



## **Scientific Method**

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### **Research Host:**

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### **Grade Level:**

Middle-High School

## Scientific Method

The Scientific Method is used to reach conclusions and to further the development of theories to explain phenomena in the physical world. Inferences and scientific theories are generated based on the scientific evidence **currently** available. As more information is generated through more investigations and evidence, theories change.

### **Purpose:**

This activity demonstrates that scientific inferences and conclusions are made based on the knowledge currently available and on the evident presented. Students need to appreciate that scientific theories may be modified when **new** evidence is obtained. This activity **dramatically** demonstrates that the data one has available can bias the conclusions that one reaches; further, that as more evidence is presented, scientific theories can be modified to fit the evidence given. Science is tentative and constantly changing because all possible data is never available.

### **Objectives:**

Students will be able to:

- collect and organize information
- make observations
- evaluate and make inferences
- coordinate new information with old information by performing a series of investigations
- modify old information based on new evidence
- write defense of their inferences
- evaluate and critique inferences presented by other investigative teams
- provide alternative explanations or inferences for evidence presented
- re-evaluate inferences and conclusions when ALL evidence is gathered.

### **Grade Level & Work Groups for Activity:**

This activity is appropriate for grades 6-12. Students should work in groups of three (3).

### **Materials:**

- one set of 16 “checks” for each group of three students.

### **Procedure:**

1. Each team is given an envelope containing five of the 16 checks. The checks have been previously randomly selected so that no group receives the same combination of checks.
2. Each group is then asked to examine their data (checks) and to write five inferences that would account for the information learned from the checks. The students are asked to support their inferences with the evidence on the checks.
3. When students complete their inferences, each team is given four more checks and is asked to re-evaluate their inferences using the new data. Students can either restate or add to their list of inferences.

4. When the second round is complete the students are given four more checks and repeat the process.
5. Each group of students will have 13 of the original 16 checks when they have completed the exercise. Each team then presents their conclusions to the class and describes their supporting evidence. Other students in the class evaluate the appropriateness of the inferences.

It will become apparent to students that because the teams have had access to different sequences and sources of information, conclusions and inferences will be different. Students should discuss the following issues and discuss how these issues influenced their conclusions and inferences:

1. The order that the checks were received.
2. The importance of evidence NOT received.
3. The importance of bias within each team.
4. Is “truth” in the final conclusion of each group?

This activity is open-ended. As long as the inferences reached are logical, anything goes!

**Student Worksheet:**

ROUND ONE:

DATA:

- 1.
- 2.
- 3.
- 4.

INFERENCES DEVELOPED:

- |    |                        |
|----|------------------------|
| 1. | EVIDENCE FOR INFERENCE |
| 2. | EVIDENCE FOR INFERENCE |
| 3. | EVIDENCE FOR INFERENCE |

FINAL CONCLUSION:

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ROUND TWO:

DATA:

- 1.
- 2.
- 3.
- 4.

INFERENCES DEVELOPED:

- |    |                        |
|----|------------------------|
| 1. | EVIDENCE FOR INFERENCE |
| 2. | EVIDENCE FOR INFERENCE |
| 3. | EVIDENCE FOR INFERENCE |

FINAL CONCLUSION

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ROUND THREE:

DATA:

- 1.
- 2.
- 3.

INFERENCES DEVELOPED:

1. EVIDENCE FOR INFERENCE
2. EVIDENCE FOR INFERENCE
3. EVIDENCE FOR INFERENCE

FINAL CONCLUSION:

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1. How many revisions did you make to final conclusion from ROUND 1 to ROUND 2?
2. How many revisions did you make to final conclusion from ROUND 2 to ROUND 3?
3. How many revisions did you make to final conclusion from ROUND 1 to ROUND 3?
4. Were any of your final conclusions in any round the same as the final conclusion in any round of any other group?
5. What did you learn from this activity?

**TEACHER PACKET:**

Computer generate 16 bank checks with the following information:

1. Check #1:

Date: October 14, 1991  
Pay to: Sandy Beach Apartments:  
Amount: \$1500.00  
Memo: Rent check  
Check Imprint Should Read:  
Mr. Sam Science  
16 Hartbrake Dr.  
Sensles, WA 10038

2. Check #2:

Date: July 14, 1992  
Pay To: Judge Judy Justice  
Amount: \$5000.00  
Memo: Contribution  
Check Imprint Should Read:  
Mr. and Mrs. Sam Science  
1443 Happy Blvd.  
Sensles, WA 10038

3. Check #3:

Date: January 21, 1993  
Pay To: Headmaster, Military Academy  
Amount: \$500  
Memo: None  
Check Imprint Should Read: Same as #2

4. Check #4:

Date: December 24, 1985  
Pay To: Computer City  
Amount: \$5000.00  
Memo: None  
Check Imprint: Same as #2

5. Check #5:

Date: January 2, 1995  
Pay to: Horan and McCourtney Funeral Home:  
Amount: \$15,000.00  
Memo: None  
Check Imprint: Same as #1

6. Check #6:

Date: November 3, 1994  
Pay To: M.A.D.D.  
Amount: \$1500.00  
Memo: None  
Check Imprint: Same as #1

7. Check #7:

Date: October 15, 1994  
Pay To: Good Samaritan Hospital  
Amount: \$24,000.00  
Memo: None  
Check Imprint: Same as #2

8. Check #8:

Date: August 15, 1994  
Pay To: Rapid Ambulance  
Amount: \$3000.00  
Memo: None  
Check Imprint: Same as #1

9. Check #9:

Date: June 25, 1994  
Pay To: Jack's Jewelry Store  
Amount: \$4000.00  
Memo: None  
Check Imprint: Same as #1

10. Check #10

Date: March 22, 1994  
Pay To: Giles, O'Keefe and Miles  
Amount: \$2000.00  
Memo: None  
Check Imprint: Same as #1

11. Check #11

Date: March 11, 1994  
Pay TO: We Hammer 'em Out  
Amount: \$1458.00  
Memo: None  
Check Imprint: Same as #1

12. Check #12

Date: February 20, 1994  
Pay To: Ferrari, Inc.  
Amount: \$35,000.00  
Memo: None  
Check Imprint: Same as #2

13. Check #13:

Date: June 15, 1979  
Pay To: Baby Things  
Amount: \$858.00  
Memo: None  
Check Imprint: Same as #1

14. Check \$14:

Date: August 10, 1991  
Pay To: Rigid Military Academy  
Amount: \$5750.00  
Memo: None  
Check Imprint: Same as #2

15. Check #15:

Date: August 6, 1979  
Pay To: Mercy Hospital  
Amount: \$2500.00  
Memo: None  
Check Imprint: Same as #2

16. Check #16:

Date: July 5, 1994  
Pay To: Sam Science  
Amount: \$5000.00  
Memo: Happy Birthday  
Check Imprint: Same as #2

ALL CHECKS ARE SIGNED BY SAM SCIENCE