What Students Need to Know!

FL GED Research Project

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FL GED Research Project

What the data is telling us!

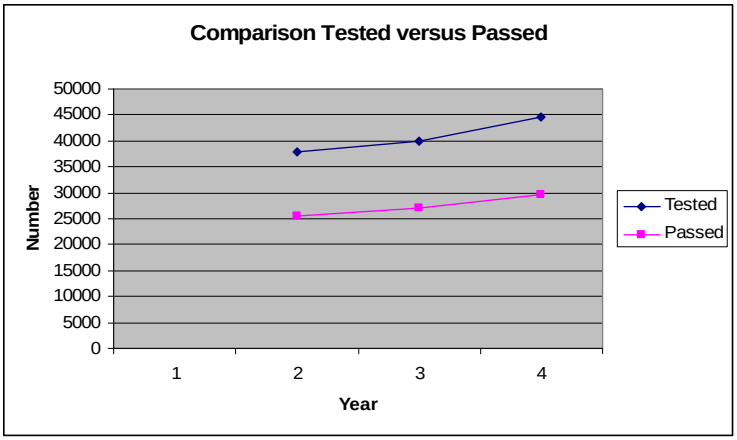
On an annual basis, approximately 30% of Florida's GED candidates fail to meet the minimum standards required to earn a State of Florida High School Diploma. The Florida GED Research Project, an adult education state leadership activity conducted by Central Florida Community College, was designed to review the data and identify strategies and resources that teachers, support staff, and administrators could use to better assist their students in passing the GED Tests.

The Florida GED Research Project reviewed two types of data. The first data set consisted of reports obtained from the GED Testing Service. The second set of data was obtained from a review of student results on the Official GED Practice Tests from 10 sites in the state of Florida that represented school districts, community colleges, and correctional institutions. The following report outlines the findings of the research team and serves as the basis for the development and implementation of professional development and instructional resources for teachers.

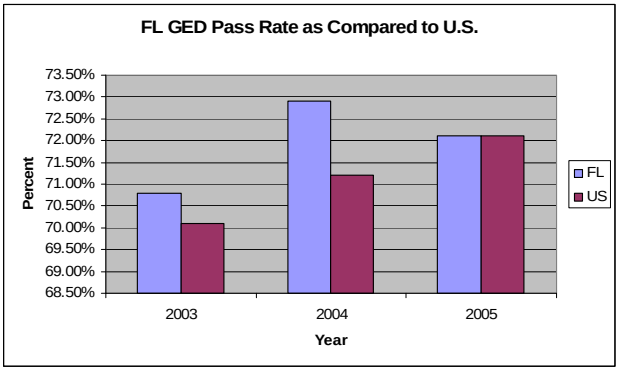
Data from the GED Testing Service

Who Passed the GED Tests? is a statistical report that is issued each year by the GED Testing Service. This report provides information from both a national and state level and includes a wide range of data including passing rate (national and by state), demographic information about students who take the test, and average test scores for those who complete and those who pass the GED Tests. The following data was drawn from the *Who Passed the GED Tests?* for 2003, 2004, and 2005. It should be noted that data for 2006 will not be published until late 2007.

The number of candidates taking the GED Tests continues to increase each year. However, despite the growth in the total number of candidates testing, GED Testing Centers are reaching only 1.6%-2.0% of adults in the state of Florida who do not have a high school diploma. In 2005, more than 2.4 million adults living in Florida did not have a high school diploma. During 2005, approximately 44,000 adults took the GED Test. However, slightly less than 30,000 candidates passed the tests. As indicated by the graph below, there is a significant discrepancy between the number of students who test and those who pass the tests and ultimately earn a State of Florida High School Diploma.

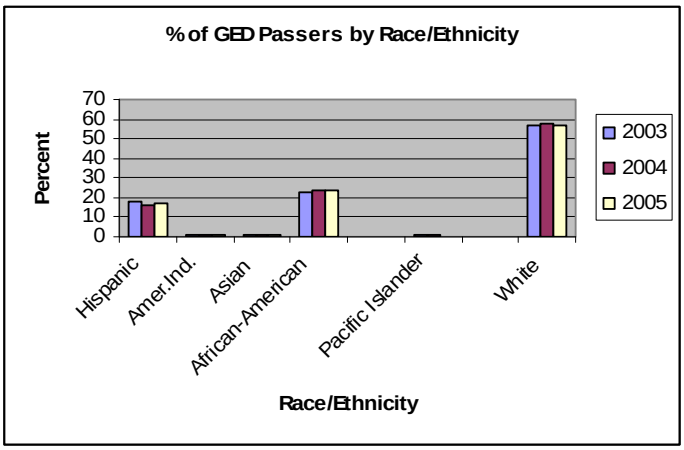


As indicated by the graph, during 2003-2005, Florida's GED Passing Rate remained close to that of the national passing rate, 70-72%. In 2004, Florida's passing rate exceeded the national passing rate by approximately 1.7%. The year 2004 saw the highest passing rate of the three years reviewed. In 2005, the passing rate declined by approximately 2%.



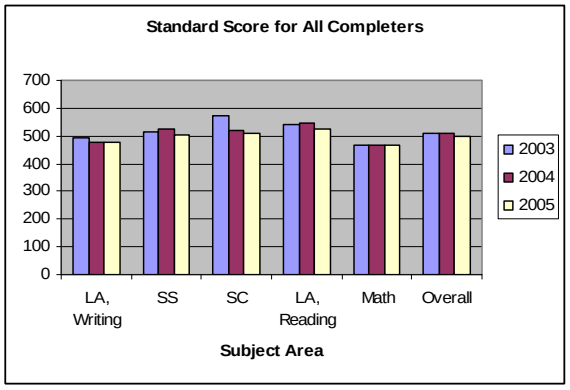
In 2005, 22 states had passing rates exceeding 80%. Of those 22 states, three states had passing rates at or above 90%. It should be noted that some of the states with higher passing rates require GED candidates to take and pass the Official GED Practice Test prior to registering for the GED Tests. Nineteen states had passing rates below that of Florida.

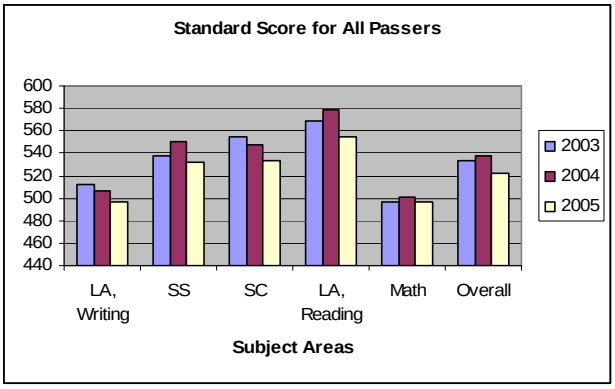
The gender and ethnic makeup of Florida's GED candidates has remained relatively constant over the past few years. Approximately 54% of GED candidates are male and 46% are female.



As shown by the graph, there has been a slight decrease in the percent of Hispanic adults who take the GED Tests, 18% in 2003 versus 16.6% in 2005. During that same period, the percent of African-American candidates has increased from 22.6% to 24.1%. The percent of American Indian and Asian candidates has declined slightly during that same time frame.

Of even greater import to teachers is the mean passing score within each of the GED Tests. This data assists teachers in understanding what overall subject areas present the greatest challenges and allows them to look at their own test results to see where students rank in terms of the overall national mean passing scores for GED candidates, completers, and passers.

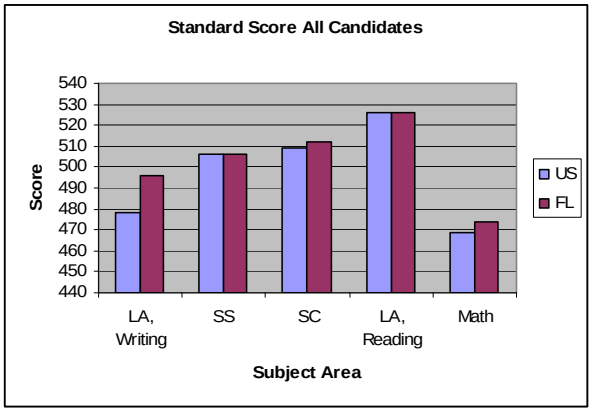


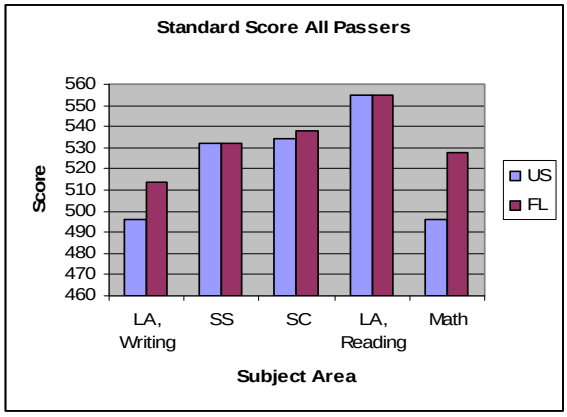


In *Who Passed the GED Tests? 2005*, the GED Testing Service made a significant change in the data that was reported. For the first time, the GED Testing Service provided data relative to the mean passing

scores for each state. The data was broken down at the national level by both those who took the tests and those who passed the tests.

The following graphs show how Florida compares to the nation on the GED Tests.





The data shows that Florida candidates who passed the tests scored higher in four out of five subjects. In fact, Florida passers scored 18 points higher on Language Arts, Writing and 32 points higher on Mathematics. This clearly indicates that students who are adequately prepared for the test attain higher scores than their peers across the nation.

Based on the data, the standard score for all Florida candidates is about the same as that for the nation with Florida candidates scoring slightly higher in Science, Mathematics, and Language Arts, Writing. It is important to remember that this group includes approximately 30% of candidates who did not attain a passing score on the GED Tests.

The data is clear that the GED Language Arts, Writing Test and the GED Mathematics Test present the greatest challenges to adult learners in Florida. The GED Social Studies, Science, and Language Arts, Reading Tests present fewer challenges for most GED students. It is important to note, that while many of the mean standard scores are significantly above the 450 average required to pass the test, these scores are not at a level that adequately prepares students for postsecondary education and training. Each year, the GED Testing Services provides a comparison of GED Test Scores to estimated class ranking. Scores at the 450 level place a student in the bottom 40% of a graduating class. Scores at the 500 level place students in the bottom 50% of a graduating class. The GED Testing Service indicates that more than 65% of students take the GED in order to pursue higher education and training. Therefore, students need scores that are a better indication of their readiness for postsecondary education.

Based on the data from the GED Testing Service, approximately 30% of Florida GED candidates are not successful on the GED Tests. The data clearly shows that overall Language Arts, Writing and Mathematics present the greatest challenges for students. However, the question remains as to what specific content and cognitive skills created the greatest challenges for students who are preparing for the GED Tests. To identify those areas, the Florida GED Research Project undertook a second phase of research with the intent of identifying specific areas that are troublesome for students and what teachers can do to help alleviate these problems.

Data from the Official GED Practice Test Review

The Florida GED Research Project obtained Official GED Practice Test results from a total of 10 sites throughout the state that represented school districts, community colleges, and correctional institutions. Official Practice Test results were obtained from various regions around the state.

These results represent a combination of both large and small, rural and urban programs, as well as various correctional facilities.

The project research team conducted an item analysis of more than 1,280 individual tests. Four forms of the test were included in the analysis: Forms PA, PB, PC, and PD. Results for each form and each content area were tabulated and provided the researchers with information on those areas which presented the greatest challenges to GED students.

Two-hundred and sixty-four (264) essays written for the Official GED Practice Test were holistically scored using the four-point writing rubric from the GED Testing Service. Prompts for the essays included those from the PA, PB, PC, and PD versions of the Official GED Practice Tests.

The specific results of Phase II of the Florida GED Research Project are included in each of the content area chapters of this resource guide. An overview of what the research revealed is provided, as well as specific information on test area content and cognitive skill requirements and instructional strategies and activities that may be used to enhance student success on the GED Tests.

Language Arts, Writing

Analysis of the Language Arts, Writing, Part I – Multiple Choice

The Language Arts, Writing Test assesses four specific areas: mechanics, usage, organization, and sentence structure. Questions are presented in three formats: correction, revision, and construction shift. The test assesses the student's ability to edit and revise text. Material is presented through workplace, how-to, or informational text. Six to eight questions are presented for each document. Students are asked to correct or revise a sentence or in some cases recast (rewrite) a sentence or combine two sentences into one more effective sentence.

Seventeen questions were identified as moderately to severely problematic for students, meaning that more than 35% of all students were unable to select the correct response for that particular question. Two questions, one dealing with subject-verb agreement and the other with the combination of two sentences, were missed by more than 75% of students assessed.

While students demonstrated some difficulty in all four areas of Language Arts, Writing, the greatest percentage of questions missed were in two primary areas:

- ***Organization*** where students were asked to move or remove a sentence or determine appropriate text divisions within a document.
- ***Sentence Structure*** where students were asked to combine sentences, or to identify and correct sentence fragments, run-on sentences, comma splices, improper coordination and subordination, modification, and parallel structure.

Understanding the types of questions on the GED Language Arts, Writing Test can help students better understand how to approach answering those questions. Students exhibited substantial problems with correction type questions which involved one sentence, a number of sentences, a complete paragraph, or the text as a whole and asked what correction should be made. Correction questions cover all four areas of the test.

The construction shift type of question consists of a stem that must be rewritten using a different structure. Stems in construction shift questions do not contain errors. These questions test a student's ability to employ alternate structures correctly rather than the ability to correct errors. Construction shift questions require students to logically think through the process of changing a sentence, or in the case of organization, change the structure of a document.

Conclusion

Based on an analysis of the items missed, the following areas create significant challenges for students. Instructors should place a greater emphasis on the following areas, especially just prior to the students taking the GED Language Arts, Writing Test:

- Mechanics
  - Overuse or misuse of commas
  - Verb tense in order to maintain parallel structure
- Usage
  - Appropriate use of *which* and *that*

- Subject-verb agreement
- Organization
  - Removing a sentence because it does not fit within a passage
  - Moving a sentence to an appropriate location within a passage
- Sentence Structure
  - Combination of two sentences to create a more effective sentence
  - Split sentences to avoid run-ons

GED Language Arts, Writing Test Overview

The GED Language Arts, Writing Test measures a student's ability to write a well-constructed essay, as well as to revise and edit samples written by someone else.

The Language Arts, Writing Test is divided into two parts. Part I requires that students demonstrate revising and editing skills – organization, sentence structure, usage, and mechanics – by answering multiple-choice questions based on specific passages of writing. Part II requires that students craft an essay that demonstrates their ability to write. The scores earned on both parts of the test are combined and reported on a standard score scale as a single score.

Documents Used in the Test

Language Arts, Writing, Part I includes topics for students to proofread with which they are familiar. Passages for this part of the test are taken from:

- Workplace and community documents, which are part of the real-world environment. These types of passages include such items as letters, memos, meeting notes, reports, executive summaries, applications, and similar correspondence.

- "How to" texts, which are documents that provide instructions or directions. These types of passages focus on such topics as securing a job, writing a resume, dressing for success, leasing a car, how to get to a specific location, etc.

- Informational texts, which are documents that provide an analysis of a particular topic. These passages may involve position papers, critical evaluations, support papers, etc. on such topics as: the growing popularity of mega-malls, a review of a book or movie, or examining the needs of a local community for affordable housing.

Language Arts, Writing Test, Part I Content Areas

Organization - 15%	Effective text divisions Topic sentences Unity/coherence in writing
Sentence Structure - 30%	Sentence fragments and run-on sentences Comma splices Improper subordination Modification – improper and dangling modifiers Parallelism
Usage - 30%	Subject verb agreement • agreement in number • interrupting phrases • inverted structure Verb tense errors • sequence of tenses • word clues to tense in sentences or paragraphs • verb form Pronoun reference Wrong pronoun Pronoun shift Vague or ambiguous reference Agreement with antecedent
Mechanics - 25%	Capitalization • proper names/adjectives • titles • months/seasons Punctuation • commas in a series • commas between independent clauses joined by a conjunction • introductory elements • appositives • comma overuse Spelling – restricted solely to possessives, contractions, and homonyms

GED Language Arts, Writing Test, Part I Question Types

The GED Language Arts, Writing Test, Part I, includes three different item or question types. The question types are:

- Correction – 45%
- Revision – 35%
- Construction Shift – 25%

Correction Type Questions
This item type is used to test skills in: organization, sentence structure, usage, and mechanics.

Correction questions may involve one sentence, a number of sentences, a complete paragraph, or the text as a whole and ask what correction should be made. The student is provided a series of choices and asked what correction should be made to the selected passage.

Example of a Correction Type Question

Sentence 4: Janice a new parent, will be attending a conference at the local elementary school where she will meet the new principal.

Which correction should be made to sentence 4?

(1) insert a comma after Janice
(2) delete the comma after parent
(3) insert a comma after school
(4) replace principal with principle
(5) no correction is necessary

Revision

This item type is used to test skills in: sentence structure, usage, and mechanics. A revision item question has a stem with a part underlined that may or may not contain an error. The answers list five possible corrections to the underlined section of the stem. In this type of question, the first alternative is always exactly the same as that appearing in the original sentence. This means that students must be able to recognize when no change or revision is necessary.

Example of a Revision Type Question

Samuel graduated from Baylor Magnet High School.
Graduating with an International Baccalaureate Diploma.

Which is the best way to write the underlined portion of these sentences? If the original is the best way, choose option (1).

(1) School. Graduating with
(2) School, I graduated with
(3) School. A graduation with
(4) School. Having graduated with
(5) School with

Construction Shift

A construction shift type of question is used to test skills in: mechanics (punctuation), and sentence structure. This type of question has a stem that must be rewritten using a different structure, resulting in a more clearly stated sentence. This type of question requires that students use good organizational skills as they think through the process of how to change a sentence or structure of a document. Unlike correction and revision items, construction shift items generally do not contain errors. The purpose of this type of question is to assess how well a student can rewrite with clarity and still keep the ideas of the writer. A student may have to combine paragraphs, separate paragraphs, insert a new sentence, or rewrite for better understanding.

Example of a Construction Shift Type of Question

Sometimes students are provided with some type of document, paragraph, or even a short essay. A construction shift question may require that the student decide how moving or deleting text would improve the selected passage. The question would be worded like the following.

12. Which revision would improve the effectiveness of the document?

Begin a new paragraph with

(1) sentence 2
(2) sentence 6
(3) sentence 8
(4) sentence 11
(5) sentence 14

Strategies to Address Organization

1. Take newsmagazines, such as *People*, *Time*, or *Newsweek,* and remove the staples and rearrange the pages. Divide students into teams of 3 or 4. Give each team a "rearranged" magazine. The first team to put the magazine back in order wins. Ask the teams to explain what type of organizational skills they used to put the magazine pages back into the correct sequence. This activity shows students the importance of organization and encourages them to work in teams to solve problems – a very important real-world skill. Enhance the level of difficulty by removing the page numbers from the magazines.
2. Find or write paragraphs that incorporate transition words, such as first, second, next, last, etc. Make individual sentence strips from the paragraph. Place the sentence strips in random order in an envelope. Give each team an envelope that has all of the sentences needed to build an effective paragraph. Have the teams put the sentences together in the correct order to form the paragraph. Have the students read aloud their paragraphs. If a sentence is out of order, go to the next team. Continue until the paragraph has been put together correctly. As students' skill levels improve, increase the level of difficulty of the paragraph.
3. Divide the group into teams. Give each team an assignment that requires a set of directions. Have the teams write the directions for the assignment. Review the directions with the entire class and see if the teams included everything needed to complete the assignment or if someone would have difficulty completing the assignment if given incomplete directions. Examples of assignments include: building an ice cream sundae, fixing a flat tire, doing the laundry, driving to a specific area landmark.

Organization Activities

In this Scrambled Sentence exercise, a sentence has been broken into parts, and the parts have been listed out of their order. Read the parts carefully and then decide what would be the best order in which to arrange them to form a well-constructed, effective sentence.

Scrambled Sentence1

A- begin to lengthen
B- to shorten
C- the nights

D- the days
E- after June 21st

In this activity, there are a series of short, often choppy sentences, resulting in a monotonous style. Using appropriate connectives and proper subordination, combine statements so as to show the relationship of ideas that apparently belong together.

Sentence Effectiveness Activity 1

1. The Arch of Triumph in Paris is the largest triumphal arch in the world.
2. It was erected to commemorate the victories of the armies of the French Revolution and of Napoleon.
3. Beneath it there now lies buried the body of an unknown soldier.
4. He is the symbol of thousands of Frenchmen.
5. They gave their lives fighting Germany in World War I.

Beneath the Arch of Triumph in Paris, the world's largest triumphal arch erected to commemorate the victories of the armies of the French Revolution and Napoleon, now lies buried the body of an unknown soldier, the symbol of thousands of Frenchmen who gave their lives fighting Germany in World War I.

The above type of activity uses the following teaching points:

- Introductory phrases
- Appositives
- Relative Clauses
- Comma rules for introductory phrases and appositives

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Take sentence combining to another level. Scramble paragraphs, so that the candidates look for transitional words, phrases, and clauses to understand the relationship among sentences in a paragraph.

Scrambled Paragraph 1

*The sentences below are listed out of their original order. Read them carefully and decide what would be the **best order** in which to arrange them.*

A- This studio he turned into a kind of "art factory."
B- Then he would tell a student to go on with the coloring.
C- Three thousand pictures were finally turned out in this center, many of them sold for high prices.
D- The master would first sketch the main outlines of a picture.
E- Once, in a studio, Rubens, the famous artist became the master of a group of painters.
F- Later, he himself would give the finishing touches to the painting.

Once, in a large, studio, Rubens, the famous artist, became the master of a group of painters.
This studio he turned into a kind of "art factory."
The master would first sketch the main outlines of a picture.
Then he would tell a student to go on with the coloring.
Later, he himself would give the finishing touches to the painting.

Three thousand pictures were finally turned out in this center of art, many of which were sold for high prices.

Answer: E, A, D, B, F, C

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Strategies to Address Grammar

> "Research over a period of 90 years has consistently shown that the teaching of school grammar has little or no effect on students."
>
> *George Hillocks & Michael Smith (1991)*

Reading the Problem Carefully

One of the problems with any grammar question is: "What is it really asking me to do?" This requires that students have a working knowledge of grammar. However, how does one teach grammar? For decades, grammar has been taught systematically through such techniques as diagramming sentences. However, research does not support that teaching grammar independently or systematically improves a student's writing skills.

So how do you teach grammar? According to the research, what works better is to use grammar in context. Discuss grammar and punctuation rules and usage in the context of writing. Have students apply what they have learned to writing sentences, rather than isolated skills instruction. To improve a student's repertoire of syntactic structure, have them practice combining and expanding sentences. As with most things learned, we learn better when we can apply what we have learned to lots of different situations.

Some Successful Ways of Teaching Grammar and Punctuation

Writing is a process. When students first write down their ideas, they are often more concerned about the thoughts and words or vocabulary that they are using. Teaching the editing process is when students should be taught to take a close look at grammar. Some common techniques to successfully teach grammar and punctuation skills in the adult education classroom are:

Technique	Ideas
Searching for Error Patterns	Searching for error patterns is essential for good instruction. Examine a student's text closely for the types of errors he or she is making and pinpoint the areas of concern that seem most prevalent. An example would be a failure to capitalize titles. Teach students to look for similar error patterns in the printed works of others. Although searching for error patterns takes time, it usually takes no more effort than correcting the same student's errors for him/her over and over again.
Teaching Grammar and Punctuation through Discussion and Explanation	Students generally have a reason for "why" they do something. One of the most useful ways of teaching grammar is to first discover what logic the student is using. If a student is repeatedly having problems with commas, have the student number all of the commas in a passage and then on a separate piece of paper have the student write

	an explanation of why he or she felt a comma was needed. Students may find this difficult at first, but discuss that they do not need to use any grammar terminology to explain their reasons. Your job is to look at any patterns and then conference with the student about how their logic was correct and how it was incorrect. Have the student then write a grammar rule in his/her own words.
Peer Responding	Have students read a passage and respond to a specific area of grammar. You may wish to give the students a paper that you have written in which you have errors embedded, such as verb tense errors. Have students underline sentences that strike them as strangely worded or punctuation marks that seem to be misused. Work on the corrections collaboratively rather than having students merely correct a paper. Teamwork is a great skill to build in a classroom!
Handbooks as Reference Sources	Introduce students to grammar handbooks by showing them how they can be used as references when writing or editing. Using reference materials is an important real-world skill. Scan the table of contents with the students to show students how handbooks can serve as a dictionary of grammar /punctuation.
Read-Aloud Strategies	Teach students to read written passages aloud. Often the mere reading aloud will produce a "That doesn't sound right!"
Journal and Logs	You may wish to have your students begin a journal of grammar rules or a spelling log. In this way, students become more aware of their problem areas in communication and have an immediate reference that makes sense to them. These self-developed tools will help the student in editing passages on the GED Test and in his/her real-world writing. *Note: Although the GED 2002 Series Tests do not specifically identify spelling as a skill that is assessed, correctly spelling words that are frequently used by the student in his/her workplace or community is a positive skill to learn.*

Analysis of the Language Arts, Writing Test, Part II – The Essay

Part II of the GED Language Arts, Writing Test requires that students compose an essay based on an assigned topic. Students must earn a minimal score of 2 on the essay or the multiple-choice portion of the test is not scored and the student receives no score for the GED Language Arts, Writing Test. The GED Testing Service has reported that the average score earned on the essay is currently a 2.2, representing marginal writing at best. In 2005, the Florida GED Testing Office reported a slightly higher average score of 2.5 on the essay. Due to these relatively low scores on the essay, the Florida GED Research Project Team conducted a more intense review of the students' essays and the manner in which they were scored to determine:

1. the specific problem areas that students demonstrated in each of the in each of the five areas included on the scoring rubric;

2. whether or not individuals who scored the essays appeared to have a clear understanding of the scoring rubric; and
3. whether or not appropriate methodologies were used to score the essays.

Analysis

Two-hundred and sixty-four (264) essays written for the Official GED Practice Test were holistically scored using the four-point writing rubric from the GED Testing Service. Prompts for the essays included those from the PA, PB, PC, and PD versions of the Official GED Practice Tests.

Results of the study were as follows:

Level of Writing	0	1	2	3	4
Number of Participants Holistically Scored at This Level	21	66	130	47	0

The following generalizations are based on the error patterns exhibited by individuals who were administered the Official GED Practice Language Arts, Writing Test, Part II.

Response to the Prompt

- Students often misinterpreted the topic and responded inappropriately to the questions. For example: Writing a "why" essay when the topic requires a "how-to" essay.
- Students had difficulty staying focused on ideas that supported their response to the topic.

Organization

- Students often used a five-paragraph structure; however, they were unable to appropriately structure the essay for clarity. Many essays used the same introductory phrases for each paragraph, which made it difficult to read the writing sample.
- Many essays exhibited continuous repetition of words and ideas, using the exact same information for both introduction and conclusion paragraphs. Phrases and ideas were repetitive throughout the essays without any development.

Development and Details

- Students failed to include supporting details and specific examples. Instead, lists were often used within the essay structure.
- Students failed to develop a topic into a meaningful writing

Conventions of EAE

Organization

- Essays lacked clarity of sentence and paragraph structure.
- Continuous repetition of words and ideas were noted throughout the essays.
- Many of the essays were difficult to read due to a lack of cohesiveness in the writing. Words were left out of sentences that were necessary for meaning. Students also appeared to have a difficult time in merely crafting a correctly written sentence.
- Many essays exhibited a basic subject/verb pattern, such as: I went to the store. Essays at the GED level should exhibit more complex sentence structure.

Mechanics

- Essays exhibited run-on sentences, as well as sentence fragments. The use of the words "and" and "because" were often used to begin sentences.

- Students showed poor understanding of subordination when writing, which resulted in a lack of clarity.
- Many essays did not use appropriate capitalization or punctuation. Examples include the non-use of capitalization for beginning a sentence and the word "I." Overuse and inappropriate use of commas made many of the essays difficult to read.

Usage

- Essays exhibited difficulty with subject-verb agreement and verb tense errors.
- Pronoun reference errors were also prevalent throughout the writings. Students also appeared to have difficulty in determining whether to use the word "I", "me", or "myself".
- Parallel structure was a strong error pattern throughout many of the essays.
- Although spelling is not directly assessed by the GED Testing Service, it was noted that numerous essays exhibited such poor spelling that it interfered with the understanding of the essay.
- Students also showed difficulty in selecting the correct word (homonym). Examples included such words as:
  - poor/pour
  - their/there/they're
  - higher/hire

Word Choice

- Essays exhibited very limited word choice.
- Many of the essays were unable to clearly communicate ideas to the reader.

Additional Comments

- Analytical scoring was employed on some of the essays with editing marks and comments from the instructor. It appears that there is confusion regarding analytical versus holistic scoring, as well as the appropriate use of the Official GED Language Arts, Writing Test, Part II as a diagnostic tool
- The four-point rubric was not used to holistically score the essays. This was determined through viewing such scores as 2.75, 2.8, 3.2 or a range of scores that could be awarded to the essay, such as 3.75 – 4.0. None of these scores are valid if using the recommended scoring rubric.
- Many of the essays show undeveloped critical thinking skills, as well as writing skills. These essays had little or no focus, limited or no development of ideas, lack of details or examples, irrelevant information, poor control of the conventions of EAE, and ineffective word choice. It would appear that these students require a structured approach to the writing craft, beginning at the sentence level before they attempt a higher-level writing assignment.

The GED Essay

Success on the GED Writing Test requires the student to compose an essay. Unlike earlier versions of the GED Tests, the 2002 Series GED Language Arts, Writing Test does not prescribe the length of the essay. The essay should be well planned, drafted, and polished. The essay should use the following format: introductory paragraph, developmental paragraphs, and a conclusion.

Although students generally enter the GED program with an understanding of the basic rules of English grammar and writing, some remediation may be required in specific areas. It is

recommended that the teacher use one of the many commercially printed or computer-based materials.

Effective writing programs involve the complete writing process. Many adults have never been skilled writers; thus they are unaware that writing is a process that is broken up into manageable steps. The stages many teachers focus on are

- Selecting or becoming involved in a topic
- Pre-writing that includes considering an approach and gathering one's thoughts, information, or ideas
- Drafting which includes organizing materials and getting the words down on paper
- Revising which focuses on polishing the meaning and proofreading the writing sample

While students need to understand the basic conventions of English, such as grammar, punctuation, and spelling, one of the most important things the teacher can do is help the student develop a comfort level with writing. This can only occur if the student is provided ample opportunities to write. Writing should occur during each classroom session and should be integrated into the learning process. Students can write on topics that encompass the entire GED curricula. It is important to remove the artificial barrier between other subjects and writing. Remember, not all written work needs to be graded. Students need to be comfortable in the writing process and have opportunities to write real life assignments.

- Provide writing opportunities for students each day that they are in class. Teachers may wish to start their GED classes with a timed writing activity of 3-5 minutes. Have students write on an assigned topic chosen by the teacher or by the students.
- Have students keep writing journals. Journals can provide a non-threatening environment for writing. Do not grade the journals, but rather read them on a regular basis and respond to comments the students have made. Do not mark errors in spelling or grammar. Allow the student to develop a comfort level with writing. Save the grading for other writing assignments.
- Have students write when they are working with other subjects. Students can summarize what they learned in Social Studies, Science, or any other subject. Have students write about their reactions to political cartoons, expressing their opinions about whether they agree or disagree with the cartoonist. This can serve two purposes: (1) improve writing and (2) improve skills in interpreting graphic-based material.

Strategies for Teaching Writing Skills

1. Provide writing opportunities for students every day that they are in class. Teachers may wish to start their classes with a timed writing activity of 3-5 minutes. Have students write on an assigned topic chosen by the teacher or by the students.
2. Have students keep writing journals. Journals can provide a non- threatening environment for writing. Do not grade the journals, but rather read them on a regular basis and respond to comments the students have made. Do not mark errors in spelling or grammar. Allow the student to develop a comfort level with writing. Save the grading for other writing assignments.
3. Have students write when they are working on other subjects. Students can summarize what they have learned in social studies, science, or any other subject.
4. Have students write about their reactions to political cartoons, expressing their opinions about whether they agree or disagree with the cartoonist. This can serve two purposes: (1) improve writing and (2) improve skills in interpreting graphic-based material. It also encourages critical thinking.

5. Modeling – One of the best techniques for teaching writing is for the teacher to model the process. Have the class select an essay topic and write it on the board. Then lead the class into a brainstorming session and write their ideas on the board. Next help them decide how to organize the ideas. From here, move into writing the first paragraph, the supporting paragraphs, and the conclusion. (This will probably take several class periods to accomplish.) Once the essay is complete, the teacher should model how to revise and edit the essay.
6. Essay Editing Checklist – Have students use an essay editing checklist such as the one Steck-Vaughn provides in the GED Instructor's Resource Guide. Help them to use this every time they write an essay to make certain they have included everything they should have. Teachers should also use this checklist when evaluating their students' essays.
7. Peer Reviews – Have students form a team of two and have each team member share his/her essay with his/her partner. The partner's job is to help critique and point out pieces that may need to be revised. Before this activity, help the class establish some rules about critiquing and stress that everyone's essay is a work in progress and they are not to focus on the writer but on the essay.
8. Use Student Essays to Teach Editing – Ask students for their permission to save their essays with their names removed. Start a collection of essays and use them as models when teaching editing and revising skills.

The following are additional strategies that you can use to enhance writing in your classroom (Routman, 1996).

1. Graphic Organizers – These are excellent learning tools designed to help the student focus on concepts, illustrate ideas, provide a step-by-step procedure and encourage organized thinking. They help students organize their thoughts and provide a visual picture of what they are going to write about. Graphic organizers are also known as advanced organizers, mind maps, or spider webs.
2. Journals - Students can keep journals to document and enhance their understanding of materials that are read for class. Encourage students to write entries that reflect the main idea, major points, or questions that they may have after reading a selection. To increase critical thinking skills, instructors may request that students write about possible applications of ideas. Journals can also assist students to better understand what has been taught.
3. Learning Logs – These are journals where the page is divided into two columns. Key concepts are written in the left column and student responses to the concepts are written in the right column. This method assists students in organizational skills and formulating ideas for personal writing.
4. Brainstorming - In brainstorming activities, teachers provide students with a problem. They then ask them to quickly jot down ideas about the problem. Students should be encouraged to come up with as many ideas as possible and not worry about form or grammar. Brainstorming can be used either prior to presenting a topic or as a summarizing activity. Prior to the introduction of new material, brainstorming can be used for students to predict answers or solutions. As a summarizing technique, students can quickly identify important things to remember.
5. Cross-Disciplinary Writing - Students need to write in a variety of genres. They should be encouraged to write poetry, letters, stories, interviews, "how to books," greeting cards, messages, children's stories, etc.
6. Extended Timed Writing - Because the GED Tests are timed, students should experience longer timed writings as they near the skill level required to successfully pass the GED Language Arts, Writing Test. Instructors should provide lined paper similar to that used on the exam as well as a pen for writing. Initially, timed writings should be short. Provide topics that are easily handled by the student. Remember that all writings do not need to

be graded. Prior to taking the GED Language Arts, Writing Test, the student should be able to write a five-paragraph essay on any given topic in a 45-minute period.

The following lists ideas for assisting students with the various stages of the writing process:

Planning – the first step in the writing process. Have your students respond to these three planning questions:

- What is the topic of our writing?
- Who is our audience? What will be interesting to them?
- What do we want to accomplish by writing about this topic (e.g., convey information, persuade policy makers, etc.)?

Professional writers plan their writing, sometimes at their desks, sometimes while engaged in other routine activities such as mowing the lawn or washing dishes. Novice writers need to understand the importance of planning and often require explicit directions on how to plan. Your students may need help and encouragement to think and read about a topic before they begin writing.

Teachers can help adults get started through such pre-writing activities as:

- Memory searches
- Listing, charting, webbing, or clustering raw ideas
- Group brainstorming
- Free writing
- Large and small group discussion and partner interviews
- Reading and research on questions generated through class discussion

Drafting – the process of writing down ideas, organizing them into a sequence, and providing the reader with a frame for understanding these ideas. The end result is a composition or "first draft" of the ideas. The following questions might be helpful to students as they compose their first drafts:

- What ideas or thoughts will you include?
- How will you organize the material?
- How will you introduce, develop and conclude our first draft?
- What will the title of your paper be?

Research continues to identify many advantages to having students write cooperatively. At the idea stage, multiple perspectives help students explore the topic more extensively. Students working together on a computer often create higher quality drafts with a tighter focus on the topic. The immediate response that is provided by a writing partner during the composing stage helps students develop their ideas in a coherent way.

Polishing – the process of editing and revising based on an evaluation of the writing. Writing is hard work. A writer devotes a great deal of time and effort on a piece of writing. Feedback on students' writing can significantly improve the quality of their work. The response can be in the form of a conference with the teacher, but it is also important to encourage peer response, since peers constitute the primary audience for the writing sample. Student response groups can be very helpful in reviewing the strengths and weaknesses of written work. However, teachers must be cautious when using student response groups so that individual self-esteem is maintained.

Students may require help to understand that the revision of an article or writing sample is a creative step that all professional writers engage in frequently. It is not just correcting a poorly written paper. Writers often go through many revisions before they are satisfied with their work. It is helpful if the teacher can arrange to have a professional writer talk with the class about his or her own process of revision. The process of revision also helps students learn to analyze their writing, correct weaknesses, and avoid the same problems in future writing.

The questions that students should ask themselves as they proceed through the polishing stage are:

- How can the responses from others improve my paper?
- What new ideas do I have for the paper?
- What information should I add or delete?
- Have I corrected all spelling and grammatical errors?

Internet Resources for Language Arts, Writing

The Internet is an incredible resource for teachers and for students. From handouts to interactive games for students, the Internet can provide opportunities for students to build their writing skills and to master the fine points of grammar. It is recommended that teachers review each site to determine whether or not the site meets the needs of students in that particular learning environment. Please note that some sites are intended specifically for teachers to refresh their own skills in Language Arts, Writing or to obtain handouts that can be used as practice activities in the classroom.

Please note: All websites reviewed April 2007. All links are currently active.

ABC's of the Writing Process This site shows the five basic steps in the writing process: prewriting, writing, revising, editing and publishing.
http://www.angelfire.com/wi/writingprocess

At the Classroom Level: Writing in the Disciplines and Writing to Learn, Northwest Regional Educational Laboratories.
http://www.nwrel.org/request/2004dec/classroom.html.

Authentic Assessment Toolbox Extensive site developed by Jonathan Mueller that provides materials on how to use authentic tasks and/or assessments in the classroom.
http://jonathan.mueller.faculty.noctrl.edu/toolbook/howdoyoudoit.htm

Brief Guide to Business Writing Online text developed by the University of Iowa that provides easy to understand information on commonly used and accepted guidelines for business writing.
http://www.biz.uiowa.edu/faculty/kbrown/writing.html

Common Errors in English This site provides information on hundreds of common errors found in writing focusing on the misuse of words.
www.wsu.edu/~brians/errors/index.html

EdHelper.Com Downloadable graphic organizers.
http://www.edhelper.com/teachers/graphic_organizers.htm?

eMints National Center This website is a collaborative effort between the Missouri Department of Elementary and Secondary Education and University of Missouri System Office of Academic Affairs. It is designed to provide teachers and students with professional development and support from certified instructional specialist. It includes a wide range of writing resources for teachers.
http://www.emints.org/ethemes/resources/S00000646.shtml?prnfriendly

More resources at: http://www.emints.org/ethemes/resources/S00000357.shtml

Freeology.Com The Teacher's Freebie Directory Free downloadable graphic organizers and hundreds of writing prompts.
http://www.freeology.com/graphicorgs/

GED Testing Service Examples of questions on the language arts, writing portion of the GED plus information on the GED Tests.
http://www.gedtest.org

Grammar Bytes An interactive site for the basics of grammar. Games change periodically.
http://www.chompchomp.com/

Grammar Slammer This website acts as a resource guide for all things related to grammar and includes rules and examples for all areas.
http://englishplus.com/grammar/gsdeluxe.htm

Graphic.Org Wide variety of graphic organizers with information about their use.
http://www.graphic.org/goindex.html

Guide to Grammar and Writing Professor Charles Darling at Capital Community College has created this incredible resource on grammar and writing. The site provides information at the word and sentence, paragraph, or essay level.
http://grammar.ccc.commnet.edu/grammar/

The Guide to Grammar and Writing also features online quizzes and an assortment of downloadable PowerPoint presentations on various grammatical issues.
http://webster.commnet.edu/grammar/index.htm

Hacker Handbook This interactive resource includes a series of quizzes to test student's knowledge in all areas of grammar. These exercises were developed by Dianne Hacket at Prince George's Community College in Maryland. Note: Shockwave is required to complete the exercises.
http://www.bedfordstmartins.com/hacker/exercises/

Hard Spell This interactive spelling game includes hundreds of words and never uses the same list twice. It is challenging but excellent for helping students with more difficult words. In Game 1 you must find the word that is spelled correctly. In Game 2, you find the incorrectly spelled word and correct it.
http://www.bbc.co.uk/hardspell/hardspell_game.shtml

High School Ace A list of different language arts websites, including commonly confused words, grammar and vocabulary lessons, and poetry.
http://highschoolace.com/ace/ace.cfm

Northwest Regional Educational Laboratory Look at the Six-Trait Analytical Assessment Model developed for evaluating writing. The six traits include ideas, organization, voice, word choice, sentence fluency, and conventions. (The Presentations Trait has recently been added to make it 6+1 traits.) This site provides a wealth of information about the six traits, including lesson ideas and downloadable handouts.
http://www.nwrel.org/assessment/

Online Technical Writing: Online Textbook This book was developed to provide users with some basic technical writing skills which can help students improve their writing in class as well as in the workplace.
http://www.io.com/~hcexres/textbook/

Paradigm Online Writing This is a comprehensive online textbook covering all aspects of the writing process.
http://www.powa.org/

Purdue University's OWL One of the most extensive collections of advice about writing found on the web. About half of the more than 75 handouts address punctuation and grammatical issues and include exercises for the user. Others focus on style, reference formats, and give advice about the writing process itself.
http://owl.english.purdue.edu/

RAFTS Northern Nevada Writing Project The project includes print materials that may be purchased as well as access to RAFTS prompts that can be generated electronically.
http://www.unr.edu/educ/nnwp/index.html

Region 15 Graphic Organizers Wide range of downloadable graphic organizers (available in English and Spanish) many of which have multiple variations.
http://www.region15.org/curriculum/graphicorg.html

Rubric Bank This site established by Chicago Public Schools includes rubrics for all subject areas. Teachers may access the rubrics as pdf files and may adapt them as needed.
http://intranet.cps.k12.il.us/Assessments/Ideas_and_Rubrics/Rubric_Bank/WritingRubrics.pdf

Spell Check at Funbrain This site provides two levels of difficulty. Excellent resource for students who have problems with spelling.
http://www.funbrain.com/spell/index.html

Teaching Writing in Middle and High Schools Northwest Regional Educational Laboratories.
http://www.nwrel.org/request/2004dec/principles.html

The Elements of Style An easy-to-understand guide to correct grammar. This online version contains the complete original text. It is filled with tips on how to write clearly and correctly and how to avoid the most common grammatical errors.
http://www.bartleby.com/141/index.html

The Internet Grammar Guide An online course in English grammar written primarily for university undergraduates. However, useful to anyone who is interested in the English language.
http://www.ucl.ac.uk/internet-grammar/

The National Commission on Writing in America's Schools and Colleges This site includes research reports developed to focus national attention on the teaching and learning of writing. In addition to research reports, the site also provides access to The National Writing Project which includes 30 activities for the classroom.
http://www.writingcommission.org

The National Council of Teachers of English (NCTE) A wealth of information on the writing process, NCTE has developed national standards for assessment and evaluation in the area of English. One of the 29 standards for assessment and evaluation in the NCTE report states that "control of the conventions of edited American English...spelling, handwriting, punctuation and grammatical usage should be developed primarily during the writing process.
http://www.ncte.org/

The WAC Clearinghouse This site publishes journals, books, and other resources for teachers who use writing in their courses.
http://wac.colostate.edu/index.cfm

The Writing Site This site is maintained by the Corporation for Educational Technology and the Indiana Department of Education. The site includes extensive writing resources for the classroom.
http://www.thewritingsite.org

University Vocabulary Trainer This site includes college level vocabulary but is a great interactive vocabulary site with a variety of activities. Don't let the Chinese translations in some areas keep you form using this site. It was developed by the Language Centre at the University of Hong Kong University of Science and Technology. Registration is required, but it is free.
http://uvt.ust.hk/about.html

Wacky Web Choose from over a dozen different story titles, then fill in the blanks for different parts of speech. After you've identified all the words, click and a nonsensical story will be made with them.
http://www.eduplace.com/tales/

WebGrammar This site includes general to specific grammar tips as well as a Writing Section with style guides and other resources.
http://www.webgrammar.com/

Word Games This site includes eight word games that students can play alone or as a group.
http://www.eastoftheweb.com/games/index.html

Writing Centre of the University of Ottawa HyperGrammar.
http://www.uottawa.ca/academic/arts/writcent/hypergrammar/partsp.html

Writing Skills Necessary for Employment A report on business and the need for writing within the workplace National Commission on Writing, College Board.
http://www.writingcommission.org/pr.writing_for_employ.html

Mathematics

Analysis of the GED Mathematics Test, Parts I and II

As indicated in the first chapter of this resource guide, the GED Mathematics Test consistently receives the lowest scores of all five content areas. In 2004, the GED Testing Service conducted an item analysis of three operational forms of the GED Mathematics Test. The findings of the Florida GED Research Project mirror the results of the national study – students have difficulty with three primary areas: measurement and geometry, algebraic thinking or calculation, and graphic literacy.

The GED Mathematics Test consists of two parts. Both parts are equally weighted and include the same types of questions. Part I allows for the use of the calculator. Part II does not allow calculator use. Both parts include alternate format questions which require students to construct a response much as the student would have to do in real-life situations which require calculations or problem solving. All questions are presented as word problems.

The GED Mathematics Test includes four content areas:

- Number operations and number sense
- Measurement and geometry
- Data, statistics, and probability
- Algebra, functions and patterns

Questions on the GED Mathematics Test are presented in three formats:

- Procedural problems which require that the student be able to determine what operation and/or process is needed to solve the problem.
- Conceptual problems which require the student to understand basic mathematical concepts and be able to “set-up” the problem but not solve it.
- Application problems which focus on the use of mathematical concepts and procedures in real-life situations.

Twenty-one questions were identified as moderately to severely problematic for students, i.e., questions missed by 40% or more of the students tested. Eleven of these questions (52%) required that students interpret information from a graphic. This provides clear evidence that GED students lack basic graphic literacy skills essential for success on the GED Tests. Students had the greatest difficulty in dealing with graphics which involved triangles, angles, and multi-line graphs.

Fourteen of the twenty-one most frequently missed questions (67%) were presented as application problems indicating that students lack the ability to take basic mathematical skills and concepts and apply them to real-life situations. This may be due in part to the instructional practices in many classrooms which focus on the use of either textbooks or computer-assisted instruction which often presents contrived situations rather than those a student would experience in real-life.

Seven of the most frequently missed questions were in the area of measurement and geometry. In a national study conducted by the GED Testing Service, geometry was proven to be the most problematic for students nationwide. Eight of the most frequently missed questions were in the area of algebra, another area identified as problematic by the GED Testing Service.

Conclusion

Based on an analysis of the items missed, the following areas create significant challenges for students and thus instructors should place a greater emphasis on these areas, especially just prior to the students taking the GED Mathematics Test:

- Number Operations and Number Sense
  - Percentage problems
  - Problems that require a gridded response
- Measurement and Geometry
  - Comparison of two similar figures
  - Triangles and angles (supplementary and complementary)
  - Pythagorean Theorem
- Data, Statistics, and Probability
  - Location of data in a chart or table
  - Interpretation of a line or bar graph
- Algebra, Functions and Patterns
  - Exponents
  - Proportions to solve for a variable
  - Y-intercept
  - Determine value of a variable

GED Mathematics Content

The GED Mathematics Test assesses the student's understanding of math concepts and his/her ability to apply those concepts in different situations. In mathematics, it is not enough to be able to know that the area of a rectangle is "length times width," but rather to know when area should be calculated in order to solve a specific problem.

The GED Mathematics Test is divided into two parts. Part I allows for the use of a calculator. Part II does not. Both parts include open-ended questions in which the answers are placed on a grid. Two types of grids are used:

- Standard grid
- Coordinate plane grid

The GED Mathematics Test is designed to:

- Measure problem-solving, analytical, and reasoning skills
- Determine if a student can interpret information from word problems and from graphics such as charts, tables, graphs, and diagrams
- Present problems in a real-life context
- Provide reference materials such as the formulas page and directions for calculator and grid use
- Allow candidates to use a calculator on Part I to avoid the tedium of long involved calculations and to provide numbers that one would see used in real-life
- Require candidates construct an answer to about 20% of the questions and then record those answers on standard and coordinate plane grids

GED Mathematics Content Areas

The GED Math Test includes questions from four major areas:

- Number Operations and Number Sense
- Measurement and Geometry
- Data Analysis, Statistics, and Probability
- Algebra, Functions, and Patterns

Number Operations and Number Sense

About 20-30% of the GED Mathematics Test is in the area of Number Operations and Number Sense. The skills to be tested include:

- represent and use numbers in a variety of equivalent forms (integer, fraction, decimal, percent, exponential, and scientific) in real world and mathematical problem situations;
- represent, analyze, and apply whole numbers, decimals, fractions, percents, ratios, proportions, exponents, roots, and scientific notation in a wide variety of situations;
- recognize equivalencies and order relations for whole numbers, fractions, decimals, integers, and rational numbers;
- select the appropriate operations to solve problems (for example, *When should I divide*?);
- relate basic arithmetic operations to one another;
- calculate with mental math, pencil and paper, and a scientific calculator using whole numbers, fractions, decimals, and integers; and
- use estimation to solve problems and assess the reasonableness of an answer.

Measurement and Geometry

About 20–30% of the GED Mathematics Test is in the area of Measurement and Geometry. The skills to be tested include:

- model and solve problems using the concepts of perpendicularity, parallelism, congruence, and similarity of geometric figures;
- use spatial visualization skills to describe and analyze geometric figures and translations/rotations of geometric figures;
- use the Pythagorean Theorem to model and solve problems;
- find, use, and interpret the slope of a line, the *y*-intercept of a line, and the intersection of two lines;
- use coordinates to design and describe geometric figures;
- identify and select appropriate units of metric and customary measures;
- convert and estimate units of metric and customary measure (all conversions within systems);
- solve and estimate solutions to problems involving length, perimeter, area, surface area, volume, angle measurement, capacity, weight, and mass;
- use uniform rates (e.g., miles per hour, bushels per acre) in problem situations;
- read and interpret scales, meters, and gauges; and
- predict the impact of changes in linear dimension on the perimeter, area, and volume of figures.

Data Analysis, Statistics, and Probability

About 20–30% of the questions on the GED Mathematics Test are in the area of Data and Statistics. The skills to be tested include:

- construct, interpret, and draw inferences from tables, charts, and graphs;
- make inferences and convincing arguments that are based on data analysis;
- evaluate arguments that are based on data analysis, including distinguishing between correlation and causation;
- represent data graphically in ways that make sense and are appropriate to the context;
- apply measures of central tendency (mean, median, mode) and analyze the effect of changes in data on these measures;
- use an informal line of best fit to predict from data;
- apply and recognize sampling and bias in statistical claims;
- make predictions that are based on experimental or theoretical probabilities, including listing possible outcomes; and
- compare and contrast different sets of data on the basis of measures of central tendency and dispersion.

Algebra, Functions, and Patterns

About 20–30% of the GED Mathematics Test is in the area of Algebra. The skills to be tested include:

- analyze and represent situations involving variable quantities with tables, graphs, verbal descriptions, and equations;
- recognize that a variety of problem situations may be modeled by the same function or type of function (e.g., $y = mx + b$, $y = ax^2$, $y = a^x$, $y = 1/x$);
- convert between different representations, such as tables, graphs, verbal descriptions, and equations;
- create and use algebraic expressions and equations to model situations and solve problems;
- evaluate formulas;
- solve equations, including first degree, quadratic, power, and systems of linear equations;
- recognize and use direct and indirect variation;
- analyze tables and graphs to identify and generalize patterns and relationships; and
- analyze and use functional relationships to explain how a change in one quantity results in change in the other quantity, including linear, quadratic, and exponential functions.

GED Mathematics Test Question Types

The GED Mathematics Test includes three types of questions. These questions are designed to assess how well students can demonstrate their ability to apply math skills in different situations. A general explanation and a sample question for each question type are located on the next page.

Procedural Questions

Procedural questions require a candidate to select and apply the appropriate process for solving a problem. Approximately 20% of the questions on the GED Mathematics Test will be procedural. Procedural questions include these types of skills:

- select and apply the correct operation or procedure to solve a problem;
- verify and justify the correctness of a procedure using concrete models or symbolic methods;
- modify procedures to deal with factors inherent in problem settings;
- use numerical algorithms;
- read and interpret graphs, charts, and tables;
- execute geometric constructions; and
- round, estimate and order numbers as needed in a given situation.

Example

The warehouse is shipping 6832 calculators. If each box can contain 28 calculators, how many boxes will be needed for the shipment?

(1) 79
(2) 154
(3) 169
(4) 244
(5) 239

To find the number of boxes needed, the number of calculators is divided by the number per box.

- boxes needed = number of calculators ÷ number of calculators per box
- boxes needed = 6832 ÷ 28
- boxes needed = 244

Conceptual Questions

Conceptual questions require a candidate to demonstrate knowledge of how basic math concepts and principles work. In some conceptual problems, candidates will be required to identify how to solve a problem, but they will not be required to actually compute the answer. Approximately 30% of the questions on the GED Mathematics Test assess conceptual understanding. These questions assess the ability to:

- recognize and label basic mathematical concepts;
- generate examples and counter-examples of concepts;
- interrelate models, diagrams, and representatives of math concepts;
- identify and apply concepts and principles of mathematics;
- know and apply facts and definitions;
- compare, contrast, and integrate related concepts and principles;
- recognize, interpret and apply signs, symbols, and mathematical terms; and
- interpret assumptions and relationships.

Example

Shane is working with a spreadsheet on his computer. The spreadsheet will calculate the cost of the wood trim around rectangular windows based on the dimensions of the window and the price of the wood. The following entries have been made.

Length of window in feet	Width of window in feet	Price per foot of wood trim	Cost of trim for window
A7	**B7**	**C7**	

Shane wants to enter a formula in the last column so that the spreadsheet will calculate the final cost of the job. Which of the following formulas should he enter?

(1) A7 x B7 x C7
(2) (2 x A7 + 2 x B7) x C7
(3) A7 + B7 + C7
(4) (A7 + B7) x C7
(5) A7 x B7 + C7

The candidate must recognize that the perimeter of the rectangle must be found and multiplied by the cost per foot of the trim used. The cell locations become the variables in the formula.

- (perimeter of rectangular window) times (price per foot of wood trim)
- (2 x length + 2 x width) x price per foot
- (2 x A7 + 2 x B7) x C7

Application/Modeling/Problem Solving

These questions assess the ability to apply mathematical principles and problem-solving strategies. About 50% of the questions on the GED Mathematics Test involve the skills of application, modeling, or problem solving. These questions require the ability to:

- recognize and identify the type of problem that is represented;
- decide whether or not there is sufficient information provided to solve a problem;
- select only the information that is necessary to solve a given problem;
- apply the appropriate problem-solving strategy to compute an answer;
- adapt strategies or procedures to solve a problem; and
- determine whether an answer is reasonable and correct.

Example

Byron purchased a $5000 certificate of deposit (CD) at his local bank. The CD will pay him 7 percent simple interest at the end of two years. In dollars, how much INTEREST will Byron have earned from his CD at the end of the two-year period?

Mark your answer in the circles in the grid on your answer sheet.

The formula for simple interest is found on the formulas page in the front of the GED Mathematics Test.

- simple interest = principal x rate x time
- simple interest = $5000 x 0.07 x 2
- simple interest = $700

Strategies for Teaching Mathematics

Students are often fearful regarding mathematics. Address and evaluate attitudes and beliefs regarding both learning math and using math. Prior to any true learning taking place, the instructor must discuss with students how traditional methods of teaching mathematics may have caused them to develop a negative attitude.

1. Determine what students already know about a topic before instruction. Use an informal discussion of what students already know about a topic prior to teaching. Formal assessment instruments do not always provide an accurate picture of a student's real life knowledge or thinking processes. For example, if discussing positive and negative integers, discuss a bank account and the concept of being "overdrawn" or in the negative category.

2. Develop understanding by providing opportunities to explore mathematical ideas with concrete or visual representations and hands-on activities. Students will learn more effectively if they can visualize concretely an abstract concept (If you can “see” it you can solve it).

3. Use manipulatives such as Cuisenaire rods, fraction circles, geoboards, algebra tiles, or everyday objects such as coins, toothpicks, etc. to help students explain how mathematical rules and concepts work. Start with concrete objects to move to abstract ideas.

4. Encourage the development and practice of estimation skills. During everyday life, one does not always use "exact" math. Teach students how to estimate. Strategies to use can include rounding to whole numbers, multiplying by 10 rather than 9, or dividing by whole numbers rather than multiplying by fractions. Use test examples to show students that good estimation can result in correct answers. Have the students work out the problem using computation skills to support their estimations.

5. Emphasize the use of "mental math" as a legitimate alternative computational strategy. Encourage the development of mental math skills by making connections between different mathematical procedures and concepts. GED students often have difficulty with multi-step problems. Teach them mental math strategies that "make sense to them." An example would be to multiply $4.00 by 4 and then subtract 4 from the answer to solve the equation $3.99 x 4. Utilizing division rather than percentages is another example of mental math, i.e. dividing a number by 4 rather than multiplying it by the equivalent percentage 25%. Always discuss the "why" of such skills and whether paper/pencil calculation or mental math is the best method to use for the problem.

6. View computation as a tool for problem solving, not an end in itself. GED students must learn more than mere calculations. The GED Tests focus on *why* and *when* concepts. Integrate problem-solving abilities while teaching computation skills. Story problems or real-life problems must be a significant part of instructional time. Have students write their own story problems to reinforce the connection between computation and real-life skills. Share the problems with the class, providing a mixture of computational procedures rather than supporting just one concept such as subtracting fractions.

7. Encourage use of multiple solution strategies. Teach your students how to solve problems in different ways. In many mathematical problems, there is more than one way to find the solution. There are eight categories of problem solving strategies. Help students learn how to use as many of these as possible, so they have a full repertoire of

strategies to draw from when they encounter different problems. These categories of problem-solving strategies include:

- Drawing a picture or diagram
- Marking a chart or graph
- Dividing a problem into smaller parts
- Looking for patterns
- Using a formula or written equation
- Computing or simplifying
- Using the process of elimination
- Working backwards

8. Help students understand the process required in problem solving.
    - Read the problem carefully. Reread if necessary.
    - Determine the meaning of key words or special terms.
    - State the goal in your own words.
    - List the important information.
    - Recall similar problems and recall how they were solved.
    - Try different approaches.
    - Match your solution with the original goal. Does it make sense? Is it accurate?

9. Develop students' calculator skills. Calculators are allowed on Part I of the GED Mathematics Test. Since calculators are allowed, set aside time to teach students how to correctly use the calculators to perform single and multi-tasked problems. Calculators can be used by students to check their work, to solve tedious computations, and as a problem-solving tool. It is important that the Casio *fx*-260 Solar Scientific Calculator be used in the GED classroom. The Casio is the official GED calculator and is provided for students when they take the GED Tests. If students work with a different type of calculator in the classroom and then have to use the Casio for the test, they may become confused over the different methods of operation found with different brands of calculators.

10. Provide opportunities for group work. The workforce requires teamwork. Even in mathematics, teachers should work on the concept of teaming. Develop a project where a group effort is appropriate. An example would be to organize an activity where the development of a plan, schedule, budget, needed business materials, and a report would be required. As with all group activities, clear goals and rules must initiate the project. A rubric would be helpful in providing students with the structure to assess their own progress as a group.

    Link numeracy and literacy instruction by providing opportunities for students to communicate about mathematical issues. Students need to be able to communicate about math. Teachers should provide real life activities in which math is used. Examples would include teaching math concepts to others, letters of complaint to companies clearly detailing a billing problem, a detailed explanation of why a bank statement was incorrect, or a formal discussion of why a method was selected to solve a particular real life problem.

    Provide problem-solving tasks within a meaningful, realistic context in order to facilitate transfer of learning.

    Students need to view math as a necessary skill in their lives. Students can assist transference of mathematical skills to real-life experiences through the sharing of experiences. These experiences can be used as problem-solving projects for the class. Projects can be as simple as comparing the price of cereals to as complex as finding the best mortgage deal. Discuss how students use math in their daily lives and set up problems based upon these scenarios.

11. Develop students' skills in interpreting numerical or graphical information appearing within documents and text. Math does not always take the form of computation. Graphs, tables, text, payment schedules, and contracts are just a few of the ways in which text is filled with mathematical concepts. Strategies to use in teaching students how to accurately interpret such documents can include having students graph information from their lives for the last 24 hours. Pictorial, circle, line, or any type of graph can be used to visually document numerical information. Another activity would be to have students critique and discuss an article filled with numerical information such as an employee benefit statement.

12. Assess a broad range of skills, reasoning processes, and dispositions using a range of methods. The GED Mathematics Test assesses skills in a variety of methods. Use various assessment strategies when teaching mathematics. Include not only multiple-choice questions, but also alternate format questions that require the use of standard and coordinate plane grids. Provide open-ended questions, graphs, tables, text, and short answer questions requiring verbal documentation of how a solution was obtained. Remember that assessments do not always have to be formally graded. Having students write down the steps they use to solve a problem and why they chose those particular steps can help students become more confident in their problem solving ability. Written explanations can also offer you insight into areas that are causing problems and where students may need additional instruction.

Recommendation from GED Testing Service

The GED Testing Service recommends that all preparation programs provide a well-rounded mathematics curriculum and that they place special emphasis on the following just prior to the student taking the GED Mathematics Test. The following tips focus on items that have traditionally provided students with the greatest challenges in passing the GED Mathematics Test.

Geometry Tips

- Any side of a triangle CANNOT be the sum or difference of the other two sides (Pythagorean Theorem).
- If a geometric figure is shaded, the question will ask for area; if only the outline is shown, the question will ask for perimeter (circumference).
- To find an area of a shape that is not a common geometric figure, partition the area into non-overlapping areas that are common geometric figures.
- If lines are parallel, any pair of angles will either be equal or have a sum of 180°.
- The interior angles within all triangles have a sum of 180°.
- The interior angles within a square or rectangle have a sum of 360°.

Calculation Tips

- Replace a variable with a REASONABLE number, and then test the alternatives.
- Be able to find 10% of ANY number.
- Try to think of reasonable (or unreasonable) answers for questions, particularly those involving fractions.
- Try alternate means of calculation, particularly testing the alternatives (best on Part I).

- Remember that exponents are powers, and that a negative exponent in scientific notation indicates a small decimal number
- Be able to access the square root on the calculator; alternately, have a sense of the size of the answer.

Graphic Tips

- Have candidates find examples of different types of graphs.
- Have candidates create questions for their graphics and/or those of others.
- Develop the capacity to translate from graphics to text as well as text to graphics.
- Develop the capacity to select pertinent information from the information presented.
- To reinforce the need to read and interpret scales, present graphs without scales or without units.

Activities for the Mathematics Classroom

The following are just a few activities that teachers can use to help students enhance their skills in the GED Mathematics classroom. Handouts may be reproduced as needed.

- Personal Math Dictionary – have students keep their own dictionary of key math terms, definitions, and when appropriate a drawing or diagram that represents the term.

- Geometry Concentration – helps students build their vocabulary skills.

- Impossible Triangles – helps students master understanding of the characteristics of various triangles and then be able to identify whether a triangle could be constructed given the rules that govern triangles.

- It's All Just Math Transference! – have student translate text to mathematical expressions, an essential skill in mastering algebra and working with variables.

My Personal Mathematics Dictionary

Math Term	Definition (In my own words)	My Own Example/Drawing
Example: Scalene triangle	A triangle that has three unequal sides and angles.	

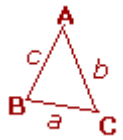
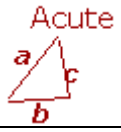
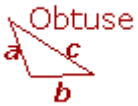
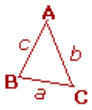
Geometry Concentration

Students need to be able to use and apply the vocabulary of geometry. Use the following terms to create games such as concentration, jeopardy, or matching activities to ensure that students understand the vocabulary used on the GED Mathematics Test. You may wish to add additional geometric terms based on texts and students' experiences.

Term	Definition
Right angle	A 90 degree angle.
Equilateral triangle	A triangle with all sides equal.
Scalene triangle	A triangle having three unequal sides and angles.
Vertex	The intersection of two sides.
Right triangle	A triangle with one internal angle equal to 90 degrees.
Pentagon	A polygon with 5 sides and 5 angles.
Square	A rectangle having all four sides of equal length.
Intersecting lines	Lines that cross each other.
Perpendicular lines	Two lines that cross each other to form a 90 degree angle.
Acute angle	An angle less than 90 degrees.
Chord	The line segment between two points on a given curve.
Radius	A straight line extending from the center of a circle to the surface.
Line segment	One part of a line.
Line	A continuous extent of length.
Point	A position in space.
Rectangle	A quadrilateral with opposite sides parallel and all angles 90°
Circle	A closed plane.
Closed curve	A curve that is continuous with meeting end points.
Hexagon	A six-sided figure.
Obtuse angle	An angle greater than 90 degrees.
Congruent angles	Two angles that have the same measure.
Bisect	To separate an angle into two congruent angles.
Degrees	The unit that angles are measured.
Isosceles triangle	A triangle with at least two sides congruent.
Similar	Figures that have the same shape, but not necessarily the same size.
Parallelogram	A quadrilateral with both pairs of opposite sides parallel.
Trapezoid	A quadrilateral with exactly one pair of opposite sides parallel.

Impossible Triangles

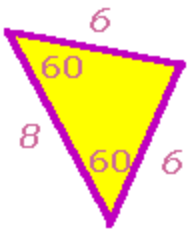
Provide students with the following rules and see if they can determine why the triangles on the worksheet could not be drawn as indicated. For each triangle, select the rule that is violated.

Rules	
	**1.** In any triangle, a + b > c b + c > a a + c > b.
	**2.** In an acute triangle, $c^2 < a^2 + b^2$.
	**3.** In a right triangle, $c^2 = a^2 + b^2$.
	**4.** In an obtuse triangle, $c^2 > a^2 + b^2$.
	**5.** In any triangle, a < b, if and only if Angle A < Angle B.
	**6.** A triangle has all sides of equal length if and only if all its angles are of equal measure.

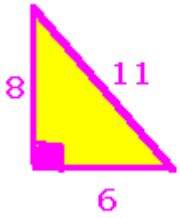
Lanius, Cynthia. MathForum. Retrieved from the World Wide Web at: http://math.rice.edu/~lanius/Geom/Imposs/index.html.

Impossible Triangles

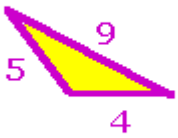
For each triangle below, select the rule that is violated. Select Rule # 1, 2, 3, 4, 5, or 6.



1. Rule violated is: _____

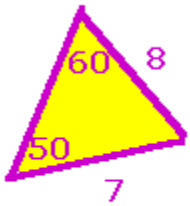


2. Rule violated is: _____

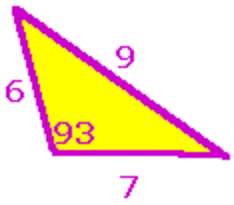


3. Rule violated is: _____

4. Rule violated is: _____



5. Rule violated is: _____



Answers to Impossible Triangles

a. Rule 6
b. Rule 3
c. Rule 1
d. Rule 5
e. Rule 4

Regardless of What You Call the Terms, It's All Just Math!
Transference

Translate the following into a mathematical expression.

1. the difference between twice x and y
2. the difference between the square of x and x
3. the quotient of y and 3
4. five times the sum of x and y
5. the sum of 4 times x and y
6. ten less than x
7. the product of a, b, and c
8. the sum of 7 and x
9. x minus 8
10. x less than 8

Try These!

For each of the following, write an expression in terms of the given variable that represents the indicated quantity.

1. The cost of having a mechanic fix your car if he spends *h* hours on the job and charges $39 for parts and $45 per hour for labor.
2. The sum of three consecutive even numbers if the first number is *n*.
3. The amount of money in Steve's bank account if he put in *d* dollars the first year, $600 more the second year than the first year, and twice as much the third year as the second year.
4. The first side of a triangle is *s* yards long. The second side is 3 yards longer than the first side. The third side is three times as long as the second side. What is the perimeter of the triangle in feet?

Internet Resources for Mathematics

The Internet is an incredible resource for teachers and for students. From handouts to interactive games for students, the Internet can provide opportunities for students to build their mathematics skills and to learn how to apply those skills to real-life tasks and situations. It is recommended that teachers review each site to determine whether or not the site meets the needs of students in their particular learning environment. Please note that some sites are intended specifically for teachers to refresh their own skills in mathematics or to obtain handouts that can be used as practice activities in the classroom.

Please note: All websites reviewed April 2007. All links are currently active

AAAMath This site has hundreds of pages of basic math skills, interactive practice, challenge games and random math problems.
http://aaamath.com

Algebra Lab Activities and information for algebra and how to solve different types of problems.
http://www.algebralab.org/

Algebra Bingo A fun game to get students familiar with terminology.
http://www.sageoak.com/bingo.asp?whichbingo=Algebra

Algebra Courses The Math Lab provides courses in basic and more advanced algebra.
http://www.themathlab.com/Algebra/algebra.htm

Algebra Course from Annenberg An algebra course for teacher or student knowledge.
http://www.learner.org/channel/courses/learningmath/algebra/index.html

Algebra Review in Ten Lessons University of Akron.
http://www.math.uakron.edu/~dpstory/mpt_home.html

An Online Algebra Text A full online textbook by James Brennan, Boise State University.
http://www.jamesbrennan.org/algebra/

Annenburg Geometry A great introduction to geometry for teachers and students.
http://www.learner.org/teacherslab/math/geometry/across.html

Annenberg Math Courses for Elementary and Middle School Teachers This is an online course of study to get started with different math strategies and ideas.
http://www.learner.org/channel/courses/learningmath/index.html

Animated Pythagorean Theorem United States Naval Academy Mathematics. Department. Shows a proof of the Pythagorean theorem.
http://www.nadn.navy.mil/MathDept/mdm/pyth.html

Aplus Math Click on the worksheets and create your own drills. Can specify number of problems per page, operation, and types of problems.
http://www.aplusmath.com/

Atlas of Geometry Expressions Saltire Software. Overview of different terms and theorems in geometry.
http://www.geometryexpressions.com/Geometry_Atlas/GeometryAtlas.php

British Broadcasting Company Lots of games, activities, lesson plans, and information in all areas of mathematics.
http://www.bbc.co.uk/schools/gcsebitesize/maths/algebrafi/

Brunnermath Personal teacher website with lots of math lessons – may take a bit to download. In both English and Spanish.
http://www.brunnermath.com/geometry.htm

Clever Games for Clever People Mathematic games that can be used in the classroom to teach critical thinking and problem solving skills. Taken from: Conway, John. 1976. On Numbers and Games. New York: Academic Press, Inc.
http://www.cs.uidaho.edu/~casey931/conway/games.html

Colby Community Math Department A mathematics reference collection of "K through 14" math tables, facts, definitions, formulas and explanations.
http://www.colbycc.org/www/math/math.htm

Eisenhower National Clearing House for Math (ENC Online) Use math topic words to find web sites with lesson plans and activities.
http://www.enc.org/features/lessonplans/math/0,1544,,00.shtm

EdHelper.com A site of lots of resources, games, and activities for all different levels of math.
http://www.edhelper.com/

ErforA (Education Resources for Adults) A website that includes numerous resources focusing on communications and numeracy. The materials are suitable for adults with functioning levels between 6.0 and 12.0.
http://www.fodoweb.com/erfora/index.asp

Expressions and Equations Ideas for teaching introductory algebraic topics.
http://www.pleasanton.k12.ca.us/pleasanton/MathWeb/Grade8/AlgExpress/AlgExpress_TOC.html

Free Online Mathematics Interactive math activities. H & H Publishing Company.
http://www.onlinecollegeprep.com/FreeArithmetic/

Futures Channel Movies and activities connect math to the real world.
http://www.thefutureschannel.com/hands-on_math/geometry.php

Geometry Center University of Minnesota. Site filled with information and activities.
http://www.geom.uiuc.edu/

Geometry Junkyard Lots of different topics on a variety of geometric topics.
http://www.ics.uci.edu/~eppstein/junkyard/

Geometry Online An online geometry course of study.
http://math.rice.edu/~lanius/Geom/

Geometry Prep Lots of information for the geometry classroom.
http://www.regentsprep.org/Regents/math/geometry/math-GEOMETRY.htm

Guide to Problem Solving Research information and ideas on how to develop better problem solving skills.
http://www.mnlincs.org/abeonline/solving/index.htm

Illuminations Great lesson plans from NCTM.
http://illuminations.nctm.org

INsites into Algebra 1 Algebra information and professional development for middle and high school teachers from Annenberg.
http://www.learner.org/resources/series196.html

Introduction to Geometry Good review of geometric principles.
http://library.thinkquest.org/2647/geometry/intro/intro.htm

King's List of Online Math Activities Take a look at the section on geometry for lots of great sites with excellent materials and activities.
http://www.k111.k12.il.us/King/math.htm#About%20Space%20Activities

LINCS Science and Numeracy Collection This site contains numerous links to science and mathematics materials and resources.
http://literacynet.org/sciencelincs/studentlearner-num.html

Math in Daily Life Annenberg site for applied math skills for daily life.
http://www.learner.org/exhibits/dailymath/

Mathematics Resources on the Internet This website contains hundreds of links to math websites.
http://mathres.kevius.com/

Math Open Reference A great site of definitions and visuals for students.
http://www.mathopenref.com/triangle.html

Math Placement Test Online College Prep Interactive algebra examples.
http://www.onlinecollegeprep.com/placementtest/intro/PlacementTest.htm

My Math Test Department of Mathematics at Nassau College and Addison-Wesley provide information for this site on math.
http://www.mymathtest.com/

National Council of Teachers of Math (NCTM) Professional organization for teachers of mathematics. Research, publications, national standards, and general information are available at the site.
http://www.nctm.org/

National Library of Virtual Manipulatives for Math All types of virtual manipulatives for use in the classroom from algebra tiles to fraction strips. This is a great site for students who need to see the "why" of math.
http://nlvm.usu.edu/en/nav/topic_t_2.html and http://nlvm.usu.edu/en/nav/index.html

PBS Teacher Source Lesson plans and lots of activities for all math levels.
http://www.pbs.org/teachersource/math.htm

Professor Freedman's Math Help Information on basic math and algebra written for the adult audience.
http://www.mathpower.com/

PurpleMath.com If you're looking for practical algebra lessons, then look no further. This site gives great practical tips, hints, and provides algebra examples. Also it helps to point out common mistakes.
http://www.purplemath.com/modules/modules.htm

Teaching and Problem Solving Sites Includes such informational sites as: Algebra.Help, The Math Forum, etc.
http://www2.hawaii.edu/suremath/sites.html

Teach-nology Algebra practice for students.
http://www.teach-nology.com/teachers/subject_matter/math/algebra/

The Franklin Institute Math and science resources, math worksheets and problem solving, and a great list of math websites.
http://sln.fi.edu/tfi/hotlists/math.html
http://sln.fi.edu/

The Math Forum This comprehensive math website provides articles, lesson plans, and support for any topic in mathematics from K-12 through advanced college courses. The site provides students with sample problems in every mathematical area. "Ask Dr. Math" allows students to ask about math problems and receive an answer via the Internet.
http://mathforum.org/

The Top Ten Sites Choose your topic and go to the top ten sites as identified by the Exploratorium in California.
http://www.exploratorium.edu/learning_studio/cool/mathematics.html

Language Arts, Reading

Analysis o f Language Arts, Reading

Language Arts, Reading is a passage-based, multiple-choice test that measures a student's ability to comprehend and interpret reading selections and to apply those interpretations to new contexts. Literary texts in each test form comprise 75% of the test and include at least one selection from each of the following areas:

- Poetry
- Drama
- Prose Fiction before 1920
- Prose Fiction between 1920-1960
- Prose Fiction after 1960

Nonfiction texts in each test form comprise 25% of the test and include two selections representing two of the three following types of texts:

- Nonfiction prose;
- Critical review of visual and performing arts; and
- Workplace and community documents, such as mission and goal statements, rules for employee behavior, legal documents, communications, such as letters, excerpts from manuals, etc.

The multiple-choice questions on Language Arts, Reading are constructed on four cognitive levels based on Bloom's taxonomy, including: comprehension, application, analysis, and synthesis. Synthesis requires that students take information from the passage and combine it with information presented in the stem of the question in order to determine an appropriate answer.

Seventeen questions were found to be moderately or severely problematic for students. Of these seventeen questions, seven (41%) were derived from fiction passages. The remaining questions were evenly distributed among poetry, drama, and workplace and community documents. Students had difficulty at all levels of Bloom's taxonomy with the highest incidences (five questions each) that required the student to analyze and synthesize information.

Conclusion

Based on an analysis of the items missed, the following areas create significant challenges for students. Instructors should place a greater emphasis on these areas, especially just prior to the students taking the GED Language Arts, Reading Test:

- Fiction
  - Summarization
  - Prediction
  - Compare/contrast
  - Characterization
- Poetry and Drama

    - Attribute feelings
    - Cause and effect
    - Prediction
- Workplace and Community Documents
    - Transfer information to a different situation based on what is read

Content of the Language Arts, Reading Test

The GED Language Arts, Reading Test assesses a student's ability to comprehend and interpret reading passages. In addition, students are also required to apply what they have read to new situations. The test includes passages from literary texts, such as poetry, drama, and fiction prose as well as nonfiction prose from workplace and community document. Most passages consist of 200-400 words with four to eight questions for each selection.

Only 20% of the questions assess the basic comprehension skills of students. The remaining 80% require that students use the higher-order thinking skills of:

- application that requires the ability to use information and ideas from a text in a situation different from that described;
- analysis that requires the ability to break down information into basic elements and can require multiple or complex references; and
- synthesis that requires the ability to put elements together to form a whole.

The GED Language Arts, Reading Test also includes synthesis questions, which require the student to use additional information about the text or the author of the text from a question stem. This type of questions requires the student to synthesize the information presented in the text and that provided in the question stem to form a new understanding of the text. For example, a student reads a passage from Edgar Allen Poe. In the question stem, the student is given additional information about Poe's life and how his life may have affected the tone of the passage. Synthesis questions present special challenges to students. Teachers should address these types of questions with students.

Many GED students are not very proficient readers. Their proficiency level can be affected by their reading speed and fluency. For students to be successful on the test, they need to increase their proficiency levels.

Strategies for Teaching Reading

As students become proficient readers, they develop strategies for solving problems within the reading materials. The following are good practices to implement in the GED classroom.

1. Deliver a balanced content reading program including oral, written, and reading materials from a variety of resources.
    - Teach students to read both orally and silently from a variety of fiction and non-fiction materials. Use such diverse materials as technical manuals, literature, magazines, newspapers, textbooks, and business communications.
    - Have students use writing activities to increase their comprehension.
    - Use comprehension activities that include higher order skills of evaluation, synthesis, analysis, inference, and inquiry.
    - Teach students vocabulary building.
    - Use formal and informal assessments such as comprehension tests, portfolios, teacher observation of oral and silent reading, timed readings, and writing assignments.

2. Teach students how to use the structure of language to increase speed and comprehension. Through modeling and demonstrations, teach students how to use text organization to aid in their reading comprehension skills:
    - Select an article and photocopy the section for each student.
    - Read the selection through, paragraph by paragraph, and "think aloud" your own strategies for reading the selection. Have students write down your think alouds in the margin.
    - After completing the reading demonstration, have students summarize the strategies that you used for reading the text.
    - Have students write their own summary of strategies.
    - Complete numerous demonstrations until students understand the strategies that you use.

3. Teach students how to use contextual clues, prefixes, suffixes, decoding skills, and high frequency words
    - Have students identify main ideas, introductory, and conclusion sentences
    - Have students review graphs, charts, lists, bold and italicized print, and symbolism in articles

4. Integrate reading and writing instruction
    - Have students read and write on a daily basis.
    - Use writing to critique a reading sample.

5. Use multiple resources to teach each individual student to better comprehend the written word, such as:
    - Libraries
    - Internet
    - Technology
    - Real life

Gaining Proficiency in Reading

There are a wide range of strategies that students can use to improve their comprehension skills. A major component of good reading comprehension is to have strategies or activities that students can use before they read, while they read, and to check what they have read upon completion.

The problem with most adult education students is that they just start reading and don't use any of the strategies that could help them be more effective readers. The following are activities to utilize in the process of increasing reading comprehension skills.

Pre-Reading Activities

Pre-reading activities prepare students to read the upcoming selection. They can get students interested in reading the selection, remind students of things they already know that will help them understand and enjoy the selection, and pre-teach aspects of the selection that students may find difficult. Pre-reading activities are important. Only with adequate preparation will the experience of reading be enjoyable, rewarding, and successful. Pre-reading options to use in the classroom include motivating students, relating the reading to students' lives, activating

background knowledge, building text-specific knowledge, pre-teaching vocabulary, pre-teaching concepts, pre-questioning, predicting, setting directions, and suggesting reading strategies.

During Reading Activities

Reading activities include both things that students themselves do as they are reading and things that teachers do to assist them as they are reading. During reading activities should include silent reading by students, oral reading by teachers, teacher-guided reading, oral reading by students, and teacher modification of the text.

Post-Reading Activities

Post-reading activities serve many purposes. They provide opportunities for students to synthesize and organize information gleaned from the text so that they can understand and recall important points. They allow students to evaluate an author's message, his or her stance in presenting the message, and the quality of the text itself. Post-reading strategies also allow both teachers and students to evaluate students' understanding of the text and opportunities for students to respond to text.

The following is a list of strategies for each part of the reading comprehension process with explanations, activities, and templates that can be used in GED classroom.

Strategy – Skimming

An important pre-reading strategy is skimming. Skimming is used to quickly identify the main ideas of a text. Most people use skimming when they first open a newspaper. They are not interested in reading every article in depth, but rather skim through the articles within certain sections to see which ones they want to read more carefully. Skimming is usually done at a faster speed than normal reading.

Skimming Method #1

- Run your eyes down the middle to the page
- Zero in on the facts you need

Skimming Method #2

- Skim from the top left-hand corner to the bottom right-hand corner of the page.
- Skim from the top right-hand corner to the bottom left-hand corner.

Scanning

Another pre-reading strategy is scanning. Scanning is a technique that you use when you look up a word in the dictionary or you locate someone’s phone number in a telephone directory. When you scan, you search for key words or ideas. Usually, you know what you are looking for so you concentrate on finding that one thing. Scanning involves moving your eyes quickly down the page to find specific words or phrases.

To scan for specific information, you must:

- start at the beginning of the passage or text;
- move your eyes quickly over the lines, looking for key words related to the information you are trying to find; and
- stop scanning and begin reading as soon as you locate any key words.

TIPP? It!

TIPP? is one strategy that can be used to skim text. When using TIPP?, you focus on the titles, introduction, first sentence of each paragraph, photographs, and other graphic material (graphs, charts, tables) and then determine what questions you have that may be answered by the text. You can use the following graphic organizer to TIPP? an article or any text.

TIPP?	
Title	What do the titles/subheadings and layout tell me?
Introduction	Skim this to get the main idea.
Paragraph	Read the first line of paragraphs/text boxes.
Pictures	What do the diagrams, photos, and graphs show me?
?	Can you come up with any questions?

When introducing the TIPP?, model the process for students and then have students work with you on TIPP?ing a reading sample.

The GIST Procedure (Generating Interactions between Schemata & Text)

The GIST Procedure is a strategy that can be used to improve students' abilities to comprehend the gist or main ideas of paragraphs by providing a prescription for answering the 5 Ws and H questions and then summarizing the passage or by reading and summarizing from sentences to paragraphs to the entire passage. This strategy incorporates reading and writing. At a higher level of comprehension, students may even wish to try to get the "gist" of an entire chapter or unit in a summary sentence.

A GIST form is included in this chapter. Duplicate the form as needed for students. The goal is to get students to develop the habit of asking the basic 5Ws and an H question and summarize as they read any text in any content area.

More Strategies for Teaching Reading

As students become proficient readers, they develop strategies for solving problems within the reading materials. The following are good activities to implement in the classroom.

- Deliver a balanced content reading program including oral, written, and reading materials from a variety of resources.
- Teach students to read both orally and silently from a variety of fiction and nonfiction materials. Use such diverse materials as technical manuals, literature, magazines, newspapers, textbooks, and business communications.
- Have students use writing activities to increase their comprehension.
- Use comprehension activities that include higher order skills of evaluation, synthesis, analyzing, inference and inquiry.
- Teach students vocabulary building.
- Use formal and informal assessments such as comprehension tests, portfolios, and teacher observation of oral and silent reading, timed readings, and writing assignments.

Teach students, through demonstrations, how to use text organization to aid their comprehension.

- Select an article and photocopy the section for each student.
- Read the selection through, paragraph by paragraph, and “think aloud” your own strategies for reading the selection. Have students write down your think-alouds in the margin.
- After completing the reading demonstration, have students summarize the strategies that you used for reading the text.
- Have students write their own summary of strategies.
- Complete numerous demonstrations until students understand the strategies that you use.
- Teach students how to use contextual clues, prefixes, suffixes, decoding skills, and high frequency words.
- Have students identify main ideas, introductory, and conclusion sentences.
- Have students review graphs, charts, lists, bold and italicized print, and symbolism in articles.

Integrate reading and writing instruction.

- Have students read and write on a daily basis.
- Use writing to critique a reading sample.

The following strategies are essential for students to gain greater proficiency in reading:

- Inference - reaching conclusions based on textual information
- Identifying Important Information - finding critical facts or details in the text regardless of the type of writing
- Monitoring - identifying difficulties and changing strategies to improve understanding
- Summarizing - pulling together important information from a lengthy article
- Question Generating - asking silent questions about the reading material in order to integrate information

It is very important that teachers work with students to develop the skills they need to be proficient readers who have a better understanding of what they read.

Strategies for Timed Readings

The fluent reader is able to quickly review an article with understanding. Many students read in a slow and methodical fashion with decreased ability to comprehend. Use timed readings to increase a student's reading speed and comprehension. There are many commercial materials for timed reading; however, any type of fiction or non-fiction reading material can be used. Initiate timed readings by providing a student with a single paragraph. Time the student for one minute. Divide the number of words the student has read by the number of minutes used in the timing. This is the student's rate of reading per minute. As the student becomes more fluent, increase the timed readings to five minutes. Add simple comprehension questions after the student is comfortable with the process.

Reading activities can also be located on the Internet. Use of a computer for timed readings provides a student with independence and a simple way to incorporate this strategy into the classroom.

Students who are proficient readers have a heightened awareness and use of the organization and structure of texts. They know how to read in strategic ways to obtain important knowledge in

diverse reading materials. The strategic reader knows how to preview an article in order to become familiar with the focus, scope, findings and complexity of the material before doing a more thorough reading.

Activities for Teaching Language Arts, Reading

The following are just a few activities that teachers can use to help students enhance their skills in the GED Language Arts, Reading classroom. Handouts may be reproduced as needed.

- TIPP? It – helps students gain pre-reading skills that are essential for enhancing reading comprehension.
- GIST – assists students in mastering summarization skills another important component of reading comprehension.
- Questioning the Author – helps students identify the author's purpose and encourages students to make inferences based on what they have read.
- Heteronyms – provides students practice using words that have different sounds and different meanings but are spelled the same.
- Contranyms – serves as a vocabulary building activity that enables students to recognize words that have two opposite meanings, such as "bad" or "critical."

TIPP? It!

Elements	Notes
T – Title What do the title, subheadings, and layout tell me about this text?	
I – Introduction What is included in the introduction?	
P – Paragraphs What information is included in the first sentence of each paragraph?	
P – Photographs What do the photographs, maps, charts, tables, illustrations tell me?	
?? – Questions What questions do I have about this text?	

Getting the GIST– 5 Ws and H

Name of Text

_____

Complete the following:

Questions	Answer
Who?	
What?	
When?	
Where?	
Why?	
How?	

Write a GIST statement of 20 words or less that summarizes the text.

_____

_____

_____

_____

_____

_____

Questioning the Author

Questioning the Author is one strategy students can use to gain greater proficiency in reading. Using the Questioning the Author format, students make inferences, identify important information, monitor their own understanding of the material, summarize what they have read, and generate their own questions about the author's intent or purpose. The following strategies are essential for students to gain greater proficiency in reading:

The following is an example of Questioning the Author using a short workplace statement as the reading text.

Questioning the Author
Sample Text

Each employee must wash his hands thoroughly with warm water and soap after each trip to the toilet and before beginning work.	
What is the author trying to tell you?	
Why is the author telling you that?	
Is it said clearly?	
How might the author have written it more clearly?	
What would you have wanted to say instead?	

Questioning the Author

Text (Reference to material or actual text)	
What is the author trying to tell you?	
Why is the author telling you that?	
Is it said clearly?	
How might the author have written it more clearly?	
What would you have wanted to say instead?	

Heteronyms (A Different "nym")

A heteronym is a word that has a different sound and different meanings, but the same spelling. All of the heteronyms on the list contain more than one syllable. In Column I, write each heteronym with the accent indicating the meaning that you have chosen. In Column II write a phrase containing the word you have chosen.

Heteronym	Column I	Column II
1. content		
2. invalid		
3. object		
4. minute		
5. conduct		
6. digest		
7. contract		
8. converse		
9. address		
10. compound		
11. desert		
12. complex		
13. discount		
14. relay		
15. attribute		
16. convict		
17. present		
18. defect		
19. advocate		
20. upset		
21. contest		
22. upgrade		
23. compress		
24. buffet		
25. compact		

“Contranyms”

A "contranym" is a homographic antonym, a word that can have two opposite meanings. See if you can find the definitions for each of the following.

Contranym	Definition 1	Definition 2
1. aloha		
2. bad		
3. bolt		
4. buckle		
5. clip		
6. commencement		
7. conviction		
8. critical		
9. dispense		
10. dust		
11. fast		
12. handicap		
13. lease		
14. let		
15. limit		
16. moot		
17. overlook		
18. oversight		
19. peer		
20. qualified		
21. refrain		
22. sanction		
23. scan		
24. splice		
25. take		

Internet Resources for Language Arts, Reading

The Internet is an incredible resource for teachers and for students. From handouts to interactive games for students, the Internet can provide opportunities for students to build basic and advanced reading skills and to learn how to apply those skills to real-life tasks and situations. It is recommended that teachers review each site to determine whether or not the site meets the needs of students in that particular learning environment. Please note that some sites are intended specifically for teachers to provide them with the latest research on teaching reading and how to enhance their students' reading skills.

Please note: All websites reviewed April 2007. All links are currently active

Augusta Technical College Reading strategies for students.
http://www.augusta.tec.ga.us/CounselingCenter/AcademicCounseling/readingStrategies.shtml

Awesome Library Education Sites Lists and links to the top 5% educational sites on the Internet.
http://awesomelibrary.org/

Cerritos College Skills Tutorials Practice in the area of reading.
http://www.cerritos.edu/reading/tutorials.htm

College Reading Skills Program Techniques for Skillful Reading
http://www.csupomona.edu/~lrc/crsp/techniques.html.

Critical Reading Explains how to analyze content, language and structure.
http://www.criticalreading.com/

Detroit Newspapers in Education (NIE Online) Sponsored by The Detroit News, NIE Online provides links to daily lesson plans for use in teaching current events. The site also includes an index of weekly plans.
http://nieonline.com/detroit/index.cfm

EdHelper.Com Downloadable graphic organizers.
http://www.edhelper.com/teachers/graphic_organizers.htm?

Education with Student News from CNN This site provides teachers with instructional materials for integrating current events across the curriculum. A student section keeps students in grades 6-12 aware of the latest news of interest to them. Lesson plans, background material, profiles, links to useful Internet sites, and forums for interaction with other teachers are also included.
http://www.cnn.com/EDUCATION/.

Florida Newspapers in Education A list of the Florida newspapers that implement the Newspapers in Education program.
http://www.floridanewspaperineducation.org/index.htm

Graphic.Org Wide variety of graphic organizers with information about their use.
http://www.graphic.org/goindex.html

Heteronym Home Page Find out everything you wanted to know about heteronyms.
http://www-personal.umich.edu/~cellis/heteronym.html

Interactive Word Games Games to strengthen vocabulary skills.
http://www.wordplays.com/p/index

Power Reading See what it is like to read between 200 and 500 words a minute.
http://www.powerreading.com/speedtest.html

Reading Skills in Business: Information from Answers.com Strategies for assisting students in building the skills they need to be successful readers in the workplace.
http://www.answers.com/topic/reading-skills-in-business

Regents Reading Test University System of Georgia Activities to check comprehension skills.
http://www2.gsu.edu/~wwwrtp/instrdg.htm

RHL School Free downloadable reading comprehension worksheets.
http://www.rhlschool.com

Smithsonian Online All types of reading resources from the Smithsonian Museum.
http://www.si.edu/

The English Zone Printable worksheets for reading comprehension and vocabulary.
http://www.english-zone.com/

The Internet Public Library References, books, and exhibits.
http://www.ipl.org/

The Wacky World of Word Use different games and activities from this site for vocabulary enrichment.
http://www.gecdsb.on.ca/d&g/jan00/web4.htm

Tools for Reading, Writing, and Thinking A compilation of downloadable graphic organizers hosted by the Greece Central School District.
http://www.greece.k12.ny.us/instruction/ela/6-12/Tools/Index.htm

Using Newspapers in the Classroom This website includes a list of activities across a variety of content areas that can be completed in the classroom by using newspapers.
http://www.teachersdesk.org/news.html

Vocabulary University Lots of fun activities and interactive games that assist students in learning such vocabulary fundamentals as root words.
http://www.vocabulary.com/

Wisconsin Literacy Education and Reading Network Source An excellent resource for teachers to add strategies and techniques to the adult education program.
http://wilearns.state.wi.us/apps/default.asp

Word Games This site includes eight word games that students can play alone or as a group.
http://www.eastoftheweb.com/games/index.html

Word Play Extensive site that lists links to sites for acronyms, homonyms, language translation, mnemonics, American slang, anagrams, American Sign Language, lyric meanings, Shakespearean insults, Mad Libs, Klingon language, limericks, oxymorons, palindromes, puns, rhyming dictionary, rap dictionary, idioms, and so much more.
http://www.wolinskyweb.net/word.htm

Social Studies

Analysis of the GED Social Studies Test

The GED Social Studies Test questions are based on prose and graphics-based information drawn from a variety of sources, including academic and practical texts as well as primary and secondary sources. Approximately 60% of the questions relate to concepts and issues taken from a global or international perspective and 40% address a national setting. Source materials and questions on the Social Studies Test address the experiences of citizens, consumers, and workers in the United States (Canada) and the rest of the world. The test includes questions in each of the following areas:

- History: 40% (U.S. - 25%, World - 15%)
- Geography: 15%
- Civics and Government: 25%
- Economics: 20%

The Social Studies Test requires that students use higher-level thinking skills. These skills often require prior knowledge of important social studies concepts, principles, and events. The questions require that students be able to comprehend, apply, analyze, and evaluate information. Approximately 50% of the test includes graphic-based material, including: graphs, charts, tables, maps, photographs, and editorial cartoons.

Nineteen questions were identified as moderately to severely problematic for students. U.S. History and Civics and Government presented the greatest challenge for students and represented eleven of the nineteen most frequently missed questions (58%). Students had the greatest difficulty with questions which required them to analyze and evaluate information from text, graphics, and text/graphic combinations.

Ten of the nineteen questions (53%) included a graphic. Students exhibited difficulty with graphics that included maps, photographs, timelines, tables, and graphs. While most publishers include a variety of graphics in their GED preparation materials, it appears that there is insufficient practice for students to be able to take a basic understanding of a particular graphic and then use that information to answer higher-order questions.

Conclusion

Based on an analysis of the items missed, the following areas create significant challenges for students and thus instructors should place a greater emphasis on these areas, especially just prior to the students taking the GED Social Studies Test:

- Graphic Literacy
  - Interpret graphs
  - Identify data from tables and charts
  - Interpret editorial cartoons
  - Interpret photographs from various historical eras
  - Use maps and recognize key features
  - Compare two graphics and interpret data from each
- U.S. History (general knowledge of major concepts and historical eras)
  - Key historical documents and their significance

- World History (general knowledge of major concepts and historical eras)
- Economics (general knowledge of major concepts)
- Geography
  - Identify geographical areas and ecosystems
- Civics and Government (general knowledge of major concepts)

Content of the Social Studies Test

The GED Social Studies Test is composed of multiple-choice questions that require students to understand, use, analyze, and evaluate information from selected passages, charts, maps, graphs, political cartoons, photographs and diagrams. This test measures the student's ability to use knowledge and information about fundamental social studies concepts and principles in a variety of ways.

The questions are taken from the following content areas:

- History
  - U.S. History
    - Beginnings to 1820 (Native Peoples, Colonization, Settlement, Revolution, the New Nation)
    - 1800 – 1900 (Westward Expansion, Reform, Civil War, Reconstruction, Industrial Development)
    - 1890 – Present (Emergence of Modern America, The Great Depression, World War II, Postwar U.S., Contemporary U.S.)
  - World History
    - Beginning – 1000 B.C. (Early Civilizations)
    - 1000 B.C. – 300 B.C. (Classical Traditions, Empires, Religions)
    - 300 B.C. – 1770 A.D. (Trade, First Global Age)
    - 1750 – 1914 (Age of Revolutions)
    - 1900 – Present (Urbanization, World Wars, Global Depression, New Democracies in Africa, Asia, South America, the Cold War, Global Culture)
- Civics and Government
  - Civic Life
  - Politics
  - American Government
  - Foundations of the American Political System
  - Relationship of U.S. to Other Nations
  - Role of Citizens in American Democracy
- Economics
  - Economic Reasoning and Choice
  - Comparison of Economic Systems
  - Free Enterprise System
  - Production
  - Consumers
  - Financial Institutions
  - Government's Role in the Economy
  - Labor and the Economy
  - Global Markets
  - Foreign Trade
- Geography
  - World in Spatial Terms

- Places, Regions, and Physical Systems
- Human Systems
- Environment
- Uses of Geography

Questions on the GED Social Studies Test present material using passages drawn from various social studies text, excerpts from practical documents such as consumer information, voter guides, etc., and key documents which include:

- U.S. Constitution
- Declaration of Independence
- The Federalist Papers
- Landmark Supreme Court Cases

Approximately 50% of the questions include graphic-based information presented in the form of graphs, charts, maps, photographs, and political cartoons.

Strategies for the GED Social Studies Test

Only 20% of the GED Social Studies Test questions require students to use basic comprehension skills. The remainder of the questions requires the higher-order thinking skills of:

- Application
- Analysis
- Evaluation

To assist students in obtaining the skills required for the GED Social Studies Test, teachers should:

- Incorporate small and large groups sessions into the GED classroom, focusing on social studies concepts and principles that will help students gain core knowledge they will need on the test. Teachers may wish to provide short (15 minute) lessons or activities that focus on a single concept or principle, such as:
  - Equal rights
  - Equal protection under the law
  - Global depression
  - Westward expansion
  - Global conflict
- Develop lessons that focus on concepts or principles included in key historical documents. These may include:
  - “All men are created equal”
  - Probable cause
  - Freedom of speech, religion, etc
  - Voter’s rights
- Use the newspaper to show the connection between historical documents and current events. Provide students with copies of the Bill of Rights. Have the students work in teams to identify articles in the paper that relate to the rights outline in the first ten amendments of the U.S. Constitution.
- Discuss the differences between “hard news” articles and editorials to provide students with a better understanding of fact versus opinion.
- Start each day with a political cartoon. Use political cartoons that focus on current events, so students can develop skills at interpreting what the cartoonist is trying to portray.

- Have students conduct polls or surveys about issues that impact them in their daily lives. Have students construct graphs to report their survey results.
- Introduce students to geography. Bring in different types of maps so students can learn how to recognize key symbols, legends, etc. that they will need when taking the tests.

More Strategies for Teaching Social Studies

- Incorporate small and large group sessions into the classroom, focusing on social studies concepts and principles that will help students gain core knowledge. Teachers may wish to provide short (15 minute) lessons or activities that focus on a single concept or principle, such as:
    - Equal rights
    - Equal protection under the law
    - Global depression
    - Westward expansion
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- Develop lessons that focus on concepts or principles included in key historical documents. These may include:
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- Discuss the differences between "hard news" articles and editorials to provide students with a better understanding of fact versus opinion.
- Start each day with a political cartoon. Use political cartoons that focus on current events, so students can develop skills at interpreting what the cartoonist is trying to portray.
- Have students conduct polls or surveys about issues that impact them in their daily lives. Have students construct graphs to report their survey results.
- Introduce students to geography. Bring in different types of maps so students can learn how to recognize key symbols, legends, etc. that they will need when taking the tests.
- Work constantly with the vocabulary of social studies. Give them ample opportunities to see, hear, and pronounce the words. Make sure they know the meanings.

Activities for Teaching Social Studies

The following are just a few activities that teachers can use to help students enhance their skills in the GED Social Studies classroom. Handouts may be reproduced as needed.

- ABC Brainstorm – provides a creative way for students to demonstrate what they know about a given topic. For example, students brainstorm what they know about World War II. Each item must begin with a different letter –A = Adolph Hitler, B = British, etc.

- Supreme Court Matching – provides practice in matching landmark Supreme Court cases with the court's actual ruling.

- Cartoons for the Classroom – helps students learn to interpret editorial cartoons. These lessons are available from the Detroit Free Press.

- Cartoon Analysis Worksheet – provides students with three levels of questions as they master the skill of interpreting editorial cartoons.

- Preamble to the U.S. Constitution and Bill of Rights – provides students with an overview of each of the first ten amendments to the constitution.

- History in Disguise – provides a fun activity that combines math and history.

- Comparison Alley – provides an alternative to the usual Venn diagram. This worksheet can be used to compare and contrast the Declaration of Independence and the U.S. Constitution.

ABC Brainstorm

Topic _____

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z

Summary Paragraph

Supreme Court Matching

Marbury vs. Madison President Jefferson, a Republican, refused to allow his predecessor's appointees to take their place in the courts. Marbury sued Secretary of State James Madison to be appointed justice of the peace.	Ruled that the Supreme Court is the final authority on the Constitution and what it means and that the Supreme Court has authority to declare acts of Congress and the President unconstitutional.
McCulloch vs. Maryland President Madison approved charter for the Bank of the United States. State of Maryland levied a tax on the bank but the federal government refused to pay.	Ruled that States had surrendered certain powers when they ratified the U.S. Constitution.
Scott vs. Sanford Dred Scott was born a slave and taken by his master to Louisiana where slavery was not allowed. After his master died he sued stating he was entitled to freedom because he had been taken to a free state.	Ruled that the Missouri Compromise of 1850 violated the Fifth Amendment because it deprived property owners of due process.
Brown vs. Board of Education, Topeka, Kansas A suit brought on behalf of Linda Carol Brown who was forced to walk twenty-one blocks to the nearest all back school because of doctrine of "separate but equal."	Found that rights were violated under the equal protection provisions stated in the Fourteenth Amendment.
Schenck vs. US Charles Schenck, a member of the Socialist Party, was tried under Espionage Act in 1918. He appealed stating that the Espionage Act violated his right to freedom of speech and the press.	Ruled that questions related to freedom of speech depend on the circumstances and established the test of "clear and present danger."
New York Times vs. U.S. In 1971, New York Times printed the Pentagon Papers. A lower court ordered the Times to stop publication. The Times appealed to the Supreme Court that they had a right and responsibility to make citizens aware of what was happening.	In one of few cases, the Supreme Court did not reach a single opinion, but rather submitted a decision of the Court (per curiam) placing a heavy burden of proof on the government when limiting release of information to citizens.
Escobedo vs. Illinois Arrested for murder of his brother-in-law, Danny Escobedo was taken to the police station. He repeatedly asked to speak with his lawyer, but the police refused. He finally confessed to the murder and found guilty of the crime.	Ruled that rights were violated under the Sixth Amendment.
Miranda vs. Arizona Ernesto Miranda was arrested in Arizona for robbery, kidnapping, and rape. While in custody he signed a confession. His conviction was overturned on appeal.	Ruled that rights were violated under the Fifth Amendment.

Cartoons for the Classroom

Presented by NIEonline.com and the Association of American Editorial Cartoonists (AAEC)

Cartoon Analysis Worksheet Page 1

Visuals

1. List the objects or people you see in the cartoon.

_____

_____

_____

2. Which of these objects are symbols?

_____

_____

_____

3. What do you think each symbol means?

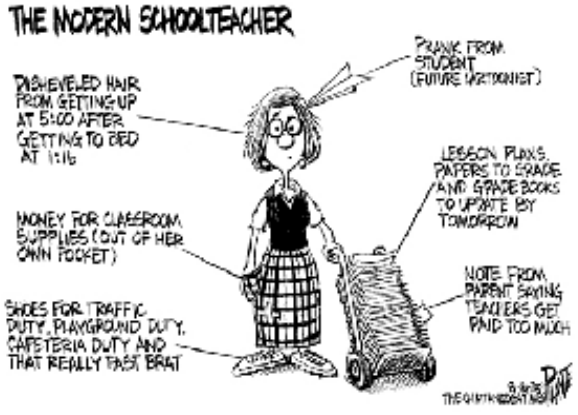
_____

_____

_____

_____

Just for fun



Courtesy Bruce Plante Chattanooga Times Free Press

Your Name _____

Newspaper_____

Cartoonist_____

Date of Cartoon _____

Words (not all toons include words)

4. Identify the cartoon caption and/or title.

_____

5. Locate three words or phrases used by the cartoonist to identify objects or people within the cartoon.

_____

_____

_____

6. Record any important dates or numbers that appear in the cartoon.

_____

7. Which words or phrases in the cartoon appear to be the most significant? Why do you think so?

_____

_____

_____

8. List adjectives that describe the emotions portrayed in the cartoon.

_____

_____

Worksheet adapted from the U.S. National Archives and Records Administration's Digital Classroom
http://www.archives.gov/digital_classroom/lessons/analysis_worksheets/cartoon.html

Cartoons for the Classroom

Presented by NIEonline.com and the Association of American Editorial Cartoonists (AAEC)

Cartoon Analysis Worksheet

9. Describe the action taking place in the cartoon.

10. Explain how the words clarify the symbols.

11. Explain the message of the cartoon.

12. What special interest groups would agree/disagree with the cartoon's message?

Just for fun

Courtesy Jim Borgman / Cincinnati Enquirer

Worksheet adapted from the U.S. National Archives and Records Administration's Digital Classroom
http://www.archives.gov/digital_classroom/lessons/analysis_worksheets/cartoon.html

Cartoon Analysis Worksheet

Level 1	
Visuals	**Words**
1. List the objects of people you see in the cartoon.	1. Identify the cartoon caption and/or title. 2. Locate three words or phrases used by the cartoonist to identify objects or people within the cartoon. 3. Record any important dates or numbers that appear in the cartoon.
Level 2	
Visuals	**Words**
2. Which of the objects on your list are symbols? 3. What do you think each symbol means?	4. Which words or phrases in the cartoon appear to be the most significant? Why do you think so? 5. List adjectives that describe the emotions portrayed in the cartoon.
Level 3	
A. Describe the action taking place in the cartoon. B. Explain how the words in the cartoon clarify the symbols? C. Explain the message of the cartoon. D. What special interest groups would agree/disagree with the cartoon's message? Why?	

PREAMBLE TO THE CONSTITUTION TO THE UNITED STATES

We the People of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America.

THE FIRST 10 AMENDMENTS TO THE CONSTITUTION AS RATIFIED BY THE STATES

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 defense.

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.

National Archives and Records Administration: Retrieved from the World Wide Web at. http://www.archives.gov/.

The following are important events from history. Do you know in which year each took place?

Boston Tea Party	Pilgrims came to America
U.S. entered World War I	Columbus discovered America
John Brown raided Harper's Ferry	Edward VIII became king, then abdicated
Revolutionary War began	Magna Carta signed
U.S. Declaration of Independence	Battle of Alamo
Lincoln issued the Emancipation Proclamation	Only time in U.S. history that a president was elected to a fourth term

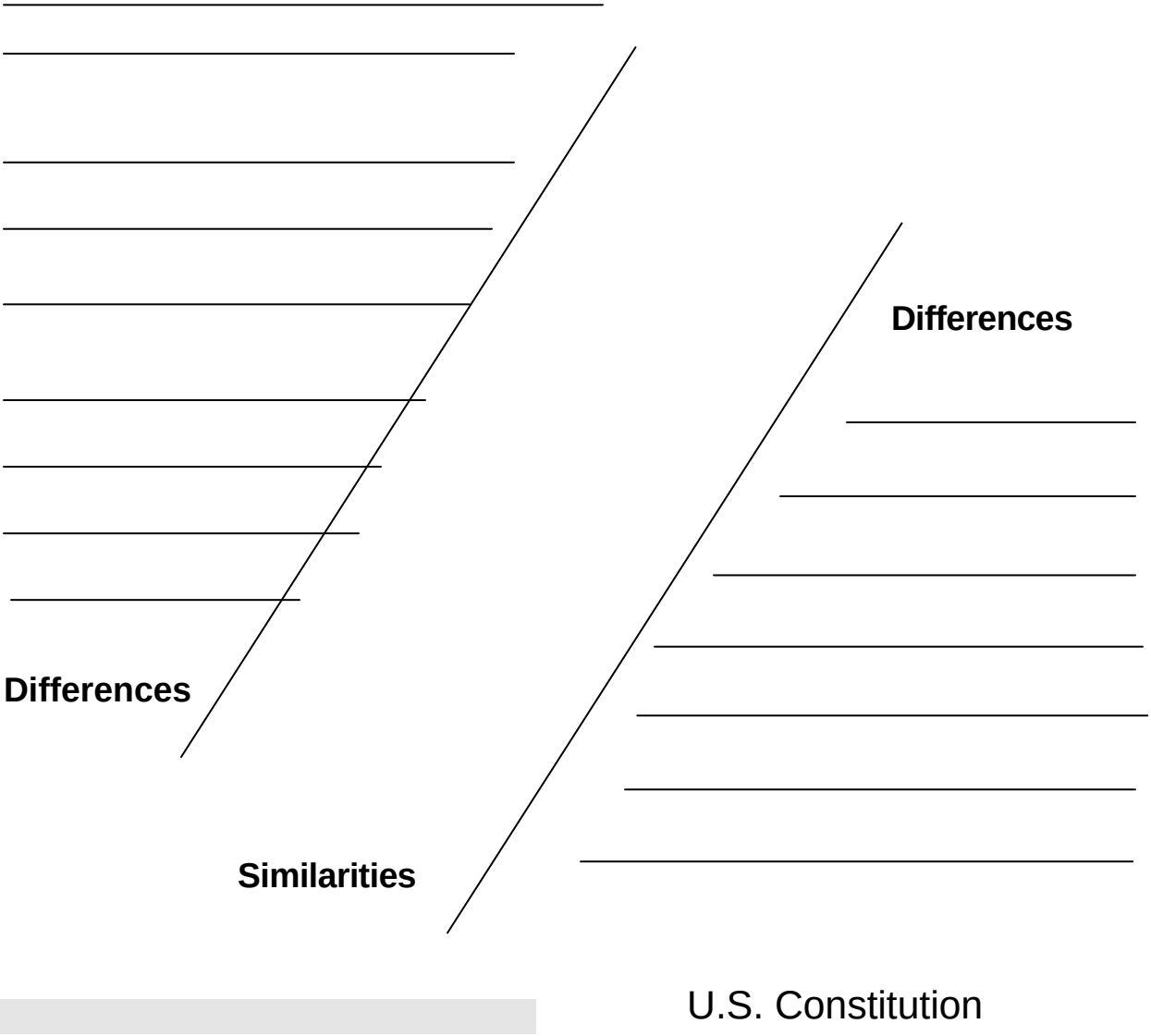
You can compute each of the 12 dates in the table below. In each row you are given 2 numbers Add, subtract, multiply, and divide the numbers and write the answers in the columns. The first one is done for you.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
a	b	a+b	a-b	a*b	a/b	Sum of answers
333	3	336	330	999	111	1776
373	1					
394	2					
426	2					
284	4					
255	5					
270	5					
120	8					
184	8					
160	10					
132	12					
85	17					

Challenge Grant Learning Exchange. Retrieved from the World Wide Web at http://mainland.cctt.org/mathsummer/default.asp.

Comparison Alley

Identify similarities and differences between the Declaration of Independence and the U. S. Constitution.



Internet Resources for Social Studies

The Internet is an incredible resource for teachers and for students. From handouts to interactive games for students, the Internet can provide opportunities for students to build their knowledge about each of the various content areas covered in social studies. It is important that students have some basic understanding of social studies concepts if they are to be successful on the GED Social Studies Test. It is recommended that teachers review each site to determine whether or not the site meets the needs of students in that particular learning environment. Many of the sites listed below can be used to give students more interactive experience in learning about history. For example, the American Memory Timeline provides access to videos and audio recordings that can bring history to life.

Please note: All websites reviewed April 2007. All links are currently active

A Road Map to the U.S. Constitution An overview of the constitution and important Supreme Court cases.
http://library.thinkquest.org/11572.

American Memory Timeline Lets you explore different events in American history from the Library of Congress.
http://memory.loc.gov/ammem/ndlpedu/features/timeline/index.html.

An Outline of American History An overview of history and government developed as part of *The American Revolution—an HTML Project.*
http://odur.let.rug.nl/~usa/H/index.htm

Basic Reading In U.S. Democracy An overview of key historic documents and the events that surrounded them, speeches, landmark Supreme Court cases.
http://usinfo.state.gov/usa/infousa/facts/democrac/demo.htm

Brief Timeline of American Literature and Events Provides information on political and social history and American literature
http://guweb2.gonzaga.edu/faculty/campbell/enl311/timefram.html

Center for Civic Education This site provides basic information and resources for civic education.
http://www.civiced.org

Channel One – Behind Famous War Photos This site provides background information on some of the most famous war photos of the past.
http://www.channelone.com/news/2005/02/18/war_photos/

Chart of Inventions from Encyclopedia Britannica
http://corporate.britannica.com/press/inventions.html

Charters of Freedom This site sponsored by the U.S. Archives provides transcripts as well as samples of major historical documents, including Declaration of Independence, U.S. Constitution, etc.
http://www.archives.gov/national_archives_experience/charters/declaration.html#more

Civics Online A Michigan State University online program.
http://www.civics-online.org

Constitutional Topic: Articles of Confederation The Constitutional Topics pages at the USConstitution.net site are presented to delve deeper into topics than can be provided on the

Glossary Page or in the FAQ pages.
http://www.usconstitution.net/consttop_arti.html

Daryl Cagle's Professional Cartoonists Index! Includes a teacher guide to the different cartoons from over sixty cartoonists.
http://www.cagle.com.

Foundation for Teaching Economics Provides lessons for the classroom.
http://www.fte.org/

Inflation and Money by the National Foundation for Teachers of Economics
http://www.fte.org/teachers/lessons/efl/eflesson8.htm

Great Engineering Achievements of the 20th Century, National Academy of Engineering.
http://www.greatachievements.org/greatachievements/index.html

Landmark Court Decisions
http://www.constitution.org/ussc/usscdeci.htm

Landmark Supreme Court Cases & the Bill of Rights
http://www.citadel.edu/citadel/otherserv/psci/courses/kuzenski/cases.htm

Made in the USA. A lesson plan produced by National Geographic.
http://www.nationalgeographic.com/resources/ngo/education/ideas912/912made.html

National Atlas.Gov This site provides free outline maps of the United States.
http://nationalatlas.gov/index.html.

National Archives and Records Administration The website of the National Archives; educational units and copies of national documents are available.
http://www.archives.gov.

National Geographic Political, physical, cultural, and weather maps to download.
http://www.nationalgeographic.com/resources/ngo/maps/.

National Center for Education Statistics This site provides students with tools to create their own graphs.
http://nces.ed.gov/nceskids/createagraph/

National Council on Economic Education
http://www.ncee.net/ea/standards/

National Geographic Political, physical, cultural, and weather maps to download.
http://www.nationalgeographic.com/resources/ngo/maps/

Online History of the United States
http://www.usgennet.org/usa/topic/colonial/book/index.html

On Politics – Historic Supreme Court Cases This site was developed by the Washington Post and provides information on historic cases.
http://www.washingtonpost.com/wp-srv/national/longterm/supcourt/history/historic.htm

PBS Teacher Source An excellent source for lessons for social studies.
http://www.pbs.org/newshour/extra/teachers/lessonplans/socialstudies/Vote2004/political_cartoons.html

News Hour Extra Lesson plan for working with political cartoons.
http://www.pbs.org/newshour/extra/teachers/lessonplans/socialstudies/Vote2004/political_cartoons.html

Popular songs in American History Songs may be downloaded.
http://www.contemplator.com/america/

Practical Money Skills Excellent resources for the classroom produced by Visa. Educators may order sample materials and access lesson plans k-college.
http://www.practicalmoneyskills.com/english/teachers/level/php?id=3

Public Policy Inquiry – Campaign Finance – Supreme Court Cases
http://www.campaignfinancesite.org/court/buckley1.html

Supreme Court Law Cases Summaries Touro College Jacob D. Fuchsberg Law Center provides summaries of landmark cases.
http://www.tourolaw.edu/patch/CaseSummary.html

Street Law and The Supreme Court Historical Society This site provides information on landmark Supreme Court cases including resources for teachers including lesson plans, questions, background information, etc.
http://www.landmarkcases.org/index.html

Take the Spending Challenge This interactive site focuses on how people use and abuse credit cards. A great hands-on activity for students.
http://www.themint.org/owing/spendingchallenge.php

The American Presidency
http://ap.grolier.com/

The American Revolution – An HTML Project.
http://odur.let.rug.nl/~usa/D/index.htm

The Declaration of Independence The Call for Independence: How the Declaration Came to Be.
http://www.historychannel.com/exhibits/declaration/call.html

The Federalist Papers
http://odur.let.rug.nl/~usa/D/1776-1800/federalist.fedxx.htm

The Mint – It Makes Cents Ins and Outs of Credit Cards Everything you need to know about credit cards.
http://www.themint.org/owing/creditcardinsouts.php

This Day In History Channel.Com provides information on events that occurred in history related to Automotive, Civil War History, Cold War History, Crime History, Entertainment History, Literary History, Old West History, Technology History, Vietnam War History, Wall St. History, WWII History.
http://www.historychannel.com/today/

University of Iowa Displayable maps in thematic categories.
http://www.cgrer.uiowa.edu/servers/servers_references.html

Science

Analysis of the GED Science Test

The GED Science Test bases the content of its questions on three of eight broad content standards for grades 9-12 outlined by the National Science Education Standards (NSES). The content areas targeted by the test questions are as follows:

- Physical Science: 35%
- Life Science: 45%
- Earth and Space Science: 20%

Questions are presented at four cognitive skill levels: comprehension, application, analysis, and evaluation. The GED Science Test requires more than just reading in the content area. The test requires that students have some understanding of basic science concepts and be able to apply those concepts in real-life situations.

Seventeen questions were identified as moderately to severely problematic for students. Life science created the greatest challenge for students with 41% of the most frequently missed questions falling into this area. The remaining questions were evenly divided between physical science and earth/space science. Students exhibited difficulty in all four cognitive skill areas.

Seventy-six percent (76%) of the most frequently missed questions included graphics such as process diagrams, multi-line graphs, and tables or charts. Eight of the thirteen questions (62%) included a diagram, a clear indication that diagrams especially process diagrams present major problems for the GED student.

Conclusion
Based on an analysis of the items missed, the following areas create significant challenges for students. Instructors should place a greater emphasis on these areas, especially just prior to the students taking the GED Science Test:

- Graphic Literacy
  - Interpreting graphs
  - Identifying data in a chart or table
  - Understanding process diagrams
- Life Science (general concept knowledge)
- Physical Science (general concept knowledge)
- Earth and Space Science (general concept knowledge)

Content of the GED Science Test

The GED Science Test requires that students understand or use the information provided to solve a problem or make a judgment, using abstract reasoning and problem solving. The questions that compose this test are taken from the areas of:

- Life Sciences /Biology
- Physical Science (including physics and chemistry)
- Earth and Space Science

Students need knowledge of fundamental science concepts and issues with the ability to apply higher order thinking skills. The content includes reading passages as well as graphs, charts, diagrams, and tables.

The GED Science Test is based on the National Science Education Standards, which include:

- **Unifying Concepts and Processes** outline standards that need to be developed over a student's entire education and that go beyond disciplinary boundaries.

- **Science as Inquiry** advances the student toward higher-level content knowledge and cognitive skills by helping him/her to develop questioning and reasoning abilities.

- **Science and Technology** focuses on developing a student's ability to design technology and understand links between science and technology, including: decision-making abilities in identifying and stating a problem; and designing, implementing, and evaluating a solution.

- **Science in Social and Personal Perspectives** addresses the scientific foundation a student needs to evaluate and make decisions about personal and social issues that may be encountered.

- **History and Nature of Science** addresses the student's understanding of and ability to apply history to science.

The GED Science Test places an emphasis on environment and health issues as well as the relevance of science in everyday life.

Strategies for Teaching Science

As with the other tests, science requires that students use the higher-order thinking skills of application, analysis, synthesis, and evaluation. To assist students in obtaining the skills required for the GED Science Test, teachers should:

- Incorporate small and large groups sessions into the GED classroom, focusing on science concepts and principles that will help students gain core knowledge they will need on the test.
- Use the local newspaper or *USA Today* to provide students with an opportunity to interpret graphic-based material, including graphs, charts, maps, etc. The newspaper is an excellent resource for information related to the environment and health issues. Most newspapers at the very least include a health section once per week. Use articles to discuss issues such as diet, exercise, disease prevention, medical advances, etc.
- Have students conduct surveys about environmental, health, or other science issues that affect their daily lives. Have the students construct graphs to report their results. If students understand when and why they should use line versus bar graphs versus circle graphs, it will help them interpret the graphs included on the test.
- Use the weather map in the local newspaper to track weather trends and changes. Have students make predictions based on the information provided on the maps.
- Use the Internet to expose students to new material. Capture their interest through the exploration of websites that focus on various aspects of science.

- Have the students conduct simple experiments. Have the materials they will need to conduct the experiment in zip lock bags or small containers – creating "Lab in a Bag" activities. Students love the labs. They can grab a bag and do their own work or work in a small group to complete the activity.

Activities for Teaching Science

The following are just a few activities that teachers can use to help students enhance their skills in the GED Science classroom. Handouts may be reproduced as needed.

- Graphing Trends in Temperature – provides students with practice in constructing graphs as well as basic concepts related to weather.
- Weather Words Matching Game – builds vocabulary essential for Earth/Space Science.
- The Scientific Method – provides an overview of the scientific method and a series of simple experiments that can be conducted in class.

Graphing Trends in Temperature

Use a newspaper or go to the National Weather Survey (http://www.nws.noaa.gov/) or to AccuWeather (http://www.accuweather.com/weatherf/index_corp) to find cities in the United States or in the world. Pick five cities of your choice. Find and record a five-day forecast on the following graph. You will need five days of newspapers that are in sequential order.

	City 1 Name	**City 2 Name**	**City 3 Name**	**City 4 Name**	**City 5 Name**
Temperature					
Day 1					
Day 2					
Day 3					
Day 4					
Day 5					

Chart your findings, using graph paper. Make sure that you label the information and provide a legend. Be prepared to discuss why you selected a specific type of graph to display the data.

On the back of the worksheet, find the range, mean, median, and mode of the information that you have found. Calculating these types of statistics is often used to provide weather information.

Weather Words Matching Game

Air Mass	a large dome of air, which has similar horizontal temperature and moisture characteristics
Cold Front	the front edge of a relatively cold mass of air
Dew Point	limit to the amount of water air can hold
High Pressure	sinking air, which is generally associated with fair weather patterns
Low Pressure	rising air, which is generally associated with stormy weather patterns
Overrun	during winter, warm air moves above cold air at the surface, creating much of the winter precipitation
Rain	nearly steady and uniform fall of precipitation over an area
Showers	intermittent and scattered rainfall of varying intensity
Relative Humidity	measure of the amount of water in the air compared with the amount of water the air can hold at that temperature
Unstable Atmosphere	result of cold air moving above warm air, which often creates severe weather, including tornadoes
Warm Front	the front edge of a relatively warmer mass of air

The Scientific Method – It's Simple to Teach in Three Easy Steps!

Observe - make observations about something in the world.

Hypothesize - try to come to some sense about your observations and formulate a hypothesis or theory for why things are this way.

Test the hypothesis - come up with a method to test the validity of your hypothesis through an experiment that will confirm or deny the hypothesis and based on the results of the test on the hypothesis, either modify the theory or accept it as being likely.

Experiments for Everyone

Experiments do not have to be difficult in order for students to learn about the scientific method. The following two follow the method and use common items. Students learn to observe, predict or hypothesize, and test the hypothesis – skills needed for the GED Tests, as well as real life.

The Winner Is!

Find out which chewing gum has the longest lasting flavor. You will need:

1 piece of fruity flavored bubble gum
1 stick of mint flavored gum
1 stick of cinnamon flavored gum
1 stopwatch

Step 1 – Observe
Observe that your three pieces of gum all have different sizes and smells.
Step 2 – Hypothesize
Based on your observations, make a guess at which flavor of gum will last the longest.
Step 3 – Test the Hypothesis
Conduct an experiment. Have a partner time you while you chew on one piece. Say "stop" when you can't taste its flavor any longer. Record the time that it took for that particular piece of gum to lose flavor. Repeat Step 3 with the other two pieces of gum and compare the data.

Which flavor lasts the longest? Was your hypothesis correct? Why or why not?

Oil Spill! Clean It Up

When oil tankers accidentally spill their cargo of oil into the ocean they cause a huge environmental danger. Oil is extremely hard to remove from the water and the beaches, and the whole environment is damaged. In this experiment, you can see how hard it is to remove oil from sand. You will need:

Large plastic cup
Sand
2 tablespoons of vegetable oil
(This experiment can be messy, so you might want to do it outdoors.)

Step 1 – Observe
Fill a plastic cup with sand and oil and mix well. Observe the problem that you have.
Step 2 – Hypothesize
Based on your observations, make a guess at what tools you could use to get the oil off the sand.
Step 3 – Test the Hypothesis

Conduct an experiment. Use a spoon, a straw, paper, towel, an old toothbrush, a sponge – anything that you can think of to get the oil off the sand and help save the environment!

Raw or Cooked?

Find out which spins the longest, a raw egg or a cooked egg. For this experiment, you will need:

1 cooked egg
1 raw egg
1 plate

Step 1 – Observe
Observe the two eggs.
Step 2 – Hypothesize
Based on your observations, make a guess as to which egg will spin the longest and why.
Step 3 – Test the Hypothesis
Spin each egg in turn on a plate. The egg that continues to spin for a longer time is the cooked one. Now spin the eggs again, and then quickly stop both of them. Then let go of both eggs. You will see that the cooked egg stays still but the raw one starts spinning again.

Why Does This Happen?
The contents of the egg have more inertia when they are raw, because they are in the form of a liquid. This inertia slows down the raw egg and that is why it stopped spinning before the cooked egg. In step 2, the liquid in the raw egg was still moving when you stopped both eggs, so that movement made the raw egg begin to spin again.

Friction

Which is easier to spin – a smoother ball or a less smooth ball? For this experiment, you will need:

A bowl of water
Smooth rubber ball
Tennis ball

Step 1 – Observe
Observe the two types of balls.
Step 2 – Hypothesize
Based on your observations, make a guess as to which ball will spin the longest and why.
Step 3 – Test the Hypothesis
Try spinning the rubber ball in the water. Next spin the tennis ball in the water. Which one is easier to spin? The smoother ball is easier to spin because the smooth surface causes less friction with the water.

Bernoulli Effect

Flying Paper Strips

- Using the ruler, measure and cut-out strips of paper about 2 inches wide and 6 inches long.
- Hold the shortest end just under your mouth and blow over the paper. What happened?
- What do you think will happen if you change the size of the paper?
- Do you think the shape of the strip of paper is important? Try experimenting.
- Do you think the experiment will always work?

Internet Resources for Science

The Internet is an incredible resource for teachers and for students. From handouts to interactive games for students, the Internet can provide opportunities for students to build their understanding of the scientific process as well as basic science concepts. It is recommended that teachers review each site to determine whether or not the site meets the needs of students in that particular learning environment. Many of the sites listed below can be used to provide students with hands-on learning experience in science. Since the majority of adult education classroom do not have access to science labs, the Internet provides a virtual laboratory that can enhance students' understanding of importance scientific concepts.

Please note: All websites reviewed April 2007. All links are currently active.

Access Excellence The National Health Museum. Interactive sites about real-life science. Students can hypothesize an answer, watch the clip, and then see whether or not they predicted correctly.
http://www.accessexcellence.org/

American Museum of Natural History Lots of different information on the "ology" of science, such as astronomy, archeology, etc.
http://ology.amnh.org/index.html

Analytical Chemistry Umeå University, Sweden. Lots of great websites on chemistry, plus some fun ones like the T.W.I.N.K.I.E.S. Project.
http://www.anachem.umu.se/eks/pointers.htm

Annenberg/CPB Amusement Park Physics Learn about science behind merry-go-rounds, roller coasters, bumper cars and more.
http://www.learner.org/exhibits/parkphysics/coaster/

Annenberg/CPG Weather Learn what causes rain, thunder, tornadoes and more.
http://www.learner.org/exhibits/weather

Boston Museum of Science These online exhibits cover a wide range of science topics, from Aging and Ice to Robots and Weather.
http://www.mos.org/exhibits/online_exhibits.html

Brain POP You MUST go to this site! There are tons of online cartoons videos to watch and fun quizzes to take about science. Please notice that many things are free, but if you wish to view everything there is a small fee for a license.
http://www.brainpop.com/

Cells Alive This site can be used by teachers and students. Lots of great interactivity and resources on the basics of cells.
http://www.cellsalive.com/toc.htm

Chem4Kids Designed for students, covering topics such as Matter, Atoms, Elements, Reactions, Key Topics and Mathematics.
http://www.chem4kids.com/.

Columbia Virtual Body Excellent Shockwave-based interactive tour of the human body: nervous, digestive, circulatory and skeletal systems. Includes such activities as "Organize Your Organs" and "Build a Skeleton." In English and Spanish.
http://www.medtropolis.com/VBody.asp

ChemWeb OnLine An overview of the basics of chemistry as developed by a high school student. Good graphics and easy to understand text.
http://library.thinkquest.org/10429/high/indexh.htm

Delights of Chemistry University of Leeds. Department of Chemistry. This is a collection of three dozen experiments and demonstrations, two photo libraries and streaming chemistry video.
http://www.chem.leeds.ac.uk/delights/

Discovery Channel The website has lots more information than even the channel.
http://www.discovery.com/

Earth Floor: Biomes Virtual tour of a tropical rain forest, tropical savannah, mid-latitude deciduous forest, desert, sub-arctic taiga and polar tundra.
http://www.cotf.edu/ete/modules/msese/earthsysflr/biomes.html.

Educators' Bridge University for Atmospheric Research. Resources and lessons for all levels of science.
http://www.eo.ucar.edu/educators/index.html

Eisenhower National Clearinghouse Resources on science and math research and education. Small yearly fee to access these materials.
http://www.enc.org

Environmental News The latest information on the environment. Good source of information and graphics.
http://www.enn.com/

Explore Science This is another site NOT to be missed! Tons of interactive science lessons on every topic you can imagine! Scientific concepts and news stories.
http://www.explorelearning.com/

Exploratorium Online since 1993, the Exploratorium was one of the first science museums to build a site on the World Wide Web. The site contains over 15,000 articles and displays including interactivity regarding scientific concepts - fascinating for learners of all ages.
http://www.exploratorium.edu/

Extreme Science Ever wondered what the biggest, baddest, and the best are in the natural world? This is the place to find out plus the latest in science and technology.
http://www.extremescience.com

Fear of Physics Basic information on physics concepts with interactive activities. Great site with easy to understand explanations of such things as “Why Satellites Don’t Fall!”, “First One Down” “the G Factor”, etc.
http://www.fearofphysics.com/

First Science Includes science articles, games, science cams on the web, science crossword puzzles, even science poetry and cartoons.
http://www.firstscience.com/site/home.asp

Franklin Institute Excellent collection of online resources and activities designed to create curiosity and promote science in everyday life.
http://www.fi.edu/explore.html

General Chemistry Online Information from a chemistry course. Includes a free newsletter.
http://antoine.frostburg.edu/chem/senese/101/index.shtml

How Things Work This site is geared towards adults and high school students. It shows you how lots of things work, like cds and engines.
http://www.howthingswork.com

Inventions Sponsored by National Geographic, this site invites students to help test out the workings of a new contraption while working through five different activities.
http://www.nationalgeographic.com/features/96/inventions/

Invention Dimension MIT-based site promoting the spirit of invention, with games, resources, an inventor's handbook and the Inventor of the Week. Brain Drain is a fun interactive game that tests knowledge about different inventions.
http://web.mit.edu/invent/invent-main.html

Lawrence Hall of Science University of California, Berkeley Great site for materials, lessons, and even online experiments for all ages.
http://www.lawrencehallofscience.org/lhshome.html

Mad Sci Network The laboratory that never sleeps! Great database full of questions answered by scientists who are experts in their field from the Washington University at St. Louis. Includes experiments as well.
http://www.madsci.org/

Make a Splash with Color Information on light theory in three sections: Talking about Color, The Lighter Side of Color, and An Eye on Color.
http://www.thetech.org/exhibits_events/online/color/intro/

Making Waves Guide to sound and electromagnetic radiation including Sound, Radio, Microwave, Infrared and Ultraviolet Light, Lasers, X - Rays, and Gamma Rays. Created by students.
http://www.smgaels.org/physics/home.htm

Mr. Parks Biology Songs Includes science songs – listen if you dare.
http://whhs.guhsd.net/park/biosongs.html

Nanoworld Image Gallery High quality magnified microscopic images of blood, cells, animals, diseases, microbes, pollen, yeast, molds and plant and animal tissue. Fun to test your knowledge about what some of the images are.
http://www.uq.edu.au/nanoworld/images_1.html

National Earthquake Information Center From U.S.G.S., this is an online archive of current and general earthquake data, as well as station codes and coordinates.
http://wwwneic.cr.usgs.gov/

Neptune's Web Sponsored by the Naval Meteorology and Oceanography Command: facts, quizzes, searches, ask an oceanographer, teacher resources.
http://pao.cnmoc.navy.mil/Educate/Neptune/Neptune.htm

NASA’s Official Site
http://spaceflight.nasa.gov/

NASA's Origins Examines questions of the origins of our universe; excellent graphics and (of course) first rate information, including images from the Spitzer telescope.
http://origins.jpl.nasa.gov/

NASA's Quest Made for teachers and students, includes online projects and events which fill your classroom full of excitement and higher level thinking
http://quest.arc.nasa.gov/

NASA Space Place NASA's salute to elementary space science with an emphasis on hands-on activities that make sophisticated concepts meaningful.
http://spaceplace.jpl.nasa.gov/index.shtml

Oregon Museum of Science and Industry From BusyTown and Engineer It to WaterWorks and Virtual Tours, this site offers all kinds of online experiences for experiencing Science.
http://www.omsi.edu/explore/online.cfm

PBS: Science & Nature Highlights and background information on every Science-based PBS program on the air; check out the Science for the Classroom link.
http://www.pbs.org/science/

Periodic Table of Comic Books James Holler and John P. Selegue Department of Chemistry. University of Kentucky. Takes the periodic table and uses comics that use this element in them. Very creative!
http://www.uky.edu/Projects/Chemcomics/

Pfizer Fun Zone A really cool place to learn all about science and people who work in specific fields.http://www.pfizerfunzone.com/funzone/
http://www.pfizerfunzone.com/funzone

pH Factor This Miami Museum of Science site introduce acids and bases to students.
http://www.miamisci.org/ph/

Physics Central Website of The American Physical Society This site communicates the importance of physics in the world and the latest research and the people who are doing it.
http://www.physicscentral.com/

Physics 2000 Beginner level information from ongoing physics workshop through Grants from the Colorado Commission on Higher Education and the National Science Foundation and the University of Colorado at Boulder. An interactive journey through modern physics, including segments on Einstein's Legacy and the Atomic Lab.
http://www.colorado.edu/physics/2000/index.pl

ProTon Don An interactive game with the periodic table from Fun Brain.
http://www.funbrain.com/periodic/index.html

Reekos Mad Scientist Lab Great experiments to do in the classroom with explanations of basic concepts attached.
http://www.spartechsoftware.com/reeko/

Science Junction Billed as a 'science cybercommunity for teachers, students and researchers of Science', this site seeks to make connections between science and everyday life. A great website filled with sites on all of the different types of science – from biology to chemistry to physics. Also includes lesson plans and lots of ideas on how to teach science.
http://www.ncsu.edu/sciencejunction/

Science Master Space science information for the classroom.
http://www.sciencemaster.com/space/space.php

Science Museum of Minnesota Well-designed and nicely formatted original online exhibits and activities covering ten high-interest Science topics.
http://www.smm.org/explorescience/websites/

Science Netlinks Lesson plans with activities in all areas of science for K-12. Part of the MarcoPolo Education Foundation.
http://www.sciencenetlinks.com/matrix.cfm

Science News Online A science magazine that has been around for over 70 years.
http://www.sciencenews.org/

Science Odyssey Lots of interactive stuff to do. Definitely visit the "You Try It" link.
http://www.pbs.org/wgbh/aso

Science 10 Resource Materials This site contains classroom ready lessons on: water quality, chemical change, food additives, human nutrition, and science challenge.
http://www.saskschools.ca/curr_content/science10/index.html

Sea Web A multimedia public education project designed to raise awareness of the world ocean and the life within it. Lab.
http://www.seaweb.org/

Seeing, Hearing and Smelling the World A multitude of science topics explored through an examination of the brain and our senses; sophisticated subject matter. Howard Hughes Medical Institute.
http://www.hhmi.org/senses/

Space Link More of NASA's wealth: Briefs, Educator's Guides, Educational Programs, Wallsheets, Lithographs, Slide Sets and Videotapes.
http://www.nasa.gov/home/index.html?skipIntro=1

Songs for Teaching Science Lots of fun.
http://www.songsforteaching.com/sciencesongs.htm

Strange Matter A traveling exhibition developed by the Ontario Science Centre and presented by the Materials Research Society with the support of the National Science Foundation. Lots of interesting materials on the “study of stuff.”
http://www.strangematterexhibit.com/

Table of Elements An already prepared drill on the Periodic Table of Elements.
http://www.edu4kids.com/chem/

Tanner’s Topics: General Chemistry A great overview of the basic areas of atoms, molecules, elements, physical chemistry, images, and solutions.
http://www.tannerm.com/

Teaching Science Matters An education resource for elementary and middle school teachers and pre-service teachers. Supported by the Eisenhower Technology Grant in conjunction with the Science Education Consortium at Princeton University. However, good ideas for all science classrooms.
http://www.princeton.edu/teacher/tsm/

The Lab The Lab is the Australian Broadcasting Corporation's online gateway to science, including original material, news, features and forums.
http://www.abc.net.au/science/default.htm

The Particle Adventure Particle Data Group. U.S. Department of Energy. Available in different languages, this is a fun interactive site for students. Good materials, which are free to download.
http://particleadventure.org/particleadventure/

The Physics Classroom The Physics Classroom and Mathsoft Engineering & Education, Inc. Great information on how to teach basic physical principles in the classroom.
http://www.physicsclassroom.com/Default2.html

The Top Ten Sites Choose your topic and go to the top ten sites as identified by the Exploratorium in California.
http://www.exploratorium.edu/learning_studio/sciencesites.html

The Visible Human Site This is the site of the human man and woman with lots of graphics.
http://www.nlm.nih.gov/research/visible/visible_human.html

The Why Files University of Wisconsin, Board of Regents. Real world articles to support all areas of science. Click on the “Why Files in Education.”
http://whyfiles.org/teach/

USGS Learning Web Friendly format presenting data and activities from the U.S.G.S.; check out FrogWatch and Exploring Caves.
http://www.usgs.gov/education/

Vision Learning Lessons for the different competency areas of earth and space science. Lessons include graphics and can be viewed in Spanish.
http://www.visionlearning.com/index.php

Volcano World Learn all about volcanoes!
http://www.volcanoworld.org

Weather Classroom The Weather Classroom presents all kinds of online interactive resources for students and teachers; worth investigating.
http://www.weatherclassroom.com/index.php

World Weather Project Developed by the Department of Atmospheric Sciences (DAS) at the University of Illinois Urbana-Champaign (UIUC), WW2010 (the weather world 2010 project) is a WWW framework for integrating current and archived weather data with multimedia instructional resources using new and innovative technologies.
http://ww2010.atmos.uiuc.edu/(Gh)/home.rxml

Hands-On Science Experiment Websites

Although many of the websites listed on previous pages have experiments, demonstrations, graphics, activities, and lesson plans included, here are a few to get you started on "hands-on" experiences with science.

Brain Pop – Experiment with Bob This is part of the free section of Brain Pop.
http://www.brainpop.com/

Dr. Matrix World of Science This site is a partnership between IBM, the New York Hall of Science and the Association of Science-Technology Centers. It has dozens of experiments you can do at home, on-line interactive adventures, a guide to many science centers and science field trips, and live cams from many science and technology centers worldwide.
http://www.scientium.com/drmatrix/awards/

Edible/Inedible Experiments Lots of experiments that are easy to use in any type of classroom.
http://www.madsci.org/experiments/

Exploratorium Snacks
http://www.exploratorium.edu/snacks/

Frog Dissection Net Frog A free dissection system for use in the classroom.
http://curry.edschool.virginia.edu/go/frog/

Home Experiments The name says it all as most products for these experiments are found in one's home.
http://scifun.chem.wisc.edu/HOMEEXPTS/HOMEEXPTS.HTML

Fun Science Gallery
http://www.funsci.com/texts/index_en.htm

Funology Science Experiments
http://www.funology.com/laboratory/index.cfm

Little Shop of Physics – The Amazing Physics of Everyday Objects
http://littleshop.physics.colostate.edu/OnlineExperiments/OnlineExpts.html

Newton's Apple This site includes experiments and even streaming video showing demonstrations of a variety of scientific topics. :
http://www.ktca.org/newtons/index.html

Nye Labs.com This is indeed "Bill Nye, the science guy" with lots of activities and applications for science.
http://www.billnye.com

Reekos Mad Science Lab Interesting information and applications for science.
http://www.spartechsoftware.com/reeko/

School for Champions Physical science experiments.
http://www.school-for-champions.com/science/experiments.htm

Science Experiments You Can Do!
http://www.west.net/~science/expindx.htm

Science Hobbyist
http://www.eskimo.com/~billb/

The Adventures of Science Bob
http://www.sciencebob.com/experiments/experiments.html

The Atoms Family Miami Museum of Science. Experiments regarding the study of atoms.
http://www.miamisci.org/af/sln/

The Science Explorer
http://www.brainpop.com/
http://www.exploratorium.edu/science_explorer/