



GED as Project

Pathways to Passing the GED

Volume **5**

SCIENCE AND SOCIAL STUDIES



GED as Project

Pathways to Passing the GED



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Preface

The GED high school equivalency exam has been available to adults for nearly 60 years. Yet, according to the 2000 Census, an estimated 1,000,000 adults in Virginia have neither completed high school nor taken the GED. They are at a disadvantage in our fast-paced, information-driven age, where formal learning and schooling are more important than ever. Helping those adults achieve success on the GED remains, as it has been for many years, a central tenet of adult education in Virginia and across America. The implementation of GED 2002 presents a unique opportunity for adult educators to help adults achieve their goal of attaining a GED. Now seems an appropriate time to examine current needs, practices, and state of the art for preparing adults to pass the GED. We must take a fresh look not only at the subject matter, but also at the way it is taught.

We have examined the GED: its content, its structure, both old and new, and the skills embedded in the test. In addition, we have reviewed many current teaching methodologies. Our review has led us to propose *GED as Project: Pathways to Passing the GED* as a means of achieving effective results with adults pursuing their GEDs. As the name implies, the overarching principle of *GED as Project* is the value of project-based learning in adult education. We propose that the GED test itself can be a powerful project for those adults who choose to pursue it.

In *Volume 1: Introduction*, we describe our concept of the *GED as Project*, articulating the role of the instructor, the role of the individual (both as test taker and as learner), and the role of instructional materials in the classroom. We outline for instructors the necessary practices for using this approach. Central to *GED as Project* are the Inquiry Activities, designed to stimulate discovery by the learner, facilitated by the instructor. Grouped together by the theme and/or skills to be explored, Inquiry Activities are the basis of Learning Projects. We define Learning Project and Inquiry Activity, provide a template or guide to use in developing Inquiry Activities, and provide sample Inquiry Activities for two Learning Projects: “GED and You” and “GED and You Revisited.” In addition, we provide an annotated list of references for use with GED 2002.

In *Volume 2: Mathematics*, we use items from an Official GED Practice Test to develop the Inquiry Activities that, grouped together, form the Math Learning Projects. Also included in this volume is a Learning Project called “GED Math and You,” which has been designed as a companion to “GED and You” in Volume 1.

In *Volume 3, Language Arts, Reading*, we again use an Official GED Practice Test to develop the Inquiry Activities that form the Language Arts, Reading Learning Projects. “GED, Language Arts, Reading and You” is included in this volume, offering the opportunity to explore this content area as well.

Volume 4, Language Arts, Writing uses the Official GED Practice Test to provide the subject material for essays and to develop revision techniques necessary for strong performance on the GED Language Arts, Writing test. The Scoring Guide is included in this volume to inform the learners about how the essays will be evaluated. “GED Language Arts, Writing and You” is also included in this volume.

Volume 5: Science and Social Studies completes the set. These two content areas are taken together, since the techniques and strategies for dealing with each are the same. Again, we use the Official GED Practice Tests to develop the Learning Projects. This volume includes the Learning Projects “GED Science and You” and “GED Social Studies and You” to complete the exploration.

Through the learning approach advocated by *GED as Project*, the adult who seeks help in achieving the GED is regarded in two distinct ways: as a test taker and as a learner. Using *GED as Project* allows instructors to facilitate adults in the skill of taking tests as well as the skill of learning. One helps the adults to pass a credentialing test; the other equips them for both life-long learning and competing in today’s world – a win/win for all adults pursuing their GEDs.



Foreword

GED as Project: Pathways to Passing the GED has been developed through the hard work, dedication, and vision of many adult education professionals. Funded by the Office of Adult Education and Literacy, Virginia Department of Education, the project was begun by Virginia's Workforce Improvement Network (WIN), a partnership between James Madison University and the Virginia Literacy Foundation. This final phase was developed by the Virginia Literacy Institute at Virginia Commonwealth University.

The first phase of this project included the development of the problem-based approach as presented in *GED as Project*, and the math Learning Projects found in Volume 2. Phase two of the project includes Volumes 3 and 4, *Language Arts, Reading and Writing*. The third and final phase presents Science and Social Studies in Volume 5. Go to the *GED as Project* website at: www.jmu.edu/gedproject to see the most current information about this project

The project team members are as follows:

- Barbara E. Gibson – Principal Investigator
- Marcia Phillips – Project Coordinator
- Susan Holt – Instruction
- Randall Stamper – Editorial Assistant
- John Vaughan – Technology

We are deeply appreciative of the consultants who guided and supported this phase of our work. Their commitment to the vision of *GED as Project* inspired the team to higher levels than we had imagined possible. Consultants for this phase of the project were:

- Gene and Mary Boteler, social studies teachers in Montgomery County, Maryland, and consultants to the GED Testing Service.
- Dr. Diane Foucar-Szocki, Associate Professor and Coordinator of the Adult Education/Human Resource Development Undergraduate and Graduate Degree Program in the College of Education at James Madison University.
- Suzanne Kirk, Liaison for Statewide Initiatives with the Science Museum of Virginia
- Eric M. Rhoades, Director of Science Education at the Virginia Department of Education.

Field testing of this volume of *GED as Project* was conducted with three adult education programs across Virginia. The instructors and administrators who participated in the field test not only used the materials we provided, but also made suggestions for varying approaches. They provided important insights and ideas to the project team, many of which were integrated into the final manual. The adult learners who agreed to participate in the field test also contributed significantly to *GED as Project* by allowing us to collect samples of their work, sharing their thoughts and ideas while in the classroom, and giving valuable input during site visits. The field test sites and participating adult educators are:

- Mt. Rogers Regional Adult Education Program – Christy Hicks, Coordinator. Instructors: Jerry Mays, Rita Roper, Bobbie Taylor.
- Prince William County Public Schools, Adult Education – Susan Garlock, Coordinator. Instructors: George Bartlett, Debbie Caselli, Vickey Logan, Eileen Rakshys.
- Suffolk City Schools, Pruden Learning Center – Robin Rose, Coordinator. Instructors: Deb Habecker, Rebecca Mohler, Cindy Smith

The following deserve special recognition for their contributions to specific areas of the project:

- Gwen Smith, who wrote the script for the videotapes accompanying *GED as Project*, and starred as Mrs. Harriman, the instructor.
- Workforce Improvement Network (WIN) for its continued partnership on this project.

Finally, we wish to recognize Dr. Yvonne Thayer, Director of the Office of Adult Education and Literacy, Virginia Department of Education, for her commitment to the advancement of adult education practice and her dedication to the adults for whom the GED is a pathway to success as workers, parents, and citizens. Her desire for an articulated approach to teaching the new GED ultimately led to the development of *GED as Project*. We thank her for her leadership and her vision.



Introduction

The two content areas of Science and Social Studies are presented in *GED as Project* in the Learning Project and Inquiry Activities format established in *Pathways to Passing the GED: Introduction*. The stimulus for the Inquiry Activities found in this guide is primarily from the test questions in the 2002 Official GED Practice Tests for science and social studies. The organization of the Inquiry Activities moves the learners across both science and social studies and back to math, reading, and writing in an integrated approach.

As has been the case with the earlier phases of *GED as Project*, learners move through Learning Projects in a manner that incorporates previous learning into current learning. In this volume, an even more overt effort is made to integrate the materials in the Inquiries into other subject matter.

Introduction to Science and Social Studies Learning Projects and Inquiry Activities

In the GED 2002, the question items in both the science and social studies tests have an increased proportion of visual-based questions as compared with the earlier GED. Somewhere between 50 to 60 percent of the questions will include maps, charts, tables, graphs, diagrams, political cartoons, advertisements, or photographs. Many of these are taken from workplace materials such as manuals or standard forms. In many instances, the visuals complement accompanying text.

The use of these materials reflects the role of graphic images in today's world in presenting information on television and on the Internet, as well as in newspapers and manuals. These visuals are not new, but have taken on increasing importance in our information-driven age, where they serve to attract our attention and allow us to make sense of the increasing masses of information necessary to succeed in work and at home.

The first three Learning Projects in this volume are arranged around the visuals. Learning Project 1 studies graphs as they are presented in both science and social studies. All the GED tests will have bar graphs, which show amounts at specified intervals or conditions, and line graphs, which show change over time. Both these graphs have horizontal and vertical axes that establish the amounts and conditions. Learners will likely be familiar with graphs from their math studies.

The graphs of Learning Project 1 can be used as extensions of the work in math. They can also be used to lead your learners toward integrating computation into their work with graphs. Pie charts, which show the relationship of a part to the whole, while not part of this Official Practice Test, will be found on the GED.

Learning Project 2 features charts and diagrams. Complex scientific information is often diagrammed for easier access. This is especially helpful for visual learners. Both science and social studies use numerous charts and tables to give information. Typically, a table has several headings on the vertical columns and the horizontal rows. In order to find the specific information, the learner must go down a column and across a row to the point of intersection. Flowcharts, which show a process, are also tested in the GED, although none of the questions on the Official Practice Test uses one. We have included an example of a flow chart in Appendix B.

Learning Project 3 features the test items in social studies and science that have maps and pictures. Maps are particularly important, since high school graduates are expected to understand the different types of map projections, be able to locate places using scale and computing distances, interpret map symbols, and visualize what the maps mean. Further, high school graduates are expected to be able to identify continents, regions, and major population centers, as well as the oceans. In a world that increasingly uses the picture to tell the story, your learners will be expected to get more information from photographs. Not only should they use the captions and titles, they need to identify details, background features, and key subjects. The educated adult is aware that photographs and film show not only what happens, but also the point of view of the photographer, and your learners should become aware of that as well.

Probably nothing on the GED test will require an understanding of topic, context, and point of view more than the political cartoon. Each test has one, and most instructors have indicated the difficulty they pose for learners. Cartoonists display their points of view by the types of caricatures they employ and the symbols they use. Relative size can also make a potent point. Observers cannot understand a cartoon if they do not know the incident or situation being alluded to, or if they do not recognize the people being depicted. They also need to know that the cartoon is showing a bias, either favorable or not, and they should be aware of that position. The use of symbols is generally easier to convey, but, again, test takers will need to be aware of the sym-



bols used for the United States, for Canada, and for other foreign powers. Additionally, they should be familiar with the symbols of corporate America, as these, too, play a role in our everyday lives and may well be a part of a cartoon in the daily paper, if not on the test. We have included a website that has a large number of political cartoons, all found in the public domain, which you can use to develop the skills of your learners to understand these powerful examples of public opinion.

Learning Project 4 features a group of test items based on a reading passage of several paragraphs. In social studies, your learners will be expected to know about the bases of the government of the United States. A question will highlight a Supreme Court decision. Others may focus on the Constitution or the Declaration of Independence. In this Official Practice Test, the Supreme Court and the Constitution are the subjects of the group of questions found in Learning Project 4. The subject matter is the forced march of the Cherokees in the early 19th Century, and the role of Andrew Jackson in that decision. Questions focus primarily on the concept of the separation of powers and the distinct roles played by the three branches of the United States government – executive, legislative, and judicial.

Reading in the content areas requires some different strategies than reading literary genres. The vocabulary inherent to the subject needs to be understood; this is even more problematic in science than in social studies. Also, learners need to know the concepts about which they are reading in order to build the context and create understanding from the text. We begin to address this in Learning Project 4 and continue in Learning Project 5, which is the long science passage. In Appendix C, we provide examples of concept maps and charts. Instructors may have other styles they prefer to use to help their learners organize the facts contained in their reading. This is another way of integrating the materials in this volume, since the visuals show material on charts and tables, and learners will later begin to chart or map reading materials to better understand what they have read.


Learning Project 6 groups short reading passages where questions ask for supporting details from the text. In this Learning Project, we refer to the Reading volume and particularly to the first Learning Project in that volume, where learners identify the types of questions. The passages in this Learning Project are very short, but there is still good opportunity for concept mapping or charting for those learners whose learning styles make that a useful exercise.

In Learning Project 7, the short passages all require the

learners to draw conclusions from the information they read. Again we refer to the Reading volume for additional practice in dealing with questions that require drawing conclusions. These Inquiry Activities could be used as extensions for the IAs in the Reading volume that deal with drawing conclusions or vice versa.

Learning Project 8 introduces several passages that require the learners to analyze beyond the information that is provided on the test item. Problem solving skills can be used to good effect in this group. The items in this Learning Project show clearly that taking time and assessing each answer choice can be a very helpful approach, even if the learner does not know the answer.

Learning Project 9 is the final Learning Project in the book. Once again, several questions are posed about one multi-paragraph passage. The social studies passage discusses forms of government, the keystone of government study. The first Inquiry forces the learners to consider the questions only. Each question is a different type, looking for a distinct response from the learner. In the final Inquiry Activity, instructors will want to explain to learners the test-taking strategy of recognizing that questions are presented sequentially relative to the passage. This strategy was first noted in the Reading volume.

In this volume, we have added a graphic to denote when valuable tips are provided to the learners. When you see the small mortarboard graphic, [] you should encourage your learners to pay particular attention to the adjacent text. The information there will be especially helpful to them when they are taking the GED test.

The GED as Project Approach to the Content Areas

The tripartite basis for the GED test is comprised of reading, writing, and mathematics. Building these skills is the focus of most of the classroom attention. Test results in general bear out that most adults seeking their GEDs need considerable instruction and development in their math skills, and most have reason to be concerned about the writing portion of the test. The Language Arts, Reading portion of the GED test looks at the genres of reading that the high school graduate will have had considerable exposure to – drama, poetry, and fiction – and adds to these the reading that most adults are exposed to: workplace materials and reviews. *GED as Project Language Arts, Reading* focused on the strategies



that good readers incorporate into their reading; it also considered the genres and recommended or modeled strategies in relation to the genres. Good readers, of course, incorporate strategies without overt awareness of what they are doing. Less-skilled readers need to develop the strategies in order to construct meaning from the text.

Reading in the content areas is not so much about learning basic reading skills as it is about making students aware that reading is a tool for thinking and learning. In the content areas, learners need to make connections between what they know and what is presented on the page.

Nothing is more important to the making of sense of subject matter than the reader's prior knowledge. In order to learn new information, the learners must be able to bring forth what they already know and fit the new information into some sort of order, or schema (Billmeyer & Barton, 1998; Richardson & Morgan, 2003.) Readers try to make sense of the information they read by assessing it against what they already know. If their knowledge framework is well organized, they can accommodate new information readily. The more extensive their knowledge and skills in the area about which they are reading, the more they will learn and remember.

Within the framework of the GED classroom, little time is available to build extensive contexts for the information learners will need to do well on the test. In earlier forms of the GED test, a successful reader could be expected to do well in both the science and social studies sections. However, the GED 2002 has changed significantly. The inclusion of visuals and the focus on higher-level thinking skills requires that more attention be paid to assisting learners in becoming aware of how they can build their knowledge frameworks.

Concept mapping is a helpful tool for learners to use as they develop a context for what they read. This visual representation of the schema that we all develop to store and organize information is particularly useful for helping learners to become aware of how they process what they read. Ineffective readers are often unaware that there is something they should be doing to improve their understanding of what they read. As learners learn how to learn, they can begin to develop these meta-cognitive skills for themselves and become independent and successful in their own learning processes. Examples of types of concept maps are in Appendix C. Instructors are free to design their own or use other approaches.

Another facet of reading in the content areas is vocabulary. Every content area has its own specific vocabulary, particularly where it identifies important key concepts (Billmeyer

& Barton, 1998). For that reason alone, it is critical for learners to recognize and be able to define the terms found.

Content area vocabulary is specific to the concept; there is not much chance that readers will have encountered the words somewhere else, so terms should be explicitly taught. Because the new vocabulary can also be a new concept, the work should focus on the connections and not simply a definition of the term. Encouraging contextual definition and allowing the learners to identify the difficult words in a passage by skimming or scanning can be very effective.

Content Areas

The body of knowledge that makes up science includes: earth science, chemistry, physics, aero-space science, and biology. Students in elementary and secondary school systems have the opportunity to have thirteen years of study in the various aspects of this content area. Each of the four major areas has its own specific organizing structure. They share little in the way of vocabulary.

In the field loosely termed social studies, history and geography, civics, and government all come together. Again, students will have been exposed to years of classes in these fields of study. For GED preparation, the contrast between materials to cover, knowledge to impart, and time to accomplish this is immense.

While mathematics, reading, and writing are skills that can be organized and developed in a variety of ways, the content areas are a body of concepts and facts, which learners either know or do not know. This is the almost overwhelming challenge to the instructor: where to begin, what to emphasize, what to ignore. We know that on the GED science test, the life, physical, and earth and space sciences will all be tested. Questions will also encompass the National Science Education Standards, which connect the subject standards in strands which include: unifying concepts and processes, science as inquiry, science and technology, science in social and personal perspectives, and the history and nature of science (National Academy of Science, 1996.)

What makes it feasible for the instructor to cover this breadth of material is that the science questions typically draw upon daily experiences to illustrate scientific principles. In many cases, asking your learners, "Where in your lives have you encountered this type of situation?" is a good first step to take as you lead the class toward finding the correct answer.

Social studies puts itself within the context of daily life by



its use of visuals, particularly with advertisements and consumer issues. Topics covered in history and government are those any high school graduate would be expected to know. Many of the historical issues are those that resonate today, such as the treatment of the Indian nations in the 19th century. Again, building the awareness that today's news is tomorrow's history is a good first approach to the questions of the practice test.

The Content Area Template

The Content Area Template is a guide for the Inquiry Activities within the Learning Projects. The bulleted subsections are unique to the content areas.

The Learning Projects and Inquiry Activities in this guide are examples for inquiry-oriented instruction. Instructors should use their instincts for the teachable moment and their sense of their own class to develop further questions for Inquiry Activities or a different group of activities altogether. Your learners' different learning styles and the interests of your classes can be your best guide.

There are a variety of sources for materials beyond the test items in Practice Test A for the GED. You will be able to modify any of the materials you have been accustomed to using by using the Inquiry Template. Repetition plays an important role in the meta-cognitive process. Therefore, similar thinking/process questions are asked throughout the Learning Projects. It is through following the familiar process that learners begin to understand how they learn and to develop their own learning skills.

1) Identifying the Problem

In the first step of the process, learners are instructed to read the question in order to focus on what they are being asked to do. Particularly in test items where they are being asked to locate information, it is important to recognize the task at hand. In test items with long reading passages, learners are asked, as in any reading passage, to look over the passage to get a general understanding of the topic.

2) Becoming Familiar with the Problem

This step introduces several strategies important to reading in the content areas. The first is to preview the passage or the visual and the question. In dealing with

the vast material in the content areas, learners must focus clearly on the topic at hand; recognize it as being an American history question, or a biology question, and recognize that the material and its vocabulary are connected. The next strategy is to activate prior knowledge.

Working in content areas requires that learners bring up what they might know and what they have learned in specific content areas. New ideas cannot actually be learned and understood unless they are added to a body of knowledge. Adults, even those who have had little formal education, or whose experiences in the classroom have been unsuccessful, have learned a good deal about the content areas of science and social studies. It helps them to understand their own body of knowledge when they actively call it up.

The third strategy is for learners to identify the purpose of the questions. Learners should think about what they are looking for in a visual or a passage. They should also consider what about the topic interests them. As learners become better acquainted with the topics, their interests, prior knowledge, and understanding of purpose will assist them in developing an understanding of the concepts of these two content areas.

3. Planning, Assigning, and Performing Tasks

Planning

In the first phase of this step, learners decide whether they should work alone, in pairs, or in a group. Group learning, especially in these content areas, is particularly effective, for each member of the group can bring knowledge or awareness that the others do not have.

Assigning

If they are working in groups or pairs, the learners will have to decide upon who will take which roles in reading or in discussion, or identifying the important facts. As facilitator, you will be able to assess when your learners have reached the point that they should be simulating test-taking conditions by working alone.

Performing Tasks

As they are working on the task at hand, learners will use the following strategies:

- **Clarifying words.** Developing a working science and social studies vocabulary is paramount in building the body of knowledge and having an understanding of the concepts in both these fields. The vocabularies are distinct to the content areas; recognizing the words and



knowing what they mean is often enough to be able to answer the questions on the GED.

- **Building a context.** Learners must determine whether the passage or visual provides enough information for them to answer the question. This assists their building of the context of the field, so they can understand what is being asked of them and why it is important within their lives and also within the framework of the content area.
- **Analyzing the information.** Learners should look at the text or the questions to determine what they are being asked to do with the passage or visual or what kind of question they are being asked to answer. In this strategy the reader determines whether the answers can be found in the text, are not in the text, are the opposite of what is in the text, or not accurate.

Finally, **learners answer the question and defend their answers.** How they have dealt with the question is often more important to the learning process than what the answer is.

4. Sharing with Others

Telling other people what you know helps you to understand the material better. So take this opportunity not only to share the knowledge, but also to learn it more completely.

Learners see this statement every time they get to step 4, Sharing with Others. It may not at first be clear to your learners that the person who gets the most out of conveying information is the one who is conveying, not the one listening. The more learners communicate in pairs, small groups, or with the whole class, the more they will use thinking skills to get and convey information. One learns best when one teaches.

Sharing with others is an integral part of the Inquiry process. Communicating an understanding reinforces a learner’s ability to make meaning. The groups discuss and then report to the class how they did the work, what strategies they used, and any questions they may have. The groups should be encouraged to lead class discussions, which further helps to build communication skills.

5. Reflecting, Extending, Evaluating

The three activities of this step are at the heart of the learning process. This step expands the test-taking process emphasized earlier in the template by using what was learned and applying it to new situations or test

questions. The visuals and topics in the passages on the Practice Test will not be repeated in the GED test; exploring how they learned and applying this to other topics will prepare learners to handle the test itself.

Reflecting: *Think about what you have learned.*

Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don’t get much time to think about what was learned.

Reflection questions help the learners consciously examine their understanding. Reflecting questions tend to be analytical in Sternberg’s *Successful Intelligence* model (2000). Here you can ask learners to reflect on:

- thinking skills learned
- strategies used
- test-taking skills developed

Other reflecting questions include:

- What did I need to know to be successful in getting this answer?
- Is there a different way to learn the concepts presented here?
- How will this Inquiry Activity help me pass the GED?

Extending: *Extend what you learned to new situations.*

In extending, you are being asked to transfer the information presented in the Practice Test question to other information or situations.

The learner has the opportunity here to build upon the knowledge presented by making connections. Understanding relationships, observing patterns, and recognizing differences are all important in constructing meaning, getting at a deeper understanding of the content learned, and transferring that learning to new situations. Most of the IAs have several extending activities. Instructors should feel free to choose among them taking into consideration their classes’ interests and time constraints.

In the content areas, the extension activities offer an opportunity for learners to recognize certain science or social studies concepts and, then, to develop those concepts more fully by taking them into the skills areas – math, writing, and reading. The extending activities can be done in groups and reported to the larger group. The questions tend to be creative or practical in Sternberg’s *Successful Intelligence* model (2000). Some examples of these questions might be:



- What strategy might someone use to understand this material?
- How might you use this in your home or at work?

Evaluating: *Assess what you learned and how you learned it.*

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or didn't benefit from the content and/or the methods presented in this IA.

The evaluation questions reinforce this highest thinking level in Bloom's Cognitive Taxonomy.

Evaluation questions tend to be analytical and practical in Sternberg's *Successful Intelligence* model (2000). Questions that could be asked include:

- What parts of the activity worked best for you? Explain.
- What parts did not work well for you? Explain.
- What thinking strategy will you use when taking the GED test? Why?
- How does following this 5-step format make you feel?

The Inquiry Activity template is dynamic and can be applied to different situations in multiple ways.

Student versions of all the Inquiry Activities can be downloaded from the *GED as Project* website:

<http://www.jmu.edu/gedproject>

Figure 1

The Science and Social Studies Template

- 1. Identifying the Problem**
- 2. Becoming Familiar with the Problem**
 - *Preview the passage*
 - *Activate prior knowledge*
 - *Identify the purpose*
- 3. Planning, Assigning, and Performing Tasks**
(Individually, in pairs, or in groups)
 - *Clarify words*
 - *Build a context*
 - *Analyze the information*
 - *Answer the question*
 - *Defend your answer*
- 4. Sharing with Others**
- 5. Reflecting, Extending, and Evaluating**





Learning Project

GED Science and You

(Note: Italicized portions should be directed to the students.)

Inquiry Activity #1: Explore Your Experiences with Science

1. Identifying the Problem

This activity is started after the class has taken the *GED Science Practice Test*. This portion of the activity is done individually.

The problem you will be exploring involves the following questions. As in other inquiry activities, this first step asks you not to answer the question at once, but to make sure that you understand the questions being asked. If you want to discuss your understanding of the questions with others, please do so.

What are some of the things you know about science, and what are some of the things you want to know?

2. Becoming Familiar with the Problem

This second step starts the process of thinking about what you already know about the subject. Take some notes on what you know about the question. To help you, consider the following questions:

The list of questions may seem too extensive to you. These are not intended to be answered individually, but rather to start the learners' thinking process about science and their experiences with the subject. As you download the original version for your learners, you may wish to eliminate some or many of the questions. Or you may prefer to hold a class discussion in which you prompt with some, any, or all of the following. Your sense of your class will be your guide.

Think about the experience you have just had in taking the GED Science Practice Test. Don't think about whether you got an answer right or wrong but focus instead on what kind of reading and questions were on the test and how you reacted to them. Make some notes on your recollections.

Think further beyond the Practice Test you just took and recall your reactions when you looked at the test in the GED and You experience. This may have been some time ago.

- 1. What were your thoughts and reactions while you took the science test?*
- 2. What science seemed familiar to you? What had you seen or read about before?*
- 3. What science seemed unfamiliar to you, such as specific words, ideas, charts or graphs, kinds of questions?*
- 4. Think back to your experience with science in school. Recall when you first had science lessons. When did science become more challenging? What science courses did you take? What do you remember about those courses?*
- 5. What do you remember about the science books? Were they interesting or boring? Hard or easy to read? What did the teachers do to help you? What else do you remember about science in school?*

3. Planning, Assigning, and Performing Tasks

Planning: *This is an individual activity. You can think about how you will organize your thoughts and recollections to answer this question.*



Performing Tasks:

Doing the Work

Think a little more about the experiences you had in science in school and in this GED class. Write down the thoughts that go through your mind as you remember those experiences. Write down notes to the following questions:

1. How do you feel when you think about science?
2. What are some of the things you know about science, and what are some of the things you want to know?

Make a list of your answers divided into the following categories: *What I Know about Science*, and *What I Want to Know about Science*.

Reaching a Conclusion

Now form groups. Each group will do the following:

1. From the group members' lists, develop a list of the science topics that the group knows about.
2. Develop a list of the science topics the group members don't know that much about.
3. Besides general science, what other areas of science (life science, earth science, physical science) do you have questions about? List as many as possible.
4. Discuss some of the emotional reactions you had when you talked about science in school.

The group should prepare its lists for presentation to the class and decide if it wants to discuss the feelings the group members had about science in school.

4. Sharing with Others

Each group will present its lists to the rest of the class and be prepared to lead a class discussion if there are questions or comments from the class.

The instructor will lead a discussion that references and pulls together some of the following items among all the groups, after they have made their presentations.

- Class members' strengths in understanding general science concepts
- Class members' lists of other areas of science study about which they would like to know more

Lead a discussion on science experiences that create anxiety and concern among class members. If considerable discussion about science anxiety ensues, then you might want to develop an Inquiry Activity that allows the learners, working alone or with others, to explore some of their experiences.

5. Reflecting, Extending, Evaluating

In this section the questions are divided so the learners can think about what they experienced, extend their learning experiences to new contexts, and evaluate their learning. The kinds of questions used to accomplish this kind of thinking are the analytical, creative, and practical questions discussed by Robert Sternberg in his book, *Successful Intelligence* (2000).

In general, creative and practical questions are most useful in the Extending subsection. Analytical questions are most useful in Reflecting and Evaluating. In these subsections, use questions you have developed from your just-in-time assessments or as a result of comments made during the sharing portion of the Inquiry Activity.

If you feel the learners are sufficiently confident, they may lead the discussion. As the instructor, you are a member of the class and should participate in the discussion. This is a wonderful opportunity for just-in-time assessments.

**Reflecting: Think about what you have learned.**

These questions tend to be analytical in Sternberg's *Successful Intelligence* model.

1. *What new discoveries have you made about GED science?*
2. *What impact do you think your emotional reaction to science has when learning the subject?*
3. *What impact do you think your emotional reactions to science have when taking a science test?*
4. *What areas of science will you need to work on most?*
5. *Make a list or plan for how you will work to prepare for the GED science test.*

Extending: Extend what you learned to new situations.

These questions tend to be creative or practical in Sternberg's *Successful Intelligence* model.

1. *Think about how you feel in a course you like.*
2. *How do you feel in that course, and how can you transfer that feeling to a course you may not like so much, like science?*
3. *Think about the things you use in your everyday life that come from scientific development. What are some of these things? What would your life be like without them?*

Evaluating: Assess what you learned and how you learned it.

These questions tend to be analytical in Sternberg's *Successful Intelligence* model.

1. *If you have a negative reaction to science, what do you think causes that reaction?*
2. *How do you think you could overcome that reaction?*
3. *How do you feel about your motivation to pass the science portion of the GED test?*
4. *How will you study for science?*
5. *What made thinking about how you feel about science valuable to you?*
6. *How might you improve this activity?*



Learning Project

GED Science and You

(Note: Italicized portions should be directed to the students.)

Inquiry Activity #2: Developing your Science Action Plan

1. Identifying the Problem

Your task in this Inquiry Activity is to look at the section of the Action Plan in Appendix 2 of GED as Project Volume I and add a new section that you will call My Science Action Plan. The questions asked in this section are:

- 1. With what kinds of science am I most familiar?*
- 2. What do I know about science?*
- 3. How can I use my reading skills to help understand science questions?*
- 4. How can I use my thinking skills to help answer the questions?*
- 5. How can I use my test-taking skills in the science section of the GED?*
- 6. What parts of the “GED and You” action plan can I use in this science action plan?*

Again, do not do the work. Instead, think about your understanding of the questions. Ask others if you need clarification.

2. Becoming Familiar with the Problem (Individually)

Review the work you did in Inquiry Activity #1 of this Learning Project.

Review the action plan you developed.

Review the questions in the science section of the action plan, listed above. Make some preliminary notes about what you already know about the subject.

3. Planning, Assigning, and Performing Tasks

Planning: *This is an individual activity. Plan how you are going to approach the task of answering the questions.*

Doing the Work: *Start to think in a systematic way about how you will develop an action plan for GED science.*

Reaching a Conclusion: *Develop your science action plan.*

4. Sharing with Others

This activity is designed to help build awareness of the science portion of the GED, the three divisions of science study: life science, earth science, and physical science, and how the learners interact with them. Becoming aware of these issues is an important part of the learning process.

Discussing them is important too. Everyone should share his or her science action plan with the instructor. The plan should indicate that each learner’s understanding has deepened. One person’s insight, whether the instructor’s or a classmate’s, might help someone else’s understanding.



Decide if you would like to share your work with a partner, a group, or the class. You will be asked to share your revised plan with your instructor.

5. Reflecting, Extending, Evaluating

Reflecting: *Think about what you have learned.*

These questions tend to be analytical in Sternberg's *Successful Intelligence* model (2000).

1. *What new discoveries have you made about the GED, thinking skills, and science?*
2. *What questions do you now have about the GED, thinking skills, or science?*

Extending: *Extend what you have learned to new situations.*

These questions tend to be creative or practical in the Sternberg *Successful Intelligence* model (2000).

1. *Develop a new set of questions for the science action plan.*
2. *Who in your neighborhood or at work might be able to help you study science?*

Evaluating: *Assess what you learned and how you learned it.*

These questions tend to be analytical in Sternberg's *Successful Intelligence* model (2000).

1. *How do you feel about your motivation to pass the science portion of the GED?*
2. *How will you study for science?*
3. *Are you reading any more outside of class? If so, how might that help you in science?*



Learning Project

GED Social Studies and You

(Note: Italicized portions should be directed to the students.)

Inquiry Activity #1: Explore Your Experiences with Social Studies

1. Identifying the Problem

This activity is started after the class has taken the *GED Social Studies Practice Test*. This portion of the activity is done individually.

The problem you will be exploring involves the following questions. As in other inquiry activities, this first step asks you not to answer the question at once, but to make sure that you understand the questions being asked. If you want to discuss your understanding on the questions with others, please do so.

What are some of the things you know about social studies, and what are some of the things you want to know?

2. Becoming Familiar with the Problem

This second step starts the process of thinking about what you already know about the subject. Take some notes on what you know about the question. To help you consider the following questions:

The list of questions may seem too extensive to you. These are not intended to be answered individually, but rather to start the learners' thinking process about social studies and their experiences with the subject. As you download the original version for your learners, you may wish to eliminate some or many of the questions. Or you may prefer to hold a class discussion in which you prompt with some, any, or all of the following. Your sense of your class will be your guide.

Think about the experience you have just had in taking the GED Social Studies Practice Test. Don't think about whether you got an answer right or wrong but focus instead on what kind of reading passages and questions were on the test and how you reacted to them. Make some notes about your recollections.

Think further beyond the practice test you just took and recall your reactions when you looked at the test in the GED and You experience. This may have been some time ago.

- 1. What were your thoughts and reactions while you took the social studies test?*
- 2. What part of social studies seemed familiar to you? What had you seen or read about before?*
- 3. What part of social studies seemed unfamiliar to you, such as specific words, ideas, charts or graphs, kinds of questions?*
- 4. Think back to your experience with social studies in school. Recall when you first had social studies lessons. When did social studies become more challenging? What social studies courses did you take? What do you remember about those courses?*
- 5. What do you remember about the social studies text books? Were they interesting or boring? Hard or easy to read? What did the teachers do to help you? What else do you remember about social studies in school?*

3. Planning, Assigning, and Performing Tasks

Planning: This is an individual activity. You can think about how you will organize your thoughts and recollections to answer



this question.

Doing the Work: Think a little more about the experiences you had in social studies in school and in this GED class. Write down the thoughts that go through your mind as you remember those experiences. Write down notes to the following questions:

1. How do you feel when you think about social studies?
2. What are some of the things you know about social studies, and what are some of the things you want to know?

Make a list to your answers divided into the following categories: *What I Know about Social Studies* and *What I Want to Know about Social Studies*

Reaching a Conclusion: Now form groups. Each group will do the following:

1. From the group members' lists, develop a list of the social studies topics that the group knows about.
2. Develop a list of the social studies topics the group members don't know that much about.
3. What aspects of social studies: history, geography, civics, government, do you have questions about? List as many as possible.
4. Discuss some of the emotional reactions you had when you talked about social studies in school.

The group should prepare its lists for presentation to the class and decide if it wants to discuss the feelings the group members had about social studies in school.

4. Sharing with Others

Each group will present its lists to the rest of the class and be prepared to lead a class discussion if there are questions or comments from the class.

The instructor will lead a discussion that references and pulls together some of the following items among all the groups after they have made their presentations.

- Class members' strengths in understanding general social studies concepts
- Class members' lists of areas of social studies about which they would like to know more

Lead a discussion on social studies experiences that create anxiety and concern among class members. If considerable discussion about social studies anxiety ensues, then you might want to develop an Inquiry Activity that allows the learners, working alone or with others, to explore some of their experiences.

5. Reflecting, Extending, Evaluating

In this section, the questions are divided so the learners can think about what they experienced, extend their learning experiences to new contexts, and evaluate their learning. The kinds of questions used to accomplish this kind of thinking are the analytical, creative, and practical questions discussed by Robert Sternberg in his book, *Successful Intelligence* (2000).

In general, creative and practical questions are most useful in the Extending subsection. Analytical questions are most useful in Reflecting and Evaluating. In these subsections, use questions you have developed from your just-in-time assessments or as a result of comments made during the sharing portion of the Inquiry Activity.

If you feel the learners are sufficiently confident, they may lead the discussion. As the instructor, you are a member of the class and should participate in the discussion. This is a wonderful opportunity for just-in-time assessments.

Reflecting: Think about what you have learned.

These questions tend to be analytical in Sternberg's *Successful Intelligence* model.



GED as Project

Pathways to Passing the GED

1. *What new discoveries have you made about GED social studies?*
2. *What impact do you think your emotional reaction to social studies has when learning the subject?*
3. *What impact do you think your emotional reactions to social studies have when taking a social studies test?*
4. *What areas of social studies will you need to work on most?*
5. *Make a list or plan for how you will work to prepare for the GED Social Studies Test.*

Extending: Extend what you learned to new situations.

These questions tend to be creative or practical in Sternberg's *Successful Intelligence* model (2000).

1. *Think about how you feel in a course you like.*
2. *How do you feel in that course, and how can you transfer that feeling to a course you may not like so much, like social studies?*
3. *How are the nightly news on television or articles in the newspaper related to social studies?*

Evaluating: Assess what you learned and how you learned it.

These questions tend to be analytical in Sternberg's *Successful Intelligence* model (2000).

1. *If you have a negative reaction to social studies, what do you think causes that reaction?*
2. *How do you think you could overcome that reaction?*
3. *How do you feel about your motivation to pass the social studies portion of the GED test?*
4. *How will you study for social studies?*
5. *What made thinking about how you feel about social studies valuable to you?*
6. *How might you improve this activity?*



Learning Project

GED Social Studies and You

(Note: Italicized portions should be directed to the students.)

Inquiry Activity #2: Developing your Social Studies Action Plan

1. Identifying the Problem

Your task in this Inquiry Activity is to look at the section of the action plan in Appendix 2 of GED as Project Volume I and add a new section that you will call My Social Studies Action Plan. The questions asked in this section are:

- 1. With what areas of social studies am I most familiar?*
- 2. What do I know about social studies?*
- 3. How can I use my reading skills to help understand social studies questions?*
- 4. How can I use my thinking skills to help answer the questions?*
- 5. How can I use my test-taking skills in the social studies section of the GED?*
- 6. What parts of the “GED and You” action plan can I use in My Social Studies Action Plan?*

Again, do not do the work. Instead, think about your understanding of the questions. Ask others if you need clarification.

2. Becoming Familiar with the Problem (Individually)

Review the work you did in Inquiry Activity #1 of this Learning Project.

Review the action plan you developed.

Review the questions in the social studies section of the action plan, listed above. Make some preliminary notes about what you already know about the subject.

3. Planning, Assigning, and Performing Tasks

Planning: This is an individual activity. Plan how you are going to approach the task of answering the questions.

Doing the Work: Start to think in a systematic way about how you will develop an action plan for GED social studies.

Reaching a Conclusion: Develop your action plan.

4. Sharing with Others

This activity is designed to help build awareness of the social studies portion of the GED, the areas of concentration that make up social studies: history, civics, government, geography, and economics, and how the learners interact with them. Becoming aware of these issues is an important part of the learning process.

Discussing them is important too. Everyone should share his or her action plan with the instructor. The plan should indicate that each learner’s understanding has deepened. One person’s insight, whether the instructor’s or a classmate’s, might help someone else’s understanding.



Decide if you would like to share your work with a partner, a group, or the class. You will be asked to share your revised plan with your instructor.

5. Reflecting, Extending, Evaluating

Reflecting: *Think about what you have learned.*

These questions tend to be analytical in Sternberg's *Successful Intelligence* model (2000).

1. *What new discoveries have you made about the GED, thinking skills, and social studies?*
2. *What questions do you now have about the GED, thinking skills, or social studies?*

Extending: *Extend what you have learned to new situations.*

These questions tend to be creative or practical in the Sternberg *Successful Intelligence* model (2000).

1. *Develop a new set of questions for your action plan.*
2. *Who in your neighborhood or at work might be able to help you study social studies?*

Evaluating: *Assess what you learned and how you learned it.*

These questions tend to be analytical in Sternberg's *Successful Intelligence* model.

1. *How do you feel about your motivation to pass the social studies portion of the GED?*
2. *How will you study for social studies?*
3. *Are you reading any more outside of class? If so, how might that help you in social studies?*



Creating Your Own Inquiry Activities

The *GED as Project* materials you find in the printed volumes and on our website are written for the GED-level learner, using the PA Practice Test items. If you need material suited more to your class' needs and ability level, we encourage you to write your own Inquiry Activities using your own materials. Material may be pulled from a workbook, from the internet, or, to be most effective, from authentic materials that daily surround your learners in their homes and at work, such as newspaper stories, instruction sheets at work, charts, graphs, and maps.

No two adult education classes are alike. Dealing with the challenges of multi-level classes, as well as the learners' needs to pursue a variety of content areas in their studies, means that instructors must look to a variety of sources to develop effective lessons. The inquiry process is a powerful

tool to help both instructor and learners at any level.

Be sure to refresh your knowledge of good facilitation, asking good questions, setting up and managing a facilitative classroom, and small group dynamics by scanning *GED as Project Introduction: Volume #1* (the yellow book). *Learning to Think, Learning to Learn* by Jennifer Cromley would also be an excellent resource to set up your creative, project-oriented thinking. Your adult learning center office may have this book, or you can find it online at: www.nifl.gov/nifl/fellowship/cromley_report.pdf

The *GED as Project* case study team at Fairfax County Public Schools & Community Education Program developed the following template to serve as a strategic guide for writing your own activities.



Inquiry Activity Template for ABE Classes

Adapted from the GED as Project template

1. Identifying The Problem

The inquiry activity should revolve around answering this question or solving this problem. It should be stated as a problem for the learners to solve and can be followed by some themes or concepts the learners can think about that will help them clarify the problem. They should **not** solve the problem yet.

2. Becoming Familiar With The Problem

This step should lead learners to retrieve their prior knowledge related to the problem; to organize what is already known; and to acquire new knowledge about the problem. For example, in this step, you might ask them to discuss what they already know; to restate the question; to decide which facts might be helpful to break the problem down into smaller pieces or steps; to do some research about sources of information that they might use; or to explain the situation to each other.

3. Planning, Assigning, and Performing Tasks

Learners do the work and reach a conclusion about the problem, either answering the question or solving the problem that is stated in Step 1. They work in pairs, small groups, or individually.

4. Sharing With Others

Learners report to the larger group what they did in Step 3 and their results.

5. Reflecting, Extending, Evaluating

The questions in this step give learners an opportunity to think about what they have done and get the most out of it. Questions are designed to: transfer knowledge gained beyond the scope of this specific problem; state personal relevance of the problem; make it meaningful; make up a similar question themselves; reflect on what they learned and on the ways in which they learn; evaluate what skills they learned or practiced; and assess whether they need more practice.



An Example of How to Apply the Template:

Suppose you have a multi-level ABE class. What follows is a guide to create your own Inquiry Activity from, as an example, a Social Studies passage in your ABE workbook. You may type up the Inquiry Activity to hand out to the class, or you may simply post the Inquiry Process template poster and deliver the lesson orally using the 5-step, problem-solving method.

- 1) Decide on a passage or visual that supports your lesson.
- 2) Decide which questions or activities you want to use with the passage or visual. These may either be provided in the book, or you may make up your own. The questions can be as long or short as you wish, depending on how long you want the class to work on this IA. On the average, IAs take about an hour, depending on the extensions you use to add breadth and depth to the learning. You can have the learners simply turn to material in the book, or you can copy it onto a handout and make changes.
- 3) Creating the Steps:

Step 1: Identifying the Problem

Provide questions that direct the class to scan the passage and to figure out what type of document it is. Have them scan the questions or work that follows the passage, but remind them *not* to answer the questions yet.

Step 2: Becoming Familiar with the Problem

Provide questions for the learners to check the passage for vocabulary words they are unsure of, and discuss these as a whole group or in their small groups. Have dictionaries and a thesaurus available. Have them share or write down what they know about the subject in the passage. Where have they seen something like this before? (Build on their prior knowledge in this step.)

Step 3: Doing the Work and Step 4: Sharing

Have the class do the work by themselves, guessing if they have to. Your class should be a safe environment in which they can make mistakes. After the independent work is done, let them form into small groups or pairs to check out their answers with each other. Finally, let each small group share and compare their answers *and how they arrived at these answers* with the whole group. Make sure they are thinking about thinking and about how they learn.

If there are discussions that show the learners are very confused and have gone far enough trying to figure out the answer for themselves, step in and offer a burst lecture to clarify or further explain with material to provide the context they need. Provide a mixture of direct instruction and facilitation throughout this Inquiry Activity as needed.

Step 5: Reflecting, Extending, and Evaluating

Reflecting: Here, you should ask questions about what the class learned.

Extending: Then, extend their learning to a new situation by asking them to do an additional task that uses their new knowledge. Use additional resources, other media, or authentic material to keep things interesting and real-life oriented. Use material from another subject area if you can. This reinforces integrated learning and helps develop critical-thinking skills.

Evaluating: Finally, ask the learners if this process worked for them. How might they find it useful in their studies, on the job, or in the community?

For more information on writing Inquiry Activities, you may contact:

Lori Baker at Fairfax County Public Schools – Lori.Baker@fcps.edu

Leslie Manning at Fairfax County Public Schools – leslie.manning@fcps.edu

Susan Holt through the Virginia Adult Learning Resource Center – msholt@comcast.net



Learning Project **1**


Understanding Graphs

This Learning Project addresses one of the areas that both the science and social studies GED tests emphasize: graphs. In the GED 2002, more than half of the questions in these content areas feature visuals. The reason for this can be seen in the media that present information to us every day: television, newspapers, magazines, and online sources. More and more, people are presented with a visual representation of the information given in an accompanying article.

In order to capture the information displayed in these condensations of lengthy or complex passages, test takers will need to know the components of graphs. The graphs have two axes, one horizontal and one vertical. Each is labeled: information across the bottom and information going from bottom to top. Bar graphs show amounts at given time intervals (days, week, months, centuries) and line graphs use the indicator lines, most commonly from left to right, to show variation over time.

Students will have seen graphs in their math study, but there is a key difference between math and science and social studies. In math, the students will work with the differing amounts in some way. In the science or social studies graphs, students will be expected to understand or analyze the information in the visuals.

In Inquiry 1-1, learners are confronted with a bar graph. When they are given visuals, learners are asked to read the question first and then look at the graph. When locating information or understanding a visual representation of a complex subject, the viewer needs the context in order to

make sense of the representation. That comes from the caption or title of the entire visual, the labeling of the axes, and, in the case of the test taker, the question being asked about the visual. The question is the reason the reader looks at the graph, and, therefore, it provides the need to understand the labels. Test-taker tips [] appear in this Inquiry, as they will throughout the Learning Projects.

Inquiry 1-2 is a science-based bar graph, which is approached in the same way as the social studies question in 1-1. The importance of the axes' labels is stressed. Here, too, test-taker tips refine and stress the information presented about dealing with the answer choices.

Inquiry 1-3 has two line graphs. Both of these items are science questions and show variations. In addition, both show that a careful study of the graph is all that is needed for a correct answer to the question. In the extension item in Inquiry 1-3, the information is apparently very complicated. However, the test question asks only for similar points, which, even without understanding the topic, can be discerned.

Inquiry 1-4 is more involved. This visual has several questions related to it and a reading passage that complements but does not explain the time line. As is frequently the case in the new GED, the test taker will have to draw conclusions from the material presented. Because of the complexity of this particular passage, we suggest instructors use the question-asking reading strategy presented in Learning Project 7 of the Reading volume.



Learning Project 1 Understanding Graphs

The GED 2002 has a greater number of charts and graphs than earlier tests in order to emphasize the importance of being able to locate information appropriate to answering the questions from a vast array of supporting or distracting data. In *GED as Project*, we have grouped the questions from Practice Test A that use visuals into the first three learning projects.

Both the social studies and the science portions of the GED test use graphs as the basis for a number of questions. These make an obvious extension to the study of graphs in math, and they make it clear to the learners that graphs are a common presence in their daily lives. We have grouped together all the questions featuring visuals from both the social studies and science PA tests together, where the graphics have similarities.

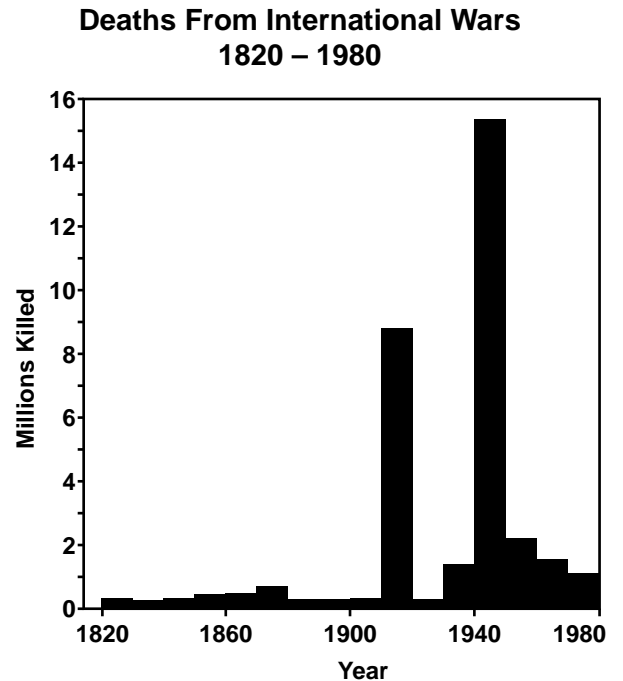
Inquiry Activity 1-1: Reading Bar Graphs

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 15 Social Studies PA)

Read the question first, then look at the graph.

15. Which question about the history of international wars can be answered by using the information in the graph?
- (1) Why did the number of deaths caused by war increase in the twentieth century?
 - (2) During which decade in the twentieth century did war cause the most deaths?
 - (3) To what extent did the number of war deaths change in 1990?
 - (4) How many civilians, compared with soldiers, died in international wars?
 - (5) Which areas of the world have been most severely affected by war?



Sources: J. David Singer and Melvin Small, adapted from *The Wages of War, 1815-1965: A Statistical Handbook* (New York: John Wiley, 1972); and Small and Singer, *Resort to Arms* (Beverly Hills, Calif.: Sage, 1982).

Have you seen passages graphs like this before? Where? When? Why?

What words or symbols might be important to understand in order to answer the question, and what are they telling you?

It is important to note that deaths are being counted in the millions. Also, this graph covers only international wars. Some very significant losses in the American Civil War (1861-65) will not be on this graph.

Is there anything in the graph you do not understand?



This graph gives a vivid portrayal of death caused by international warfare. It is also significant that most of the answer choices address subtleties not shown on the graph, such as regions affected, civilian as opposed to military deaths, and the reasons for increases.

2. Becoming Familiar with the Problem

Ask yourself questions like the following, taking note of those that were helpful so you can use them again.

Re-read the question. What are you being asked to find out?

The answer choices in this instance are given as questions, which is unusual. Learners will have to identify the question to which the graph provides the answer.

From reading the title, what do you already know about the topic of this graph?

The title of the graph is straightforward: Deaths from International Wars, from 1820 to 1980. Knowing the title will allow learners to eliminate one incorrect choice (3) promptly.

Read the labels on the sides. What information do the bars tell you?

What do you already know about the information on the graph from your previous reading or experiences?

War is well known. Most, if not all, of your learners will be aware of World War II; that knowledge will reinforce the information on the graph and the correct answer.

You may want to do a burst lecture here about the use and purpose of graphs in accompanying articles. Newspapers and magazines can provide a lot of additional materials for this.

Does the topic attract your attention?

3. Planning, Assigning, and Performing Tasks

You may wish to work in a group to do this Activity.

The task that you will complete is to read the passage. The following strategies can be helpful. Try to answer the test question any way that you can, even if you have to guess. Be aware of the reasoning and steps you use. The following questions can be helpful.

What information does the graph provide that can answer the questions in the problem?

What information that the answer choices questions ask for is not on the graph?

The graph does not provide a breakdown of civilian deaths, reasons for increased numbers of dead, or areas of the world where wars occurred. The graph ends with 1980.

Find your answer to the question.

The correct answer is (2) which decade had the most deaths caused by war. It is the only answer choice for which the graph provides enough information.

Is your answer completely covered by the information in the graph?



Questions that use bar graphs require careful reading. The graphs may provide either more information than is needed, or not enough information for the answer choices. Test takers should keep in mind that they can often use the information provided, or not provided, to eliminate one or more of the answer choices. Reading the title of the graph, the labels on the sides, and the question carefully will keep the learners from becoming confused.

Be able to defend your answer and the way you found it.

4. Sharing with Others

Telling other people what you know helps you to understand the material better. So take this opportunity not only to share the knowledge, but also to learn it more completely.

Whole class: Share with the whole class the steps you used in order to answer the question. Take notes on any different ways of answering the question the other groups used.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *What have you learned about the use of graphs in this Activity?*
2. *How does focusing on the title and the labels help you understand the purpose of the graph?*
3. *How are graphs useful in making information clear to readers?*
4. *What does focusing on what is on the graph mean to you as a test taker?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in the Practice Test question to other information or situations.

1. *How is this graph different from those you have seen in math problems? Use the graph problem in Volume 2 Math, Inquiry Activity 5-2 to answer this.*

You may wish to do math, science, and social studies graphs as one unit. Primarily the differences will be that math graphs will require computation and the science and social studies graphs show the point of the story.

2. *Make up a different question about this graph that could be used on the GED. Exchange it with others in your group to answer.*
3. *How would you go about adding information to this graph to answer other questions?*

Civilian and military deaths could be different columns. Other graphs could show causes, regions, introduction of weaponry, or other factors.

Other additions could be to turn this into a math problem by adding a question about different numbers of deaths in different eras, or finding the differences between civilian and military deaths.



Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers; it is your chance to look more closely at your learning style and the opportunity to state how you benefited or didn't benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What parts of this IA will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*





Learning Project 1 Understanding Graphs

**Inquiry Activity 1-2:
Gathering Information from Bar Graphs**

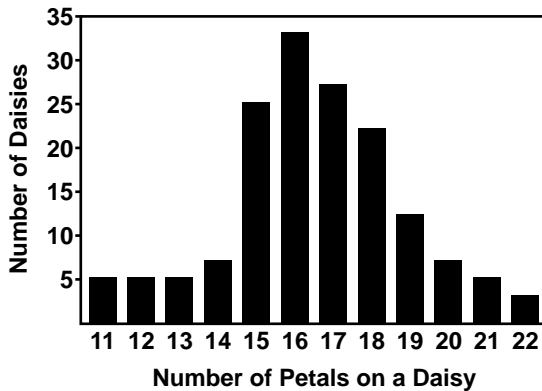
(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 2 Science PA)

Read the introduction first, then look at the graph, and then read the question.

- A naturalist wanted to answer the question, “How many petals does an average daisy have?” He gathered a large number of daisies and counted the number of petals on each. He then listed his observations in the following graph.

**A Survey of the Number of Petals
Produced by Daisy Flowers**



Which of the following statements could BEST be supported by his observations?

- The most common number of petals on a daisy is 15.
- The least common number of petals on a daisy is 20.
- The largest number of petals on a daisy is 19.
- The smallest number of petals on a daisy is 14.
- The number of petals on a daisy varies.

Where have you seen graphs like this before?

What words or symbols might be important to understand in order to answer the question, and what are they telling you?

Is there anything in the graph you do not understand?

In this graph, all the answers, except for the correct answer, are directly contradicted by the information given on the graph. The correct answer (choice 5) is the only one that is not specific in numbers. This is a variation on the approach to answers shown in the first Inquiry Activity. There, several answer choices called for information not provided by the graph.



2. Becoming Familiar with the Problem

Ask yourself questions like the following, taking note of those that were helpful so you can use them again.

Re-read the question. What are you being asked to find out?

The correct answer will be a statement that agrees with the information provided by the graph. The answer is not the same as the important finding of the study.

From reading the title, what do you already know about the topic of this graph?

Read the labels on the sides. What information do the bars tell you?

What do you already know about the information on the graph from your previous reading or experiences?

Does the topic attract your attention?

You might get some discussion here on silly science projects.

3. Planning, Assigning, and Performing Tasks

Try to answer the test question any way that you can, even if you have to guess. Be aware of the reasoning and steps you use. The following questions can be helpful.

What information does the graph provide that can answer the questions in the problem?

What information shown on the graph is different from the answer choices?

Most of the answer choices have incorrect numbers in them.

Select your answer to the question.

The correct answer is (5) The number of petals varies.

Is your answer choice defended by the information given in the graph?

Be able to defend your answer and the way you found it.

4. Sharing with Others

You may wish to do this Activity in a small group.

Telling other people what you know helps you to understand the material better. So take this opportunity not only to share the knowledge, but also to learn it more completely.

Whole class: Share with the whole class the steps you used in order to answer the question. Take notes on any different ways of answering the question the other groups used.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *Look at the answer choices for this question. How is the correct answer different from the other choices?*



The correct answer is the only one without a specific number. This may be a useful test-taking tip.



2. *How did focusing on the information actually given by the graph help you to understand problem better?*
3. *How necessary to understanding the question and getting the correct answer is the paragraph preceding the graph?*

The paragraph sets up the topic, but it is not necessary for reading and understanding the graph or answering the question correctly. This may also be a useful test-taking insight, as many of the questions with graphic components have reading passages that may be skimmed rather than read carefully.

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in the Practice Test question to other information or situations.

1. *Make another graph that shows the results of a study your group might think of doing. You could study how many people you know who attended different movies, or what makes of cars (or any other products) are popular, or any topic you come up with in your group. Have your labels show the information you have gathered.*
2. *Write a multiple-choice question about the findings of your group study from question 1, and exchange it with others to answer.*
3. *Write an essay about another science study you did or have heard about.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers; it is your chance to look more closely at your learning style and the opportunity to state how you benefited or didn't benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What parts of this this IA will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



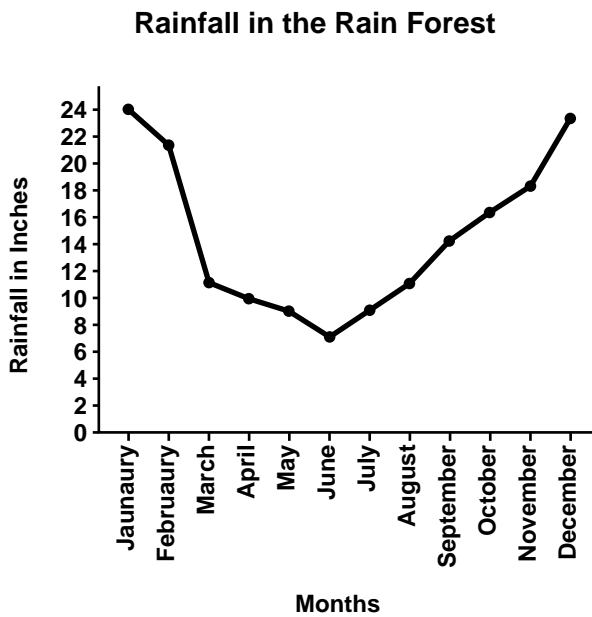
Learning Project 1 Understanding Graphs

Inquiry Activity 1-3: Interpreting Line Graphs

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 1 and 20, Science PA)

Read the question first, then look at the graph.



1. Based on the data provided in the chart, in which months is the rainfall about the same?

- (1) March and August
- (2) January and November
- (3) February and June
- (4) May and September
- (5) October and December

Where have you seen graphs like this before?

What words or symbols might be important to understand in order to answer the question, and what are they telling you?

Is there anything in the graph you do not understand?

2. Becoming Familiar with the Problem

Ask yourself questions like the following, taking note of those that were helpful so you can use them again.



Re-read the question. What are you being asked to find out?

Since we know that test-takers often misread the question, it is important for your learners to read it carefully and recognize what they are being asked to do in order to answer the question correctly. Multiple choice questions, which offer a number of enticing distractors, can feed into the incorrect readings.

From reading the title, what do you already know about the topic of this graph?

Read the labels on the sides. What information do the points on the line tell you?

The labels show that rainfall in inches by the months of the year is being graphed.

What do you already know about the information on the graph from your previous reading or experiences?

Many of your learners will know about measuring rainfall in inches. The fact that the measurements are from the rain forest is irrelevant to answering the question. The enormous amounts of rain in inches might be an interesting discussion.

Does the topic attract your attention?

3. Planning, Assigning, and Performing Tasks

You may wish to do this Activity in a small group.

Try to answer the test question any way that you can, even if you have to guess. Be aware of the reasoning and steps you use. The following questions can be helpful.

What information does the graph provide that can answer the questions in the problem?

Find your answer to the question.

The correct answer is (1) March and August.

Is your answer completely covered by the information in the graph?

Be able to defend your answer and the way you found it.

Some may go through the months as given in the answer choices, while others will study the graph to find their answers before considering the choices. While we often suggest that learners consider all the answers carefully, a question like this can be answered quickly and accurately by studying the graph first.

4. Sharing with Others

Telling other people what you know helps you to understand the material better. So take this opportunity not only to share the knowledge, but also to learn it more completely.

Small Groups: *Compare your answer choice with the others in the group. Explain why you selected this answer and why you think it is correct. Agree on the correct answer and the steps you would recommend for solving this problem.*

Whole class: *Share with the whole class the steps you used in order to answer the question.*

Take notes on any different ways of answering the question the other groups used.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.



1. *What have you learned about answering questions that feature graphs?*
2. *If this graph had been on a grid, would you have found it easier to get the answer? Explain your answer.*
3. *Would you find this question easier if the information was given in a bar graph? Explain your answer.*

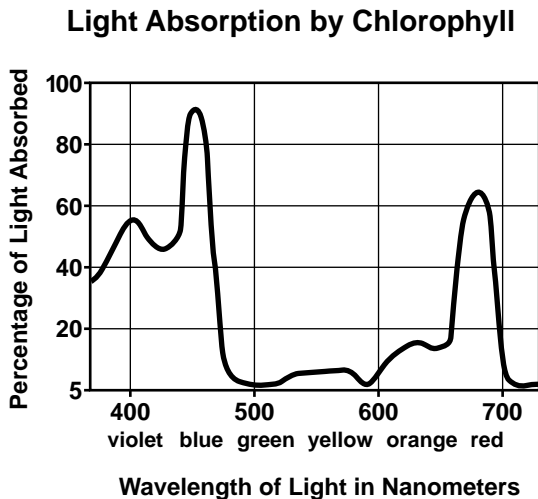
Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in the Practice Test question to other information or situations.

This Extension section focuses on another graph question. In this case, the material appears highly technical and difficult. However, the problem posed by the question is virtually identical to the rain forest question.

The following question asks you again to compare the data found in the graph.

20. The graph below shows the percentage of light of different wavelengths that is absorbed by chlorophyll.



For a plant to achieve the maximum rate of photosynthesis, what wavelengths of light would be MOST effective?

- (1) violet and blue
- (2) blue and red
- (3) green and orange
- (4) orange and red
- (5) violet and yellow

1. *How is this question like the question about rainfall?*

It is asking the learner to find two points of similarity on the graph.

2. *What do you need to understand on this graph to be able to get the correct answer?*



All they need to understand is how to find the similar points. This question appears to be very difficult and highly technical, with polysyllabic, scientific vocabulary (nanometer, wavelength, light absorption). A careful reading of the graph will give the answer and perhaps some understanding of wavelength and color; but even a cursory identification of the question will lead your learners to the two highest peaks, and the correct answer, (2) blue and red.

3. *Is there information on this graph that you do not need to know in order to answer the question?*
4. *What do your answers to questions 2 and 3 mean to you as a test taker?*
5. *What do you know about the properties of color?*

Here, you might want to lead a discussion about the nature of color absorption and reflection. You could use questions about the color of plants and what wavelengths of light are absorbed/reflected back to the eye if a plant is green, red, yellow, etc. Black absorbs all wavelengths; white reflects all.

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers; it is your chance to look more closely at your learning style and the opportunity to state how you benefited or didn't benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What parts of this Inquiry Activity will you use when taking the GED test? Why?*
4. *How did following this 5-step format make you feel?*



Learning Project 1 Understanding Graphs

Inquiry Activity 1-4: Recognizing Points on a Time Line

(Note: *Italicized portions should be directed to the students.*)

1. Identifying the Problem (Items 20-23 Social Studies PA)

In this Inquiry Activity, we move from the single question graph to a larger graphical display along with several small passages that relate to it, but do not explain it. In addition to the challenges of reading the time line, learners will also have to draw conclusions that they will derive from the passage and the graphic.

The reading strategy used for this passage is the question-asking strategy, which is presented in *Language Arts, Reading, Learning Project 7-1*. You may also wish to model the Think Aloud process as shown in Appendix B of the Reading volume, pages 104-106.

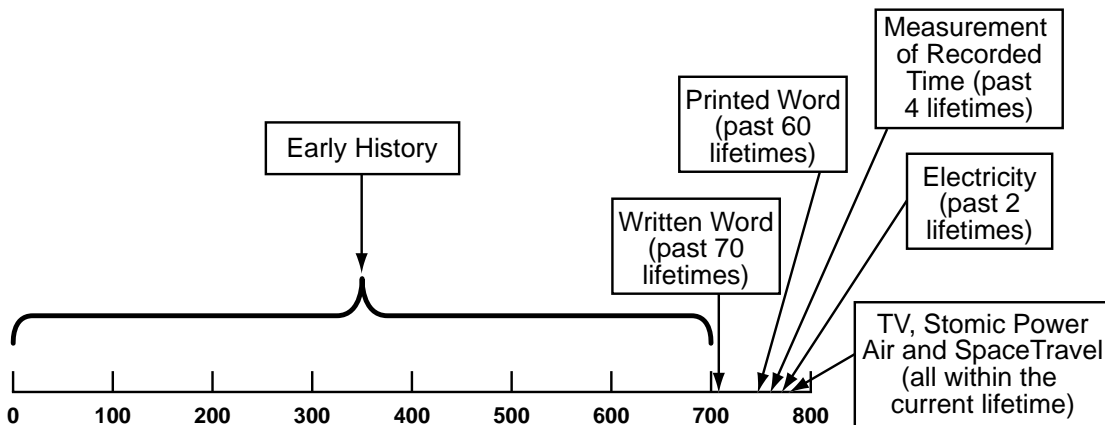
Both the passage and the question stems have some difficult vocabulary. You may want to use this passage for an extended vocabulary lesson.

Look over the graphic, the passage, and the title. From the title of the graphic, what do you think you will be asked to do?

What are you being asked to read? What will you have to do to be successful in this Activity?

Dot down your thoughts, or share them with a partner.

**Humanity's Lifelines
(62 Years in Each Lifetime)**



Source: Adapted from Alvin Toffler, 1970.

Alvin Toffler, a famous “futurist,” developed the above time line in 1970. He divided the past 50,000 years of history into lifetimes of 62 years each. According to Toffler’s “800 lifetimes,” many of humanity’s major technological benefits have been developed within a few “lifetimes.”



The quality of many people’s lives depends on how technology is used. But the challenge to society is how skillfully people can adapt to such great changes in technology, lifestyles, and environment. In 1970, Charles Reich warned people of the dangers of uncontrolled technology when he wrote:

“Technology and production can be benefactors of man, but they are mindless instruments. If undirected they careen along with a momentum of their own . . .

“Organizations and bureaucracy, which are applications of technology to social institutions, increasingly dictate how we shall live our lives, with the logic of organizations taking precedence over any other value.”

Source: James O. Lugo, adapted from *Living Psychology*, 4th ed. (CAT Publishing Company, Calif. 1991) 240-51.

20. According to the time line, which of the following statements most accurately describe the historical development of technological changes?
- (1) Technological changes have developed at a steady pace.
 - (2) Every human “lifetime” has produced major technological changes
 - (3) Most important technological changes occurred during the same ten-year period.
 - (4) Technological change has slowed down in the past 100 years.
 - (5) Technological changes have happened more frequently in the past two lifetimes than before.
21. What would Charles Reich have called the nuclear weapons that proliferated during the twentieth century?
- (1) a bureaucracy
 - (2) mindless instruments
 - (3) logical organization
 - (4) social organizations
 - (5) controlled technology
22. Which of the following is an example of people adapting to the new technology of the latest lifetime shown in the time line?
- People:
- (1) are less likely to travel
 - (2) read books from other countries
 - (3) adjust their activities to seasonal changes
 - (4) exchange information rapidly
 - (5) grow their own food
23. How does the passage defend the idea that technological developments challenge people in their daily lives in the twentieth century?
- By claiming that:
- (1) technology was expensive
 - (2) people did not want to belong to organizations
 - (3) many societies did not have modern technology
 - (4) people needed skills that helped them live with new technology
 - (5) technological changes took too long to occur for people to benefit from them



Where have you seen graphs like this before?

What words or symbols might be important to understand in order to answer the question, and what are they telling you?

Is there anything in the time line you do not understand?

2 Becoming Familiar with the Problem

Ask yourself questions like the following, taking note of those that were helpful so you can use them again.

Re-read the questions. What are you being asked to find out?

From reading the title, what do you already know about the topic of this graph?

What do the numbers on the timeline mean?

What information given in the boxes is relevant to what you need?

Does the topic attract your attention?

Preview the Passage. *How is the passage organized? What kind of punctuation is used? What is bold and what is not? What do these things tell you?*

Set a Purpose. *The purpose is to study the timeline and then read the passage, asking questions as you read.*

3. Planning, Assigning, and Performing Tasks

Planning: *Determine if you want to work individually, with a partner, or in a small group.*

Assigning: *Discuss the information given on the timeline. Read the passage aloud or in groups. Determine who will start reading and where you will stop to ask questions. You might want to stop after each sentence.*

Doing the Work: *As you read the passage, consider these strategies:*

Clarify: *Find and mark any words you might not know. See if the passage gives you enough information to clarify the meaning of the words. If not, find the meaning by asking someone or looking it up.*

Write down questions as you read. *As you read the passage, stop occasionally to write questions that have occurred to you. These could be questions like the following:*

I wonder what a _____ does?

I am confused by the word _____.

Why is technology a challenge?

Were there any parts of the timeline or phrases in the passage you did not understand?

Now answer the questions in the problem any way that you can, even if you have to guess. Be aware of the reasoning and the steps you use. The following questions can be helpful:

What are the questions asking you to do?

What information does the timeline provide to answer the questions?

What information is found only in the passage?

Find your answers to the questions.

The answer to 20 is choice (5) Technological changes have happened more frequently in the past two lifetimes. The timeline shows six changes within the time frame; the most depicted by the graph.



The answer to 21 is (2) mindless instruments. The other choices refer to organizations; the weapons do not control themselves.

The answer to 22 is (4) exchange information rapidly. The advances shown on the time line refer to TV and travel; the other choices are technologies developed in earlier lifetimes.

The answer to 23 is (4) people needed skills that helped them live with new technology. The passage refers to a need for skillful adaptation to great technological changes.

Be able to defend your answers and the ways you found them.

4. Sharing with Others

Telling other people what you know helps you to understand the material better. So take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: Compare your answer choices with the others in the group. Explain why you selected these answers and why you think they are correct. Agree on the correct answers and the steps you would recommend for solving this problem.

Whole class: Share with the whole class the steps you used in order to answer the questions.

Take notes on any different ways of answering the questions the other groups had.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start you thinking about the experience you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *Look again at the timeline. If you were telling someone else what information it provided, what would you tell that person?*
2. *What would you say is the most important idea shown on this graph?*
3. *Why do you think the far end of the timeline has so much information on it?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in the Practice Test question to other information or situations.

1. *From looking at this time line, what would you guess the value of the written word is to the progress of technology?*
2. *Write an essay on the value of technology to your life.*

The topic here is purposely vague. If you wish, you may ask for an essay on a more defined title of your choosing.

3. *Many science fiction books and movies often consider the role of technology. What are some movies or stories you have read that address this topic?*

Movies in the science fiction genre address many of the serious issues created by technology, whether the subject is radiation, as in the always-popular *Godzilla* movies, cloning or psychological controls in the *Star Wars* series, machine over man in *The Matrix*, or the widespread mayhem of the *Terminator* movies.



Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers; it is your chance to look more closely at your learning style and the opportunity to state how you benefited or didn't benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What parts of this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 2

Reading Charts and Diagrams

This Learning Project deals with other types of visuals that people encounter on a daily basis – charts and diagrams. The chart typically has several headings, both on the vertical columns and the horizontal rows. In order to get meaning from the table, the reader will look down the column and across the row to the point at which the two attributes intersect.

The visuals in this Learning Project are all examples of the tables and diagrams that are frequently encountered in daily life. In some cases, the visual is accompanied by text, which it complements or illustrates. In other cases, the visual is the only information by which the test taker will answer the item. Again, the learners look at the question before examining the visual. And, as they do with graphs, learners work with the organization of the chart or diagram and its title to make meaning from the text.

Inquiry 2-1 has two tables. In neither case do the test takers need to understand the concept being displayed in the tables. They need only match the numbers, in one the smallest and in the other, by matching numbers with the directions. The tables are similar to those seen on the back of food mixes, fertilizers, and myriad other household products. The topic of two-cycle engines is familiar to many as well. This shows the learners that, although the ideas may seem difficult and the vocabulary is challenging, most of the items in the science test reference things with which they are very familiar in their daily lives.

Inquiry 2-2 presents both science and social studies. The strategies for approaching the visuals are the same for each content area. Again, learners will need to look for the organizing structure, or at the details in the diagram.

The charts in Inquiry 2-3 are from the social studies PA. They should be familiar to anyone who has bought a major appliance. In this item, the information on the charts is not specifically tested; the reason or purpose for having these prominently displayed is. The answer does not appear in the



text. Learners are referred to the Reading volume and Inquiry 2-3 for further exploration of dealing with questions that ask for the author's purpose.

The final Inquiry in this Learning Project features a diagram that has no explanatory text. Test takers will need to bring their own knowledge into play in order to answer the question. Also, in the Extension of this Inquiry, learners are asked to develop diagrams or charts on their own. In addition to the science resources found in Appendix E, examples of other diagrams and flowcharts are given in Appendix B. The full GED will have questions that feature a pie chart, which shows the relationship of parts to the whole, and a flow chart, which visually recreates a process.



Learning Project 2 Reading Charts and Diagrams

Inquiry Activity 2-1: Reading Charts

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 15 & 24 Science PA)

These two questions require gathering information from a chart to find the correct answers.

Read the questions first, then look at the charts.

15. Density of Some Gases at Standard Temperature and Pressure

Gas	Density (grams per liter)
Air (dry)	1.2929
Ammonia	0.771
Chlorine	3.214
Helium	0.1785
Oxygen	1.429

Which gas listed above is the LEAST dense?

- (1) air (dry)
- (2) ammonia
- (3) chlorine
- (4) helium
- (5) oxygen

24. In order to cut her grass, Georgette recently purchased a string trimmer with the following instructions.

Mixing Instructions for 2-Cycle Engine Oil

Mix 2-cycle oil with unleaded gasoline in a 24:1 ratio of gasoline (gallons) to oil (ounces). Use the mixing instructions from an 8-ounce container of 2-cycle engine oil as listed in the following table.					
Ratio	16:1	20:1	24:1	32:1	40:1
Gas (Gal.)	1.0	1.25	1.5	2.0	2.5
Oil (Oz.)	8.0	8.0	8.0	8.0	8.0



Georgette needs to fill the trimmer's engine properly before she uses it.

Which amount of gasoline should she mix with the contents of the oil container?

- (1) 1.0 gallon
- (2) 1.25 gallons
- (3) 1.5 gallons
- (4) 2.0 gallons
- (5) 2.5 gallons

Where have you seen charts like this before?

What words or symbols might be important to understand in order to answer the questions, and what are they telling you?

In question 15, to understand the content, learners should understand density, grams, liter, and the names of the gases.



To answer the question properly, they simply need to compare the numbers.

For question 24, they will need to understand the symbol for ratios. A discussion of what ratios are and how they correlate with proportions (Learning Project 6 in the Math volume; see part 5, Extension) might be helpful. However, learners do not need to understand the concept in order to answer the question correctly. They need only match numbers.

Is there anything on the charts you do not understand?

2. Becoming Familiar with the Problem

Ask yourself questions like the following, taking note of those that were helpful so you can use them again.

Re-read each question. What are you being asked to find out?

From reading the title, what do you already know about the topic of each chart?

Read the headings on the columns. What information do they give?

What do you already know about the information on each chart from your previous reading or experiences?

The chemicals listed are all ones that most people have some experience within their lives, although most of us experience ammonia and chlorine in forms other than gas. Helium balloons are available at most florists, grocery stores, and crafts stores.

The idea of mixing things together in specific proportion (2 parts vinegar to 1 part oil) is familiar to most who have cooked. Mixing gas and oil for small engines is commonplace knowledge for any who have mowed lawns, run chain saws, or have used other machinery with two-stroke engines.

Do the topics attract your attention?

How are the charts organized?

How does the organization help you understand what is on the chart?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work in a group to do this Activity.*

Assigning: *Decide who will read the information or who will lead the discussion of what is on the chart and how each chart is organized.*



Doing the Work: As you read the charts, consider these strategies:

What information does the chart provide that can answer the questions in the problem?

Find your answer to the questions.

The correct answers are directly shown on the charts. For question 15, the answer is (4) Helium is the least dense gas.

For question 24, the answer is (3) 1.5 gallons.

Are your answers completely covered by the information in the charts?

The charts give more information than the questions require. Beyond finding the correct spot on each chart to read off the answer, nothing else is required.



It might be worth mentioning that for both questions, the answers are given in the same order as the material is presented on the chart.

Be able to defend your answer and the way you found it.

4. Sharing with Others

Telling other people what you know helps you to understand the material better. So take this opportunity not only to share the knowledge, but also to learn it more completely.

Whole class: Share with the whole class the steps you used in order to answer the questions. Take notes on any different ways of answering the questions the other groups give.

5. Reflecting, Extending, and Evaluating

Reflecting: Think about what you have learned.

Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *What have you learned about the uses of charts in this Activity?*
2. *How does the layout or organization of the charts help you understand their purposes?*
3. *How can charts be useful in making technical or unusual information clear to readers?*
4. *How important is it to understand all the material on the charts?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in the Practice Test question to other information or situations.

1. *Use the information presented on the chart in question 24 to make a proportion problem for a math class. Use Math Learning Project 6-1 as a model.*
2. *Make up a different question about one of these charts that could be used on the GED. Exchange it with others in your group to answer.*
3. *Take the information given in each of these charts and write it in a paragraph. Which is easier to understand—your paragraph, or the charts? Why?*

One of the reasons visuals appear with increasing frequency in today's media is that they present information accessibly.



Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers; it is your chance to look more closely at your learning style and the opportunity to state how you benefited or didn't benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What thinking strategy will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project **2** Understanding Charts and Diagrams

Inquiry Activity 2-2: Drawing Conclusions from Information on a Chart

This Inquiry Activity has three charts and covers both science and social studies. At first glance, it may look a little overwhelming. However, the approach to locating information on these three graphics is very similar.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 21 & 25 Science PA and 6 Social Studies PA)

In this Inquiry Activity, learners will have to read the charts and draw conclusions from the information presented there in order to answer the questions.

Read the questions before you look at the charts or any reading passages that make up the problem.

What will you have to do in order to be successful in this Activity?

21. As many as 20 percent of patients who take prescription drugs including insulin consume herbal supplements, but without realizing that such a combination may pose a health risk under certain circumstances. Patients should always consult their pharmacists or physicians before taking herbal supplements with prescription drugs.

Herb Interactions		
Herb	Interaction	When Taken With
Garlic	Increased internal bleeding	Blood-thinning drugs
Gingko Biloba	Increased internal bleeding	Blood-thinning drugs
St. John's Wort	Increased sedation	Prozac
Ginseng	Lowered blood-sugar level	Insulin or blood-sugar regulators

From the information provided in the chart above, which of the following statements is true?

Herbal supplements:

- (1) are types of vitamins that have a high calorie content
- (2) interfere with all prescription drugs
- (3) are cheaper than prescription drugs
- (4) boost the human immune system
- (5) may change the effect of certain prescription drugs.



25. Earth’s environment has changed over the centuries. Such changes can be viewed by examining fossils below Earth’s surface. The fossils shown in the following diagram were found in a rock cliff.

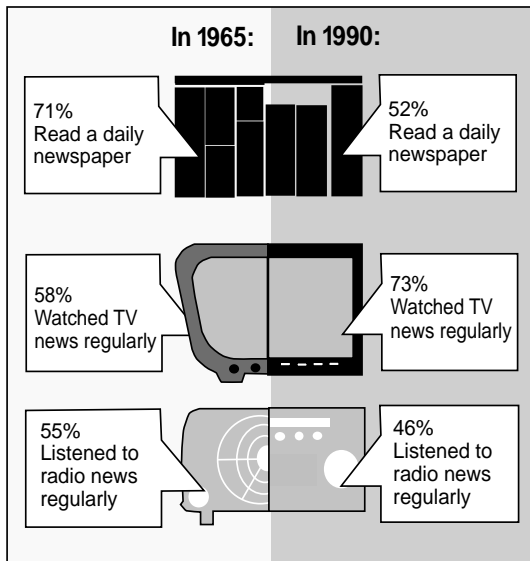
Location of Fossils in Earth’s Layers		
Surface ↓ Deep Below Surface	D	leaf, plant stem, animal footprints
	C	tree trunk, flower stem, animal footprints
	B	shark teeth, fish scales, plant stem
	A	plant stem, leaf, flower prints

What environmental change BEST explains the differences between layers A and B?

- (1) The weather changed.
- (2) Oceans covered the area.
- (3) Earthquakes occurred.
- (4) No observable changes are present.
- (5) Drought conditions prevailed.

Question 6 refers to the following diagram.

News Media Usage by Americans



Source: Adapted from Gary B. Nash, *American Odyssey: The United States in the Twentieth Century* (Lake Forest, Ill.: Glencoe/Macmillan/McGraw-Hill, 1997), 726.



6. Through which medium would the government in 1990 have been likely to attract the attention of most of the electorate to a political issue?

- (1) newspapers
- (2) magazines
- (3) television
- (4) radio
- (5) live theatre

Where have you seen charts or diagrams like this before?

What words or symbols might be important to understand in order to answer the questions?

Is there anything on these charts or diagrams that you do not understand?

2. Becoming Familiar with the Problem

Ask yourself questions like the following. You should pay attention to those that were helpful, so you can use them again.

Re-read the questions. What are you being asked to find out?

From reading the titles of these charts and diagrams, what do you already know about the subjects of these charts and diagrams? What information do you already have from your experience or reading that will help you understand the charts and diagrams?

Prescription drugs and possible drug interactions are parts of most of our lives. The rise in popularity of herbal supplements has brought these folk remedies into the mainstream. Most drug and grocery stores carry them.

Fossils may not be a part of everyday life, but they are not strange concepts. Many of us have seen leaf outlines in rocks. Making “fossils” is an elementary school art project many of us remember, and dinosaurs are always popular. In geology, a seemingly simple but important concept is that older fossils are found below younger fossils in a rock formation. There are situations when changes in the landform can shift rock layers and disrupt the geologic timeline, but this basic concept allows us to estimate the age of fossils and rock layers in relation to each other.

The term medium, as the singular of media, may need some explanation. The use of television and radio for getting news is a well-known phenomenon.

How are the charts organized? How does the organization help you understand what is on the charts?

How is the organization of information similar on all three charts? How do the charts differ from one another in their organization and presentation of materials?

This would be a good place to bring up making a chart to show the answers to these questions. Divide a piece of paper into two columns. Head the left column “Similarities,” and head the right column “Differences.” Recognizing similarities and differences is a critical thinking skill.

You may also raise the point that, for some learners, paragraphs filled with many details can be confusing. Charting that information can be a very useful learning strategy.

Look at the pictures in question 6. How do the pictures make the information in the diagram clear?

Read the headings and labels. What information do they tell you?

Do these topics attract your attention?



3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work in a group to do this activity.*

Assigning: *Decide who will read the information and who will lead the discussion of what is on the charts and how each is organized.*

Doing the Work: *As you read the charts, consider these strategies:*

Find and mark any words you might not know. See if the chart gives enough information to clarify the meaning of the words. If not, use other resources to find the meaning.

What information does the chart provide that can answer the questions for each problem?

Find your answer to the questions.

For question 21, the correct answer is (5) may change the effect of certain prescription drugs. The information on the chart shows some changes that will affect some drugs.

For question 25, the answer is (2) Oceans covered the area. Layer B contains shark teeth and fish scales indicating oceanic presence. Each layer shows changes.

For question 6, the diagram shows that more people got their news from television than any other medium in 1990, so, to get more widespread awareness, the government would make sure the television news would cover the issue.

Be able to defend your answers and the ways that you found them.

On all three questions, information from the charts will inform the choices for the answers. The information from the charts is sufficient for the learners to draw conclusions.

4. Sharing with Others

Telling people what you know helps you to understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Whole class: *Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions the other groups gave.*

5. Reflecting, Extending, Evaluating

Reflecting: **Think about what you have learned.**

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what you learned.

1. *How helpful are charts for you to learn about new or complicated material?*
2. *What have you learned about how to read charts and diagrams that has been helpful?*
3. *What are some ways that materials can be organized on a chart that will help you learn better?*

Extending: **Extend what you learned to new situations.**

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.



GED as Project

Pathways to Passing the GED

1. *Why do you think that manufacturers present information for proper use of their product on charts?*
2. *Your instructor will provide you with some other diagrams or charts. What information is being presented? Why is this format used?*
3. *Write a paragraph about the topic of one of the charts or diagrams you have studied in this Inquiry Activity. Use information given on the chart for your writing.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and to state how you benefited or did not benefit from the content and/or the methods presented here.

1. *What parts of the activity worked best for you? Why?*
2. *What parts did not work well for you? Explain.*
3. *What ideas presented here will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 2 Understanding Charts and Diagrams

Inquiry Activity 2-3: Recognizing the Purpose of Charts

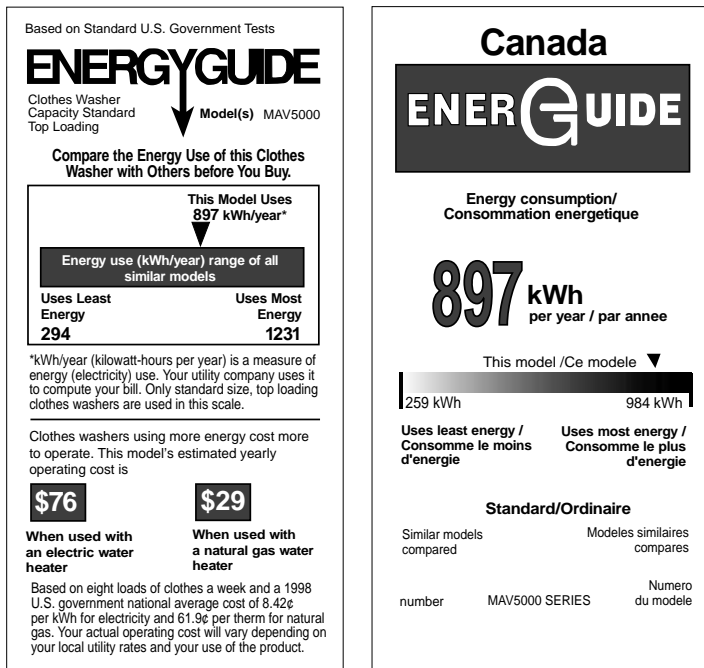
(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 8 & 9 Social Studies PA)

The two charts used for these two questions contain a considerable amount of information. They also show a certain difference in style between the United States and Canada, which is incidental. In fact, the information on the charts is incidental to answering the questions. It is the **purpose behind the charts** that will give the answer to the questions.

Read the questions first, then look at the charts.

Questions 8 and 9 refer to the following information.



8. How are these guides useful to U.S and Canadian consumers?

The guides:

- (1) are too general to be of much practical use
- (2) can give information for comparison shopping
- (3) quickly go out of date as fuel prices change
- (4) show how to assemble the appliance
- (5) show consumers how to use the appliance



9. Which of the following best explains why the U.S. and Canadian governments would support the use of the guides?

- (1) to encourage the conservation of national energy resources
- (2) to increase government regulations
- (3) to monitor consumer spending habits
- (4) to ensure that consumers buy clothes washers
- (5) to discourage competitive prices among manufacturers.

Where have you seen charts like this before?

Anyone who has bought a major appliance will have seen the U. S. version of the sticker on their purchase.

Are there any words or symbols on the charts you do not understand?

2. Becoming Familiar with the Problem

Look at the charts and ask yourself questions like the following. You should pay attention to which ones are helpful to you, so you can use them again.

Re-read each question. What are you being asked to find out?

Question 8 is asking about the usefulness of the guides. Question 9 is asking for the purpose of the guides, a question strategy covered in Inquiry Activity 2-3 of Volume 3 *Language Arts, Reading*. As with any purpose-of-the-text question, the answer will not appear exactly in the text.

From reading the headings, what do you know already about the topic of the charts?

What information on the charts do you recognize from previous experience or reading?

How are these charts organized? Does the organization help you understand what is on the chart?

One of the more interesting things learners will see is that half the copy on the Canadian chart is in French. Most product information is now given in French, Spanish, and English.

Read the highlighted information. What information do the numbers tell you?

Do these topics attract your attention?

3. Planning, Assigning, and Performing Tasks

Planning: You may decide to work in a group to do this Activity.

Assigning: Decide who will read the information or who will lead the discussion of what is on the chart and how each chart is organized.

Doing the Work: As you read the charts, consider these strategies:

Clarify: Find and mark any words you might not know. See if the chart gives enough information to clarify the meaning of the words. If not, find the meaning by asking someone or looking it up.

Analyze: Remind yourself what the question is asking you to do.

Read each answer and eliminate choices by deciding whether the information in the answer is:

- Not on the chart
- The opposite of what is on the chart
- Not accurate



You may wish to use a graphic organizer to categorize the information in the chart. Take a piece of paper and list the answer choices on the left side, spacing them so they take the entire page. On the right side of the page, identify and list details about the subject of the question. Draw an arrow from the detail to the answer choice in the circle. Determine which answer has the most support from the charts by looking at your graphic.

This visual approach is very useful for the more visual learners. A copy of this graphic is found in Appendix C.

What information does the chart provide that can answer the question for each problem?

Find your answers to the questions.

The correct answer to question 8 is (2) can give information for comparison-shopping. The chart indicates the amount of money it will cost annually to operate. The chart has a disclaimer for different fuel prices, choice (3). It does not show how to use or assemble the machine (4 and 5), and gives specific numbers, negating (1).

Question 9, general purpose for these charts, is energy conservation (1). None of the other answer choices have any support in the chart. The Canadian version, in particular, contains so little information that choices (2), (3), (4), and (5) can be quickly eliminated. Informational notices such as these are a result not only of the energy crisis of the 1970s, but also the growing consumer movement of the same era. They were a response to the public wanting to know such things as annual costs for operation, fuel efficiency, and product safety/sell-by dates.

Be able to defend your answers and the ways you found them.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Whole class: Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions other groups gave.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *What methods did you use to read the charts and answer the questions?*
2. *From what parts of the charts did you find the answers to these questions?*
3. *Were these easy or difficult questions for you to answer? Explain.*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *Where in your life do you see or use charts like the ones presented here?*
2. *Use the information on these charts to develop another multiple-choice question asking for author's purpose.*
3. *Pass your questions to other group members and use the strategies for reading the questions and determining author's purpose, answer the questions. Discuss your findings.*



Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 2 Understanding Charts and Diagrams

**Inquiry Activity 2-4:
Answering Questions that Require Content Knowledge**

(Note: Italicized portions should be directed to the students.)

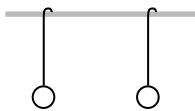
1. Identifying the Problem (Item 22 Science PA)

In this Inquiry Activity, learners will have to analyze the diagram and draw a conclusion based upon their own knowledge or understanding of the subject area. Some of the questions in both the science and social studies tests will anticipate that the learners or test takers will have certain subject knowledge. This can be a problem in these two content areas, since both draw upon a vast amount of material. In some cases, instructors will be able to create a context for their learners; in other cases, learners will need to know from their personal experience, reading, or study what the correct answer will be.

Read the question first, then look at the diagram.

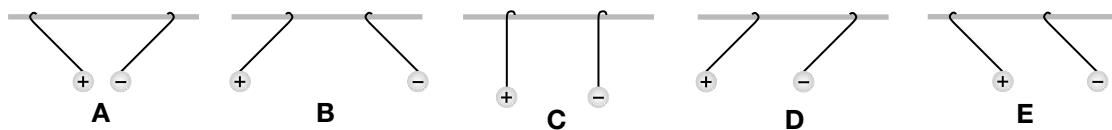
What will you have to do in order to be successful in this Activity?

22. Two identical balls are suspended by a rod, as shown in the diagram below.



A positive electrical charge is put on the left ball and a negative charge on the ball on the right.

Expected Change in Position When Particles Have Opposite Charges



After placing the charges on the balls, which of the following BEST represents how the balls will react to each other?

- (1) A
- (2) B
- (3) C
- (4) D
- (5) E

Have you ever seen charts or diagrams like this before? Where?

What words or symbols will be important to understand in order to answer the questions?

Is there anything on these charts or diagrams that you do not understand?



2. Becoming Familiar with the Problem

Ask yourself questions like the following. You should pay attention to those that were helpful, so you can use them again.

Re-read the question. What are you being asked to find out?

From reading the title of the diagram, what do you already know about the subject? What information do you already have from your experience or reading that will help you understand the diagram?

Look at the pictures in question 22. Do the pictures make the information clear?

Does this topic attract your attention?

What do you know about electricity?

Generally speaking, the learner will have to know about electricity to answer this question. Some will have recharged their car battery and will understand something about charges. Others might have heard the saying about “opposites attract” and will recognize that it has its basis in an understanding of electricity, rather than personalities. Magnets behave in a similar manner when opposite poles are brought near each other. However, electrical charge is based on an unequal number of protons (+) and electrons (-), while magnetism has to do with the alignment of molecules in certain metals. Most folks have some understanding of what they do, if not why they do it. There are some good resources regarding electricity and magnetism in Appendix E.

What do you know about opposites?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work in a group to do this activity.*

Assigning: *Decide who will read the information and who will lead the discussion of what is on the diagram.*

Doing the Work: *As you read the chart, consider these strategies:*

Clarify: *Find and mark any words you might not know. See if the diagram gives enough information to clarify the meaning of the words. If not, use other resources to find the meaning.*

Prior knowledge: *What do you already know about this topic from your own experience?*

What information does the diagram provide that can answer the question?

Find your answer to the question.

The correct answer is (1) A.

Be able to defend your answers and the ways that you found them.

4. Sharing with Others

Telling people what you know helps you to understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Whole class: *Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions the other groups gave.*



5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what you learned.

1. *If you do not know anything about electricity, what did you do to answer this question?*
2. *What are some ways that materials you do not know about can be organized on a chart or diagram that will help you learn better?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *Where else have you seen diagrams like this?*
2. *What do you know about blueprints? Or flow charts? Where might these be used?*
3. *Your instructor can provide you with some other diagrams. What information is being presented? Why is this format used?*

For “other diagrams,” see blueprints and flow chart in Appendix B.

4. *Write a paragraph about the topic of one of the diagrams you have studied in this Inquiry Activity. Use information given on the chart to develop your paragraph.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented here.

1. *What parts of the activity worked best for you? Why?*
2. *What parts did not work well for you? Explain.*
3. *What ideas presented here will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 3

Understanding Maps and Pictures



The visuals that connect the items in this Learning Project are maps or pictures. Not surprisingly, the majority of PA Test Items in this Learning Project are from the Social Studies PA. Maps are important tools in understanding historical developments and economic trends, as well as geographical issues. Maps or other depictions often include explanatory legends or graphical overlays to present a complex issue.

The map in Inquiry 3-1 shows a group of population shifts in one decade. In order to understand the story told by the map, learners will have to recognize both the size of the shifts and the population centers. The item asks the most generic question and one that can be readily discerned. Although it provides an opportunity to discuss why people move from region to region or to analyze the factors causing such large shifts, that understanding is not necessary to answer the question. It is a good opportunity both to expand upon the test item, and to show that a careful reading of the question is still one of the most necessary test-taking strategies.

Inquiry 3-2 features a photograph with a caption. It is a humorous depiction of the realities of driving early in the era of the automobile. The literary term *irony* is addressed in this item. Interestingly, *irony* does not appear in the reading test.

Inquiry 3-3 features a world map and requires test takers to understand certain aspects of equatorial and tropical geography. The vocabulary in both the question stem and the answer choices is highly technical, and an understanding of the words will be necessary for people to comprehend the question and recognize the appropriate answer. Resources for building a science vocabulary are found in Appendix E.

Inquiry 3-4 features two pictures or diagrams depicting certain phenomena. In both, the pictures complement the brief written passages. Learners could use one to clarify the other, depending on the types of learners they are. Visual learners will certainly find the picture easier than the written passage.

Inquiry 3-5 features a political cartoon. Each GED test has one, and many test takers are confused by them. It is important for people to understand that cartoonists use the same sorts of exaggeration and caricature featured in other cartoon forms. In addition, many political cartoons require an understanding of the use of symbolism. All of them require that the observer understand current political events. Cartoons used in the GED test tend to be very general, but they still require an understanding of the humor and the underlying message. Appendix A lists an excellent online source for political cartoons in the public domain.



Learning Project 3 Understanding Maps and Pictures

Inquiry Activity 3-1: Reading Maps to Draw Conclusions

(Note: Italicized portions should be directed to the students.)

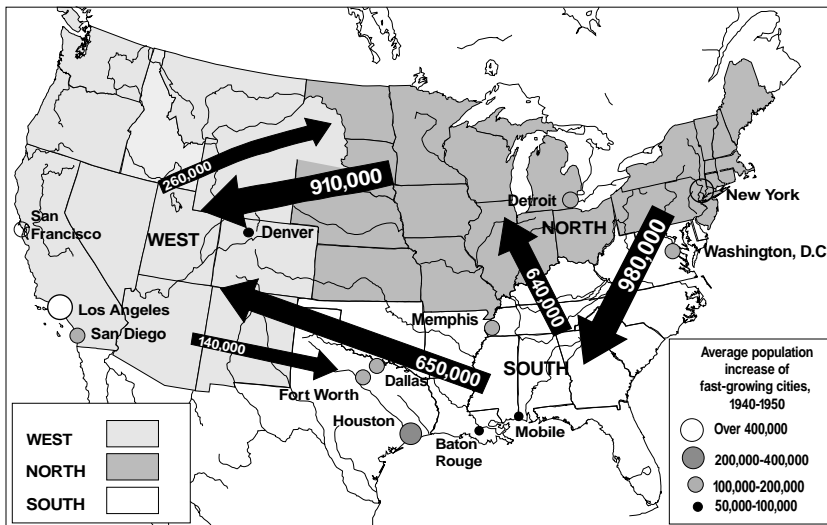
1. Identifying the Problem (Item 16 Social Studies PA)

In this Inquiry Activity, learners will look at the map of the United States and recognize the purpose of the graphical overlays. News articles often show such overlays on standard geographical presentations. These can depict an often-complex story or group of stories, as the map does in this case. Not only is the post-World War II western migration vividly shown, but also the move to the Chicago and Detroit areas by Southern workers, especially African-Americans from the deep South, and early migration from the rust belt to lower-wage southern factories, a complex combination that has had considerable effect on most of us now living in Virginia.

Study the map below and look at the arrows that overlay the map.

What do you think you will have to do in order to be successful in this Activity?

Regional Population Changes in the United States, 1940-1950



Source: United States Department of Labor, Bureau of Labor Statistics.

16. Which conclusion about migration during World War II is confirmed by clear evidence in the map?

- (1) Fewer people migrated during this time than before World War II.
- (2) The majority of migrants were women workers.
- (3) The government encouraged people to move to the North.
- (4) Racial tensions developed in several cities.
- (5) A large number of people moved to the West.



Where have you seen maps before?

What would you say this map is about?

What words or symbols might be important to understand in order to answer the question?

2. Becoming Familiar with the Problem

Look at the map and ask yourself questions like the following. You should pay attention to which ones are helpful to you, so you can use them again.

From reading the title, what do you already know about the topic of this map?

What information do the arrows present? In what two ways do they give their information?

The arrows on the map convey information both with their size and direction.

What do you already know from your own experience or reading that will help you understand the information given on the map?

Are you interested in why people move and where they might be going?

Read the question. What are you being asked to find out?

3. Planning, Assigning, and Performing Tasks

Planning: You may decide to work in pairs or a small group to do this activity.

Assigning: Decide who will read the information and who will lead the discussion of what is on the map.

Doing the Work: As you look at the map, consider this strategy:

Clarify: Find and mark any words you might not know. See if the map gives enough information to clarify the meaning of the words. If not, use other resources to find the meaning.

What information does the map provide that can answer the questions for each problem?

Find your answer to the question.

The answer to question 16 is (5) A large number of people moved to the West.

Be able to defend your answers and the ways that you found them.

The arrows give information about direction and numbers of people moving from one area to another. Some of the information seems contradictory. The graphic overlay does not provide information pertaining to population shifts prior to World War II, the gender of those who moved, the reasons for, or any consequences of, the shifts.

4. Sharing with Others

Telling people what you know helps you to understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Whole class: Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions the other groups gave.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.



Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what you learned.

1. *How helpful are maps to you? Do you follow directions better if you have a written route, or a route on a map?*
2. *What have you learned about how to gather information from maps?*
3. *What did you find interesting about the way the information was placed on the map?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *What other topics might you be able to discuss by using information from this graph?*
2. *What other information might be put on the map of the United States that would give regional changes or differences?*
3. *Find another map of the U.S. in a recent newspaper or magazine article. What information is given there?*

If there is no current event that can be discussed, the weather map from *USA Today* will show regional differences, changes, and considerable data about why people choose to live in certain areas over others.

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented here.

1. *What parts of the activity worked best for you? Why?*
2. *What parts did not work well for you? Explain.*
3. *What ideas presented here will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 3 Understanding Maps and Pictures

Inquiry Activity 3-2: Making Inferences from Pictures

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 5 Social Studies PA)

Look at the picture and the caption underneath it.



“Why, good afternoon. Yes, it is a shame. He should have fixed it before we came.”

Photography for advertisement by Gerald Carson, ca. 1913. Courtesy of Culver Pictures.

5. What irony about the history of transportation has the photographer depicted in this photograph?
- (1) Horse-drawn vehicles were initially more dependable than internal combustion engines.
 - (2) The automobile was faster than the horse.
 - (3) The internal combustion engine never became cost-effective.
 - (4) Automobiles were luxuries that few people could afford at the time.
 - (5) Long-distance road travel was common at the time

Have you seen photographs like this before? Where?

Many people have pictures of grandparents or great-grandparents in their first cars.

What words or details might be important to understand in order to answer the question?



What might you say this picture is about?

What does the caption add to the photograph?

2. Becoming Familiar with the Problem

Look at the picture and ask yourself questions like the following. You should pay attention to which ones are helpful to you, so you can use them again.

What do you know about the topic of this photograph from your own experience or reading?

Are you interested in the story the photograph shows?

Read the question. What are you being asked to find out?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work in a pair or small group to do this Activity.*

Assigning: *In your pair or group, discuss what the photograph shows and decide what the caption tells you.*

Doing the Work: *As you look at the picture, consider these strategies:*

Clarify: *Find and mark any words you might not know. Does the caption under the picture give enough information to clarify the words you do not know? If not, find the meaning by asking someone or looking it up.*

Analyze: *Remind yourself what the question is asking you to do.*

The concept of **irony** may need some clarification. In its literary usage, irony is when one says the opposite of what is meant. The opposite of what ought to happen is what does happen. In fiction or drama, irony is achieved when the reader or audience is aware of something the character or participant does not know. It may help to explain to your learners that this photo is actually a still from a film. In the movie, the young woman hops out of the automobile into the horse and buggy and is far down the road before the hapless mechanic comes out from under the car. There is something to talk about: the best ride getting the girl!

What might the purpose of the caption be?

You may wish to use the graphic organizer presented in LP 2-3 to categorize the information in the picture.

This visual approach is very useful for the more visual learners.

What do you see in the picture that can answer the question?

Find your answer to the question.

The young woman standing in the photograph showing her dismay about her situation to the gentleman in the horse-drawn buggy is expressing the quite ironic fact that early internal combustion engines were not as dependable as the horse, choice (1).

Be able to defend your answer and the way you found it.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Whole class: *Share with the whole class the steps you used to answer the question. Take notes on any different ways of answering the question other groups gave.*



5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *How did you go about studying the picture and its caption?*
2. *What did you learn about answering questions about pictures?*
3. *Was this an easy or difficult question for you to answer? Explain.*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *The credit information below the caption says that the photograph was used for an advertisement. What sort of product or company would have used this?*
2. *If members of the class have stories about early use of automobiles in their families, they might share them to start a discussion about how the automobile has changed the way we live.*
3. *Write an essay on how the automobile has changed our daily lives.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*
5. *How do you feel about answering questions about pictures?*



Learning Project 3 Understanding Maps and Pictures

**Inquiry Activity 3-3:
Analyzing Information from a Map**

In the test item used in this activity, the vocabulary in both the question stem and the answer choices is very technical. In addition, the item assumes that the concepts are familiar to your learners, which may very well not be the case. This is a good opportunity for some contextual vocabulary exercises. A guide to understanding science words is included in Appendix E.

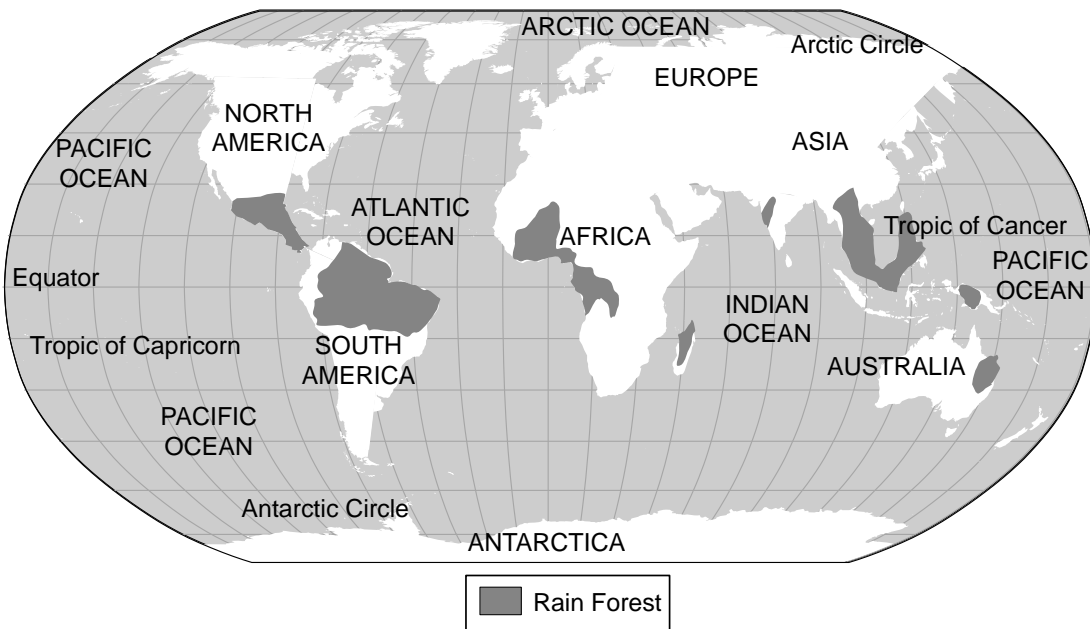
(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 1 & 2 Social Studies PA)

Look at the map below.

Questions 1 and 2 refer to the following world map.

World's Rain Forests in 1999



1. What will most likely happen if the ecology in the ecosystem featured in the map continues to be destroyed?
 - (1) The biodiversity of the areas will be lost.
 - (2) The price of beef products will fall.
 - (3) New plants will be discovered as the land is logged.
 - (4) More people will be able to harvest the vegetation there.
 - (5) Ecotourism will increase in these areas.



2. What factors of physical or cultural geography directly determine the location of the ecosystems featured in the map?
 - (1) mountainous terrain and moderate precipitation
 - (2) growing population and industry in urban centers
 - (3) year-round rainfall and warm temperatures
 - (4) human agricultural settlement and trade patterns
 - (5) middle latitudes and cold ocean currents

Where have you seen a map like this before?

What words or symbols might be important to understand in order to answer the questions, and what are they telling you?

Is there anything on the map you do not understand?

You may find that your learners are unfamiliar with rain forests. A burst lecture here could focus on terms such as biodiversity, biomes, and ecotourism to establish some familiarity and develop a vocabulary lesson. Most will be interested to know the significant number of medications, such as quinine, which is used in 70% of cancer treatments, that are derived from this relatively small land mass.

2. Becoming Familiar with the Problem

Look at the map and ask yourself questions like the following. You should pay attention to which ones are helpful to you, so you can use them again.

Re-read each question. What are you being asked to find out?

From reading the title, what do you know already about this particular map?

What information on the map do you know from previous experience or reading?

Do maps like this attract your attention?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work alone or in a group to do this Activity.*

Assigning: *Decide who will read the information or who will lead the discussion of what is on the map.*

Doing the Work: *As you read the map, consider these strategies:*

Clarify: *Find and mark any words you might not know. See if the map gives enough information to clarify the meaning of the words. If not, find the meaning by asking someone or looking it up.*

The vocabulary in both questions is quite technical and difficult. This is a good Activity to develop contextual vocabulary strategies such as the following. You may wish to provide some of the concepts and categories if your learners are having trouble.

For words that seem particularly technical, you might try to develop a graphic organizer to make a semantic map. Put the major concept, such as ecology or climate in a circle in the middle of a piece of paper. Then, brainstorm a list of terms that relate in some way to this concept. From this list, organize the terms into categories or properties, and put them on the page in the form of a map or a web. This chart will provide an outline of the concept being covered. See Appendix C for a model.

Analyze: *Remind yourself what the question is asking you to do.*



Read each answer, and eliminate answer choices by deciding whether the information in the answer is:

- Not on the map
- The opposite of what is on the map
- Not accurate

You may wish to use a graphic organizer presented in Learning Project 2-3 to categorize the information in the map.

What information does the map provide that can answer the question for each problem?

Find your answers to the questions.

The correct answer to question 1 is (1) The biodiversity of the areas will be lost.

The terminology in the question gives an indication of the answer: destruction of an ecosystem will cause biodiversity to suffer.

The correct answer to question 2 is (3) year-round rainfall and warm temperatures. For this question, someone who remembers that the equator is the warmest part of the planet and combines that understanding with the title of the map will be able to answer the question, since all the rainforests noted on this map are within the tropical and equatorial regions.

Be able to defend your answers and the ways you found them.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Whole class: Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions other groups gave.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *What methods did you use to read the map and answer the questions?*
2. *How are maps useful for conveying information?*
3. *How does the title of the problem assist you in understanding the map and answering the questions?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *What are some other purposes for world maps besides indicating climate?*
2. *Use the information on the map to develop another multiple-choice question that requires someone to reach a conclusion. Pass your questions to other group members to answer.*
3. *Find other maps in your classroom reference books. Share with others in your group the purpose for the map you have chosen, and explain how the map tells its story. Have a vocabulary term you can teach to the class.*



Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 3 Understanding Maps and Pictures

**Inquiry Activity 3-4:
Using Text and Pictures**

In the last two Inquiry Activities in this Learning Project, the text and the passage complement each other.



It might be useful to point out that such short passages usually state verbally what the visual depicts. Test takers can study one and skim the other.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 5 & 11 Science PA)

Look over the passage and the picture.

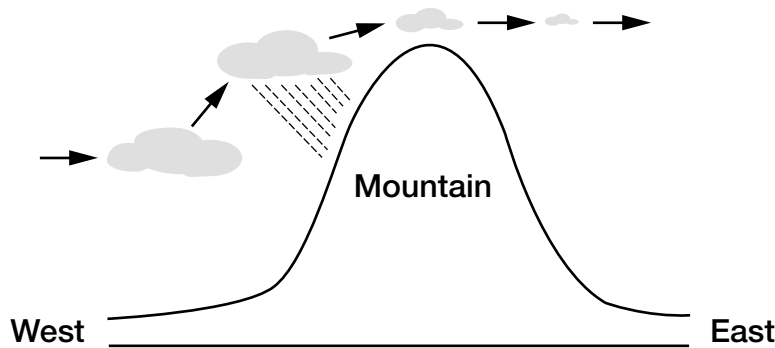
Where have you read passages like this before?

What does the picture look like to you? Think about what you see.

What will you have to do to be successful in this Activity?

Put down your thoughts, or share them with your partner.

- As a moist air mass begins to ascend one side of a mountain, the cooler, high altitudes cause the water vapor to condense and fall onto the mountain in the form of rain, hail, or snow. After the condensation occurs, the now-dry air mass continues across the mountain.



A certain mountain range runs from north to south across a continent. At this location, the winds always blow from the west to the east. Based on the process described above, which represents the BEST description of the location involved?

- much vegetation on the west side of the mountain range and dry conditions on the east side
- desert on both sides of the mountain range
- a large lake on the east side of the mountain range
- tropical conditions in the northern part of the continent
- desert conditions on the west side of the mountain range and lush forests on the east side



*What words or symbols might be important to understand in order to answer the questions? What are they telling you?
Is there anything on the picture or in the passage you do not understand?*

2. Becoming Familiar with the Problem

Look at the problem and ask yourself questions like the following. You should pay attention to which ones are helpful to you, so you can use them again.

What information in the picture do you know from previous experience or reading?

Do pictures like this attract your attention?

Now, read the questions. What are you being asked to find out?

3. Planning, Assigning, and Performing Tasks


Planning: *You may decide to work alone, in pairs, or in a group to do this Activity.*

Assigning: *Decide who will read the passage, and who will lead the discussion of what the picture is about.*

Doing the Work: *As you read the passage, consider these strategies:*

Clarify: *Find and mark any words you might not know. See if the picture gives enough information to clarify the meaning of the words. If not, find the meaning by asking someone or looking it up.*

The climate-related text of the first part of the passage may need some clarification. Some of your learners may need to be led to an understanding of the relationship between rainfall and lush vegetation. In this particular problem, the picture clarifies the text.

 As is sometimes the case, the test-taker can look at the picture, figure out what the picture is showing, and answer the question correctly without reading the explanatory text above it.

Analyze: *Remind yourself what the question is asking you to do.*

Read each answer and decide whether the information in the answer is:

- *Not shown in the picture*
- *The opposite of what is shown in the picture*
- *Not accurate*

You may wish to use the graphic organizer presented in Learning Project 2-3 to categorize the information in the picture.

What information does the picture provide that can answer the question for the problem?

Find your answer to the question.

The correct answer to question 5 is (1) much vegetation on the west side of the mountain range and dry conditions on the east side

Be able to defend your answer and the way you found it.

A further discussion could be led about the weather patterns caused by mountain ranges, such as those in the Denver/Boulder area (influenced by the Rocky Mountains) or Los Angeles (affected by the Coastal Range).

4. Sharing with Others.

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.



Small groups: Compare your answer with others in the group. Discuss the answers you found, the methods you used to find the answers, the support for your answer in the passage, and the way the picture and passage work together.

Whole class: Share with the whole class the steps you used to answer the question. Take notes on any different ways of answering the question other groups gave.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. How did looking at the picture help to clarify the information from the passage?
2. How do pictures help explain things when words become confusing?
3. What were your reasons for not choosing the answers you thought were wrong?



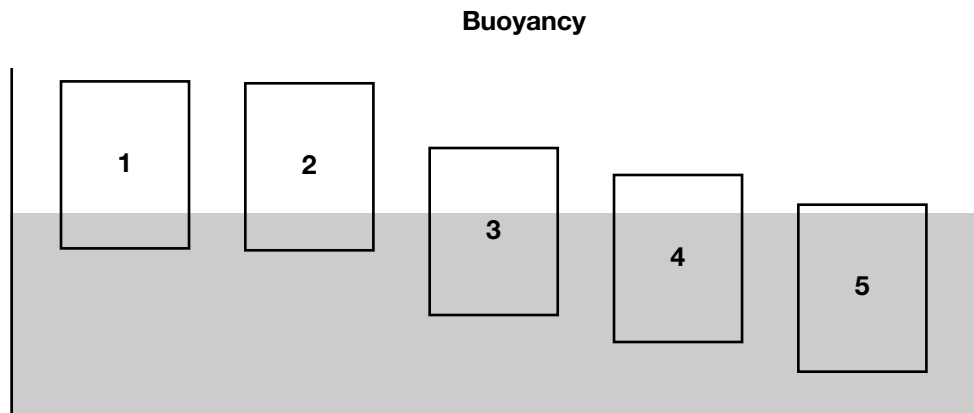
4. Did you need to read the passage to answer the question? What might this mean to you as a test-taker?

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

This extending activity uses Question 11 to build upon the strategies used in this IA.

11. The blocks in the figure below each float in water and are all the same size; each is constructed of a different substance. A block will float only if its weight is less than the weight of an equal volume of water that it displaces.



Which of the blocks shown above displaces the largest volume of water?

- (1) Block 1
- (2) Block 2
- (3) Block 3
- (4) Block 4
- (5) Block 5



1. *How is this problem like the problem in question five?*
2. *What do you need to understand in this picture to be able to get the correct answer?*

Again, the vocabulary in the brief passage is difficult, and the text itself is difficult for many to understand. One can, however, look at the picture and intuit the meaning of displace. As in the first problem in this IA, understanding from the picture is all that is necessary; one would not have to read and comprehend the text in the test-taker mode. It may be helpful to suggest that learners visualize the picture in three dimensions, or ask them what happens to the water when they step into the bathtub. (Eureka!) The correct answer is (5) Block 5.

3. *Is there information in the passage that is not shown in the picture?*



4. *What do your answers to questions 2 and 3 mean to you as a test taker?*
5. *What do you know about why and how things float?*
6. *What is another way to say "it displaces water?"*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-Step format make you feel?*



Learning Project 3 Understanding Maps and Pictures

**Inquiry Activity 3-5:
Drawing Conclusions from Pictures and Passages**

In these two items, both passage and visual must be considered together to get the correct answer. In both cases, learners will have to draw conclusions from the information presented to them. Social Studies Item 7 is the political cartoon.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 23 Science PA & 7 Social Studies PA)

Look briefly at the passage, title, and visual for each of the problems.

What are you being asked to do?

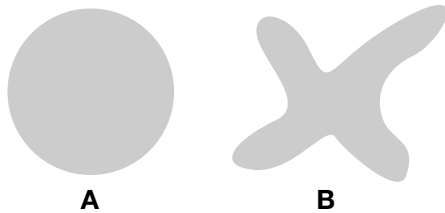
Have you seen pictures or cartoons like the following before? Where?

Think about what you see and what you think you will have to do.

Dot down your thoughts, or share them with a partner.

23. If object A and object B below both have the same mass, object B will lose heat more quickly than object A.

Body Structures and Heat Loss

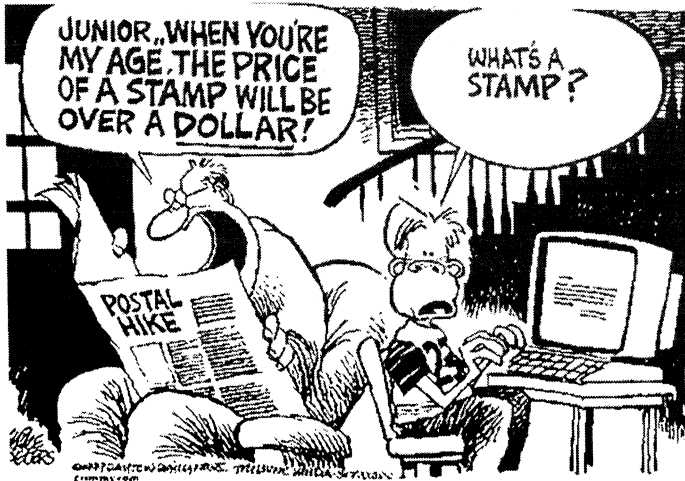


If minimizing heat loss were the main consideration, which type of animal adaptation would be BEST suited to a small animal that lives in a cold climate?

- (1) long ears and long body
- (2) small ears and short tail
- (3) long nose and long tail
- (4) short nose and large ears
- (5) long tail and short nose



Question 7 refers to the following cartoon



Source: "What's A Stamp?" Mike Peters, *Dayton Daily News*, 6 January 1999. Copyright Tribune Media Services. All rights reserved. Reprinted with permission.

7. In the United States mail service is available to all people.

What does this cartoon imply about its future use?

- (1) The mail is likely to be censored by the federal government
- (2) The computerized postal service will discourage free speech among citizens
- (3) Electronic mail will violate the U. S. Constitution
- (4) Technological changes will alter the way citizens communicate by mail.
- (5) Inflation is a constant problem for the U.S. government in its efforts to provide services to its citizens.

What words or details might be important to understand in order to answer the questions?

What might you say the pictures and passages are about?

This cartoon is more of a comment upon current issues that affect the population at large. It is not a comment upon a particular person, political group, or country. This being the case, caricature is not as critical as in many other political cartoons. There is no cloaked symbolism, and the point of view is relatively neutral. However, those characteristics will probably need to be explored more with your learners since they play larger roles in most political cartoons.

2. Becoming Familiar with the Problem

Take each question separately. Look at the picture and ask yourself questions like the following. You should pay attention to which ones are helpful to you, so you can use them again.

What do you know about the topics of these pictures from your own experience or reading?

Does each picture make sense to you?

What additional information do the words in the passages give?

Read each question. What are you being asked to find out?

What idea is each question asking about?



3. Planning, Assigning and Performing Tasks

Planning: You may decide to work alone, in a pair, or a small group to do this Activity.

Assigning: In your pair or group, discuss what the picture shows, and decide what additional clarification comes from the passage.

Doing the Work: As you look at the picture, consider these strategies:

Clarify: Find and mark any words you might not know. Do the passages give enough information to clarify the words you do not know? If not, find the meaning by asking someone or looking it up.

Analyze: Remind yourself what the questions are asking you to do. What idea is being presented in each question?

Here you might want to conduct a burst lecture and/or a demonstration for the science question. For instance, to illustrate the concept covered in the question you could place three ice cubes together on a plate and place three others individually on separate plates. Have the class observe that the cubes placed together will melt more slowly than the three separate cubes.

What might the purposes of the passages be?

You may wish to use the graphic organizer presented in LP 2-3 to sort the information found in pictures and passages.

What details in the pictures clarify the text and answer the questions?

Here, you will probably want to encourage your learners to pay close attention to all of the details in the cartoon. It is critical for them to notice that the newspaper indicates a rise in postal rates and that the boy appears to be typing a letter (email?) on the computer. Once these details have been identified, learners will need to recognize the humor of the dialogue, which is dependent upon the details.

Find your answer to the questions.

For the science problem, question 23, the correct answer is (2) small ears and a short tail. Those characteristics conform the most closely to object A.

For social studies question 7, the correct answer is (4) Technological changes will alter the way citizens communicate by mail. The cartoon addresses both the rising cost of stamps and the availability of computers, as well as identifying the probable users of each type of mail service.

Be able to defend your answers and the ways you found them.

4. Sharing with Others.

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: Compare the answers you found with the others in the group. Explain the support for each of your answers from the passages and pictures.

Whole class: Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions other groups gave.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much



time to think about what was learned.

1. *What methods did you use to study the pictures and the passages that accompanied them?*
2. *What did you learn about using pictures and passages together to find the complete answer to a question?*
3. *Were these easy or difficult questions for you to answer? Explain.*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *Either you or your instructor will bring in other cartoons from the newspaper or magazines and discuss them with your group. What information necessary to understanding the cartoon is found within the picture? Is there a caption? What does that add to your understanding?*
2. *Working with a partner or in a small group, develop a list of symbols that stand for countries, sports teams, celebrities, or companies that do business. Exchange lists with other groups and identify who or what the symbol stands for.*

If you see that the groups are having trouble with the idea of symbols, you might start them with considering flags of various states and nations and corporate logos.

3. *Where else can you find a picture added to a passage that clarifies the meaning of the passage?*
4. *Write a passage describing in an incomplete fashion how to do something. Include a diagram that adds to the text, so that both together will make a complete description.*
5. *Discuss in your groups or as a whole class why so many newspapers feature political cartoons.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*
5. *How do you feel about answering questions about pictures?*



Learning Project 4

Reading a Long Passage: Social Studies

Each GED social studies test has test items that refer to or quote Supreme Court rulings. In addition, each GED social studies test has questions that refer to the Constitution or the Declaration of Independence. The Declaration and the Bill of Rights, the first ten amendments to the Constitution, appear in Appendix D.

Both the Supreme Court ruling and the Constitutional issue are the basis for the first of the two long social studies passages in PA. The passage, which is used in all the Inquiries in this Learning Project, is printed separately, to make copying and use of the passage easier.

The practice of concept mapping, a strong content area reading strategy, is presented in this Learning Project.

The passage describes some of the conditions that laid the groundwork for the U. S. government's treatment of Indian tribes throughout the 19th century. It is a topic with which most of your learners have a certain level of familiarity, and these three Inquiry Activities generally create a great deal of discussion.

In the first Inquiry, the two questions can be answered from supporting details in the text. In Inquiry 4-2, learners will need to know about the separation of powers. Each of the three branches of government has its own specific function, and none may impinge on the powers of another branch. It may be reassuring for learners to have basic Constitutional law be that accessible.

Inquiry 4-3 features an additional reading that builds upon and somewhat expands the original passage. The passage has a mildly ironic beginning, which may be interesting to discuss. In this Inquiry Activity, it is a good time to remind test takers that all the answers to all the questions around a single passage will be congruent. They will fit with the correct answers to the other questions.



Learning Project 4 Reading a Long Passage: Social Studies

Learners will need to use the following passage when answering the questions for IAs 4-1, 4-2, and 4-3.

By the early 1800s, the Cherokees had been pushed into a small section of the southern Appalachians. They had established farms and small manufacturing shops, built schools, and published a newspaper in their own language. They governed themselves under a written constitution with a legislature, courts, and a militia. The Cherokees, while adapting to white culture in some instances, valued their own traditions and formed a separate state on their lands. The Georgia legislature refused to recognize the Cherokee state and opened all Cherokee land to white settlement.

In 1831, the U. S. Supreme Court, led by Chief Justice John Marshall, ruled that the Cherokee Nation had clearly defined boundaries within which “the laws of Georgia could have no force.” The Court further ruled that Georgia citizens could not enter Cherokee territory without Cherokee consent.

However, President Andrew Jackson rejected the Supreme Court decision. Against the strong protests of several members of Congress, he allowed illegal seizures of Cherokee lands to continue, and in 1838, the Cherokees were forced to move to unsettled lands west of the Mississippi. During their 800-mile journey, made mostly on foot, thousands of Cherokees died on the “Trail of Tears.”

In 1890, a member of the U.S. Cavalry wrote: “The long, painful journey to the West ended on March 26, 1839, with 4,000 silent graves reaching from the foothills of the Smoky Mountains to what is known as Indian territory in the West. And covetousness [greed] on the part of the white race was the cause of all that the Cherokee had to suffer...”

John Ehle, adapted from *Trail of Tears, Rise and Fall of the Cherokee Nation*, Archer Books, 1988, 394.



Learning Project 4 Reading a Long Passage: Social Studies

Inquiry Activity 4-1: Finding Supporting Details in the Passage

The passage that is the subject of this Learning Project is the first of two lengthy readings in the Social Studies PA. The questions that relate to the passage call for thoughtful understanding of the passage and, in some cases, reliance on an understanding of topics not directly covered in the reading. The use of concept mapping, like word mapping, helps to create a context for the passage and all its details.

To create a concept map, start out by putting a word in the center of the page. Its definition goes beneath the word. To one side, group examples. On the other side, list similarities. Like mind mapping, the lines go from the center to the other entries. A model appears in Appendix C.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 10 & 12 Social Studies PA)

Look over the passage. What are you being asked to read?

How does it look to you? Are there any clues from the text?

Where have you seen passages like this before?

What will you have to do to be successful in this Activity?

jot down your thoughts, or share them with your partner.

10. What happened as the Cherokees adopted many U. S. customs and institutions in the early 1800s?

The Cherokees

- (1) were accepted by white society
- (2) gave up their Cherokee arts and traditions
- (3) bought more lands west of the Mississippi
- (4) were recognized as citizens of Georgia
- (5) decided to become an independent state

12. What is the basis for the U.S. Cavalry officer's evaluation of the Cherokee experience on the "Trail of Tears"?

- (1) his loyalty as a member of the Cherokees
- (2) his pride in the U. S. military
- (3) his support for the government's actions
- (4) his recognition of an injustice
- (5) his acceptance of society's ways



2. Becoming Familiar with the Problem

Scan the passage and ask yourself questions like the following as your first step to understanding the passage.

What do you notice about the organization of this passage?

This particular passage has no bold type, no headings, and no title to guide readers. It presents very little assistance to the reader.

What do you know about the topic of this passage from your own experience or reading?

The history of the treatment of the Native American population is a familiar story. Many books (*Black Elk Speaks*, *House Made of Dawn*, etc.) and several well-known movies, including *Dances with Wolves* and *Little Big Man*, have provided dramatic portrayals. The history of Virginia's treatment of its Native American population includes not only forced reservation, but also an attempt at eliminating any public records of the population. There are several excellent books published in the 1980s and 1990s about Virginia tribes.

Are you interested in the history of Native American tribes?

Now, read the questions. What are you being asked to find out?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work by yourself, in a pair, or a small group to do this Activity.*

Assigning: *Decide who will read the passage, when you will stop to discuss the material presented, and who will lead the discussion.*

Doing the Work: *As you read the passage, do the following:*

Clarify: *Find and mark any words you might not know. Does the passage give enough information to clarify the words you do not know? If not, find the meaning by asking someone or looking it up.*

Analyze: *Remind yourself what each question is asking you to do.*

Read each answer choice and decide if the information in the answer is:

- *Not in the passage*
- *The opposite of what is in the passage*
- *Not accurate*

You may prefer to use a graphic organizer for this step. You can use the one presented in LP 2–3, or your instructor may offer another form.

Find your answers to the questions.

For question 10, the correct answer is (5) decided to become an independent state. Choice (2) is the opposite of information in the text; choices (1) and (4) are negated by statements in the text. Had they been accepted by white society, there would have been no reason for their expulsion from the state. They did not buy lands, but were forced to settle far from their native area, eliminating choice (3).

The Cavalry officer's evaluation, question 12, comes from (4) his recognition of an injustice. His comment is an indictment of the treatment of the Cherokee, even if it comes 51 years late.

What parts of the passage support your answers?

Be able to defend your answers and the ways you found them.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.



Small groups: Compare the answers you found with others in the group. Discuss the methods you used to find the answers, the support for your answers in the passage, and the reasons each learner thinks his/her answers and support are correct.

Agree on the correct answers and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions other groups gave.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. Do you prefer the analysis or the graphic organizer way to answer the questions? Explain.
2. State the ways you used to find the answers to the questions in this IA. Explain why those worked for you.
3. Was this an easy or difficult passage for you to read and understand? Explain.

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. What do you know about the Native American tribes that live in Virginia today?

There are 8 tribes in Virginia currently. See the map in Appendix B for their names and locations. Among them are the Mattaponi, the Pamunkey, the Chickahominy, and the Monacan. Of these, the first three are members of the Iroquois nation; the Monacan are Sioux. Members of your class may know others. Annually, the presentation of gifts from the Native American tribes to the Governor receives press coverage.

2. In your group, compare and contrast the way the United States government treated Indian nation lands to the way they treat sovereign lands of Canada, Mexico, or Great Britain; or the way one state treats its neighbor. Is it the same or different? Come up with some reasons that explain any differences.
3. Write another multiple-choice question about the situation of the Indians in the United States. Pass it around to others in the class to answer.
4. Do you know anyone in your neighborhood, at work, or in your family who is Native American? What do you know about their heritage?

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. What parts of the activity worked best for you? Explain.
2. What parts did not work well for you? Explain.
3. What ideas in this Inquiry Activity will you use when taking the GED test? Why?
4. How does following this 5-step format make you feel?



Learning Project 4 Reading a Long Passage: Social Studies

Inquiry Activity 4-2: Bringing Knowledge From Outside the Passage

The question in this Inquiry Activity refers to the reading passage presented at the beginning of this Learning Project.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 11 Social Studies PA)

Scan the passage and the question.

Question 11 refers to the passage introduced in Inquiry Activity 4-1.

11. Which best describes the way President Jackson responded to the 1831 Supreme Court decision about Cherokee territory?

President Jackson

- (1) disregarded constitutional law
- (2) enforced separation of powers
- (3) played party politics
- (4) enforced judicial review
- (5) supported democracy for all

2. Becoming Familiar with the Problem

Scan the passage and ask yourself questions like the following as your first step to understanding the passage.

Is there anything about the question you do not understand?

The passage states that Jackson rejected the decision of the Supreme Court and defied Congress. You may need to discuss with the class the idea of the three branches of government and the roles that each plays. This is an excellent place for the concept map.

What do you know about the topic of this passage from your own experience or reading?

This is a question where prior knowledge will be necessary to answering the question, as well as understanding the extent of the wrongdoing by President Jackson. Learners will need to know about separation of powers.

Are you interested in knowing about the ways the various Native American tribes were treated by the government?

Now, read the question. What are you being asked to find out?

3. Planning, Assigning, and Performing Tasks

Planning: You may decide to work by yourself, in a pair, or a small group to do this Activity.

Assigning: Decide who will review the passage and who will lead the discussion.



Doing the Work: As you read the passage, do the following:

Clarify: Find and mark any words you might not know. Does the passage give enough information to clarify the words you do not know? If not, find the meaning by asking someone or looking it up.

Analyze: Remind yourself what the question is asking you to do.

Read each answer choice, and decide if the information in the answer is:

- Not in the passage
- The opposite of what is in the passage
- Not accurate

You may prefer to use a graphic organizer for this step.

What parts of the passage support your answer?

Find your answer to the question.

The correct answer to question 11 is (1) disregarded constitutional law. By defying the Supreme Court decision and the protests of Congress, his actions were unconstitutional. The President cannot overturn the Court or the Congress. In fact, he was also probably playing some party (or at least popular) politics, although this is not in the passage. The other three choices: separation of powers, judicial review, and supporting political democracy are the opposite of the statements of his actions in the passage.

Be able to defend your answers and the ways you found them.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: Compare the answer you found with others in the group. Discuss the methods you used to find the answer, the support for your answer in the passage, and the reasons each learner thinks his/her answer and support are correct.

Agree on the correct answer and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: Share with the whole class the steps you used to answer the question. Take notes on any different ways of answering the question other groups gave.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. What knowledge did you have that helped you to answer the question?
2. Earlier, you indicated whether or not you were interested in the topic. How did your interest affect your reading and answering the question?
3. Was this an easy or difficult passage for you to read and understand? Explain.



Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

If your assessment of your class is that they do not know about the three branches of government, with its built-in checks and balances, this would be an excellent opportunity to present this basic fact of U. S. government, focusing on the specific functions of each branch: the legislative branch makes laws, the executive branch enforces the laws, and the judicial branch interprets the laws. A copy of the Bill of Rights is included in Appendix D. Then, have the class discuss Jackson's actions in light of the role of the three branches. Did Jackson overstep the role of his branch of government?

1. *What issues of constitutional law have you heard of?*

Every administration has had issues with constitutionality. Watergate was about the Nixon administration subverting the Constitution. During the Reagan administration, some members of the Defense Department undertook unconstitutional activities in the Iran-Contra scandal. Current concerns about national security have led to attempts by the Justice Department to establish oversight of individual freedoms. These attempts have caused some constitutional authorities and members of Congress to raise serious concerns.

2. *What are some of the freedoms and responsibilities that the U. S. Constitution guarantees all citizens?*
3. *What are some rulings of the Supreme Court that you know of?*

Two decisions that are often prominent in the news are Brown vs. Board of Education, and Roe vs. Wade.

4. *Write an essay explaining about the rights guaranteed to all citizens by the Constitution.*
5. *Use a graphic organizer or make a chart to show the checks each branch of government has upon the other two.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 4 Reading a Long Passage: Social Studies

Inquiry Activity 4-3: Building on the Knowledge

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 13 Social Studies PA)

In this Inquiry Activity, learners will read an additional commentary that adds to the longer passage addressed in IAs 4-1 and 4-2. The topic is the moving of Indians to the unsettled West, so it builds upon the Cherokee passage. This speaker is different, and his point will need the background from the first passage.

Look over the passage. What are you being asked to read?

Have you seen passages like this before?

How does it appear? Is there anything in the text that will help you understand what it is about?

The quotation marks and ellipses (...) show that this is an abbreviated quotation.

What will you have to do in order to be successful in this Activity?

13. “It is presumed that humanity dictated the original policy of the removal and concentration of the Indians in the West to save them from extinction. But today, by reason of the immense growth of the American population...the Indian races are more seriously threatened with a speedy extermination than ever before...”

— Donehogawa, first Native American Commissioner of Indian Affairs, 1870

Donehogawa’s 1870 statement supports which conclusion regarding the history of the Cherokee people?

- (1) The Cherokee culture and economy were similar to those of most other Native American groups.
- (2) Andrew Jackson’s decisions protected the Cherokee people from danger.
- (3) Cherokee conflicts with the U.S. policies were similar to the experience of other Native American groups.
- (4) Other Native American nations shared their desire for U. S. Statehood.
- (5) The U.S. government supported the desire of the Cherokees to keep their land and laws.

Where have you seen passages like this before?

What words or symbols might be important to understand in order to answer the questions?

Is there anything in this passage that you do not understand?

You may find that focusing on the irony of Donehogawa’s opening statement could spark a lively discussion.

2. Becoming Familiar with the Problem

Ask yourself questions like the following. You should pay attention to those that were helpful, so you can use them again.

What information do you already have from your experience or reading that will help you understand this passage?



Does the passage make sense to you?

Do you have an interest in the history of the Native American people in our country?

Read the question. What are you being asked to find out?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work alone, with a partner, or in a group to do this activity.*

Assigning: *Decide who will read the information and who will lead the discussion of what is in the passage.*

Doing the Work: *As you read the passage, consider these strategies:*

Clarify: *Find and mark any words you might not know. See if the passage gives enough information to clarify the meaning of the words. If not, use other resources to find the meaning.*

What information does the passage provide that can answer the questions for each problem? What information do you have from the previous passage that clarifies the passage in this Inquiry Activity?

Find your answer to the question.

Donehogawa was careful in how he positioned his message, but the answer is (3) Cherokee conflicts with the U.S. policies were similar to the experiences of other Native American groups. Choices (2) and (5) are contradicted by the passages. The discussion is not about culture, making choice (1) wrong, and there is no information about other nations wishing to become states (4).

Be able to defend your answer and the way that you found it.

It might be a good time to remind learners and test takers that all the correct answers to a group of questions around a single topic will be congruent. This answer therefore should agree in tone and topic with those of the other three questions in this group.

4. Sharing with Others

Telling people what you know helps you to understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare the answer you found with the others in the group. Explain the support for your answer from the passage.*

Whole class: *Share with the whole class the steps you used to answer the question. Take notes on any different ways of answering the question the other groups gave.*

5. Reflecting, Extending, Evaluating

Reflecting: **Think about what you have learned**

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what you learned.

- 1. What did you learn from the first questions in this Learning Project that helped you with this one?*
- 2. Was this an easy or hard question for you to answer? Explain.*
- 3. The passages in this LP have no bold type, headings, or even titles. Did that make the reading more difficult for you? Explain.*

**Extending: Extend what you learned to new situations.**

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *Write a letter to the editor giving your opinion of the treatment of the Native Americans by the U. S. governmental policies of the 19th Century.*
2. *Find another reading, either in a passage or book, which tells of other Native American problems with U. S. policy.*

One very well-known passage is the address of Chief Joseph of the Nez Perce. It is often referenced by the closing lines of his statement, “I will fight no more forever.”

3. *Find on a map the locations of Indian reservations. Why do you think that most of them are concentrated in one part of the state?*

A map of Virginia, with the Commonwealth’s Native American tribes’ names and locations is included in Appendix B. You might want to note that Virginia tribal properties have not achieved federal recognition.

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented here.

1. *What parts of the activity worked best for you? Why?*
2. *What parts did not work well for you? Explain.*
3. *What ideas presented here will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 5

Reading a Long Passage: Science



This Learning Project features the long science passage. As in Learning Project 4, the passage is printed separately to ease copying and handling with several Inquiry Activities.

The topic of this passage is soil conservation. The passage is well designed for charting details; that is, developing a simple chart with two categories. Readers can put the details they find that pertain to each category on a chart and use it to answer the questions. Learners will realize that a great deal of complicated information can be more readily understood in a chart rather than in paragraph form. Here, they can move from the relatively complicated passage of several paragraphs to an easily grasped chart.

Inquiry 5-2 requires the test takers to draw a conclusion. This higher order thinking skill requires readers to assess the information they have read and evaluate what they think it means. The answers to questions that ask readers to draw a conclusion are not found directly in the text. If you believe your learners can use more practice with drawing conclusions, you may turn them to Inquiry Activity 3-2 in the Reading volume. You may wish to begin with the reading Inquiry and use this social studies Inquiry as an extension activity.

Inquiry 5-3 presents an additional passage that adds to the passage used in 5-1 and 5-2. In this situation, the additional passage offers no new information, but it does provide a context or build a sense of urgency for the facts presented in the longer passage. This Inquiry offers the opportunity for learners to develop a sense of where to spend time reading and where to skim in the tests they take. Once again, the test taker must reach a conclusion, this time by evaluating the information in both passages.



Learning Project 5 Reading a Long Passage: Science

Learners will need to use the following passage when answering the questions for IAs 5-1, 5-2, and 5-3.

Agriculture depends on a layer of soil that averages only 15 centimeters in depth over Earth's surface. Crop plants rely on this rich upper layer called "topsoil." Erosion is a natural process by which topsoil is removed by the action of wind or water. Plant cover helps hold soil in place and limits the amount of erosion that takes place.

Soil formation takes thousands of years, but across the world, topsoil is being lost at ten times the rate at which new soil is formed. People have accelerated the rate of erosion by using the land in an uncontrolled manner.

However, erosion can be reduced in several ways. Contour plowing (plowing along the contour of the land) and terracing (making a series of level plots in a steplike fashion along a slope) reduce water runoff. To minimize soil loss when crop plants are spaced far apart, a method called strip cropping is used. In strip cropping, farmers grow low strips of vegetation that hold down the soil between the crops. Trees called windbreaks are planted between fields to help prevent the wind from carrying away topsoil.

Soil depletion also threatens topsoil. In a natural setting, nutrients from plants are returned to the soil as a result of decay. Farmers use fertilizers to return nutrients to the soil. A technique of alternating crops, called crop rotation, can also return nutrients to the soil. Legumes such as alfalfa and beans can add nitrogen to the soil. Legumes can be alternately grown with plants like wheat or sorghum, which deplete nitrogen from the soil.



Learning Project 5 Reading a Long Passage: Science

The PA Science test has one reading passage of several paragraphs and four questions which refer to it. The passage is about soil conservation, and this offers the opportunity to create a concept map similar to those we have presented in previous Learning Projects. If you have a style that you prefer, you might present it to allow learners to select the approach that works best for them. One method might be to create a chart, labeled “Soil Conservation,” with two categories, “depletion” and “erosion.” Under each category, readers can list the examples from the passage.

Inquiry Activity 5-1: Recognizing Supporting Details from Your Reading

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 7 and 8 from PA Science)

Look over the passage. What are you being asked to read?

Have you seen passages like this before?


How does it appear? Is there anything in the text that will help you understand what it is about?

What will you have to do in order to be successful in this Activity?

7. If corn is grown in the same soil for many years, such corn will deplete nitrogen from the soil. Which method could help to return depleted nutrients to the soil?
- (1) contour plowing
 - (2) terracing
 - (3) crop rotation
 - (4) strip cropping
 - (5) windbreaks
8. Which method is used to counteract the effects of erosion caused by water?
- (1) crop rotation
 - (2) soil depletion
 - (3) fertilizers
 - (4) legumes
 - (5) terracing

Are there any words in this passage that you do not understand?

The passage contains technical vocabulary that you may wish to cover in your preferred manner.

 These two questions are similar in style, in that the first asks about soil depletion and four of the answer choices refer to erosion; and the second asks about erosion and has four of the five answer choices refer to and even cite soil depletion. As a test-taking tip, you may wish to bring this to the attention of your learners; such patterns can make eliminating distractors easy, heighten confidence, and save time.



2. Becoming Familiar with the Problem

Ask yourself questions like the following. You should pay attention to those that were helpful, so you can use them again.

What information do you already have from your experience or reading that will help you understand this passage?

Does the passage make sense to you?

Do you have an interest in farming or growing things?

Read the question. What are you being asked to find out?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work alone, with a partner, or in a group to do this activity.*

Assigning: *Decide who will read the information and who will lead the discussion of what is in the passage.*

Doing the Work: *As you read the passage, consider these strategies:*

Clarify: *Find and mark any words you might not know. See if the passage gives enough information to clarify the meaning of the words. If not, use other resources to find the meaning.*

Recognizing supporting details: *Supporting details are found directly in the passage.*

What information does the passage provide that can answer the questions in this Inquiry Activity?

Analyze: *Read each question and the answer choices. Based on what each question is asking you to do, find the exact words that provide the answer.*

Read each answer choice and decide whether the information is:

- *Not in the passage*
- *The opposite of the information in the passage*
- *Not accurate*

You may prefer to use the graphic organizer found in LA 2-3, or another that you prefer.

Find your answers to the questions.

For question 7, the correct answer is (3) crop rotation, which is given in the fourth paragraph. The other answer choices do not address soil depletion.

For question 8, the correct answer is (5) terracing, the only choice that relates to soil erosion.

Be able to defend your answers and the ways that you found them.

4. Sharing with Others

Telling people what you know helps you to understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare the answers you found with the others in the group. Explain the support for your answers from the passage.*

Whole class: *Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions the other groups gave.*



5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what you learned.

1. *How does having personal or prior knowledge help you with passages like this?*
2. *Were these easy or hard questions for you to answer? Explain.*
3. *The passage in this Learning Project seems to be an excerpt from a textbook. It has no bold type, heading, or even title. Did that make the reading more difficult for you? Explain.*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *Explain to your partner or group how you might plant a garden.*
2. *Draw a picture that shows contour plowing or terracing.*
3. *Your instructor will bring in articles on gardening tips from the newspaper and/or magazines. Find some of those tips that relate to this passage, and share them with a partner.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented here.

1. *What parts of the activity worked best for you? Why?*
2. *What parts did not work well for you? Explain.*
3. *What ideas presented here will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 5 Reading a Long Passage: Science

Inquiry Activity 5-2: Drawing Conclusions

The question in this Inquiry Activity refers to the reading passage presented at the beginning of Learning Project 5. Drawing conclusions is a higher-order thinking skill requiring readers to assess information and evaluate what they read. If your learners need more practice on this strategy, you can use the reading activities in Volume 3, *Language Arts, Reading* on types of questions in IA 1-1 or on drawing conclusions in IA 3-2.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 9 Science PA)

Scan the passage and the question.

9. Why are plants able to slow down soil erosion?
- (1) They prevent plant disease.
 - (2) They prevent water from evaporating.
 - (3) They use up nutrients in the soil.
 - (4) Their roots hold the soil.
 - (5) Their leaves catch water.

2. Becoming Familiar with the Problem

Scan the passage and ask yourself questions like the following as your first step to understanding the passage.

Is there anything about the question you do not understand?

What do you know about the topic of this passage from your own experience or reading?

Are you interested in knowing about soil or agriculture?

Now, read the question. What are you being asked to find out?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work by yourself, in a pair, or a small group to do this Activity.*

Assigning: *Decide who will review the passage and who will lead the discussion.*

Doing the Work: *As you read the passage, do the following:*

Clarify: *Find and mark any words you might not know. Does the passage give enough information to clarify the words you do not know? If not, find the meaning by asking someone or looking it up.*

Analyze: *Remind yourself what the question is asking you to do.*

Read each answer choice and decide if the information in the answer is:

- *Not in the passage*
- *The opposite of what is in the passage*
- *Not accurate*

You may prefer to use a graphic organizer for this step.



What parts of the passage support your answer?

Find your answer to the question.

The correct answer to question 9 is (4) Their roots hold the soil. This is alluded to in the first paragraph. Two of the other answer choices (2 and 5) refer to water but are not addressed in the passage, nor are they to the point of the question. Using up nutrients (3) depletes the soil, and plants preventing plant disease (1) makes no sense.

Be able to defend your answer and the way you found it.

Drawing conclusions means that readers gather information from throughout the passage. The answer is not directly stated.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: Compare the answer you found with others in the group. Discuss the methods you used to find the answer, the support for your answer in the passage, and the reasons each learner thinks his/her answer and support are correct.

Agree on the correct answer and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: Share with the whole class the steps you used to answer the question. Take notes on any different ways of answering the question other groups gave.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *What knowledge did you have that helped you to answer the question?*
2. *Earlier, you indicated whether or not you were interested in the topic. How does your interest affect your reading and answering the questions?*
3. *When you read the question and answer choices, what made you choose the answer you did?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *Write a story about a time when you planted something. What was that experience like?*
2. *Write a multiple-choice question based on your story that draws a conclusion. Pass the question around for members of your group to answer and discuss.*
3. *This passage discusses problems of soil conservation. In your group, or as a class, discuss some other problems that farmers might face.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project **5** Reading a Long Passage: Science

Inquiry Activity 5-3: Reaching a Conclusion

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 6 Science PA)

In this Inquiry Activity, learners will read an additional commentary that adds to the longer passage addressed in 5-1 and 5-2.

In this instance, the additional quotation adds some sense of importance to the longer passage. However, the passage does not provide information for the answer to the question that is posed in Item 6. The information comes from the long passage.

This is one instance where the test taker can skim the additional information and answer the question without using it.



Good test takers get a sense of where they need to spend time and where they can move on without wasting time.

Skimming this quotation quickly and reading the question will show many learners right away that the new passage does not need to have a lot of time spent on it.

Look over the passage. What are you being asked to read?

Have you seen passages like this before?

How does it appear? Is there anything in the text that will help you understand what it is about?

What will you have to do in order to be successful in this Activity?

6. H.H. Bennett, one-time chief of the Soil Conservation Service, is known as the father of soil conservation. He once said, “Productive soil is life, and the production of soil is vanishing with each passing year.”

Which solution would be MOST beneficial to help resolve this environmental problem?

- (1) Tax farmers for every acre of the land they use.
- (2) Convince farmers to use accepted methods to prevent erosion.
- (3) Do not let farmers use the land.
- (4) Encourage landowners to clear-cut all vegetation.
- (5) Lower the price of fertilizers to reduce the total cost to the farmer.

Where have you seen passages like this before?

Are there any words in this passage that you do not understand?

2. Becoming Familiar with the Problem

Ask yourself questions like the following. You should pay attention to those that were helpful, so you can use them again.

What information do you already have from your experience or reading that will help you understand this passage?

Does the passage make sense to you?



Do you have an interest in the topic of soil conservation?

Read the question. What is it asking you to find out?

Can you answer the question from this passage alone?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work alone, with a partner, or in a group to do this activity.*

Assigning: *Decide who will read the information and who will lead the discussion of what is in the passage.*

Doing the Work: *As you read the passage, consider these strategies:*

Clarify: *Find and mark any words you might not know. See if the passage gives enough information to clarify the meaning of the words. If not, use other resources to find the meaning.*



Analyze: *Read the passage in question 6. Does it contain information about ways to conserve soil? If not, where will you find this information? Find the words and phrases that describe ways to conserve soil. Mark this information.*

Then, read the answer choices and decide whether the information for the answer is:

- *Not in the passages*
- *The opposite of what is in the passages*
- *Not accurate*

What information do you have from the previous passage that clarifies the second passage?

The second passage establishes a context for the first passage. It does not really add knowledge. Learners may find that they do not need to read that passage in order to answer the question that, in fact, refers to information given clearly in the first passage.

Find your answer to the question.

The correct answer to question 6 is (2) convince farmers to use accepted methods to prevent erosion. Choices (1) and (3) have the same consequence, farmers will not farm, but that may not resolve the issue of erosion. Choice (4) is contradictory, and while (5) might reduce soil depletion, it is probably not the best way to go about it.

Be able to defend your answer and the way that you found it.

4. Sharing with Others

Telling people what you know helps you to understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare the answer you found with the others in the group. Explain the support for your answer from the passage.*



Whole class: *Share with the whole class the steps you used to answer the question. Take notes on any different ways of answering the question the other groups gave.*

5. Reflecting, Extending, Evaluating

Reflecting: **Think about what you have learned**

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what you learned.



1. *What did you learn from the first questions in this Learning Project that helped you with this one?*
-  2. *What information did the short passage provide for you to answer the question? What does that tell you?*
3. *Did the quotation from H. H. Bennett in this question make the long reading more interesting or important?*
-  4. *When reading multiple-choice questions, how do you eliminate choices?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *With your group, try to find some reasons why people who are not farmers or gardeners should be interested in this topic. Share those reasons with the rest of the class.*
2. *Using a map of Virginia provided by your instructor, locate places where agriculture is a major business. How or where might you find this information if you do not know it?*
3. *Would you like to be a farmer? Write an essay that answers and explains your choice.*
4. *In your groups, discuss some ways that businesses and communities can help prevent soil erosion.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented here.

1. *What parts of the activity worked best for you? Why?*
2. *What parts did not work well for you? Explain.*
3. *What ideas presented here will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 6

Finding Details Supported by the Text

In this Learning Project, the attention turns to short passages without visual accompaniment. Each passage has a question that requires learners to find supporting details.

In these short passages, it is important that the learner focus not only on the information in the text, but also on the type of question that the test is asking. Learners and their facilitators are reminded of the test question inquiry in the Reading volume, 1-1, which focuses on and identifies the types of questions.

In addition, these short passages work well in a classroom that has fully integrated the inquiry approach. The passages can function as extensions to reading strategies, or they can be the opening into other science or social studies activities. Because they briefly touch upon interesting topics, learners can follow up on their individual interests and learn more about the topics, culminating their study in an essay or report to the class.





Learning Project **6** Finding Details Supported by the Text

Inquiry Activity 6-1: Finding Supporting Details

In both the Science and Social Studies PA tests, one short passage with one question (no graphic) requires learners to find the details in the passage to support the answer choice.

We strongly recommend that your learners do Reading IA 1-1, “Understanding the GED Questions,” prior to this activity. Reading IA 1-1 has examples of finding supporting details.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 10 Science PA)

Look at the item.

What must you do in order to answer the question correctly?

Where else have you seen questions like this?

What will you have to do to be successful in this Activity?

Get down your thoughts, or share them with your partner.

10. The living cells that conduct food and water up and down through the trunk of a tree are located in a relatively thin layer just under the bark. The center part of the trunk contains old, dead cells.

If it were necessary to kill a mature tree, which of the following methods would be most effective?

- (1) Saw a deep cut about halfway into the trunk on one side.
- (2) Remove most of the center of the trunk through a small opening.
- (3) Drive a steel spike through the bark to the center of the trunk.
- (4) Bore a hole through the center of the trunk.
- (5) Cut a deep groove below the bark around the tree trunk.

2. Becoming Familiar with the Problem

Scan the question, and ask yourself questions like the following as your first step to identifying the question.

Is there anything in the question you do not understand?

Have you ever planted or cut down a tree?

Have you ever thought about how to kill a mature tree before?

What do you think “finding supporting details” means?



3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work by yourself, in a pair, or a small group to do this Activity.*

This IA is best done in pairs or small groups.

Assigning: *Decide with your partner or in your group how you will carry out the task of answering the question.*

Doing the Work: *As you read the question, do the following:*

Scan the passage; find and mark any words you might not know. See if the passage gives you enough information to clarify the meaning of the words. If not, ask someone or look up what the words mean.

Read the answer choices for the question. Find the exact words in the passage that provide the answer. What word or words in the answer choices come closest to the topic of the reading passage.

Living cells...a relatively thin layer just under the bark

You may prefer using the graphic organizer (also used in IA 2-3, "Understanding Charts and Diagrams") or drawing a sketch for this step. Determine which answer choice is correct.

Choice (5) specifies a groove below the bark around the tree trunk. Three of the other choices refer to the center of the tree, which the passage tells us is dead cells. The other choice indicates a cut halfway through the tree. It might kill the tree also, but not as quickly (effectively).

What words used in the question tell you what kind of question it is?

The question asks for a fact.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare the answer you found with others in the group. Discuss the methods you used to find the answer, the support for your answer in the passage, and the reasons each learner thinks his/her answer and support are correct.*

Agree on the correct answer and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: *Share with the whole class the steps you used to answer the question. Take notes on any different ways of answering the question other groups gave.*

5. Reflecting, Extending, Evaluating

Reflecting: **Think about what you have learned.**

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *How helpful will it be to know what type of question is being asked?*
2. *Are questions that ask for details in the passage easy or hard for you to answer? Explain.*
3. *Does it make a difference in how you answer the question if the topic is of interest to you or not? Why might that be?*
4. *Evaluate the approaches you used to find the supporting details to answer this question.*



Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *What kind of reading might you do on the job or at home that would be looking at supporting details?*
2. *What details were you looking for?*
3. *Discuss in your small groups different ways (strategies) you might use to find supporting details.*
4. *Have you ever seen beaver damage in lowland areas? Have you noticed how the beavers fell trees to build dams? Discuss how might beavers know the facts that are given to this passage.*
5. *Using reference materials in your classroom or library, write an essay about how people take products from trees without killing them (for example: maple syrup, rubber, gum).*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 6 Finding Details Supported by the Text

Inquiry Activity 6-2: Recognizing Supporting Details

In both the Science and Social Studies PA tests, one short passage with one question (no graphic) requires learners to find the details in the passage to support the answer choice.

We strongly recommend that your learners do Reading IA 1-1, “Understanding the GED Questions,” prior to this activity. Reading IA 1-1 has examples of finding supporting details.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 14 Social Studies PA)

Look at the item.

What must you do in order to answer the question correctly?

Where else have you seen questions like this?

What will you have to do to be successful in this Activity?

Jot down your thoughts, or share them with your partner.

14. Many wine tasters are trained to judge the quality of wines. By tasting a particular wine, they can identify the region and country from which the wine comes. The taste is influenced by the type of soil in which the wine grapes grow.

These facts best support which generalization about wine production?

- (1) Heat and light are not important in wine production.
- (2) The quality of wine grapes does not vary.
- (3) Chemicals in nature generally harm wine production.
- (4) Wine production is affected more by human intervention than by nature.
- (5) Geographic conditions affect wine production.

2. Becoming Familiar with the Problem

Scan the question, and ask yourself questions like the following as your first step to identifying the question.

Is there anything in the question you do not understand?

Have you ever planted a garden?

Have you ever thought about how different conditions might affect the growth of your garden?

What are some of those different conditions?



3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work by yourself, in a pair, or a small group to do this Activity.*

This IA is best done in pairs or small groups.

Assigning: *Decide with your partner or in your group how you will carry out the task of answering the question.*

Doing the Work: *As you read the question, do the following:*

Scan the passage; find and mark any words you might not know. See if the passage gives you enough information to clarify the meaning of the words. If not, ask someone or look up what the words mean.

Depending on your class, you may find that you need to discuss terms in the question, particularly the word *geographic*.

Read the answer choices for the question. Find the exact words in the passage that provide the answer. What word or words in the answer choices come closest to the topic of the reading passage?

They can identify the region and the country. Taste is influenced by the type of soil. Here, you might want your learners to look at the answer choices and discuss how each of them relates (or doesn't) to soil.

You may prefer the graphic organizer (LA 2-3) for this step.

Determine which answer choice is correct.

The facts in the passage support choice (5) geographic conditions affect wine production. Choices (1) (3) and (4) may also be true, but they are not addressed in the passage. Choice (2) is contradicted by the passage.

What words used in the question tells you what kind of question it is?



The question refers directly to the facts in the passage. Depending upon your class, you may want to make the point that although the wording is not identical between the passage and the answer choices, all of the choices refer to geographic conditions. That is the best indication that test takers need to look for details to support the answer.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare the answer you found with others in the group. Discuss the methods you used to find the answer, the support for your answer in the passage, and the reasons each learner thinks his/her answer and support are correct.*

Agree on the correct answer and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: *Share with the whole class the steps you used to answer the question. Take notes on any different ways of answering the question other groups gave.*

5. Reflecting, Extending, Evaluating

Reflecting: **Think about what you have learned.**

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *What would you say is a good approach for answering questions that ask for supporting details?*



2. Does using your prior knowledge or interest help you answer questions like these? Explain.



3. How does understanding the test questions and answer choices help you take tests?

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. In your group, find some other small passages to read, and devise other multiple-choice questions that look for supporting details.
2. Exchange the questions you have written with each other. Discuss in your small groups any differing strategies you have used to find supporting details.
3. There are many wineries in Virginia. Discuss in the class or group whether any of you have ever visited one, worked at one, or observed the winemaking process.
4. Grapes for white wine are grown in humid areas, while grapes for red wines are grown on hills or mountainsides. Given this information, discuss in your groups where in Virginia each of these types of grapes might be grown.

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. What parts of the activity worked best for you? Explain.
2. What parts did not work well for you? Explain.
3. What ideas in this Inquiry Activity will you use when taking the GED test? Why?
4. How does following this 5-step format make you feel?



Learning Project 7

Drawing Conclusions from the Text



The short passages in this Learning Project require your readers to draw conclusions from the text. This is a higher order thinking skill. The answers will not be found directly in the small passages. Readers will have to assess and evaluate the reading material and derive their answers.

In Inquiry 7-1, the question is an application question. Learners will take the principles discussed in the passage and apply them to another field. This inquiry could be used as an extension to reading classes that are learning about application questions.

Inquiry 7-2 consists of five brief passages. Three of these are from the Science PA, and the remaining two are from the Social Studies PA. In these very short passages, the entire item is taken as one object. Here again, learners are asked to draw conclusions from the one or two sentences. Vocabulary is a challenge for many learners; these passages could be used to develop vocabulary as well as develop the skills in drawing conclusions. They could also be used in conjunction with the Reading volume, when learners are first presented with questions types in Reading Inquiry 1-1.

The extensions in each of the inquiries in this Learning Project again offer a wide range of independent projects for learners working alone or in groups to follow their interests, learn about a topic, and write an essay or a group of questions about that material.



Learning Project **7** Drawing Conclusion From the Text

Inquiry Activity 7-1: Deriving a Conclusion

The item in this Inquiry Activity is characterized by a short, two-sentence passage with strong information from which the test taker must derive the correct conclusion. As we consider this short passage, we do not separate the item from the answer choices.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Item 16 Science PA)

Look at the test item.

What must you do in order to answer the question correctly?

Where else have you seen questions like this?

You may wish to have your class identify that this is an application question.

What will you have to do to be successful in this Activity?

Jot down your thoughts, or share them with your partner.

16. Bats navigate by sending out and receiving sound waves. The bat can determine the shape, size, and location of an object by measuring the time it takes for the sound waves to return.

Which of the following uses this principle?

- (1) a telephone call that is transmitted via satellite
- (2) a radio signal that is sent from a tower to a radio receiver
- (3) a special photograph taken by a satellite that shows areas of different temperature
- (4) a message transmitted over phone lines from one computer to another
- (5) a sonar system that can determine if there are fish beneath a ship

2. Becoming Familiar with the Problem

Scan the item, and ask yourself questions like the following as your first step to identifying the question.

Is there anything in the item you do not understand?

What do you know about bats?

What technical terms might you need to have clarified or defined?

What kinds of technologies are being referred to in the answer choices?

3. Planning, Assigning, and Performing Tasks

Planning: You may decide to work by yourself, in a pair, or a small group to do this Activity.



This IA is best done in pairs or small groups.

Assigning: *Decide with your partner or in your group how you will carry out the task of answering the question.*

Doing the Work: *As you read the question, do the following:*

Scan the item; find and mark any words in the paragraph or the answer choices you might not know. See if the passage gives you enough information to clarify the meaning of the words. If not, ask someone or look up what the words mean.

The technological vocabulary may be confusing initially. Learners who recognize and can define the word **sonar** will likely know the answer.

What words in the question can guide you to derive the correct answer?

This is an application question, where the information in the reading can be applied to another field. Application questions are defined in Reading Inquiry Activity 1-1. A good reader will recognize that this is an application question from being asked to take the principle from one topic or field and apply it to another.

Determine which answer choice is correct.

Choice (5): the sonar system uses the same technology, bouncing sound off of an object and tracking its return, to find and recognize size, shapes, and movement as do the bats. The first two choices refer to telecommunications, the photograph does not use sound, and while electronic mail does use sound, the visible output has nothing to do with where things are located.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare the answer you found with others in the group. Discuss the methods you used to find the answer, the support for your answer in the passage, and the reasons each learner thinks his/her answer and support are correct.*

Agree on the correct answer and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: *Share with the whole class the steps you used to answer the question. Take notes on any different ways of answering the question other groups gave.*

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *How helpful will it be to know what type of question is being asked?*
2. *Are questions that ask you to apply information from one field to something in another easy or difficult for you?*

Explain.

3. *Does it make a difference in how you answer the question if the topic is of interest to you or not? Why might that be?*
4. *How important is the correct vocabulary in understanding how to answer the item?*

The vocabulary that appears in science items creates most of the challenge to answering the questions correctly. Most of the



science in the PA can be answered from life experiences or a very general knowledge of how things work. Finding ways to develop a scientific vocabulary will be of the greatest help to your learners. Appendix E has some good resources for vocabulary development.

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *What kind of reading might you do on the job or at home that would call for you to apply what you know to another topic?*
2. *Have a discussion in your groups or with the entire class sharing ways that you might develop a scientific vocabulary.*
3. *Using some reference materials in your class, try to find some other examples of technology using animal behaviors, like the bats' method of navigating by sound waves.*

A number of popular science books and television shows feature a variety of animal behaviors. Another interesting aspect might be considering how animals change their behaviors in the face of technology.

Have you seen any movies about submarines (Crimson Tide, Hunt for Red October)? How did seeing these movies help you understand the question?

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project **7** Drawing Conclusion From the Text

Inquiry Activity 7-2: Combining Information to Draw Conclusions

There are five items in this Inquiry Activity, all characterized by short, two or three-sentence passages with strong information from which the test taker must derive the correct conclusion. As we consider these, we do not separate the passage from the answer choices, but take the item as a whole.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 4, 14, & 18 Science PA; 3 & 4 Social Studies PA)

Look at each test item.

What must you do in order to answer the questions correctly?

Where else have you seen questions like this?

If you have not already done so, have your learners take a look at Reading IA 1-1, “Identifying Types of Questions.”

What will you have to do to be successful in this Activity?

Got down your thoughts, or share them with your partner.

Correct choices are starred for teachers.

Science 4

At high altitudes, the atmosphere contains fewer molecules per unit volume of air than it does at low altitudes.

For which reason may people experience shortness of breath more quickly at the top of a mountain than along a seashore?

- (1) a slower pulse rate
- (2) a great gravitational force on the body
- (3) a lower percent of oxygen in the blood **
- (4) a faster heartbeat
- (5) a slower circulation of blood

Science 14

Smokestacks used by industries that burn coal or oil often give off sulfur dioxide as a by-product. Sulfur dioxide reacts with the oxygen in the air to form sulfur trioxide. Sulfur trioxide then combines with the water in the air to form sulfuric acid.

What is the most prominent atmospheric consequence of this series of chemical reactions?

- (1) The atmosphere is polluted with substances that are harmful to humans and to the environment. **



- (2) Plants that require a basic soil with a high pH level thrive.
- (3) The atmosphere becomes less polluted because sulfuric acid dissolves all particles in the air.
- (4) Marine life reproduces faster because of the increasing acidity of the water.
- (5) Increased sulfur dioxide emissions have little effect because wind blows the emissions away.

Science 18

The force of gravity causes objects to fall toward Earth, but it is commonly observed that a feather falls more slowly than a penny. However, when a feather and a penny are placed in a chamber where all the air has been removed, they both fall at the same rate.

These observations indicate that:

- (1) the shape of the feather causes gravity to have less force
- (2) metals fall faster than feathers even when no air is present
- (3) air resistance will cause the feather to fall more slowly **
- (4) air resistance acts more on the penny than on the feather
- (5) both the feather and the penny fall more slowly in a vacuum

Social Studies 3

The United States generates 4.5 billion pounds of toxic waste each year. Much toxic waste is composed of cancer-causing chemical compounds that remain after the production of chemicals, paper, metals, and plastic.

Based on this information, what does improper disposal of toxic waste in the United States most likely produce?

- (1) poisoned water supply **
- (2) a fuel crisis
- (3) decrease in illness
- (4) fertile soil
- (5) recycled materials

Social Studies 4

Some large companies use vocational retraining programs to teach people to do work that is different from their present jobs. The retraining is often necessary because some employees' jobs are no longer needed to make a company's product.

What is the main purpose of these programs?

- (1) to encourage people to leave the company
- (2) to improve the quality of products
- (3) to increase the salaries of employees
- (4) to make it possible for people to continue to work **
- (5) to promote people to higher paying jobs.



2. Becoming Familiar with the Problem

Scan the items, and ask yourself questions like the following as your first step to identifying the question.

Is there anything in the items you do not understand?

What vocabulary might you need to have clarified or defined?

What items do you think you can answer without having unfamiliar words defined for you?

The science passages have very specific vocabulary in each passage. In most cases, if the words are understood, the test takers will be able to answer the questions readily.

What are the questions asking you to do?

In each case, the question asks the test taker to use the information in the paragraph to draw a conclusion.

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work by yourself, in a pair, or a small group to do this Activity.*

Assigning: *If you are working with a partner, decide how you will carry out the task of answering the question.*

Doing the Work: *As you read the questions, do the following:*

Scan the items; find and mark any words in the paragraphs or the answer choices you might not know. See if the passages give you enough information to clarify the meaning of the words. If not, ask someone or look up what the words mean.

Science passages will have technical or specific vocabulary challenges. In this case, also, social studies item 3 about pollution may pose some vocabulary challenges as well.



What words in the questions show you what the questions are asking you to do?

For test takers, words such as **reasons, consequences, show** or **indicate, purpose, or based on this information**, are clues that they will need to draw conclusions.



Also, each of the questions refers the test takers specifically to the reading passage, which shows them they will need to read that small passage carefully.



Determine which answer choices are correct.

For Science item 4, choice (3) is the only choice that refers in any way to air (oxygen). Three of the choices refer to the same thing, circulation or pulse. Multiple references are usually an indicator that they can be eliminated from consideration, and choice (2) refers to gravity, which does not appear in the passage.



For item 14, the correct answer is the very general choice (1). Often the most generic answer is the correct one. Whatever the correctness of choices 2 through 4, they are not mentioned in the passage, which is about air. Choice (5) identifies one of the difficulties in dealing with the problem of acid rain: that the damage is at considerable distance from where the pollution occurs. That is more a political consequence. Many people would find this passage easier to understand if the term **acid rain** had been used. You may be able to find useful newspaper articles or online sources to build interest.

For item 18, the correct choice is (3). The resistance of the air will affect the lighter feather more than the denser coin. You could conduct an experiment here dropping objects of different weights, including a sheet of paper. The paper will exhibit a response to air resistance similar to that of a feather. If you or the class is so inclined, a burst lecture about the properties of vacuums or differing resistance of water and air might make the point clear.

For item 3, understanding that **toxic** and **poisonous** are synonymous will lead to the correct choice (1). Improper disposal



of toxic waste clearly will not lead to fertile soil or a decrease in illness, it has nothing to do with a fuel crisis, and recycling is an alternative to disposal.

Social Studies 4 is correctly answered by choice (4.) There is no mention in the passage of salary increase or promotion, only retraining brought on by differing needs. It is not logical for a company to retrain someone it will be laying off, and while quality control is likely a by-product, it is not mentioned as a reason for retraining.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: Compare the answers you found with others in the group. Discuss the methods you used to find the answers, the support for your answers in the passages, and the reasons each learner thinks his/her answers and support are correct.

Agree on the correct answers and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions other groups gave.

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.



1. *What does it mean to you as a test taker to be able to recognize what the question is asking you to do?*
2. *Do you find it easy or difficult to draw conclusions from these short passages? Explain.*
3. *Do some of the questions seem easier to you than others? Explain.*
4. *Are these short passages easier or more difficult than the longer passages that have a group of questions based on the same reading?*
5. *What techniques did you use to answer the questions in this Activity?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *Using reference materials provided by your instructor, or that you have located yourself, write an essay about a local environmental issue that has attracted your interest.*

Most localities have had a widely publicized issue, whether it is strip mining, mountain reclamation, landfill issues, damaged waterways, or clear-cutting of trees. Improper disposal of wastes, both farm and manufacturing, has also had its share of interest.

2. *In your groups, use paragraphs from your essays to write multiple-choice questions that require drawing conclusions.*
3. *Exchange questions with other groups and answer each others' questions. Discuss as a class how you came up with the correct answers.*
4. *Your instructor will provide materials and directions for science experiments. After you and your group have done the*



experiment, write an explanation of what you did and what it shows.

A variety of easy and inexpensive science experiments appear in Appendix E. This particular extension activity could be repeated each time you have a hands-on science class. Writing up the step-by-step procedures and telling what the entire activity shows is an excellent practice for developing clear writing.

5. *Among your group or class, identify people who have participated in re-training programs. Find out what their experiences have been. Discuss as a group the advantages of such programs.*

Some of your participants may be involved in job readiness programs. Their information will provide some interesting discussion. You may want to have a panel discussion or a debate identifying the pros and cons of such programs.

You could have a guest speaker come in and talk to the class. Speakers could be drawn from the local Virginia Extension Service or the Virginia Department of Forestry, DEQ, etc. Go to: www.vanaturally.org for a list of available speakers.

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



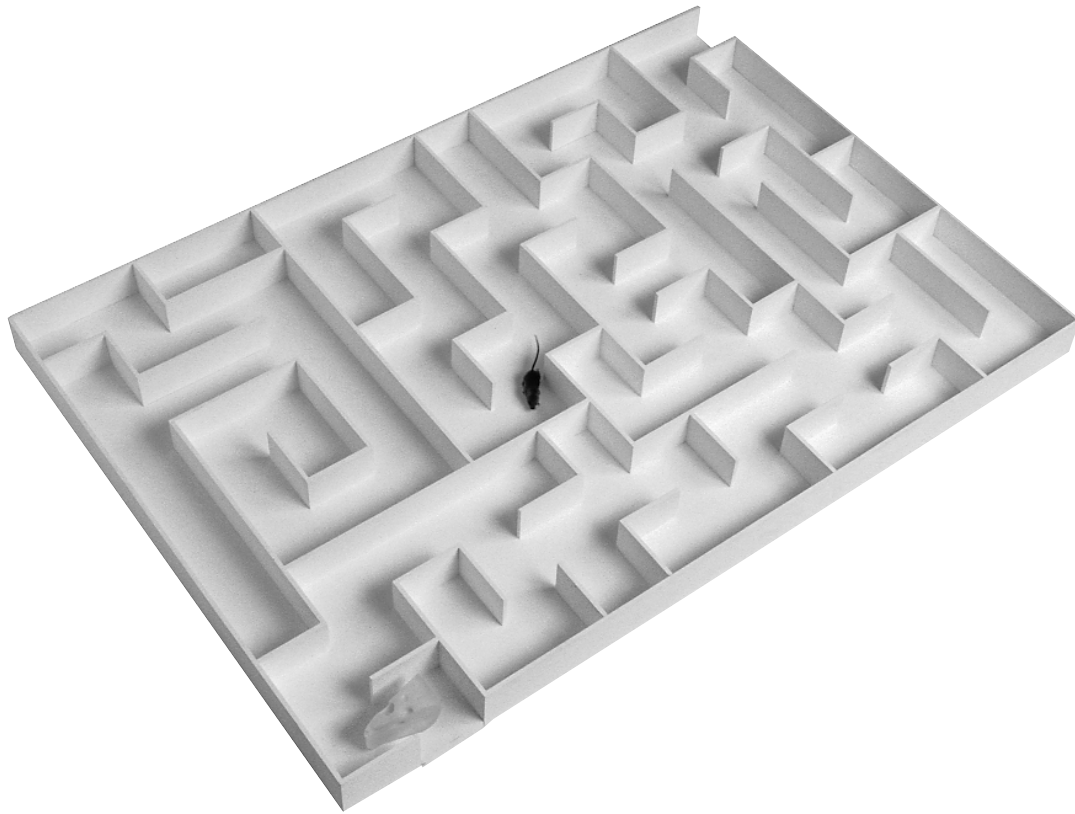
Learning Project 8

Using Your Skills to Answer Questions

The two Inquiry Activities in this Learning Project require analysis by the test taker beyond the information given in the passage. As with Learning Project 7, both the passage and the question are considered as a single entity. In the questions that make up these two inquiries, learners will need to draw on information beyond what is given in the passage. In some cases, learners can use common sense; other questions will require prior experience or prior knowledge. A number of test-taking tips are shown in these two inquiries as well.

In Inquiry 8-2, learners focus on two test-taking skills. First, learners must read the answer choices carefully, because several answer choices, if read carelessly, will lead the test taker to make a poor choice. Additionally, the need to eliminate distractors is seen as a good way to narrow the field of choices.

The topics in these questions range from the solar system to consumer economics. As in every Inquiry, learners may have prior knowledge with which they can answer questions. Sometimes they just need to take the time to realize what they know.





Learning Project 8 Using Your Skills to Answer Questions

Inquiry Activity 8-1: Finding the Answers

The items in this Inquiry Activity are short, two or three-sentence passages followed by questions that require analysis beyond the information given. As with science item 22 (IA 2-1), your learners may need to have information from another source to answer the questions; they may have it from their life experiences, or they may be able to problem solve. As with the items in LP 7, we do not separate the items from the answer choices.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 13 & 19 Science)

Look at the test items.

What must you do in order to answer the question correctly?

Where else have you seen questions like this?

If you have not already done so, have your learners take a look at Reading IA 1-1, “Identifying Types of Questions.”

What will you have to do to be successful in this Activity?

jot down your thoughts, or share them with your partner.

13. As part of a laboratory experiment, five students measured the weight of the same leaf four times. They recorded 20 slightly different weights. All of the work was done carefully and correctly. Their goal was to be as accurate as possible and reduce error in the experiment to a minimum.

Which of the following is the BEST method to report the weight of the leaf?

- (1) Ask the teacher to weigh the leaf.
- (2) Report the first measurement.
- (3) Average all the weights that were recorded.
- (4) Average the highest and lowest weights recorded.
- (5) Discard the lowest five weights.

19. When sunlight is absorbed by an object, the energy heats the object. But if light is reflected by or passes through the object, the object is heated to a lesser degree.

An automobile with black seatcovers is left outside on a sunny day with its windows rolled up. Which of the following will heat up the MOST while causing the inside of the automobile to get warm?

- (1) window glass in the side windows
- (2) the white steering wheel cover
- (3) window glass in the front windshield
- (4) the black seatcovers
- (5) the air inside the automobile




2. Becoming Familiar with the Problem

Scan the items, and ask yourself questions like the following as your first step to identifying the question.

Is there anything in the items you do not understand?

Why would you think the words are capitalized in the questions?

 The capitalized words will guide the test takers to the correct answer. In the case of number 13, there are a number of ways to accomplish the task. In item 19, everything in the car will be warm, as most of us have experienced, but the hottest things will be the black seatcovers.

What technical terms or ideas might you need to have clarified or defined?

3. Planning, Assigning, and Performing Tasks

Planning: You may decide to work by yourself, in a pair, or a small group to do this Activity.

Assigning: Decide with your partner or in your group how you will carry out the task of answering the questions.


Doing the Work: As you read the items, do the following:

Scan the items; find and mark any words in the paragraphs or the answer choices you might not know. See if the passages give you enough information to clarify the meaning of the words. If not, use other resources to define the terms.

Unusual for science items, the vocabulary is not likely to be an issue in these two questions. In both cases, the questions can be answered by common sense or life experience.

Determine which answer choices are correct.

For item 13, the best method would be choice (3), to average the weights. Reporting on one measurement or throwing out high weights or low weights will skew the results. Asking the teacher is not doing the assignment.

 Good problem solving skills will lead the learners to the correct answer. Test takers need not pore over the reading passage. Its information is vague; we do not know the reason, nor are we asked to discover, why there is such variance.

For question 19, most of your learners will have had the experience of sitting on hot seatcovers, choice (4). Everything will be hot, but they will be the hottest. Again, they can allow their own knowledge to lead them to the answer without having to search for textual clues. This pairs well with one of the earlier IAs that deals with absorption of colors and why we see the colors we do. Black is the absorption of all wavelengths of light, hence, the most energy (heat).

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: Compare the answers you found with others in the group. Discuss the methods you used to find the answers, the support for your answers in the passage, and the reasons each learner thinks his/her answers and support are correct.

Agree on the correct answers and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions other groups gave.



5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.



1. What have you learned about the capitalized words in occasional questions? How will that help you as a test taker?
2. How does your life experience assist you in answering questions like these?
3. What problem-solving skills did you use to answer these questions?

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. In your groups, come up with examples from the PA test where you used your own experiences to answer multiple-choice questions.
2. Come up with other multiple-choice questions for these two items that also derive from life experiences and not from a reading passage.
3. If you needed a new roof, what information from item 19 might you make use of? Does where you live make a difference in choosing roof colors? Explain.
4. In your group, who among you have had experiences weighing objects? At work? In the home? What do you know about scales that will help you understand the problem set out in item 13?

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. What parts of the activity worked best for you? Explain.
2. What parts did not work well for you? Explain.
3. What ideas in this Inquiry Activity will you use when taking the GED test? Why?
4. How does following this 5-step format make you feel?



Learning Project 8 Using Your Skills to Answer Questions

Inquiry Activity 8-2: Solving the Problem

The items in this Inquiry Activity consist simply of questions for which your learners must derive an answer. Your learners will need to use information from other sources to answer the question – prior knowledge, prior experience, problem solving, or test-taking strategies

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 3 Science & 24 Social Studies PA)

Look at the test items.

What must you do in order to answer the questions correctly?

Where else have you seen questions like this?

If you have not already done so, have your learners take a look at Reading IA 1-1, “Identifying Types of Questions.”

What will you have to do to be successful in this Activity?

Jot down your thoughts, or share them with your partner.

3. Which of the following statements could be directly derived from the fact that Earth rotates on a tilted axis while revolving around the sun?
 - (1) Earth is widest at the equator.
 - (2) While the Northern Hemisphere experiences winter, the Southern Hemisphere experience summer.
 - (3) Most of Earth’s surface is covered by ocean.
 - (4) The desert area of East Africa increases in size each year.
 - (5) Erosion occurs in a west-to-east pattern.

24. Which of the following is the most reasonable explanation for a surplus of a product on the market?
 - (1) Most consumers find the product reasonably priced.
 - (2) The producers overestimated the demand for the product.
 - (3) An expensive substitute for the product is available.
 - (4) Producers have not supplied enough of the product.
 - (5) The product has many uses.

2. Becoming Familiar with the Problem

Scan the items, and ask yourself questions like the following as your first step to identifying the question.

Is there anything in the items you do not understand?



What sets these two items apart from all the other short passages we have looked at?

These two items are questions only. There is no explicatory passage that accompanies them. That means the answer to each item will have to come from the test taker/learner and not from test material.



You may want to point out that it is important to read the question and answer choices for item 24 very carefully since misreading answers 1 and 3 might confuse them.

What technical terms or ideas might you need to have clarified or defined?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work by yourself, in a pair, or a small group to do this Activity.*

Assigning: *Decide with your partner or in your group how you will carry out the task of answering the question.*

Doing the Work: *As you read the items, do the following:*

Scan the items; find and mark any words in the questions or the answer choices you might not know. See if the questions or the answer choices give you enough information to clarify the meaning of the words. If not, use other resources to define the term.

For science question 3, you may wish to draw the earth as it is described in the question. How might that help you find the answer?

Depending upon your class and the types of learners they are, you may want to draw a sketch on the board. You can download an excellent example from: <http://library.thinkquest.org/29033/begin/earthsunmoon.htm>



Decide how you will go about answering the questions.

A test taker might be able to eliminate distractors or other evidently incorrect answers. Particularly in questions where the answer is not clear from the passage, test takers should eliminate distractors to narrow their answer choice options.

Learners may have other problem-solving approaches: using what they might know from other sources, experiences they may have had, or what is often called common sense.

Determine which answer choices are correct.

In Item 3, guessing the answer from the given of a tilted axis might be somewhat daunting. A close look at the answers can eliminate several choices that seem to have nothing to do with tilt: the amount of ocean (3) or the increasing desert area (4). Choice (1) fits well with the roundness and rotating but seems remote from the tilted axis. While choice (5) may be true, and may have something to do with a tilted axis, it is not as readily seen as the fact stated in choice (2), which is certainly true, and may seem to refer to the tilt.

In item 24, shoppers should be able to work out the answer from the choices given if they give themselves time and read the options. A reasonably priced (choice 1), useful (choice 5) product is likely to sell at a steady rate. If there were not enough of the product (choice 4) or a more expensive version was available, the product in question is likely to sell out. That leaves choice (2) that the producers thought more people would buy the product than did.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare the answers you found with others in the group. Discuss the methods you used to find the answers, the support for your answers in the passage, and the reasons each learner thinks his/her answers and support are correct.*



Agree on the correct answers and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Both in the group and the whole-class discussion, you and the class may wish to refer to the sketch.

Whole class: *Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions other groups gave.*

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.



1. *What have you learned about reading the questions and answer choices to find the correct response? How will that help you as a test taker?*
2. *What do you know about these topics?*
3. *What problem-solving skills did you use to answer these questions?*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *With your partner or with the class, discuss what usually happens to products that are left at the end of the season.*
2. *How do you, in your personal life, take advantage of the situation described in social studies 24?*
3. *In your groups, make a model of the sun and Earth, showing how Earth rotates on its axis and revolves around the sun.*
4. *Using reference materials in your classroom, find pictures of the solar system. What other information do you know about the planets that would make good multiple-choice questions?*
5. *Write an essay about space exploration. If you have a strong opinion about this topic, give reasons and examples that make your opinion clear and persuasive.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 9

Recognizing Types of Questions



This Learning Project features a long passage. It is the final selection from the Social Studies PA.

The topic of this passage is the federalist form of government. Understanding federalism is key to the understanding of any issue in both civics and government classes. In addition, the passage could be used as the stepping stone into a study of the various forms of government.

Inquiry 9-1 addresses the types of questions. Without looking at the reading passages, the learners must focus on the question types and assess what each question is asking them to look for. Each question is a different type. Those learners who have been working with the types of questions in their reading activities will find this a useful review. It could be used as an extension activity for other learners who have not studied question types thoroughly.

Inquiry 9-2 reveals the passage and presents a test-taking strategy that has been offered in the Reading book: that multiple questions on a single passage will have their answers found sequentially in the passage; that is, the first question will have the answer early in the passage; the next question will be answered from the middle of the passage, and the final question will have the answer found late in the passage. This is true of all passages with multiple questions in the GED test. It is not an area on which we focus, since we look at question types and content-reading strategies. In this final inquiry, we make this strategy clear.




Learning Project 9 Recognizing the Types of Questions

Inquiry Activity 9-1: Identifying the Types of Questions

Before your learners look at types of questions in the social studies and science PA tests, they should have done Learning Project 1 in Volume 3, *Reading*, “Identifying the Kinds of Questions on the GED Reading Test.”

This is the second of the long passages in the Social Studies PA. Each of the questions is a different type: 17 is an application question, 18 asks for synthesizing the information throughout the passage, and 19 is one of the few questions in the PA that is answered directly in the passage.

 This grouping also shows very clearly the test-taking strategy that passages having more than one question will have the questions in sequential order relative to the passage. That is, the answer to the first question is found early in the passage, that for the second is found midway through the passage, and the answer to the last question is at the end of the passage.

This concept is mentioned in the Reading volume in the introduction (page 2) and in the introduction to Learning Project 3 (page 29). In the Reading Learning Projects, most of the attention is on the best strategy for particular types of passages and the types of questions. This would be a good place to focus on the reason for the PA’s order of the questions, rather than our re-ordering for the purpose of strategy or identification.

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 17 through 19 Social Studies PA)

Look over the questions.

What is each question asking you to do in order for you to answer it?

Where else have you seen questions like these?

What will you have to do to be successful in this Activity?

Put down your thoughts, or share them with your partner.

17. Which of the following is a federal system of government?

- (1) In New Zealand, power is exercised by a popularly elected parliament.
- (2) In Saudi Arabia, the king holds all executive and legislative powers.
- (3) In France, the constitution provides that the National Assembly and Ministries in Paris exercise all major powers.
- (4) In England, all important powers are vested in the national parliament in London.
- (5) In Mexico, power is divided between the national government and the governments of thirty-one states.

18. Which of the following is a reason for adopting a federal system of government?

- (1) Power should be concentrated in the hands of a few people at the national level.



- (2) Governments would have very little influence in peoples' lives.
- (3) Governments would respond differently to national and local issues.
- (4) Fewer elected officials would be needed.
- (5) Local governments would give up all of their power.

19. Which of the following comparisons between the United States and Canada is supported by the information?

- (1) The national government in Canada is more powerful than the national government in the United States.
- (2) Both U. S. and Canadian national and subnational governments provide benefits to needy citizens.
- (3) States in the United States are larger than provinces in Canada.
- (4) A greater number of poor people live in Canada than in the United States.
- (5) Both the U. S. and Canadian national governments pay for unlimited amounts of health care for their citizens.

2. Becoming Familiar with the Problem

Scan the questions and ask yourself questions like the following as your first step to identifying the questions.

What do you already know about different kinds of questions?

Have you defined types of questions before?

Why should you be interested in the kinds of questions asked in the GED test?

Which of the questions seems interesting to you?

Which of the questions seems less interesting? Why might that be the case?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work by yourself, in a pair, or a small group to do this Activity.*

This IA is best done in pairs or small groups.

Assigning: *Your task is to identify the types of questions presented in Step 1. Decide in your group or pair how you will accomplish this.*

Doing the Work: *As you read the questions, consider the following:*

What do you notice about the kinds of information these questions are asking for?

The first question is asking test takers to take what they have read and apply that to similar situations. It requires a good understanding of the reading material.

The second question requires test takers to draw a conclusion. This requires not only good reading comprehension, but also higher order thinking skills.

The final question can be answered by finding supporting details from the text.

What words used in the questions themselves tell you what kind of question it is?

Question 18 asks for a reason; that indicates some thinking on the part of the test taker. Question 19 uses the words, “supported by the information,” showing that the answer will be found directly in the passage. Question 17 is more subtle; it requires a look at the potential answers to show that the test taker must take what the text provides and use it in another instance (apply it).



4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare the answers you found with others in the group. Discuss the methods you used to find the answers, the support for your answers in the passage, and the reasons each learner thinks his/her answers and support are correct.*

Agree on the correct answers and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: *Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions other groups gave.*

5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *When you looked at just the questions without the passage to refer to, what did you have to focus on?*
2. *How are the question types the same? How are they different?*
3. *Does recognizing different types of questions make answering the question easier for you? Explain.*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *How do you use questions in your every day life?*
2. *Are the questions you ask or answer at home different from those you ask or answer at work? Explain.*
3. *Do you ask the same question in different ways depending on who/where you are asking? Explain.*
4. *Under what circumstances might you ask an application question? When might you ask a question that requires drawing a conclusion?*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Learning Project 9 Recognizing the Types of Questions

Inquiry Activity 9-2: Answering Different Types of Questions

(Note: Italicized portions should be directed to the students.)

1. Identifying the Problem (Items 17-19 Social Studies PA)

Look over the passage. What are you being asked to read?

Does the text offer any clues to the topic or what is important?

The passage has no headers, no subtitles, and no bold or italic type. It presents a very bland, boring, and uninformative face to the reader, and it offers no contextual clues as to what the most important ideas or passages may be. Recognizing and understanding forms of government is of primary importance for the understanding of both history and government.



This grouping also shows very clearly the test-taking strategy that passages having more than one question will have the questions in sequential order with the passage. That is, the answer to the first question is found early in the passage, that for the second is found midway through the passage, and the answer to the last question is at the end of the passage.

Where have you seen passages like this before?

This is a standard textbook style.

What will you have to do to be successful in this Activity?

Jot down your thoughts, or share them with your partner.

Questions 17 through 19 refer to the following information.

The governments of Canada and the United States are federal systems (that is, power is divided between the national government and smaller, subnational governments.) In the United States, power is divided between the central government and fifty states. In Canada, separate powers are assigned to the national government and to the governments of the ten provinces and the territories. In both countries some powers, such as the right to coin money or manage foreign affairs, may be exercised only by the national government. By contrast, states and provinces exercise important powers over education and local property.

Under federalism, the central and subnational powers also share many powers. In Canada and the United States, the national government works with the provinces or states to combat crime, clean the environment, and provide for the needy. Although the United States and Canada rank among the world's most affluent nations, their citizens include the disabled, the unemployed, and single parents who cannot earn enough to provide for their children.

In the United States a needy single parent may receive payments from federal and state governments, medical care funded by both levels of government, and food stamps financed by the national government. In Canada, the national and provincial governments contribute to some health care for all citizens. Needy single parents may obtain food and shelter benefits by applying through local and provincial governments.



Since welfare benefits are financed partially by state or provincial governments, they may vary according to where one lives. The welfare check of a single parent in Nova Scotia may be very different from that of a single parent in Alberta. Similarly, U.S. welfare benefits differ greatly from Maine to California.

17. Which of the following is a federal system of government?

- (1) In New Zealand, power is exercised by a popularly elected parliament.
- (2) In Saudi Arabia, the king holds all executive and legislative powers.
- (3) In France, the constitution provides that all major powers are exercised by the National Assembly and Ministries in Paris.
- (4) In England, all important powers are vested in the national parliament in London.
- (5) In Mexico, power is divided between the national government and the governments of thirty-one states.

18. Which of the following is a reason for adopting a federal system of government?

- (1) Power should be concentrated in the hands of a few people at the national level.
- (2) Governments would have very little influence in peoples' lives.
- (3) Governments would respond differently to national and local issues.
- (4) Fewer elected officials would be needed.
- (5) Local governments would give up all of their power.

19. Which of the following comparisons between the United States and Canada is supported by the information?

- (1) The national government in Canada is more powerful than the national government in the United States.
- (2) Both U. S. and Canadian national and subnational governments provide benefits to needy citizens.
- (3) States in the United States are larger than provinces in Canada.
- (4) A greater number of poor people live in Canada than in the United States.
- (5) Both the U. S. and Canadian national governments pay for unlimited amounts of health care for their citizens.

2. Becoming Familiar with the Problem


Scan the passage, and ask yourself questions like the following as your first step to understanding the passage.

What do you notice about the organization of this passage?

What is the topic of this passage?

What do you know about the topic of this passage from your own experience or reading?

Many of the class members have lived under the federal form of government all their lives. Some of your learners, particularly those who were born in other countries, may have experienced other types of federal government; this would be a good place to encourage their participation. Still others may have had very different experiences and would be interested in sharing.

 You may want to be sure that learners understand that question 19 is asking learners to compare and contrast. Learners need to understand the similarity-and-difference categorization, which is also useful in writing exercises.

Many will recognize some of the issues between states and national government that have created problems. "States rights" is a term that has particular meaning to Virginians.



You may want to conduct a burst lecture here on the differences between federal, parliamentary, and autocratic governments. This would be an excellent opportunity for your learners to create charts outlining the types and the manner in which the powers are exhibited. This chart could be an excellent basis for compare/contrast.

Are you interested in learning about the different kinds of governments?

Now, read the questions. What are you being asked to find out?

3. Planning, Assigning, and Performing Tasks

Planning: *You may decide to work by yourself, in a pair, or a small group to do this Activity.*

Assigning: *Decide who will read the passage, when you will stop to discuss the material presented, and who will lead the discussion.*

Doing the Work: *Read the passage and answer the questions.*

Clarify: *Find and mark any words you might not know. Does the passage give enough information to clarify the words you do not know? If not, find the meaning by asking someone or looking it up.*

Analyze: *Remind yourself what each question is asking you to do, as you determined with your partner in the previous (9-1) IA.*

If your learners are having trouble with this complicated passage, you might encourage them to use a graphic organizer to break down the facts and present them in a visual manner. You could also use the summarizing strategy presented in Reading Inquiry Activity 4-1.

The answer to question 17 is (5) Mexico has a federal government as indicated by the information in the answer. New Zealand and England (Choices 1 and 4) both follow a parliamentary form of government. France (choice 3) is a national system, and (2) Saudi Arabia is a totalitarian monarchy.

What parts of the passage support your answers?



This is an excellent opportunity to have your learners understand that the questions are in sequential order. The information they need for 17 is in the first paragraph. The information they need to analyze for question 18 is in the second and third paragraphs. The information for the last question is in the third and fourth paragraphs.

Are all monarchies totalitarian? Can you give some examples of constitutional monarchies?

Great Britain, Norway, Sweden, and The Netherlands come readily to mind. Also, Greece and Spain have restored their respective kings after years of living under a dictatorship.

Be able to defend your answers and the ways you found them.

4. Sharing with Others

Telling people what you know helps you understand the material better. Take this opportunity not only to share the knowledge, but also to learn it more completely.

Small groups: *Compare the answers you found with others in the group. Discuss the methods you used to find the answers, the support for your answers in the passage, and the reasons each learner thinks his/her answers and support are correct.*

Agree on the correct answers and the strategy you would use for answering questions that ask you to draw conclusions from what you have read.

Whole class: *Share with the whole class the steps you used to answer the questions. Take notes on any different ways of answering the questions other groups gave.*



5. Reflecting, Extending, Evaluating

Reflecting: Think about what you have learned.

Here are some questions to start your thinking about the experiences you just had. Thinking about what you have learned and experienced is part of the learning process. When the focus is only on the answer, you don't get much time to think about what was learned.

1. *Did knowing the types of questions and what you needed to do to answer them correctly help you in doing this Activity? Explain.*
2. *State the ways you used to find the answers the questions in this IA. Explain why those worked for you.*
3. *Was this an easy or difficult passage for you to read and understand? Explain.*

Extending: Extend what you learned to new situations.

In extending, you are being asked to transfer the information presented in this Inquiry Activity to other information or situations.

1. *In your groups, look for information that explains how the founding fathers of the United States decided upon the federal form of government.*

You may find some information on The Articles of Confederation, Shay's Rebellion, the Constitutional Convention, and the Federalist Papers helpful for your learners. Much of this is available on line at: www.archives.gov/

2. *Write an essay that explains some aspect of the federal system of government as we experience it now. Use your essay to explain the name of our country.*
3. *Using some of the reference materials provided by your instructor, write another multiple-choice question about forms of government.*
4. *Using newspaper stories and television news reports about the changing government forms in Middle East and eastern European countries, have a discussion in your small groups about the pros and cons of each of the forms of government.*

With the high profile of the Mid-East currently, you may find interest in your class about the different types of governments in the various countries there. Again, a chart showing the differing styles and uses of power would be very interesting.

5. *Write multiple-choice questions that ask for definitions of the types of power reserved for states and the powers reserved for the federal government, or make a chart that shows these.*

Evaluating: Assess what you learned and how you learned it.

In this last step, you get a chance to review the content of what you learned and the methods used to learn. These questions have no right or wrong answers. This is your chance to look more closely at your learning style and the opportunity to state how you benefited or did not benefit from the content and/or the methods presented in this IA.

1. *What parts of the activity worked best for you? Explain.*
2. *What parts did not work well for you? Explain.*
3. *What ideas in this Inquiry Activity will you use when taking the GED test? Why?*
4. *How does following this 5-step format make you feel?*



Appendices





Appendix A – Helpful Links

Below are several links to Internet sites that might prove useful when preparing to teach the Inquiry Activities.

<http://nationalatlas.gov/natlas/NatlasStart.asp> An interactive atlas of the United States, it allows users to layer several different demographic and geographic features onto maps of regions, states, and counties.

http://teachpol.tcnj.edu/amer_pol_hist/browse.htm A wealth of photographs, political cartoons, maps, portraits, and historical paintings categorized by era and subject. All images are in the public domain and may be reprinted without any sort of licensing.

<http://memory.loc.gov/ammem/amhome.html> The Library of Congress' American Memory collections. This is too vast to fully describe, but it's definitely worth your time to explore for supporting materials or just your own pleasure. An amazing site.

www.archives.gov/ The National Records Administration and Archives seeks to preserve our national history and heritage by managing the country's federal records. If you are looking for federal documents of any type (bills, journals, papers, Constitution, Declaration, etc.), this is the place to start.

<http://etext.lib.virginia.edu/oed.html> The University of Virginia's link to the Oxford English Dictionary. This is a very user-friendly way to search for the definition, etymology, and changing usage of basically every word in the English language. This is accessible through VIVA, which is available at almost all of the community colleges, private and state colleges, and universities in Virginia.

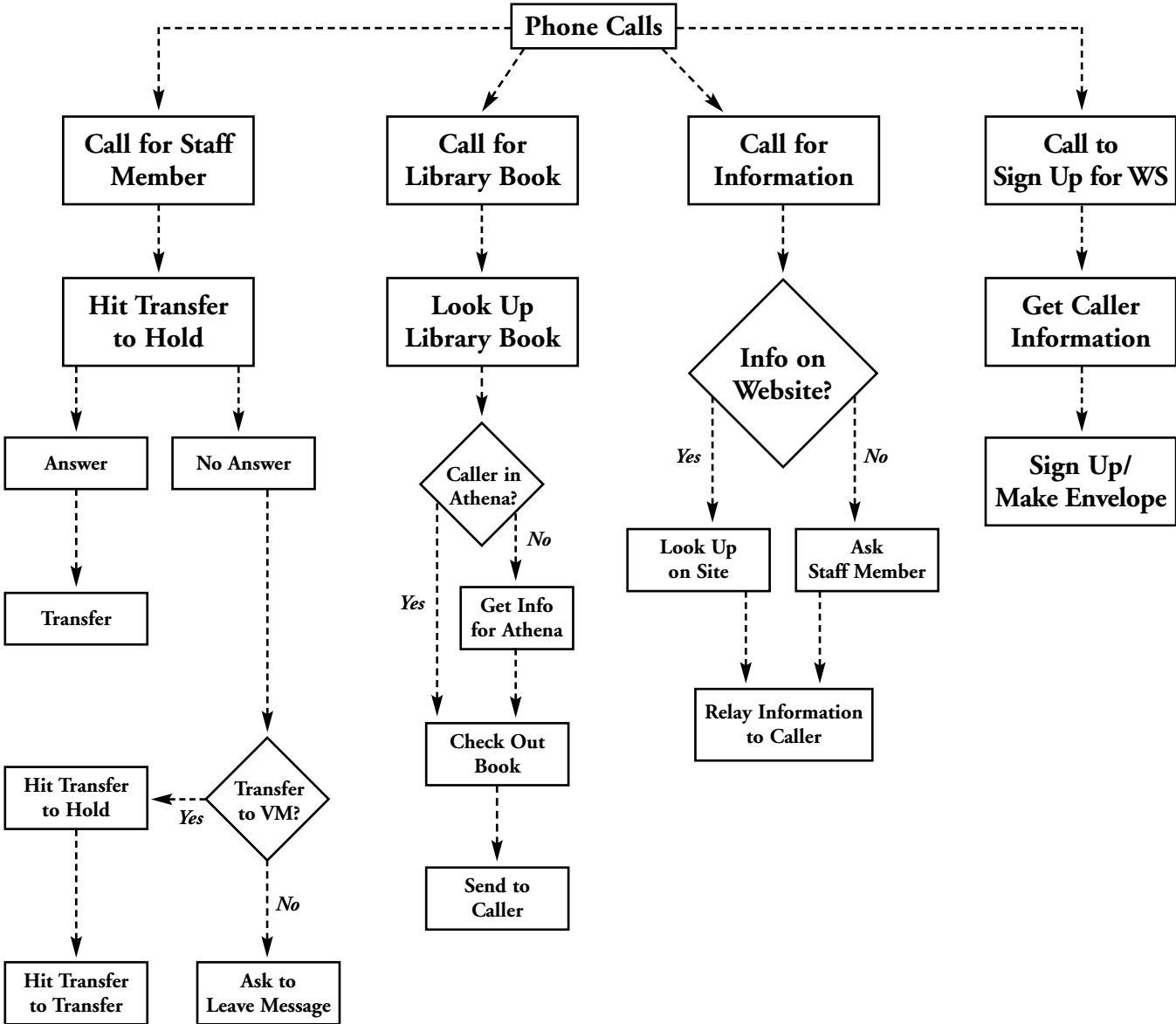
www.viva.lib.va.us/ VIVA, the virtual library of Virginia, offers a wealth of collections, search engines, and online scholarly publications.

http://marshallteachers.sandi.net/teacher_sites/mcquillan/other_stuff/Understanding%20Science%20Words.htm Maintained by Thurgood Marshall Middle School, this is an easy-to-read chart that explains many of the roots, prefixes, and suffixes used in science words. A good resource for students to learn how to deduce the general meaning of words they don't understand.



Appendix B – Flow Chart

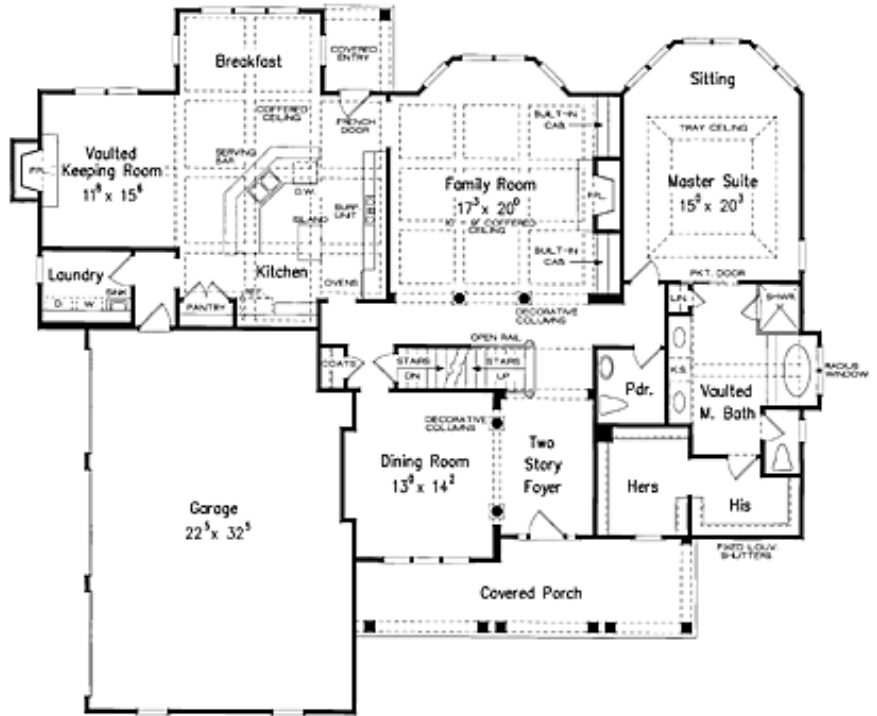
Use with Learning Project 2





Appendix B – Blueprints

Use with Learning Project 2



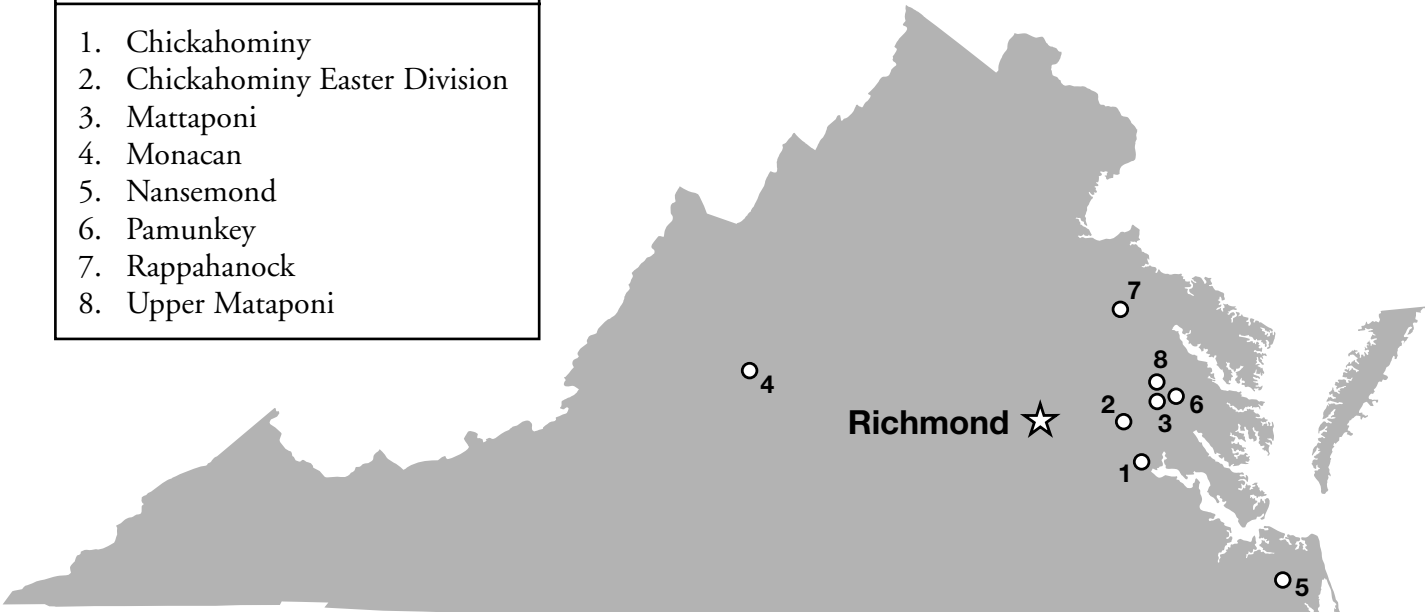


Appendix B – Map of Virginia Tribes

Use with Learning Project 4

Seven of Virginia’s eight recognized tribes, Chickahominy, Chickahominy Eastern Division, Mattaponi, Nansemond, Pamunkey, Rappahannock, and Upper Mattaponi, were part of the Powhatan Chiefdom. During the early 1600s these tribes spoke related Algonquian languages and had similar tribal governments and lifeways. The eighth state-recognized tribe, the Monacan Nation, was not a member of the Powhatan Chiefdom. Monacans spoke a Siouan language and had different tribal government and ways of living. Today, members of Virginia’s Indian tribes speak English as their primary language. They are proud of their heritage and their history. This map shows the tribal headquarters for each of Virginia’s state-recognized tribes. State recognition acknowledges the important contributions made by Virginia’s native peoples to the history of the Commonwealth of Virginia.

Map Key	
1.	Chickahominy
2.	Chickahominy Easter Division
3.	Mattaponi
4.	Monacan
5.	Nansemond
6.	Pamunkey
7.	Rappahanock
8.	Upper Mataponi





Appendix C – Concept Maps and Graphic Organizers

Graphic Organizer

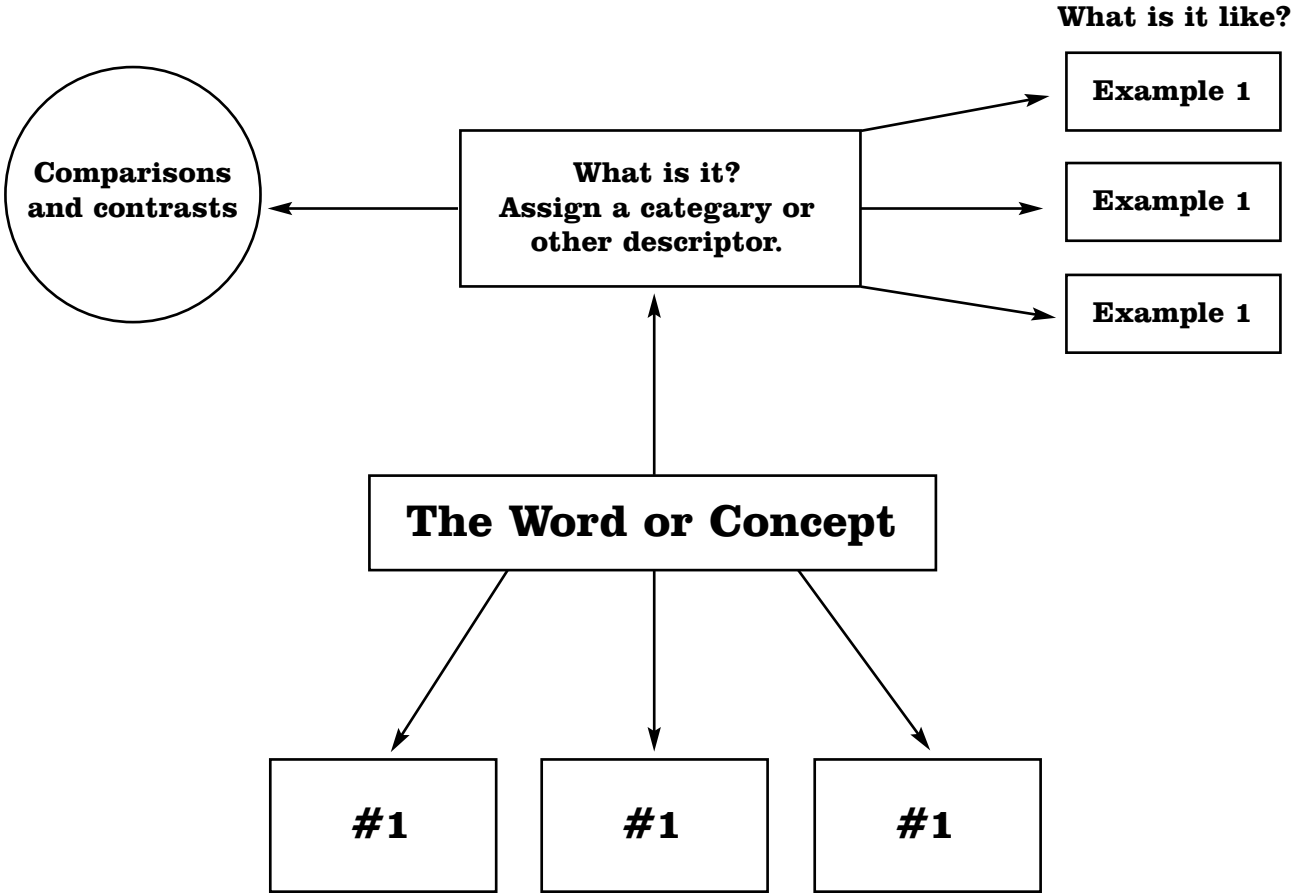
Answer Choices

Details



Appendix C – Concept Maps and Graphic Organizers

Concept Map





Appendix D – Social Studies Resources

The Bill of Rights: A Transcription

Note: The following text is a transcription of the first ten amendments to the Constitution in their original form. These amendments were ratified December 15, 1791, and form what is known as the “Bill of Rights.”

Amendment I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

Amendment II

A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed.

Amendment III

No Soldier shall, in time of peace be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

Amendment IV

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Amendment V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

Amendment VI

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the Assistance of Counsel for his defence.

Amendment VII

In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury, shall be otherwise reexamined in any Court of the United States, than according to the rules of the common law.

Amendment VIII

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

Amendment IX

The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

Amendment X

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

Note: The capitalization and punctuation in this version is from the enrolled original of the Joint Resolution of Congress proposing the Bill of Rights, which is on permanent display in the Rotunda of the National Archives Building, Washington, D.C.

U.S. National Archives & Records Administration

700 Pennsylvania Avenue NW, Washington, DC 20408 • 1-86-NARA-NARA • 1-866-272-6272

http://www.archives.gov/national_archives_experience/bill_of_rights_transcript.html



Appendix D – Social Studies Resources

The Declaration of Independence: A Transcription

IN CONGRESS, July 4, 1776.

The unanimous Declaration of the thirteen united States of America,

When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.—That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed, —That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness. Prudence, indeed, will dictate that Governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same Object evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such Government, and to provide new Guards for their future security.—Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former Systems of Government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world.

He has refused his Assent to Laws, the most wholesome and necessary for the public good.

He has forbidden his Governors to pass Laws of immediate and pressing importance, unless suspended in their operation till his Assent should be obtained; and when so suspended, he has utterly neglected to attend to them.

He has refused to pass other Laws for the accommodation of large districts of people, unless those people would relinquish the right of Representation in the Legislature, a right inestimable to them and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public Records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved Representative Houses repeatedly, for opposing with manly firmness his invasions on the rights of the people.

He has refused for a long time, after such dissolutions, to cause others to be elected; whereby the Legislative powers, incapable of Annihilation, have returned to the People at large for their exercise; the State remaining in the mean time exposed to all the dangers of invasion from without, and convulsions within.

He has endeavoured to prevent the population of these States; for that purpose obstructing the Laws for Naturalization of Foreigners; refusing to pass others to encourage their migrations hither, and raising the conditions of new Appropriations of Lands.

He has obstructed the Administration of Justice, by refusing his Assent to Laws for establishing Judiciary powers.



Appendix D *(continued)*

The Declaration of Independence: A Transcription

He has made Judges dependent on his Will alone, for the tenure of their offices, and the amount and payment of their salaries.

He has erected a multitude of New Offices, and sent hither swarms of Officers to harrass our people, and eat out their substance. He has kept among us, in times of peace, Standing Armies without the Consent of our legislatures.

He has affected to render the Military independent of and superior to the Civil power.

He has combined with others to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his Assent to their Acts of pretended Legislation:

For Quartering large bodies of armed troops among us:

For protecting them, by a mock Trial, from punishment for any Murders which they should commit on the Inhabitants of these States:

For cutting off our Trade with all parts of the world:

For imposing Taxes on us without our Consent:

For depriving us in many cases, of the benefits of Trial by Jury:

For transporting us beyond Seas to be tried for pretended offences:

For abolishing the free System of English Laws in a neighbouring Province, establishing therein an Arbitrary government, and enlarging its Boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these Colonies:

For taking away our Charters, abolishing our most valuable Laws, and altering fundamentally the Forms of our Governments:

For suspending our own Legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.

He has abdicated Government here, by declaring us out of his Protection and waging War against us.

He has plundered our seas, ravaged our Coasts, burnt our towns, and destroyed the lives of our people.

He is at this time transporting large Armies of foreign Mercenaries to compleat the works of death, desolation and tyranny, already begun with circumstances of Cruelty & perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the Head of a civilized nation.

He has constrained our fellow Citizens taken Captive on the high Seas to bear Arms against their Country, to become the executioners of their friends and Brethren, or to fall themselves by their Hands.

He has excited domestic insurrections amongst us, and has endeavoured to bring on the inhabitants of our frontiers, the merciless Indian Savages, whose known rule of warfare, is an undistinguished destruction of all ages, sexes and conditions.

In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury. A Prince whose character is thus marked by every act which may define a Tyrant, is unfit to be the ruler of a free people.



Appendix D *(continued)*

The Declaration of Independence: A Transcription

Nor have We been wanting in attentions to our Brittish brethren. We have warned them from time to time of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which, would inevitably interrupt our connections and correspondence. They too have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity, which denounces our Separation, and hold them, as we hold the rest of mankind, Enemies in War, in Peace Friends.

We, therefore, the Representatives of the united States of America, in General Congress, Assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the Name, and by Authority of the good People of these Colonies, solemnly publish and declare, That these United Colonies are, and of Right ought to be Free and Independent States; that they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain, is and ought to be totally dissolved; and that as Free and Independent States, they have full Power to levy War, conclude Peace, contract Alliances, establish Commerce, and to do all other Acts and Things which Independent States may of right do. And for the support of this Declaration, with a firm reliance on the protection of divine Providence, we mutually pledge to each other our Lives, our Fortunes and our sacred Honor.

The 56 signatures on the Declaration appear in the positions indicated:

<p><i>Column 1</i></p> <p>Georgia: Button Gwinnett Lyman Hall George Walton</p> <p><i>Column 2</i></p> <p>North Carolina: William Hooper Joseph Hewes John Penn</p> <p>South Carolina: Edward Rutledge Thomas Heyward, Jr. Thomas Lynch, Jr. Arthur Middleton</p> <p><i>Column 3</i></p> <p>Massachusetts: John Hancock</p> <p>Maryland: Samuel Chase</p>	<p>William Paca Thomas Stone Charles Carroll of Carrollton</p> <p>Virginia: George Wythe Richard Henry Lee Thomas Jefferson Benjamin Harrison Thomas Nelson, Jr. Francis Lightfoot Lee Carter Braxton</p> <p><i>Column 4</i></p> <p>Pennsylvania: Robert Morris Benjamin Rush Benjamin Franklin John Morton George Clymer James Smith</p>	<p>George Taylor James Wilson George Ross</p> <p>Delaware: Caesar Rodney George Read Thomas McKean</p> <p><i>Column 5</i></p> <p>New York: William Floyd Philip Livingston Francis Lewis Lewis Morris</p> <p>New Jersey: Richard Stockton John Witherspoon Francis Hopkinson John Hart Abraham Clark</p>	<p><i>Column 6</i></p> <p>New Hampshire: Josiah Bartlett William Whipple</p> <p>Massachusetts: Samuel Adams John Adams Robert Treat Paine Elbridge Gerry</p> <p>Rhode Island: Stephen Hopkins William Ellery</p> <p>Connecticut: Roger Sherman Samuel Huntington William Williams Oliver Wolcott</p> <p>New Hampshire: Matthew Thornton</p>
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Appendix D *(continued)*

**23 July, 1914:
The Austro-Hungarian Ultimatum to Serbia
English Translation**

The German original of this ultimatum is also available.

The Austro-Hungarian Minister for Foreign Affairs, Berchtold, to the Minister at Belgrade, von Giesl:

Vienna, July 22, 1914

Your Excellency will present the following note to the Royal Government on the afternoon of Thursday, July 23: On the 31st of March, 1909, the Royal Serbian Minister at the Court of Vienna made, in the name of his Government, the following declaration to the Imperial and Royal Government:

Serbia recognizes that her rights were not affected by the state of affairs created in Bosnia, and states that she will accordingly accommodate herself to the decisions to be reached by the Powers in connection with Article 25 of the Treaty of Berlin. Serbia, in accepting the advice of the Great Powers, binds herself to desist from the attitude of protest and opposition which she has assumed with regard to the annexation since October last, and she furthermore binds herself to alter the tendency of her present policy toward Austria-Hungary, and to live on the footing of friendly and neighborly relations with the latter in the future.

Now the history of the past few years, and particularly the painful events of the 28th of June, have proved the existence of a subversive movement in Serbia, whose object it is to separate certain portions of its territory from the Austro-Hungarian Monarchy. This movement, which came into being under the very eyes of the Serbian Government, subsequently found expression outside of the territory of the Kingdom in acts of terrorism, in a number of attempts at assassination, and in murders.

Far from fulfilling the formal obligations contained in its declaration of the 31st of March, 1909, the Royal Serbian Government has done nothing to suppress this movement. It has tolerated the criminal activities of the various unions and associations directed against the Monarchy, the unchecked utterances of the press, the glorification of the authors of assassinations, the participation of officers and officials in subversive intrigues; it has tolerated an unhealthy propaganda in its public instruction; and it has tolerated, finally, every manifestation which could betray the people of Serbia into hatred of the Monarchy and contempt for its institutions.

This toleration of which the Royal Serbian Government was guilty, was still in evidence at that moment when the events of the twenty-eighth of June exhibited to the whole world the dreadful consequences of such tolerance.

It is clear from the statements and confessions of the criminal authors of the assassination of the twenty-eighth of June, that the murder at Sarajevo was conceived at Belgrade, that the murderers received the weapons and the bombs with which they were equipped from Serbian officers and officials who belonged to the Narodna Odbrana, and, finally, that the dispatch of the criminals and of their weapons to Bosnia was arranged and effected under the conduct of Serbian frontier authorities.

The results brought out by the inquiry no longer permit the Imperial and Royal Government to maintain the attitude of patient tolerance which it has observed for years toward those agitations which center at Belgrade and are spread thence into the territories of the Monarchy. Instead, these results impose upon the Imperial and Royal Government the obligation to put an end to those intrigues, which constitute a standing menace to the peace of the Monarchy.

In order to attain this end, the Imperial and Royal Government finds itself compelled to demand that the Serbian Government give official assurance that it will condemn the propaganda directed against Austria-Hungary, that is to say, the whole body of the efforts whose ultimate object it is to separate from the Monarchy territories that belong to it; and that it will obligate itself to suppress with all the means at its command this criminal and terroristic propaganda. In order to give these assurances a character



Appendix D *(continued)*

The Austro-Hungarian Ultimatum to Serbia - English Translation

of solemnity, the Royal Serbian Government will publish on the first page of its official organ of July 26/13, the following declaration:

“The Royal Serbian Government condemns the propaganda directed against Austria-Hungary, that is to say, the whole body of the efforts whose ultimate object it is to separate from the Austro-Hungarian Monarchy territories that belong to it, and it most sincerely regrets the dreadful consequences of these criminal transactions.

“The Royal Serbian Government regrets that Serbian officers and officials should have taken part in the above-mentioned propaganda and thus have endangered the friendly and neighborly relations, to the cultivation of which the Royal Government had most solemnly pledged itself by its declarations of March 31, 1909.

“The Royal Government, which disapproves and repels every idea and every attempt to interfere in the destinies of the population of whatever portion of Austria-Hungary, regards it as its duty most expressly to call attention of the officers, officials, and the whole population of the kingdom to the fact that for the future it will proceed with the utmost rigor against any persons who shall become guilty of any such activities, activities to prevent and to suppress which, the Government will bend every effort.”

This declaration shall be brought to the attention of the Royal army simultaneously by an order of the day from His Majesty the King, and by publication in the official organ of the army.

The Royal Serbian Government will furthermore pledge itself:

1. to suppress every publication which shall incite to hatred and contempt of the Monarchy, and the general tendency of which shall be directed against the territorial integrity of the latter;
2. to proceed at once to the dissolution of the Narodna Odbrana to confiscate all of its means of propaganda, and in the same manner to proceed against the other unions and associations in Serbia which occupy themselves with propaganda against Austria-Hungary; the Royal Government will take such measures as are necessary to make sure that the dissolved associations may not continue their activities under other names or in other forms;
3. to eliminate without delay from public instruction in Serbia, everything, whether connected with the teaching corps or with the methods of teaching, that serves or may serve to nourish the propaganda against Austria-Hungary;
4. to remove from the military and administrative service in general all officers and officials who have been guilty of carrying on the propaganda against Austria-Hungary, whose names the Imperial and Royal Government reserves the right to make known to the Royal Government when communicating the material evidence now in its possession;
5. to agree to the cooperation in Serbia of the organs of the Imperial and Royal Government in the suppression of the subversive movement directed against the integrity of the Monarchy;
6. to institute a judicial inquiry against every participant in the conspiracy of the twenty-eighth of June who may be found in Serbian territory; the organs of the Imperial and Royal Government delegated for this purpose will take part in the proceedings held for this purpose;
7. to undertake with all haste the arrest of Major Voislav Tankosic and of one Milan Ciganovitch, a Serbian official, who have been compromised by the results of the inquiry;



Appendix D *(continued)*

The Austro-Hungarian Ultimatum to Serbia - English Translation

8. by efficient measures to prevent the participation of Serbian authorities in the smuggling of weapons and explosives across the frontier; to dismiss from the service and to punish severely those members of the Frontier Service at Schabats and Losnitza who assisted the authors of the crime of Sarajevo to cross the frontier;
9. to make explanations to the Imperial and Royal Government concerning the unjustifiable utterances of high Serbian functionaries in Serbia and abroad, who, without regard for their official position, have not hesitated to express themselves in a manner hostile toward Austria-Hungary since the assassination of the twenty-eighth of June;
10. to inform the Imperial and Royal Government without delay of the execution of the measures comprised in the foregoing points.

The Imperial and Royal Government awaits the reply of the Royal Government by Saturday, the twenty-fifth instant, at 6 p.m., at the latest.

A reminder of the results of the investigation about Sarajevo, to the extent they relate to the functionaries named in points 7 and 8 [above], is appended to this note.'

Appendix:

The crime investigation undertaken at court in Sarajevo against Gavrilo Princip and his comrades on account of the assassination committed on the 28th of June this year, along with the guilt of accomplices, has up until now led to the following conclusions:

1. The plan of murdering Archduke Franz Ferdinand during his stay in Sarajevo was concocted in Belgrade by Gavrilo Princip, Nedeljko Cabrinovic, a certain Milan Ciganovic, and Trifko Grabesch with the assistance of Major Voija Takosic.
2. The six bombs and four Browning pistols along with ammunition — used as tools by the criminals — were procured and given to Princip, Cabrinovic and Grabesch in Belgrade by a certain Milan Ciganovic and Major Voija Takosic.
3. The bombs are hand grenades originating from the weapons depot of the Serbian army in Kragujevatz.
4. To guarantee the success of the assassination, Ciganovic instructed Princip, Cabrinovic and Grabesch in the use of the grenades and gave lessons on shooting Browning pistols to Princip and Grabesch in a forest next to the shooting range at Topschider.
5. To make possible Princip, Cabrinovic und Grabesch's passage across the Bosnia-Herzegovina border and the smuggling of their weapons, an entire secretive transportation system was organized by Ciganovic. The entry of the criminals and their weapons into Bosnia and Herzegovina was carried out by the main border officials of Shabatatz (Rade Popovic) and Losnitza as well as by the customs agent Budivoj Grbic of Losnitza, with the complicity of several others.'

On the occasion of handing over this note, would Your Excellency please also add orally that — in the event that no unconditionally positive answer of the Royal government might be received in the meantime — after the course of the 48-hour deadline referred to in this note, as measured from the day and hour of your announcing it, you are commissioned to leave the I. and R. Embassy of Belgrade together with your personnel.



Appendix D *(continued)*

25 July, 1914: The Serbian Response to the Austro-Hungarian Ultimatum, English Translation

The Royal Government has received the communication of the Imperial and Royal Government of the 23rd inst. and is convinced that its reply will dissipate any misunderstanding which threatens to destroy the friendly and neighbourly relations between the Austrian monarchy and the kingdom of Serbia.

The Royal Government is conscious that nowhere there have been renewed protests against the great neighbourly monarchy like those which at one time were expressed in the Skuptschina, as well as in the declaration and actions of the responsible representatives of the state at that time, and which were terminated by the Serbian declaration of March 31st, 1909; furthermore that since that time neither the different corporations of the kingdom, nor the officials have made an attempt to alter the political and judicial condition created in Bosnia and the Heregovina. The Royal Government states that the I. and R. [Imperial and Royal] Government has made no protestation in this sense excepting in the case of a textbook, in regard to which the I. and R. Government has received an entirely satisfactory explanation. Serbia has given during the time of the Balkan crisis in numerous cases evidence of her pacific and moderate policy, and it is only owing to Serbia and the sacrifices which she has brought in the interest of the peace of Europe that this peace has been preserved.

The Royal Government cannot be made responsible for expressions of a private character, as for instance newspaper articles and the peaceable work of societies, expressions which are of very common appearance in other countries, and which ordinarily are not under the control of the state. This, all the less, as the Royal Government has shown great courtesy in the solution of a whole series of questions which have arisen between Serbia and Austria-Hungary, whereby it has succeeded to solve the greater number thereof, in favour of the progress of both countries.

The Royal Government was therefore painfully surprised by the assertions that citizens of Serbia had participated in the preparations of the outrage in Sarajevo. The Government expected to be invited to cooperate in the investigation of the crime, and it was ready, in order to prove its complete correctness, to proceed against all persons in regard to whom it would receive information.

According to the wishes of the I. and R. Government, the Royal Government is prepared to surrender to the court, without regard to position and rank, every Serbian citizen for whose participation in the crime of Sarajevo it should have received proof. It binds itself particularly on the first page of the official organ of the 26th of July to publish the following enunciation:

The Royal Serbian Government condemns every propaganda which should be directed against Austria-Hungary, i.e., the entirety of such activities as aim towards the separation of certain territories from the Austro-Hungarian monarchy, and it regrets sincerely the lamentable consequences of these criminal machinations....

The Royal Government regrets that according to a communication of the I. and R. Government certain Serbian officers and functionaries have participated in the propaganda just referred to, and that these have there fore endangered the amicable relations for the observation of which the Royal Government had solemnly obliged itself through the declaration of March 31st, 1909....

The Royal Government binds itself further:

1. During the next regular meeting of the Skuptschina to embody in the press laws a clause, to wit, that the incitement to hatred of, and contempt for, the Monarchy is to be most severely punished, as well as every publication whose general tendency is directed against the territorial integrity of Austria-Hungary.

It binds itself in view of the coming revision of the constitution to embody an amendment into Art. 22 of the constitutional law which permits the confiscation of such publications as is at present impossible according to the clear definition of Art. 12 of the constitution.



Appendix D *(continued)*

The Serbian Response to the Austro Hungarian Ultimatum - English Translation

2. The Government possesses no proofs and the note of the I. and R. Government does not submit them that the society *_Narodna_ _Odbrana_* and other similar societies have committed, up to the present, any criminal actions of this manner through any one of their members. Notwithstanding this, the Royal Government will accept the demand of the I. and R. Government and dissolve the society *_Narodna_ _Odbrana_*, as well as every society which should set against Austria-Hungary.
3. The Royal Serbian Government binds itself without delay to eliminate from the public instruction in Serbia anything which might further the propaganda directed against Austria-Hungary provided the I. and R. Government furnishes actual proofs of this propaganda.
4. The Royal Government is also ready to dismiss those officers and officials from the military and civil services in regard to whom it has been proved by judicial investigation that they have been guilty of actions against the territorial integrity of the Monarchy; it expects that the I. and R. Government communicate to it for the purpose of starting the investigation the names of these officers and officials, and the facts with which they have been charged.
5. The Royal Government confesses that it is not clear about the sense and the scope of that demand of the I. and R. Government which concerns the obligation on the part of the Royal Serbian Government to permit the cooperation of officials of the I. and R. Government on Serbian territory, but it declares that it is willing to accept every cooperation which does not run counter to international law and criminal law, as well as to the friendly and neighbourly relations.
6. The Royal Government considers it its duty as a matter of course to begin an investigation against all those persons who have participated in the outrage of June 28th and who are in its territory. As far as the cooperation in this investigation of specially delegated officials of the I. and R. Government is concerned, this cannot be accepted, as this is a violation of the constitution and of criminal procedure. Yet in some cases the result of the investigation might be communicated to the Austro-Hungarian officials.
7. The Royal Government has ordered on the evening of the day on which the note was received the arrest of Major Voislav Tankosic. However, as far as Milan Ciganovitch is concerned, who is a citizen of the Austro-Hungarian Monarchy and who has been employed till June 28th with the Railroad Department, it has as yet been impossible to locate him, wherefore a warrant has been issued against him.

The I. and R. Government is asked to make known, as soon as possible for the purpose of conducting the investigation, the existing grounds for suspicion and the proofs of guilt, obtained in the investigation at Sarajevo.
8. The Serbian Government will amplify and render more severe the existing measures against the suppression of smuggling of arms and explosives.

It is a matter of course that it will proceed at once against, and punish severely, those officials of the frontier service on the line Shabatz-Loznica who violated their duty and who have permitted the perpetrators of the crime to cross the frontier.
9. The Royal Government is ready to give explanations about the expressions which its officials in Serbia and abroad have made in interviews after the outrage and which, according to the assertion of the I. and R. Government, were hostile to the Monarchy. As soon as the I. and R. Government points out in detail where those expressions were made and succeeds in proving that those expressions have actually been made by the functionaries concerned, the Royal Government itself will take care that the necessary evidences and proofs are collected.
10. The Royal Government will notify the I. and R. Government, so far as this has not been already done by the present note, of the execution of the measures in question as soon as one of those measures has been ordered and put into execution.

The Royal Serbian Government believes it to be to the common interest not to rush the solution of this affair and it is therefore, in case the I. and R. Government should not consider itself satisfied with this answer, ready, as ever, to accept a peaceable solution, be it by referring the decision of this question to the International Court at The Hague or by leaving it to the decision of the Great Powers who have participated in the working out of the declaration given by the Serbian Government on March 18/31st, 1909.



Appendix D *(continued)*

“Copy of Memo from Lord Balfour to Lord Rothschild Regarding Jewish Settlement in Palestine”

Foreign Office, November 2nd, 1917

Dear Lord Rothschild,

I have much pleasure in conveying to you, on behalf of His Majesty’s Government, the following declaration of sympathy with Jewish Zionist aspirations which has been submitted to, and approved by, the Cabinet:

“His Majesty’s Government view with favour the establishment in Palestine of a national home for the Jewish people, and will use their best endeavours to facilitate the achievement of this object, it being clearly understood that nothing shall be done which may prejudice the civil and religious rights of existing non-Jewish communities in Palestine, or the rights and political status enjoyed by Jews in any other country.”

I should be grateful if you would bring this declaration to the knowledge of the Zionist Federation.

Yours,
Arthur James Balfour¹



Appendix E – Science Resources

Scientific Investigation

Modified from:

Science Standards of Learning For Virginia Public Schools

© January 2003

Goals

The purposes of scientific investigation and discovery are to satisfy humankind's quest for knowledge and understanding and to preserve and enhance the quality of the human experience. Therefore, as a result of science instruction, students will be able to achieve the following objectives:

1. Develop and use an experimental design in scientific inquiry.
2. Use the language of science to communicate understanding.
3. Investigate phenomena, using technology.
4. Apply scientific concepts, skills, and processes to everyday experiences.
5. Experience the richness and excitement of scientific discovery of the natural world through the collaborative quest for knowledge and understanding.
6. Make informed decisions regarding contemporary issues, taking into account the following:
 - public policy and legislation;
 - economic costs/benefits;
 - validation from scientific data and the use of scientific reasoning and logic;
 - respect for living things;
 - personal responsibility; and
 - history of scientific discovery.
7. Develop scientific dispositions and habits of mind including:
 - curiosity;
 - demand for verification;
 - respect for logic and rational thinking;
 - consideration of premises and consequences;
 - respect for historical contributions;
 - attention to accuracy and precision; and
 - patience and persistence.
8. Explore science-related careers and interests.

Safety

Teachers must be certain that students know how to follow safety guidelines, demonstrate appropriate laboratory safety techniques, and use equipment safely while working individually and in groups.

Safety must be given the highest priority in implementing any instructional program for science. Correct and safe techniques

must be carefully considered with regard to the safety precautions for every instructional activity. Safe science classrooms require thorough planning, careful management, and constant monitoring of student activities. Class enrollment should not exceed the designed capacity of the room.

Investigate and Understand

“Investigate” refers to scientific methodology and implies systematic use of the following inquiry skills:

- observing;
- classifying and sequencing;
- communicating;
- measuring;
- predicting;
- hypothesizing;
- inferring;
- defining, controlling, and manipulating variables in experimentation;
- designing, constructing, and interpreting models; and
- interpreting, analyzing, and evaluating data.

“Understand” refers to various levels of knowledge application. These knowledge levels include the ability to:

- recall or recognize important information, key definitions, terminology, and facts;
- explain the information in one's own words, comprehend how the information is related to other key facts, and suggest additional interpretations of its meaning or importance;
- apply the facts and principles to new problems or situations, recognizing what information is required for a particular situation, using the information to explain new phenomena, and determining when there are exceptions;
- analyze the underlying details of important facts and principles, recognizing the key relations and patterns that are not always readily visible;
- arrange and combine important facts, principles, and other information to produce a new idea, plan, procedure, or product; and
- make judgments about information in terms of its accuracy, precision, consistency, or effectiveness.



Appendix E *(continued)*

Understanding Science Words

Through the centuries, as people learned more and more about all the sciences, including the life sciences, they had to create words to express their new discoveries. Often these “word-makers” put together two or three older words from Greek and Latin to make names for new knowledge, new inventions, new medicines, and new science concepts. Some of the same root words, prefixes, and suffixes have been used over and over again.

If you know the Greek and Latin roots, you will be able to interpret words that you see for the first time. The root words, prefixes, and suffixes listed here are often used in science. Many of them may already be familiar to you.

Root	Meaning	Examples
a-, an-	<i>not, without</i>	anaerobic: without oxygen abiotic: not living
aero-	<i>air</i>	aerobic: with oxygen aerospace: atmosphere and space beyond
ant-, anti	<i>against, opposed</i>	antibody: a molecule that fights against a foreign substance in body
aqua	<i>water</i>	aquarium: a tank where water animals and plants live aquatics: sports performed in water
arthr-, arthro	<i>joint</i>	arthropod: invertebrate with jointed limbs
audi	<i>hear</i>	auditory nerve: nerve conducting messages from ear to brain, allowing a person to hear auditorium: large room where audience hears lectures, plays, concerts
bi	<i>two</i>	bivalve: having two valves bisect: cut in two
bio-	<i>life</i>	biology: study of life
carbo-	<i>carbon</i>	carbohydrate: substance made of carbon and water
carni	<i>meat, flesh</i>	carnivore: meat eater
cardi-, cardio	<i>heart</i>	cardiology: study of the heart cardiogram: record of heart action
cerebro-	<i>brain</i>	cerebrum: largest part of human brain cerebral: involving the brain
-cide	<i>kill</i>	insecticide: substance that kills insects
circu-	<i>circle, ring</i>	circulate: to go around continuously
corpus	<i>body</i>	corpse: body, usually dead
cyto	<i>cell</i>	cytoplasm: the “plasm” in a cell but outside the nucleus
den, dent	<i>tooth</i>	dentist: doctor who treats teeth denture: artificial teeth
derm	<i>skin</i>	dermatologist: doctor who treats skin dermatitis: disease of the skin
-ectomy	<i>surgical removal of organ</i>	tonsilectomy: removal of tonsils appendectomy: removal of appendix
epi-	<i>above, over</i>	epidermis: top layer of skin, over the dermis epicenter: surface of earth directly above an earthquake
erythro-	<i>red</i>	erythrocyte: red blood cell
gastro-	<i>stomach</i>	gastric juice: fluids produced in the stomach
-gram	<i>something written or drawn</i>	cardiogram: record of action of heart telegram: message sent by wire



Root	Meaning	Examples
hemo-	<i>blood</i>	hemoglobin: substance in red blood cells hemorrhage: heavy bleeding
herb-	<i>leafy plant</i>	herbivore: organism that eats plants
hydro-	<i>water</i>	hydrogen: combines with oxygen to produce water hydroelectricity: electric energy converted from running water
hyper-	<i>excessive</i>	hypertension: high blood pressure hyperactive: excessively active
-itis	<i>inflammation</i>	arthritis: inflammation of joints appendicitis: disease of appendix
-logy	<i>study of</i>	cardiology: study of the heart biology: study of living things
macro-	<i>very large</i>	macrocosm: a large system, universe
-meter	<i>a measure, tool for measuring</i>	millimeter: one-thousandth of a meter thermometer: tool for measuring heat
micro-	<i>very small</i>	microcosm: very small system
mort-	<i>death</i>	mortality: death, death rate mortal: subject to death
neuro-	<i>nerve</i>	neuron: nerve cell nervous: high strung, jittery
omni	<i>all</i>	omnivore: animal that eats all foods, from both plants and animals
ova	<i>egg</i>	ovary: female gland that produces eggs oval: egg shaped
ped	<i>foot</i>	pedestrian: person who is walking pedometer: device for measuring distance walked
pesti	<i>pest</i>	pesticide: chemical used to kill pests
photo	<i>light</i>	photosynthesis: process in which green plants use the energy from light to make carbohydrates from carbon dioxide and water
pneum-	<i>breath, air</i>	pneumonia: inflammation of lungs that affects breathing
post-	<i>after</i>	postnatal: occurring after birth postmortem: occurring after death
pre-	<i>before</i>	prenatal: occurring before birth predict: to state what may happen before it happens
pulmo	<i>lung</i>	pulmonary artery: artery from heart to lung pulmonary vein: vein from lung to heart
-scope	<i>device for viewing</i>	telescope: device for viewing distant objects
-sect	<i>cut, divide</i>	dissect: cut apart section: a part of a larger whole
syn	<i>together</i>	synthesis: coming together of parts to form a whole photosynthesis: process in which green plants use the energy from light to make carbohydrates from carbon dioxide and water
terra	<i>land</i>	terrarium: small enclosure with soil where plants are grown and small land animals may live terrestrial: living on land
therm	<i>heat</i>	thermometer: device for measuring heat thermos bottle: container to keep liquids warm
-vore	<i>devour</i>	herbivore: animal that eats plants voracious: exceedingly hungry
zoo	<i>animal</i>	zoology: study of animals zoo: public park where animals are shown

(From Thurgood Marshall Middle School, see website in Appendix A)



Appendix E (continued)

Electricity and Magnetism

A Science Museum of Virginia Activity
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Introducing Electricity and Magnetism

A Mysterious Force

The ancient Greeks discovered that certain stones found near the city of Magnesia in Asia Minor attracted bits of iron. These lodestones (naturally occurring magnets) fascinated early natural philosophers. Although they were unable to explain how a magnet worked, several properties were well known. They knew, for example, that a magnet has polarity (a north-seeking end and a south-seeking end). They knew that lodestones would attract iron filings, and that magnetic poles that are alike repel each other while unlike poles attract each other.

Magnetism

Magnetic effects occur in metals as a result of the arrangement of the electrons associated with the atoms. Atoms contain from one to more than a hundred electrons. Each electron is constantly moving as it orbits the atomic nucleus and as it spins on its axis. These motions of electric charge are, in effect, small currents. Each produces a magnetic field. In most materials, the electron spins and orbits are oriented so that the magnetic fields associated with them cancel each other, and each atom is left with no net magnetic field. However, a few materials, such as iron, nickel and cobalt, have atoms that end up with a small net magnetic field. In these materials, groups of atoms align themselves in each other's fields, forming magnetic domains. Once these domains are aligned, they produce the magnetic effects observed in magnets.

A magnet can actually be produced from a piece of iron simply by attaching the iron to a permanent magnet or even by rubbing it with a magnet. The magnetic field of the permanent magnet aligns the domains in the piece of iron.

Another Mysterious Force?

The Greek philosopher Thales of Miletus (640-546 B.C.) is credited with first reporting the attraction that results when amber is rubbed against fur. For a long time, this curious effect was associated only with amber, but over time other substances were found to behave in a similar manner. Glass, for example, seemed to have a related but opposite property. Gradually, people realized that there were two kinds of electricity. The rubbed-glass kind was called "vitreous" and the rubbed-amber kind was called "resinous."

Little more was discovered about the mysterious attraction until Sir William Gilbert (1540-1603) conducted a series of electrical experiments and published the results in his book *De Magnete* around the turn of the seventeenth century. His work reawakened the interest of other natural philosophers in this mysterious phenomenon.

In the two hundred years following Gilbert's contributions, great advances were made in understanding electricity. Scientific investigators built devices that could collect static charge, which greatly facilitated experimentation. In 1733, the French engineer Charles Coulomb (1736-1806) devised a method to measure charge and then succeeded in describing the force between the opposing charges in elegant mathematical terms. Once scientists were able to make precise measurements of the mysterious force, progress in harnessing it was swift. In 1800, Alessandro Volta (1745-1827) developed the "voltaic pile," the first charge-storing device capable of supplying a consistent current. In 1819, the Dane Hans Christian Oersted (1777-1851) discovered that a magnetic field is created by an electric current, proving that electricity and magnetism are related. In 1821, Michael Faraday, (1791-1867) an English chemist and physicist, found that a changing magnetic field can produce a current in a nearby conductor. This discovery enabled him to invent the first electric generator and motor.

With the mutual relationships of magnetism and electricity established, the masterful work of James Clerk Maxwell (1831-1879) showed the precise nature of the interactions and



Appendix E - Science Resources *(continued)*

Electricity and Magnetism

the relative strength of the two forces. The essence of his work is contained in the mathematical expressions known as “Maxwell’s Equations,” which became the cornerstone of the field of electromagnetism. Maxwell’s work in this area is often compared to that of Newton in the area of mechanics. Maxwell’s Equations are accurate even when applied in the new context of Einstein’s Theory of Special Relativity. Indeed, Maxwell—along with Lorenz and Fitzgerald—laid the groundwork for Einstein’s relativity theories decades later.

Electricity

Electricity is one of the most common and fundamental components of nature, but is often one of the least understood. Electricity holds the molecules of our bodies together, makes all living and non-living chemical processes possible, and is a basic part of all radiation from radio waves to cosmic rays. Since the mid-1900s, it has also been a primary means of transferring energy from one place to another.

There are two types of electrical charges, positive and negative. All objects contain electrical charges. When the number of positive and negative charges are nearly equal, the object is described as neutral. Some materials (conductors) allow their charges to move about more freely, while others (insulators) hold their charges tightly. Both conductors and insulators can become charged, but charges move in and out of conductors much more easily than they move in and out of insulators.

Electric charges exert forces on one another. Unlike charges attract each other, while like charges repel each other. The effects of these forces may be observed and measured.

Current Electricity

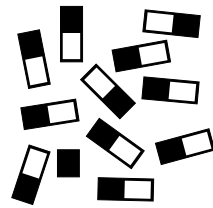
Charges must move or flow to make it possible for electricity to do work. This flow of charge is called an “electric current.” When an electric current moves through a conductor, a magnetic field is produced around the conductor. Also, when a conductor, such as a wire, moves through a magnetic field, charges flow in the conductor. These principles allow scientists and inventors to design motors and electric generators that use magnets, conductors and electric current.

Static Electricity

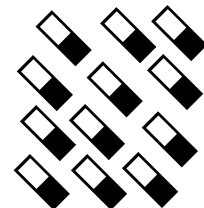
Static electricity is electrical charge which is not moving. When 2 objects rub against each other, electrons can be transferred from one object to the other. When this happens, the object that gains the electrons becomes slightly more negatively charged and the object that receives the electrons becomes slightly more positive. As long as they are far enough apart that the charge can not move from one object to the other, they remain charged with static electricity. Since they have opposite charges, the objects are attracted to each other. Once they come close enough together, the charge moves from the more negative object to the more positive object. The ionized air that results provides a path for the transfer of charge to the small sphere. As the electrons move, the light and heat energy given off creates a spark.

What is a magnet?

A magnet is a piece of metal or stone in which the tiny magnetic domains line up to form a larger magnetic field.



When the domains are in random order, the material remains non-magnetic.



When the domains line up with all their north poles pointing in the same direction, a magnet is formed.

Each magnet has both a north pole and a south pole. These poles are the strongest points in the magnet’s field. When one magnet is near another magnet, a force exists between the magnets. When the north pole is near another magnet’s south pole, the force is attractive. If like poles are near each other (north/north or south/south), the force between the poles is repulsive.

The force between two magnets can be felt even when



Appendix E - Science Resources *(continued)*

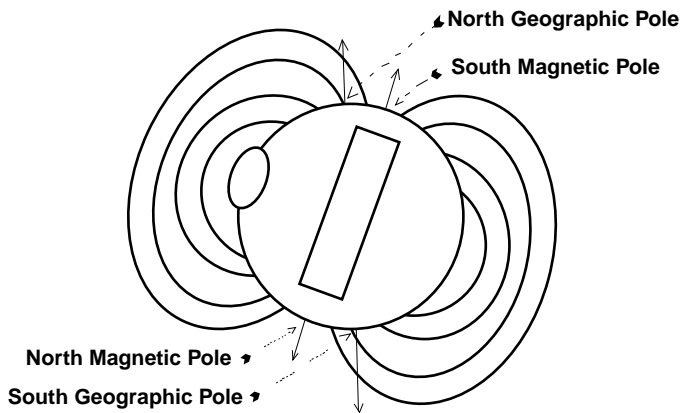
Electricity and Magnetism

substances such as paper, air or glass are positioned between the magnets. A magnet also exerts a force on other magnetic materials, such as lodestone, cobalt and iron. The magnet induces an alignment of the magnetic domains in these materials that temporarily gives them the properties of a magnet.

A compass needle points north because the Earth is a magnet; its North geographic pole is a magnetic South pole. The Earth’s magnetic axis is not quite parallel to its geographic axis (the axis of rotation), so a compass reading deviates somewhat from geographic north; this deviation, which varies with location, is called “magnetic declination.”*

A Sketch of the Earth’s Magnetic Field

A compass placed at any point in this field would point in the direction of the field line at that point. Representing the Earth’s field as that of a tilted bar magnet is only a crude approximation of the actual, fairly complex, field of configuration.



*University Physics: Seventh Edition. Francis W. Sears, Mark W. Zemansky and Hugh D. Young. pp. 684. Addison-Wesley Pub. Co. 1987.

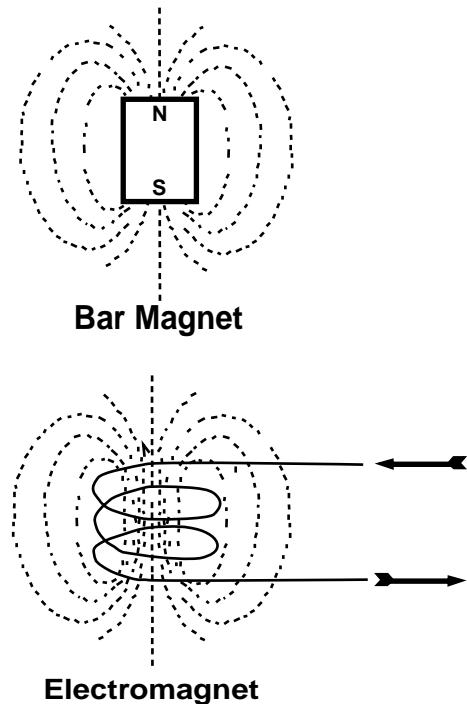
Currents and Magnets:

Can Electrical Current Create a Magnet?

Any moving charge has a magnetic field associated with it. This connection between electricity and magnetism can be utilized to make a magnet from moving charges or current.

What’s the connection?

Charges have the ability to move through a conductor. This movement of charge is called “current.” In this exhibit, the wire acts as the conductor. As the current moves through the wire, a magnetic field is produced around every point of the wire. When the wire is shaped into a coil, the fields around the individual windings combine. This makes a magnetic field that looks like the magnetic field around a permanent bar magnet.



The study of electricity cannot be separated from the study of magnetism. Whenever electrons are in motion, a magnetic field exists. Both electricity and magnetism have been studied by scientists for hundreds of years.



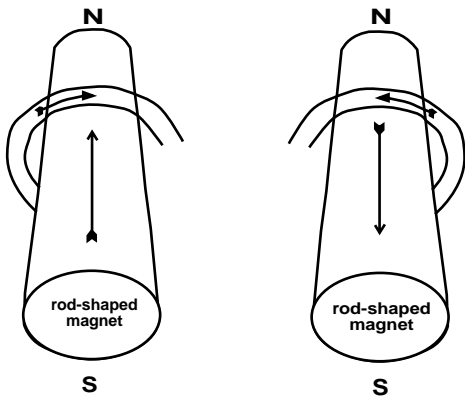
Appendix E - Science Resources *(continued)*

Electricity and Magnetism

Magnets and Currents:

Can a Magnet Create an Electrical Current?

When a rod-shaped magnet is moved in and out of a coil of wire, the changing magnetic field that this creates causes electrons in the wire to move. Mechanical energy (the back and forth motion of the rod) is converted into electrical energy in the form of current. The electrical field produced by the action of the magnet is always at right angles to the changing magnetic field. So, as the magnetic rod moves forward, the electric current flows in one direction. As the rod reverses direction, the current flows in the opposite direction. (See the diagram below.)



A current that periodically reverses direction is known as “alternating current.” The electrical energy available in most homes is alternating current.

Simple Motor: Electricity in Motion

Electric motors are found in all kinds of machinery and consumer goods, from computers and refrigerators to CD players and electric drills. Electricity is used to power these devices primarily because it is a convenient and economical method of moving energy from one place to another. Surprisingly, electrical energy in itself is rarely the desired end product. Electrical energy must usually be converted into another form of energy, such as motion. Electric motors con-

vert electrical energy into kinetic energy. The key to this conversion is the connection between electricity and magnetism.

In this simple motor, the magnetic field close to the magnet is strong. The rotating coil is made up of many turns of wire. Each turn of wire that carries current produces a magnetic field and each additional field intensifies the overall magnetic field around the coil. With this increased magnetic field, the force pushing the coil away from the permanent magnet is much greater.

In an actual motor, this increased force allows a lot more work to be done.

Glossary

AC (alternating current) – an electric current in which electrons move back and forth in a regular repeating cycle.

atom – a unit of matter, the smallest unit of an element consisting of a positively-charged nucleus surrounded by a system of electrons.

battery – two or more connected cells that produce a direct current by converting chemical energy into electrical energy. (See definition of “cell.”)

capacitor – a device used for storing electric charge.

cell – a single unit for the conversion of chemical energy into electrical energy, usually consisting of a container with electrodes and an electrolyte.

charge – the ability to push or pull possessed by the protons and electrons in atoms.

coil – a wound spiral of two or more turns of insulated wire.

compass – any of various instruments used to show direction, especially one consisting of a magnetic needle swinging freely on a pivot and pointing to the magnetic north.

conduction (transferred charge) – movement of electric charge through the direct contact of two materials without perceptible motion of the materials.

conductor – a substance through which heat or electricity can flow readily.



Appendix E - Science Resources *(continued)*

Electricity and Magnetism

current – the flow or rate of flow of electric charge in a conductor or medium between two points, usually measured in units of amperes.

DC (direct current) – an electric current in which electrons move in only one direction.

domain – a group of atoms that align themselves in each other's fields.

earth ground – a conductor that is attached to the earth which can freely accept or give up electrons.

electric generator – a device that converts kinetic energy into electrical current. Moving parts of the generator cause changes in a magnetic field that induce an electric current in a conductor.

electric motor – a device that converts electrical energy into kinetic energy, using the flow of current to generate a magnetic field that attracts or repulses the motor's moving parts.

electrode – a solid electric conductor through which an electric current enters or leaves an electrolytic cell or other medium.

electrolyte – a chemical compound that ionizes when dissolved or molten to produce an electrically conductive medium.

electron – the relatively small, easily moved particle in an atom that carries a charge that is called “negative.”

electromagnet – a soft iron core surrounded by a coil of wire that temporarily becomes a magnet when an electric current flows through the wire.

electrophorus – an apparatus for generating static electricity.

energy – the capacity for doing work and overcoming resistance.

ground – a reference point like the zero mark on a ruler. Its voltage is zero. All other voltage is measured against this point, providing a common reference point for everyone. (Earth ground may be established by driving a long metal rod into the earth.)

induction – the separation of charge of an isolated conducting object by bringing a charged body near it. –also, charging by the proximity of a charged body near a momentarily grounded, isolated conducting body.

insulator – a substance through which heat or electricity cannot flow readily.

ion – an atom that has become charged by gaining or losing one or more electrons.

joule – a unit of electrical energy equal to the work done when a current of one ampere is passed through a resistance of one ohm for one second.

kilowatt – a unit of power equal to 1,000 watts.

LED – light emitting diode. –a semiconductor diode that converts applied voltage to light and is used in digital displays.

lodestone or **magnetite** – a naturally occurring magnet.

magnet – any piece of iron, steel, nickel or magnetite (lodestone) that has the property of attracting iron or steel. This property may be naturally present or artificially induced.

magnetic field – a region of space in which a magnetic force acts.

mechanical or **kinetic energy** – energy generated by motion.

potential energy – the energy of a particle or system of particles derived from position, or condition, rather than motion. A raised weight, a coiled spring and a charged battery have potential energy.

power – the time-rate at which work is done or at which energy is transferred.
– energy per unit time.

proton – the relatively large, usually unmoving particle in an atom that carries a charge that is called “positive.”

resistance – the opposition of a body or substance to the electricity moving through it, usually resulting in the dissipation of energy in the form of heat.

semiconductor – a substance which has greater electrical conductivity than an insulator, but less than a good conductor.

static charge – a charge that is fixed or stationary.

transformer – a device used to transfer electric energy from one circuit to another, usually raising or lowering voltage as a result.

voltage – electrical potential energy.



Appendix E - Science Resources *(continued)*

Electricity and Magnetism

watt – a unit of power equal to one joule per second. A watt equals $\frac{1}{746}$ of a horsepower.

work – the transfer of energy from one physical system to another, especially the transfer of energy to a body by the application of a force that moves the body in the direction of the force. Work is calculated as the product of the force and the distance through which the body moves and may be expressed in joules, ergs and foot-pounds.

Electrical Measurements

coulomb – a unit of electric charge (first recorded use in 1881)

ampere – a unit of electric current (first recorded use in 1881)

volt – a unit of electric potential difference (first recorded use in 1873)

joule – a unit of electric energy (first recorded use in 1882)

ohm – a unit of electric resistance (first recorded use in 1870; proposed in 1861)

watt – a unit of electric power (first recorded use in 1882)

Reading List

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The Timetables of Science: A Chronology of the Most Important People and Events in the History of Science. Alexander Helleman and Bryan Bunch. Simon and Schuster, New York, 1991.

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Energy and Power: A Practical Introduction with Projects and Activities. Richard Spurgeon and Mike Flood. (Usborne Science and Experiments Series.) Usborne American Edition, printed in Spain. 1990.



Appendix E - Science Resources *(continued)*

Electricity and Magnetism

From Archimedes to Einstein. Truan Reid and Patricia Fara. (Usborne Book of Scientists.) Usborne, EDC. 1993.

Safe and Simple Electrical Experiments. Rudolf F. Graf. Dover Publications Inc. 1964.

The American Heritage Dictionary of the English Language: Third Edition was especially helpful in defining scientific terms. The tables which appear under “measurement” are of particular interest.

Other Resources

Delta Science Modules: *Electrical Circuits Kit* (gr. 3-5), *Electromagnetism Kit* (gr. 5-6) and *Electromagnetism Guide*. These modules contain all the materials needed to teach 4 weeks of creative hands-on electricity lessons to an entire class. Batteries and Guides included. Kits are available from Delta Education Hands on Science Catalog; P. O. Box 950; Hudson, NH 03051. Phone: 1-800-442-5444.

<p>The electrical supply in homes can be very dangerous because of the large supply of charged particles.</p>
<p>Never experiment with home electrical supplies or outlets.</p>

Timeline of Great Discoveries about Electricity

600 B.C.	Thales of Miletus (640-546), Greek scientist and philosopher, discovers attractive power of charged amber.
1269 A.D.	Petrus Peregrinus discovers properties of magnetism and shows that like poles repel and unlike poles attract.
1492	Christopher Columbus shows that the declination of a compass needle varies for different parts of the world.
1600	William Gilbert describes the earth as having the properties of a huge magnet (explaining the behavior of the compass needle). Gilbert also introduced the word “electric.”
1650	Otto von Guericke , German physicist, builds the first static machine.
1729	Stephen Gray , English electrical experimenter, develops the concept of conductors and non-conductors.
1733	Charles Dufay of Paris discovers that there are only two kinds of electricity and announces that like charges repel and unlike charges attract.
1747	Benjamin Franklin advances single fluid theory of electricity, originates “plus” and “minus” designations, and invents the lightning rod.
1785	Charles Augustin de Coulomb , French physicist, proves the law of inverse squares, and that the internal surface of a body cannot be charged with static electricity.
1800	Allessandro Volta , a physicist native to Lombardy, invents the voltaic pile, the first practical method of generating current.



Appendix E - Science Resources *(continued)*

Electricity and Magnetism

1819	Hans Christian Oersted , Danish physicist, discovers that a magnetic field is caused by electric current, proving that electricity and magnetism are related.
1820	André Marie Ampère , French physicist, shows the relationship between electricity and magnetism. Ampère also developed the solenoid.
1820	Dominique François Jean Arago , French physicist, discovers that a magnet can be made from an iron or steel bar placed inside a solenoid through which a current is flowing.
1821	Michael Faraday , English chemist and physicist, shows that the flow of current in a wire can cause a magnet to revolve around the wire, and that a current-carrying wire tends to revolve around a fixed magnet.
1827	George Simon Ohm , German physicist, discovers the mathematical relationship among current, voltage and resistance in an electric circuit.
1833	Karl Friedrich Gauss , German physicist and mathematician, develops an exact mathematical formula for the magnetic field.
1834	Heinrich Friedrich Emil Lenz , German-Russian physicist, establishes a method of determining the direction of an induced current in a circuit.
1840	Samuel Morse , American artist and inventor, invents the telegraph.
1859	Gaston Plante , French inventor, makes the first lead-acid storage cell for storing electrical energy.
1865	James Clerk Maxwell , Scottish physicist, explains mathematically the transmission of electric and magnetic fields through a medium.
1875	Alexander Graham Bell , American inventor, develops the electric telephone.
1879	Thomas Edison , American inventor, develops a dynamo, the incandescent lamp and many other electric devices.
1887	Heinrich Rudolph Hertz , German physicist, discovers the photoelectric effect. In 1888 Hertz also discovers that electricity may be transmitted by electromagnetic waves.
1888	Nikola Tesla , Serbian-born American engineer and inventor, discovers the principle of the rotating field on which the induction motor is based.
1895	Guglielmo Marconi , Italian inventor, begins experiments in wireless telegraphy.



Appendix E - Science Resources *(continued)*

Electricity and Magnetism

**Balloon Attraction –
A Static Electricity Game**

Electricity is everywhere. All objects have electrical charges. The Earth, a desk, and even a human body carry electrical charges. Because charge cannot be seen, electrical effects often appear mysterious. This activity explores the effects of electricity and introduces some of the basic properties of electricity.

Purpose:

Students will observe the effect between two oppositely charged objects and the effect between two similarly charged objects.

Students will explore different materials and compare the amounts of charge generated between each material and the balloon.

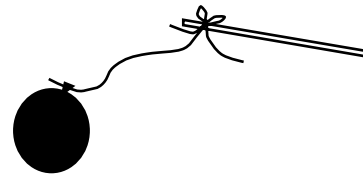
Materials:

Per person

- 1 inflated balloon
- 2 feet of string (silk or nylon thread works best)
- 1 stick or wooden dowel

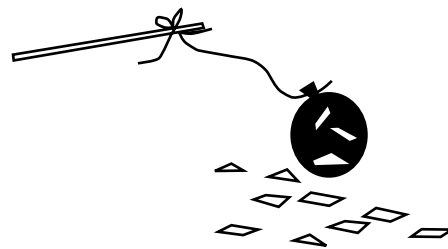
Per pair or group

- 40-50 small “fish” - (These can be cut-up pieces of paper, paper circles from a hole-punch or Styrofoam® packing peanuts.)
(optional) - masking tape; pieces of wool; large, wide plastic tubs; or a plastic swimming pool



Procedure:

1. Tape or tie one end of the string onto the stick.
2. Tape or tie the other end of the string onto the balloon.
Now you have your very own “electric” fishing pole.



Experiment A:

1. Put your fish into the fishing hole– the tub or pool. (You can use the floor or a table top as well.)
2. Holding your fishing pole over the fishing hole, try to pick up as many fish as you can on your balloon.
How many fish did you catch? _____
3. Rub the balloon on your hair or a sweater. Try fishing again. How many fish did you catch? _____
4. Try several different rubbing procedures. (Try rubbing in one direction, both directions, try a different number of rubs or use different materials to rub the balloon, etc. Keep a record of what procedure was used as well as how many fish you caught each time.)

Experiment B:

1. Using two fishing poles, charge both balloons using the same method.
2. Hold the pole up so that the balloons are the same height and about two feet apart. (Make sure the balloons are held far away from your body.)



Appendix E - Science Resources *(continued)*

Electricity and Magnetism

3. Slowly move your poles together. What happens to the balloons?
4. Repeat experiment B and place one hand between the balloons. What happens to the balloons this time?

Extension:

1. Graph the number of fish caught using each procedure.
2. As a class categorize the methods into common groups and see which method appeared most successful throughout the class, chart your results.

For Your Information:

There are two kinds of electrical charges, negative and positive. We are not usually aware of the electricity in most objects because the numbers of positive and negative charges in them are nearly equal. However, if an object has more positive charges than negative charges, we say that the object is “positively charged.” If an object has more negative charges than positive, we describe it as “negatively charged.” An object has a neutral charge if there is a balance of positive and negative charges and there is no electrical current flowing through the object.

When the balloon is rubbed against a sweater or someone’s hair, the balloon picks up electrons and becomes negatively charged. When the negatively charged balloon is brought near the neutrally charged fish, the electrons in the fish move away from the balloon. This leaves the part of the fish close to the balloon positively charged. The attraction between the negatively charged balloon and the positive charges in the fish causes the fish to “jump” to the surface of the balloon. When two objects are oppositely charged, they are attracted to one another.

When two objects are similarly charged, both with positive or both with negative charges, they will repel (or push away) from each other. When two negatively charged balloons are held close together, you can see the repulsion between the two.

Something to think about:

Lightning is a common electrical phenomenon that is produced by the attraction between unbalanced charges.

Excessive negative charges in clouds cause the electrons in the ground below to move away from the surface of the Earth. This leaves the area of the ground near the surface with a positive charge. The negative charges in the clouds are attracted to this positive ground area and the result is the bright flash you see in the sky as the charges move.

Potato Power

Although most people think of electricity as something associated with batteries, wires and wall outlets, all living things – both plants and animals – produce weak electric currents. One of the first scientists to investigate electric currents in animals was the Italian physician Luigi Galvani (1737-1798). In the year 1750, he noticed that the muscle in a frog’s leg would sometimes jerk convulsively when touched by a metal scalpel. Further experiments showed that the jerking took place when two different metals touched the frog’s muscle at the same time. Galvani concluded from this experiment that there must be an “animal electricity” contained in the frog’s body.

Another scientist of the time, Alessandro Volta (1745-1827), drew a different conclusion about the source of the electric charge. Volta believed that the jerking was caused by the electricity produced by the two different metals separated by the moist frog tissue. Some years later in 1800, Volta’s experiments led to the invention of the “voltaic pile,” or battery.

Purpose:

Students will make a simple battery using a potato and two different metal wires.

Students will understand that an electrical charge flows between two objects that have an unbalanced charge.

Materials:

Per student

- 1 6-inch length of non-insulated copper wire
- 1 paper clip
- 1 raw potato



Appendix E - Science Resources *(continued)*

Electricity and Magnetism

Procedure:

1. Insert one end of the copper wire into the potato.
2. Straighten out the paper clip and insert one end of it into the potato, close to the copper wire, but not touching it.
3. Touch the ends of the wire and the paper clip to your tongue.

Observations:

1. What did you feel?
2. Did you feel a faint tingling on your tongue, or experience a slightly acidic taste?

For Your Information:

These sensations are the result of an electric current that flows when your tongue completes the circuit between the copper wire and the paper clip.

When copper and aluminum are immersed in an ionic solution (the salty moisture in the potato), positive ions accumulate on one wire and negative ions on the other, creating a potential difference, or voltage. When the paper clip and the copper wire are connected with each other by a conducting solution, such as the moisture on your tongue, the charges move from one metal to the other through the potato, creating an electrical current. A device that works this way is called a battery.

Try these variations:

1. Try doing this experiment with a lemon, orange, tomato or grapefruit.
Do you notice any difference in the intensity of feeling on your tongue?
2. What happens if you use two copper wires or two paper clips?

Something to Think About:

Was the voltaic pile the first battery?

In 1957, the German archaeologist Wilhelm König examined an object that dated from 250 to 244 B.C. (the era of the Parthian occupation of the Baghdad region). The object, about the size of a flashlight, seemed to be an electric battery. The only piece lacking was a conducting wire to connect the copper cylinder to the exterior, which could easily have become lost over the centuries. Scientists speculate that the ancient device might have been used in electroplating, the application of a thin coating of a metal to a different metal's surface.

Extension: Turn your potato green.

Slice a raw potato in half. Make two slits in the flat face of one potato half with a knife. Carefully clean two copper pennies and slide them halfway into the slits. Attach leads to both pennies. Attach one lead to the positive terminal of a battery and the other to the negative terminal. After 30 minutes to an hour, examine the potato. You will notice a greenish color around the penny connected to the positive terminal of the battery. The color comes from copper oxide, the same green coating that often builds up on copper statues in outdoor settings.

For Your Information:

The copper atoms on the penny attached to the positive terminal of the battery have given up electrons, resulting in a positive charge. (An atom that has a net electric charge is called an ion.) This change in charge causes a chemical change in the atoms. The positive copper ions are pushed away from the positive terminal and attracted by the negative terminal. You see this movement of copper ions as the green color that migrates from the penny into the potato.



Appendix E - Science Resources *(continued)*

Electric Circuits

A Science Museum of Virginia Activity
Copyright 1999

In this activity, students investigate electric circuits. You can choose to do all or part of this series of activities.

(Time required: Three class periods of 50 minutes)

Purpose:

Students will determine what makes a complete electric circuit and construct both series and parallel circuits.

Materials:

Per Student

- Electric Circuit Activity Sheet

Per Group

- battery holder
- D-cell battery
- 4 6-inch pieces of insulated copper wire
- 2 battery clips
- 2 light bulb holders
- 2 light bulbs

You can buy batteries at any good discount store. The rest of the materials listed above can be purchased from Delta Education at 1-800-442-5444 between 8 a.m. and 10 p.m. EST.

Prerequisite Skills and Knowledge:

Students should understand the following terms before beginning this activity.

conductors – Metals and other substances that allow the flow of electric current.

electron – The relatively tiny subatomic particle found outside the nucleus of an atom that carries a negative charge.

insulator – Substances that tend to block the flow of electric current, such as glass, amber, silk and wood.

circuit – A path through which electric current travels. A cir-

cuit requires a continuous, unbroken path on a conducting material. This material is often copper wire, because, like many metals, copper lets electric current flow through it very easily.

current – Moving electric charge.

power source – The driving force that pushes electric current around a circuit. Batteries are often used to provide this force.

resistance – The opposition of a substance to the current passing through it. Even good conductors, such as gold, silver, brass, aluminum and copper, offer some resistance to the movement of electrons.

Science Background:

Electricity is something everyone takes for granted, but which is often misunderstood. Many misconceptions are associated with this phenomenon, so check in with students often during this activity to make sure they understand what they are doing.

What is electricity? This is an excellent question.

Electricity, a word familiar to everyone, can be defined as the movement of charged particles. However, the word can have so many different meanings that most scientists use the term “electric current” instead. The meaning of this term is more precise, which is essential in science communication. So, let’s begin again.

What is **electric current**? Electric current is the movement of charged particles. What must be available before charged particles can move? Charged particles must have a complete path available to them before current can flow. This path is called an **electric circuit**. Any device that uses electricity must be a part of this complete electric circuit before it can operate.

There are two basic types of electric circuits: series and parallel. In both types of circuits, a complete path beginning and ending with the power source (the battery in this activity) is necessary before current can flow and provide energy to the power users (the light bulbs in this activity). Any break in the



Appendix E - Science Resources *(continued)*

Electricity Circuits

path stops the movement of charges. The most common break in a circuit is an intentional one — the switch. When the switch is closed (“ON”), the path is complete and the power user (light bulb) works. When the switch is open (“OFF”), the path is broken and the power user (light bulb) won’t work.

Getting Started:

Ask students to think about why a plug on an electrical device has two prongs. (Of course, some plugs have three prongs, but all plugs have at least two.) Accept all answers and if the students don’t seem to know, tell them they should be able to answer this question before this activity is over!

(A circuit must provide a complete, unbroken path before charges can move from the power source through the power user and back to the power source. The two prongs provide a way for the current to come into the appliance that uses the electricity and also to return to the power source. A close look at most cords also reveals a doubled wire, for the same reason.)

Tips and Pointers:

- Have students work in groups of two, handing out only those materials needed for each step. Circulate around the room and give helpful hints or leading questions as needed.
- Check the batteries and bulbs before this activity to make sure that they are all working.

The Simple Circuit: Exercise 1

Review conductors and insulators with students before proceeding with this activity. Give each group a battery, one piece of wire, and one light bulb. Then go over the following questions, which are asked on the Electric Circuits Student Activity Sheet.

1. Examine the wires you have been given. What kind of wire do you think you are using for this activity?

(It’s a metal wire, often copper, which is an excellent conductor.)

Is this material a conductor or a non-conductor?

(It’s a conductor.)

Why is this important?

(A circuit must be made of a conductor because conductors allow the movement of charge.)

What kind of covering does the wire have?

(It has a plastic coating.)

Is this material a conductor or an insulator?

(It’s an insulator.)

Why is it important for the wire to have a covering like this?

(An insulating covering will keep the charge from making an accidental connection with another conductor, which could keep the electric circuit from working properly.)

2. Examine your light bulb carefully. How is it constructed?

Draw a detailed picture of your light bulb. Label the insulators and conductors that make up the bulb. Be sure to notice the filaments inside the bulb.

(Compare the picture below to the drawings the students make. Did they notice most of the essential parts of the bulb? If lots of them missed important observations, you might have them compare drawings and then add to what they drew.

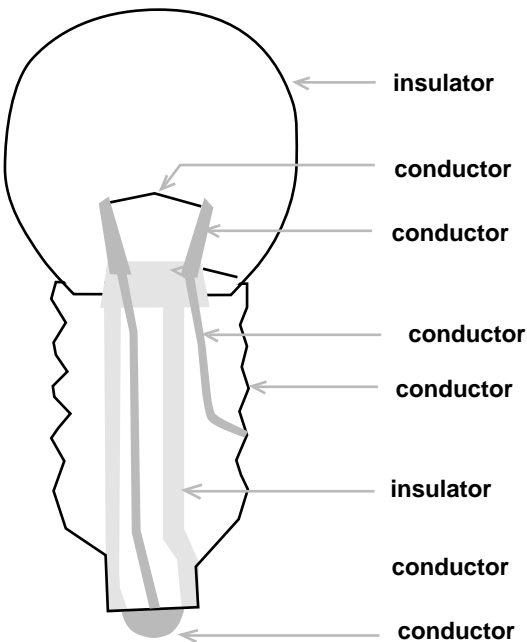
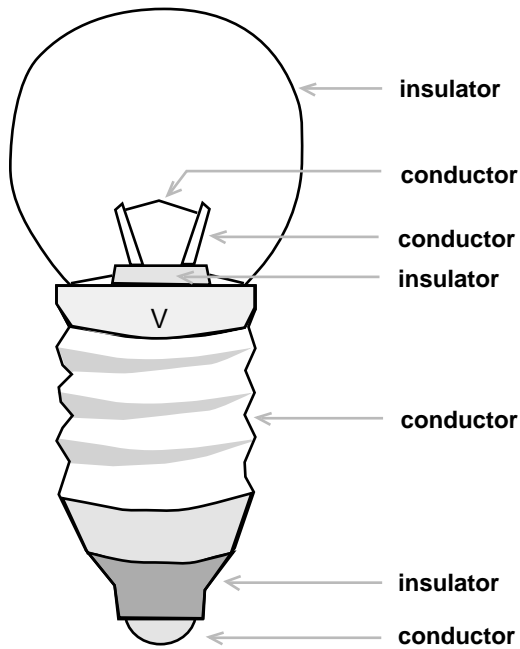
Note the cut-away picture as well. A larger version of this is provided at the end of this activity. Use it to show the



Appendix E - Science Resources *(continued)*

Electricity Circuits

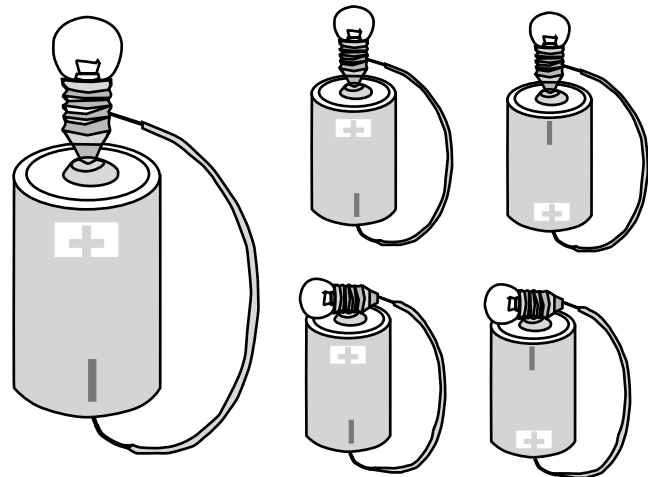
students what's happening underneath the metal covering at the base of the bulb. You can show it to them at this point in the activity, or you can ask the students to figure out what it must look like as an assessment exercise at the end of the lesson.)



Once you have gone over these questions and the students have carefully examined the light bulb, give them the following challenge:

Can you produce a light with just a battery, a bulb and a wire?

(They should eventually come up with some version of a simple, or basic, circuit such as the one pictured on the left below. Other arrangements are possible and are pictured below on the right side of the page.)



Simple Circuit
(light bulb, battery and wire)

Have the students “draw” a picture of the arrangement of these components on their activity sheets.

How does it work? Electric current flows from the battery through the wire, up into the bottom of the light bulb, through the filament, back out through the side of the bulb and back to the battery. The circuit is complete and the bulb lights up.

Give the students a bulb holder, a second piece of wire, a battery holder, and two battery clips. Challenge them to arrange these components so that the light bulb stays on. This simple circuit, which should look like the one pictured on the next page, has the same basic components as the one with just the wire, bulb and battery. The battery holder, clips and bulb

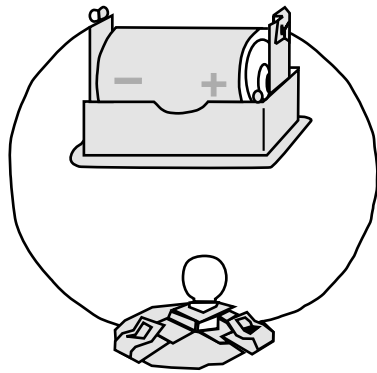


Appendix E - Science Resources *(continued)*

Electricity Circuits

holder have been added to make the circuits easier to manipulate. You may need to show the student how to use the battery clips and the bulb holders.

The battery clips flop over like bunny rabbit ears when they're properly positioned in the holders. Also, make sure the students notice how the bulb holder clips are connected to the bulb.

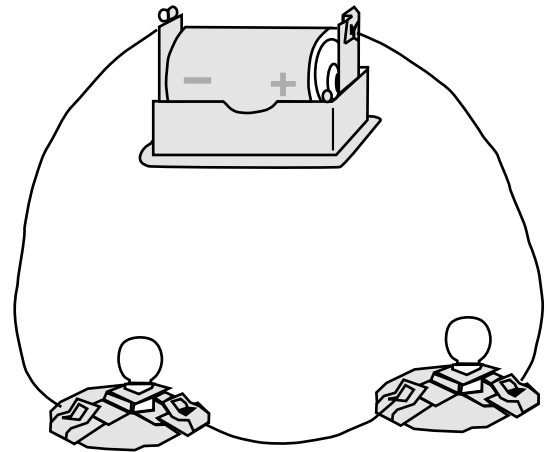


Simple Circuit

(light bulb, light bulb holder, battery, battery holder, 2 battery clips and 2 wires)

**The Series Circuit:
Exercise 2**

Now give the students a second light bulb, a second bulb holder, and a third piece of wire and challenge them to light both light bulbs. Tell them that they should have only two wires coming from the battery. (This prevents them from making a parallel circuit at this step.) Once they have completed this task, ask them to draw a diagram of this circuit on their activity sheets. It should resemble the illustration below.



Series Circuit

Once they have finished, ask the following questions, which are listed on their activity sheets.

Once all of the bulbs are lit, write down a prediction — or hypothesis — about what will happen if one of the light bulbs is unscrewed from its holder.

(They may realize that the circuit will be broken and the bulbs won't work at this point, but if they don't, they will discover this to be the case when they test the hypothesis.)

Test your hypothesis. What happened?

(Both bulbs go out.)



Appendix E - Science Resources *(continued)*

Electricity Circuits

Why did this happen?

(The circuit was broken.)

What's going on?

In a series circuit, all the components of the circuit are connected one after the other in the same path. In other words, the path between the battery and light bulbs is one big circle connected by wires. It's possible to add additional components to the circuit, such as extra batteries, switches or bulbs, but any break in the circuit in any of these components causes the current to stop flowing. This is the disadvantage of series circuits.

A burnt-out light bulb is an example of a break in a circuit. If other light bulbs are in a series circuit with a burnt-out bulb, they won't light either because the movement of charges is stopped. Christmas lights are a good example of a series circuit — although newer strands may have an alternate path for electricity to flow through if a bulb burns out.

At this point, ask students to describe the way in which the components are arranged. It may help for the students to look at their previous diagrams. Try to get them to use the words “circle,” “circular” or “circuit.”

The word “circuit” comes from the Latin word *circuitus*, which means “to go around.” Ask them to think of some other situations that are described by the word “circuit.” (You might discuss circuit riders, lecture circuits and the downhill ski circuit. What do all these words have in common?)

If time permits, allow students some unstructured time to play with their electric circuits.

The Parallel Circuit: Exercise 3

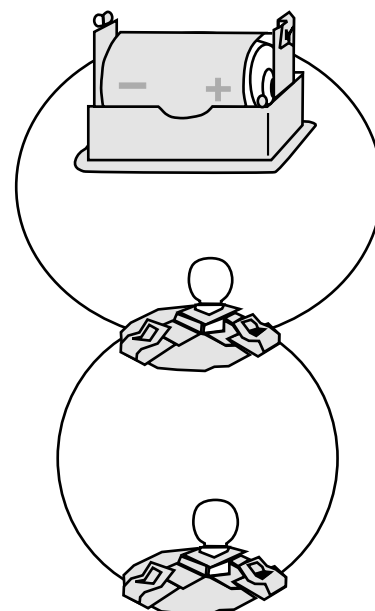
Give the students a fourth wire for this activity.

Now that students have recognized that a circuit must have a complete path in order to work, challenge students to create an electric circuit that has two light bulbs and one battery in which each light bulb works independently of the other.

This challenge may take a bit of thinking on the students' part. To make sure it is challenging, tell students they may have only one wire coming from the battery and one wire leading to the battery — all the light bulbs must come between those two wires.

Circulate around the classroom and ask the students to test their circuits for you to make sure each light bulb works independently of the other one.

Once this is accomplished, discuss and diagram an example of a parallel circuit for the class to compare to previous circuits. The diagrams should resemble the wiring pictured below.



Parallel Circuit



Appendix E - Science Resources *(continued)*

Electricity Circuits

What’s going on?

A parallel circuit has several paths that current may travel through. Each individual path finds its way back to the battery. The advantage of a parallel circuit can be seen by considering the previous example of a burnt-out light bulb. If each light bulb is on its own path, even if one light bulb burns out, the other light bulbs will still have a complete path through which charges can flow. Homes are wired using parallel circuits.

Once the students have finished this task, go over the following questions that are asked on their activity sheets.

What makes this circuit different from the first one you built?

(If one light bulb is burnt out, the other one can still work.)

The circuit you built in Exercise 2 is called a series circuit. Using what you have learned, write a definition for a series circuit.

[A series circuit is one in which the current must pass through all the items in the circuit. Any break will make all the power users (bulbs) go out.]

The circuit you have just built in Exercise 3 is called a parallel circuit. Using what you have learned, write a definition for a parallel circuit.

[A parallel circuit is one in which there is more than one path for the current to take in the circuit. If one path (or loop) has a break in it, the other paths (or loops) can still provide a complete path for the current. Even if a single power user (bulb) wired in parallel ceases to work, the other power users (bulbs) still work.]

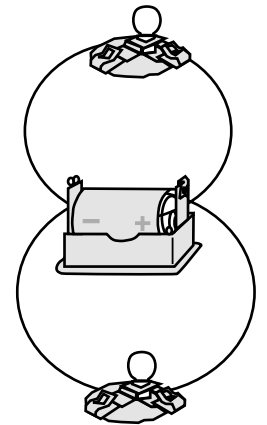
You might end the lesson by discussing the terms series and parallel. Why are these terms appropriate names for the types of circuits they describe?

If time permits, challenge students to see how additional batteries in series and in parallel affect the light bulbs in the circuit. Groups of students may combine their materials and work together in this part of the activity.

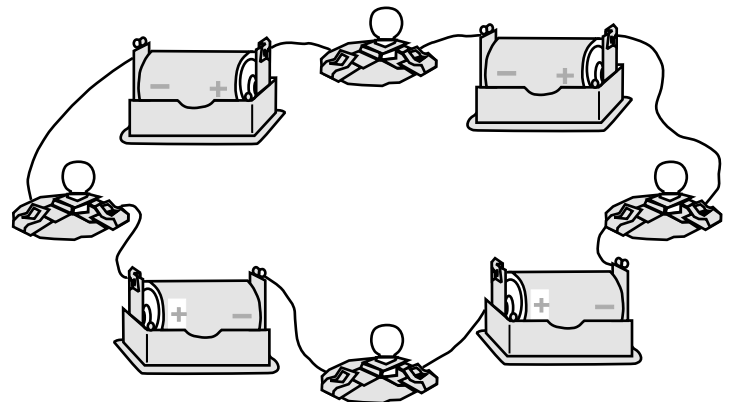
Here are a couple of pitfalls that might come up:

1. This diagram pictured here is a parallel circuit. It might, at first glance, seem to be two simple circuits that share a power source, but it’s not! Since the current leaving the positive end of the battery can flow to either bulb, the circuit is really identical to the parallel circuit shown on Page 8.

This parallel circuit uses more energy than a series circuit with the same number of bulbs — since the current here can flow more freely. Thus, a battery burning two bulbs in a parallel circuit burns out faster than one burning two bulbs in series.



2. Also note that when the students use more than one battery in a circuit, the positive and negative ends of the batteries must be properly aligned as shown in the series circuit pictured below.





Appendix E - Science Resources *(continued)*

Electricity Circuits

Integration Ideas:

Language Arts – Write a funny story about being transferred back in time 100 years and the problems this would create for a modern student.

Mathematics – Have students analyze an electric bill. Block certain parts of the statement and have students calculate total watt/hours used, cost per watt/hour, etc.

Social Studies – Investigate the effect on society of the development of electricity.

Extension:

With the students working in groups, ask them to compare the brightness of two bulbs in a parallel circuit to the two bulbs in a series circuit. The bulbs in the parallel circuit should be brighter. (See the explanation on Page 10.)

Assessment:

- Assess Student Activity Sheets.
- Ask students what type of circuit (series or parallel) they have in their homes and what the advantage of this type of circuit would be.



Appendix E - Science Resources *(continued)*

Electricity Circuits

Electric Circuits – Student Activity Sheet

The Simple Circuit: Exercise 1

Materials:

- 1 battery
- 1 light bulb
- 1 piece of wire

Examine the wires you have been given. What kind of wire do you think you are using for this activity?

Is this material a conductor or a non-conductor?

Why is this important?

What kind of covering does the wire have?

Is this material a conductor or an insulator?

Why is it important for the wire to have a covering like this?



Appendix E - Science Resources *(continued)*

Electricity Circuits

Examine your light bulb carefully. How is it constructed?

Draw a detailed picture of your light bulb. Label the insulators and conductors that make up the bulb. Notice the filaments inside the bulb.

Light Bulb

Using one wire, one battery and a light bulb, make the light bulb light up. Draw a picture of your circuit. Draw arrows, showing the path the current is taking in the circuit.

Simple Circuit



Appendix E - Science Resources *(continued)*

Electricity Circuits

Hint: If your bulb does not light up, there are several possibilities for what went wrong. Double-check the following:

- Is the battery good?
- Is the bulb good?
- Is your circuit complete?
- Do you have any places in the circuit where bare wires (or other conductors) cross or touch?
(Two wires that overlap in the middle of the circuit change the pathway and current will not flow through the whole circuit. This is called a “short circuit” and often causes the circuit to become overheated or overloaded.)

Additional Materials:

- 1 wire
- 2 battery clips
- 1 battery holder
- 1 light bulb holder

Now, using two wires, one battery, two battery clips, one battery holder, one light bulb holder and a light bulb, make your light bulb light.

The Series Circuit: Exercise 2

Materials:

- 3 wires
- 1 battery
- 2 battery clips
- 1 battery holder
- 2 light bulb holders
- 2 light bulbs

Using three wires, one battery, two battery clips, one battery holder, two light bulb holders and two light bulbs, make your light bulbs light.

You may have only one wire coming from each end of the battery.



Appendix E - Science Resources *(continued)*

Electricity Circuits

Draw a picture of your circuit. Draw arrows showing the path the current takes in the circuit.

Simple Circuit

Once all of the bulbs are lit, write down a prediction — or hypothesis — about what will happen if one of the light bulbs is unscrewed from its holder.

Test your hypothesis. What happened?

Why did this happen?



Appendix E - Science Resources *(continued)*

Electricity Circuits

The Parallel Circuit: Exercise 3

Materials:

- 4 wires
- 1 battery
- 2 battery clips
- 2 battery holder
- 2 light bulb holders
- 2 light bulbs

Using four wires, one battery, two battery clips, one battery holder, two light bulb holders and two light bulbs, make your light bulb light.

You may have only one wire coming from each end of the battery. Wire the circuit so that you can unscrew one of the bulbs without the other going out.

Draw a picture of your circuit. Draw arrows showing the path the current takes in the circuit.

Parallel Circuit



Appendix E - Science Resources *(continued)*

Electricity Circuits

What makes this circuit different from the first one you built?

The circuit you built in Exercise 2 is called a **series circuit**. Using what you have learned, write a definition for a series circuit.

The circuit you have just completed in Exercise 3 is called a **parallel circuit**. Using what you have learned, write a definition for a parallel circuit.

Diagram of the Inside of a Light Bulb



Appendix E – Science Resources

Oobleck?

A Science Museum of Virginia Activity

This workshop introduces science processes using an investigation of the physical properties of a mysterious—and fun—gooey substance. This activity also gives you the opportunity to use science to help assess and build vocabulary. The use of the Dr. Seuss book can be a fun wrap-up for the activity, but it is an optional part of the activity.

(Time required: 45 minutes)

Purpose:

Students will observe physical properties, interpret and evaluate data, and make conclusions based on that data.

Materials:

- 3 16-oz. boxes of cornstarch
- green food coloring
- lots of old newspaper
- writing paper
- 4 small plastic bowls
- 1 large mixing bowl
- water
- paper towels
- pencils
- Optional: “Bartholomew and the Oobleck” by Dr. Seuss

Procedure:

1. Make these preparations in advance.
 - A. Mix the Oobleck at least an hour before the class to allow time for adjusting the mixture. Prepare the Oobleck by adding 4 drops of green food coloring to 2 cups of water in a large mixing bowl. Then stir in 2 boxes of cornstarch. This makes enough Oobleck for 4 groups of about 8 students.
(No, don't add that third box of cornstarch! It's for later. See “C” below.)
2. Begin the activity.
 - A. Explain that the students must conduct tests on it to determine the physical properties of an unknown substance. Assure them that this substance is safe to handle and examine. **Emphasize that it is never safe to taste or eat unknown substances!**
 - B. Since the student's task is to investigate the properties of this substance, spend a few minutes discussing what physical properties are and how they are determined.
 1. A physical property is something that can be seen, heard, smelled, felt by the senses, or detected by instruments that enhance our senses (microscopes, telescopes, etc.).
 2. An experiment should include a repeatable sequence of steps that yield the same results each time. Observations need to be recorded clearly and accurately. Conclusions must be supported by observations.
 - C. Ask the students to list the 5 senses and write each on the board or overhead. Leave blank space below each word for the words generated by observation.
- B. Cover the work surface with newspaper. Provide paper towels, writing paper and a pencil for each student. You may also want to cover the floor with newspaper.
- C. Just before you start the activity, check the consistency of the Oobleck. Oobleck should flow when you tip the bowl and feel hard when you push on it. If it is too soupy, add more cornstarch. If it is too thick, add more water.
- D. Pour the Oobleck into 4 smaller bowls. Do not allow the students to “play” with the Oobleck until you have explained the activity.



Appendix E - Science Resources *(continued)*

Oobleck?

Observations:

Divide the students into groups of 2 to 4 participants. Allow the groups to explore the properties of Oobleck for about 15 minutes. Encourage them to handle the Oobleck. Have them write down their observations. Encourage them to use a variety of words to describe each property.

List the properties the students observe and pick those which seem to describe the Oobleck best. Encourage discussion of the meaning of the words and why the word should be included. Stress that open discussion and the sharing of data is a vital part of science.

Conclusion:

Optional: Read the portion of “Bartholomew and the Oobleck” that describes Oobleck. Have the students decide if this substance is really Oobleck.

Discuss the differences between solids and liquids. How does the workshop’s Oobleck fit these descriptions? (See the **For Your Information** section below.)

Clean Up!

Have the students help clean up by carefully rolling up the newspapers and throwing them away. A damp sponge will wipe up any remaining Oobleck. Do not mop up a large spill; use a sponge to absorb it. Once the Oobleck has dried, it can be vacuumed up. Do not pour Oobleck into the sink; it may clog the drain. Allow the Oobleck in the bowls to dry. Dry Oobleck can be thrown in the garbage.

For Your Information:

As you discuss the behavior of Oobleck and similar substances, the following definitions may be helpful.

fluid: A material which takes the shape of its container.

viscosity: The resistance of a fluid to flow. A material with a high viscosity does not flow easily. (Molasses is a good example.) A material with a low viscosity flows easily. (Water is a good example.)

Newtonian fluid: A fluid that becomes more viscous when cooled. (Cooking oil is a good example.)

non-Newtonian fluid: a fluid in which the viscosity is increased when the liquid is stirred or compressed. (Oobleck is a good example.)

The behavior of non-Newtonian fluids seems to be controlled by the interactions between molecules. Since it is difficult to determine what is happening at the molecular level, there are several theories that attempt to explain this behavior.

One theory compares Oobleck to a mixture of sand and water in a squeezable plastic bottle. The grains of sand are packed closely together and water fills some of the spaces between them. When the bottle is squeezed slowly, the grains of sand slide against each other and the spacing between some of the grains increases. This allows more water into these spaces and provides lubrication, so that the grains can slide and flow past each other. When the bottle is squeezed quickly, there is not enough time for the water to enter the spaces and the friction between the grains resists the flow.

A second theory is based on the chemical structure of Oobleck. Cornstarch is made up of long chains of molecules called “polymers.” It is suggested that when the mixture is compressed, these chains are stretched at right angles to the direction of compression and the molecules become “tangled.” They are unable to slide against each other easily and the viscosity increases.

A third theory suggests that an electrical attraction is built up between the starch molecules as they rub against each other. The faster they rub together, the greater the attraction becomes, resulting in an increase in the viscosity.

An excellent discussion of this question was provided by Jearl Walker in two articles in “The Amateur Scientist” section of *Scientific American*: vol. 239, no. 5, pp. 186-198, November, 1978, and vol. 246, no. 1, pp. 174-180, January, 1982.



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