligation to report.
- May be dominated entirely by quotes strung together or may be missing important information.
- Focus is limited, either just government, economic, or human issues mentioned, but not all are discussed.
- No sense of conclusion.
- Reader often spots errors in conventions.
- Sources are documented (cited in text and at end of story).

2/1. A story that shows LITTLE OR NO evidence of achievement displays:

- No lead. Whole story presented in fragmentary way. Often very brief.
- Marked by simplistic sentences and word choice. May display garbled
- syntax that interferes with sense.
- Writer unaware of journalistic responsibility, very little information. Not reporting.No quotes or documentation.
- Reader is continually aware of errors of convention.
- Sources not cited or documented.

Notes

Responder's Name _____

What rubric number do you give this writing? 5 4 3 2 1
Rationale for number?

What needs to be done to improve the writing?

The writing must have a score of 5 or 6 before it is published. Check with teachers.

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
Focus Staying on topic; Providing perspective; maintaining a point of view.	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.
Presentation of Information 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.	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.
Organization Organizational pattern may be: chronological, historical, specific to general, general to specific, causal, sequential.	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.
Authority	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.
Style Diction, sentence structure.	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 in-cident 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 spe-cific 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.

Summary of Direct Writing Assessment / Rhetorical Effectiveness Scoring Guide: Middle Grades and High School / 5-21-94

Firsthand Biographical Sketch

Sample Rubric

Criteria	6 Exemplary Writing Performanc	5 Commendable Writing Performance	4 Capable Writing Performance	3 Fair Writing Performance	2 Limited Writing Performance	1 Minimal Writing Performance
Characterization **Narrative Strategies:** states time, place, context; dialogue; names of people or objects; movements, gestures, postures, expressions; remembered feelings or insights. **Descriptive Strategies:** physical description; background description; routines, habits, activities; comparison or contrast.	Comprehensive, complex characterization; uses many strategies; presents multiple facets; rich detail; Well-chosen anecdotes; specific incidents reveal individuality.	Less depth and complexity, though vividly presented; uses several strategies; Incidents are well-chosen; relevant and recurring activities support characterization; more reliance on generalized statements about activities or less fully developed specific incidents.	Clear personality emerges, but uses fewer strategies; less complex; lacks depth; develops one specific incident or lists a series of recurring incidents; may rely on assertions or generalizations.	Subject is named but presented in generalized manner; focus may be on peripheral concern or on the writer; may depend on recurring activities, or present unfocused list of details; may narrate incident in a rambling, pointless way.	Provides unsupported claims or generalizations, or focuses on writer or several people; may present random details; incident or activities add little to characterization.	Little meaningful information; subject is named, but relationship may be superficial; single subject may not be identified; activities briefly mentioned; little specific information; incidents rarely present; may be pointless and repetitious; incidents rarely presented.
Significance	Clearly expressed, either explicitly or implicitly; integrated into the essay or in the conclusion.	Significance is apparent but not as well integrated as 6.	Significance is apparent but may seem tacked on.	Writer not clear about significance; vague or briefly stated.	Significance may not be mentioned; if mentioned, may be formulaic or not follow from evidence presented.	Stated flatly or in confusing terms, if at all.
Organization	All elements focus clearly on subject; incidents, generalized activities, details, claims and reflections form coherent essay.	Coherent; extraneous details are too minor to distract.	Coherent; may be predictable; some description or narration may add little to characterization or may detract from assertions; writer is able to refocus on the subject.	Does not maintain control; focus may be on other people or the writer.	Often contains information that does not focus on the subject; may be rambling and confusing.	May be a superficial response to the prompt or a stream of thought.
Style	Exceptional control of sentence structure; precise, imaginative, appropriate use of language.	Control of sentence structure; precise and appropriate use of language.	Sustained control of sentence structure; somewhat conventional and predictable language.	Basic control of simple sentences; may rely on general rather than specific language.	May have lapses in sentence control; may have inappropriate word choices.	Frequent lapses in sentence sense; 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 es-tablish 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 plausi-ble 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 inter-pretation, butmay withhold claim until end; may make animpressive 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
Group	**Organization** Introduction/ conclusion; Separation of ideas; Clear, logical order; Transitions; Internal summaries	Introduction attention-getting, memorable, appropriate; clear separation of balanced ideas; signposts; parallel structure evident; complete summaries separating ideas; linkages set up progression; clarified ideas when needed; internal summaries used to enrich discussion	Introduction attention-getting, clear; ideas are separate, not necessarily balanced/ clear; reasonable order in presenting ideas; short separation of ideas; linkages are obvious; summaries used mechanically; clarifies some idea	Introduction evident; main ideas of topic covered; order evident; transitions are simple in structure; summaries occasionally used	Unclear/undeveloped introduction/conclusion; incomplete coverage of ideas; some order evident; few transitions; summaries rarely used
Group	**Research** Factual information; Interviews; Validity of sources; Breadth of sources	Uses information that is relevant, authoritative, clear, timely, precise; sources reflect audience analysis; multiple authoritative and specialized sources used; recognizes biases of sources; in depth, thorough research; comprehensive sources; all viewpoints considered	Often uses information that is relevant, authoritative, clear, timely, precise; multiple sources used; relies on a variety of outside sources; is aware of some resources; variety of sources; viewpoints varied	Use of information is generalized; more opinions and own beliefs relied upon; Some sources used; uses popular, easily obtainable material; cross-section of materials used	Uses preponderance of opinions and own beliefs; some facts; limited range of sources used; uses biased or unreliable sources; limited viewpoints
Group	**Cooperation** Balanced participation; Courtesy; Listening/ responding; Staying on topic	All members participate equally; expression/acceptance/encouragement of divergent opinions; pronounced display of respect for opinions/positions of others, recognition of others' feelings; active, critical listeners, encourage meaningful feedback of discussants; all remarks precise and relevant	All members encouraged to participate; expression of a variety of viewpoints; shows respect for positions/ opinions of others; have empathy for all members; attentive listeners; give meaningful feedback; remarks pertain to topic	All members contribute ideas; variety of viewpoints may be expressed; acknowledges rights of others to express viewpoints; respectful, polite listeners; give some feedback; most re-marks relevant	Unequal contributions by members; information may be one-sided; exhibit some lack of understanding for others' rights; passive listeners; feedback lacking or inappropriate; many remarks digressive
Individual	**Speaker** Use of facts and ideas; Participation/ response; Delivery; Cooperation with group	Comments are supported with empirical data; eager participant; comments reflect indepth understanding; fluent; audience impetus; Verbally and nonverbally commanding; inspires discussion; diplomatic; attempts to elicit opinions from more reticent participants	Uses outside sources to support comments; enthusiastic participant; comments reflect knowledgeable understanding; smooth, enthusiastic, audience-directed delivery; encourages discussion; senses dynamics of group; tactful	Some outside information cited to support comments; active participant; comments indicate reasonable understanding; clear proficient delivery; related to audience; generates discussions; interacts with group	Limited use of outside data to support statements; occasional participant; comments indicate limited understanding; delivery understandable, adequate; aware of audience; cooperates in discussion; interacts 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.