Teaching the Most Missed Items for the GED® Social Studies/Science Tests

How can we help our students better prepare for and be more successful on the GED® Science and Social Studies tests? Based on information from the GED® Testing Service, this interactive workshop will identify problem areas students struggle with and provide teaching suggestions to help our students achieve at an even higher level!

"Science is a way of thinking much more than it is a body of knowledge."

- Carl Sagan

"Think of science as a verb. You have to do it."

- Jeff Goodman, Appalachian State University

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Today's Objectives

At the end of today's workshop, I will be able to:

- Explain skills and knowledge gaps students have in science and social studies
- Describe teaching methods to improve students' scientific understanding
- Access appropriate teaching resources

Science Skill and Knowledge Gaps

Gap 1
Analyzing scientific and technical arguments, evidence and text-based information

- Reconcile multiple findings, conclusions, or theories
- Express scientific information or findings verbally

Gap 2
Applying scientific processes and procedural concepts

- Design a scientific investigation
- Reason from data or evidence to a conclusion
- Make a prediction based upon data or evidence
- Understand and apply scientific models, theories, and processes

Gap 3
Reasoning quantitatively and interpreting data in scientific contexts

- Describe a data set statistically
- Determine the probability of events

Social Studies Skill and Knowledge Gaps

Gap 1
Cite or identify specific evidence to support inferences or analyses of primary and secondary sources, attending to the precise details of explanations or descriptions of a process, event or concept.

Gap 2
Compare treatments of the same social studies topic in various primary and secondary sources, noting discrepancies between and among the sources.

Gap 3
Test questions assume test-takers have a basic understanding of the social studies subject matter and terminology used in the content topics and indicators. Civics/government and economics are students' weakest areas.

Montemayor, A. (2022). *GED knowledge and skill gaps: Science*. [PowerPoint Slides].

Human Wonder Research

Is the light traveling down the cord and out the plug causing the packet to sink?

Is rubbing my hand on my hair causing the packets to sink?

Is mind control moving the packet?

What do you observe every time the packet moves?

What is your hypothesis as to why the packet moves?

Why does the packet move?

To find this site with more human wonder research topics, Google: **human wonder research app State**

How to Think Scientifically

“Science, stripped down to its essentials, is just a method for figuring things out: you look at some situation, come up with a possible explanation, and try it to see if it works. If it does, great, if not, try something else. Repeat until you find an explanation that works.

“This does not demand a complicated skill set. It’s really not much more than you need to be a functioning adult in modern society. And most people have, at one time or another, used exactly this procedure.

“If you’ve ever cooked without a recipe, you have the mental skills needed to be a scientist. You come up with new dishes in essentially the same manner as you solve scientific problems: you make a guess that cooking two particular ingredients together in some way will be delicious, then you do it, and taste to see if you’re right. That’s the scientific method right there, and millions of people have done it at some point in their lives.

“If you have ever repaired anything– a car, a dripping faucet, a blown fuse– you have the mental skills needed to be a scientist. You fix problems in everyday life in the same way that you attack scientific problems: you make a guess as to the source of the problem, you try the appropriate solution for that sort of problem, and see if it worked. That’s how science works, and millions of people make their living doing this without ever realizing that they’re thinking scientifically.”

Chad Orzell, Everybody Thinks Scientifically, Uncertain Principles Blog

Steps in the Scientific Method

Make Observations

Science begins with observation. Observation is getting information through sight, hearing, smelling, tasting, and touching.

My coffee stayed warm for two hours in my Thermos® cup. My cold drink only stayed cold for one hour in a plastic cup.

Ask Questions

Science begins with observation and continues with wonder. Humans are full of questions about what we discover from our senses. Why is the sky blue? Why do rotten eggs smell? We can ask questions using the five w’s and one h: who, what when, where, why, and how. The question has to be one that can be tested through an experiment.

What kind of cup is the best insulator?

Create a Hypothesis

Once we have done some research about our question, we can create a hypothesis, an educated guess based on observation and research. A good hypothesis is a possible explanation that can be tested with an experiment.

A Thermos® cup will keep hot water warm the longest.

Design an Experiment

Scientists design experiments where one variable is changed (experimental) and the others are kept the same (controlled). Certain experiments may have a control and experimental group. The variables stay the same in the control group while one variable is changed in the experimental group. The control group shows what happens if nothing changes so it can be compared with the experimental group.

In this experiment, the controlled variables are the water temperature, the amount of water poured in the cups, and the room temperature. The experimental variables are the different types of cups.

I heat water to 160 degrees and put an equal amount into three kinds of cups: a Thermos® cup, a plastic cup, and a Styrofoam cup.

Collect and Analyze Data

While doing the experiment, we observe what happens and collect data. The data describe what happened in the experiment and is usually shown in charts, graphs, and tables.

Cup type	Thermos®	Plastic	Styrofoam
Initial Temp	160	160	160
Water temp after 30 minutes	105	88	95
Water temp after 60 minutes	92	74	84
Water temp after 120 minutes	84	70	75

Draw Conclusions

Using our analyzed data, we now see if our hypothesis is right. The conclusion is our written statement that says what we think about our hypothesis. Scientists repeat their experiments many times to make sure their conclusions are right.

My hypothesis is correct: The temperature in the Thermos® cup was the highest after 120 minutes, therefore a thermos cup is the best insulator.

Communicate the Results

Finally, we describe the research we have done, the hypothesis, the experiment, the data, and our analysis so we can share it with others. This is done through reports, oral presentations, and journal articles. This can give other scientists a chance to repeat the experiment and see if their results match.

Science Experimental Design Practice

11 Questions you can turn into <u>simple, low-cost</u> experiments to teach experimental design:

1. Does adding aspirin to water keep flowers fresh longer?

2. How does the height from which a ping-pong ball is dropped affect the bounce height?

3. Which type of cup is a better insulator (Styrofoam, Thermos®, plastic, etc.)? Compare temperatures of hot water over time.

4. How does activity (lying, sitting, walking, running) affect pulse rate?

5. Which color of M&M's will people choose from a bowl or will they care? (This requires you to have an even number of each color of M&M evenly mixed in the bowl and not to tell the test subjects what you're testing.)

6. Compare how moldy a slice of bread will get over time under different storage conditions (in a plastic bag, left out, in a paper bag, etc.).

7. Compare how long it will take water to evaporate out of different shaped containers.

8. Roll a marble or a car down a ramp. How does the height of the ramp affect how far it goes? (This can also be set up to test how the rolling surface affects distance rolled if height remains the same and rolling surface is changed.)

9. How does the temperature of water affect how quickly it will dissolve an Alka Seltzer?

10. Does the size of a coin affect how long you can spin it on its edge before it falls? (Compare dime, penny, nickel, quarter, dollar coin). (This is a great activity to discuss the challenges in doing controlled experiments. How can we make sure the spin is the same each time?)

11. Which shape of paper falls fastest: An unfolded sheet of paper, a paper folded in fourths, or a sheet of crumpled paper? Or can you create a different shape with paper that falls even faster?

For each of these experiments, identify:

A. Hypothesis
B. Many controlled variables
C. 1 Experimental (changed) variable
D. How you will collect data
E. How data will be evaluated

Experiments # 1 – 10 Jeff Goodman, Appalachian State University, # 11 GED® Testing Service

Experimental Design Graphic Organizer

What do you notice about what you are studying?
What is your question?
What is your hypothesis?
How will you set up your experiment? What are your controlled (things that stay the same) and experimental (one change) variables?
How will you collect your data?
How do you know if your hypothesis is right? If . . . then . . .
How will you show your results?