Connecticut State Department of Education Bureau of Curriculum and Instruction

Curriculum Embedded Performance Task

Grade 5 Science
Content Standard 5.2

Catch It!
An Investigation of Factors Affecting Human Reaction Time

Teacher Manual

Modified By Wallingford Public Schools
May 2006

This electronic document can be accessed by teachers on the W drive.
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DESCRIPTION OF “CATCH IT!” INQUIRY INVESTIGATION

You will explore factors affecting human reaction time. In the inquiry starter, students become familiar with the materials and learn a technique for measuring the reaction time of different individuals. They will observe how long it takes group members to catch a falling ruler. Noting that people have different reaction times, students will then investigate one possible factor that might influence reaction time speed. Students will learn about the importance of controlling variables to make a fair test so that results are more reliable.

Approximate Time: 8 – 9 Lessons (2 weeks)

Materials needed:
For each group of 2:
- 30-cm metric ruler *
- Calculator

*Using different types of rulers (different colors, materials, transparent vs. opaque) provides another opportunity for students to investigate factors that may affect reaction time.

Key Vocabulary:
- scientific method (investigation format)
- various terms related to central nervous system
- fair test
- variable
- constant
- valid
- reliable
- increase/decrease
- trial
- average
Related Key Concepts or Big Ideas:
It is recommended to do this inquiry after students have learned about the central nervous system. (Students should be making connections and using terminology based on prior knowledge of central nervous system).

Content:
- There are different systems within the body and they work independently and together to form a functioning human body.
- The central nervous system is divided into two parts: the brain and the spinal cord.
- The somatic nervous system consists of peripheral nerve fibers that send sensory information to the central nervous system and motor nerve fibers that deliver movement instructions to skeletal muscle.
- The sense organs perceive stimuli from the environment and send signals to the brain through the nervous system.
- Some movements controlled by the brain are voluntary, and others are involuntary.
- The time it takes for the information and instruction messages to travel back and forth is a person’s reaction time.
- Different areas of your brain deal with planning, carrying out, overseeing and remembering movements.
- Human reaction time is affected by a variety of physiological and environmental factors.

Skills:
- Make scientific observations
- Recognize the difference between an observation and an opinion, a belief, a fact or a name
- Formulate a testable (investigable) question based on observations
- Predict what might happen.
- Design a fair test to answer a testable question
• Conduct simple investigations
• Collect and record data using appropriate tools, such as a metric ruler
• Organize appropriate and accurate measurements and observations, using:
  • Charts and graphs
  • Graphic organizers
  • Illustrations or diagrams
  • Journaling
• Interpret/ analyze data in tables and graphs
• Draw conclusions based on data, observations, or findings.
• Communicate results or information (oral and written) in an appropriate manner, using:
  • Presentations
  • Visuals
  • Simple reports
  • Etc.
• Seek relevant information in books, magazines and electronic media.

ENGAGE
The soccer goalie on the cover page sees the ball coming and has to move quickly to reach and catch the ball. In less than a second, he must see where the ball is traveling and know where to move his arms, legs and hands so he can catch the ball before it goes into the goal. How can the goalie make all these decisions so fast?

Teacher notes: The purpose of the introduction is to engage students in the concept of response to stimuli. Based on the needs and interests of your class, use different examples of stimuli and reactions to spark discussion. For example, you might use a video clip of a soccer game to enhance the introduction used above. Also, many students are familiar with the hand-eye coordination associated with video games, and will readily engage in a conversation on the topic. Other ideas include the game “Red Hands” in which a person holds out her hands, palms up, and her opponent places her hands on top, palms down. The first person then tries to quickly touch the backs of her opponents’ hands. All are options for engaging students in the concept of response to stimuli.
INQUIRY STARTER - EXPLORE

In this activity, you will explore how quickly people can react to catch a falling ruler. Then, you will investigate factors that may affect people’s reaction times.

1. Explore by following steps (a) through (f). Record observations (“Noticings”) and questions (“Wonderings”) as you explore.

Teacher notes: During this exploration there is likely to be a great deal of variation in the way the students are dropping, catching and recording. Allow this variation to occur, as it will create “discrepancies” that will make for rich class conversation when the activity is complete. During the debriefing when students are sharing their “noticings” and “wonderings”, ask students to suggest possible causes for different reaction times. Students may note, for example, that “Some of the rulers are plastic and some are wood” or “The researcher held the ruler with a different hand during the second trial”.

   a. The “researcher” holds the ruler vertically (straight up and down). The “subject” opens the fingers of the catching hand and holds them near the bottom of the ruler, right next to the 0 cm line (without actually touching it).

   b. Without warning, the starter lets go of the ruler and the subject catches it by quickly pinching the fingers around the falling ruler.

   c. The researcher reads the measurement on the ruler at the point where the fingers are holding it. All members record the distance the ruler dropped in a data table. Repeat several times.

Teacher note:
Remind students to record observations as they are investigating. This may include diagrams, notes, observations, thoughts, or questions they have.

If your students are experienced data collectors, you may want to increase the challenge in this task by removing all (or parts) of the data table below and requiring
students to create their own data table to record important information about their experiment.

Sample:

<table>
<thead>
<tr>
<th>Subject's Name</th>
<th>Trial 1 Distance</th>
<th>Trial 2 Distance</th>
<th>Trial 3 Distance</th>
<th>Average Distance (cm)</th>
<th>Average Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*see below</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

  d. CALCULATE the average distance it took for each subject to catch the ruler.

*Teacher notes: If students are familiar with averaging decimals, they can complete this portion on their own. If not, you may want to provide calculators and/or teach a mini-lesson on the skill. Allow extra time for this step if averages are a new concept.

  e. Use the chart below to find the closest reaction time to the AVERAGE DISTANCE (in your data table) for each subject. Then look at the Reaction Time column to find out how much time it took the subject to catch the ruler. If the exact distance is not listed in the chart, estimate the reaction time by using the numbers that are in the chart.

<table>
<thead>
<tr>
<th>Distance Ruler Dropped (in centimeters)</th>
<th>Reaction Time (in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.05</td>
</tr>
<tr>
<td>2</td>
<td>.07</td>
</tr>
<tr>
<td>3</td>
<td>.08</td>
</tr>
<tr>
<td>4</td>
<td>.09</td>
</tr>
<tr>
<td>5</td>
<td>0.10</td>
</tr>
<tr>
<td>10</td>
<td>0.14</td>
</tr>
<tr>
<td>15</td>
<td>0.18</td>
</tr>
<tr>
<td>20</td>
<td>0.20</td>
</tr>
<tr>
<td>25</td>
<td>0.23</td>
</tr>
<tr>
<td>30</td>
<td>0.25</td>
</tr>
</tbody>
</table>
f. Switch roles and repeat.

Teacher notes: Students might need extra help understanding the Reaction Time chart. For example, display the chart on an overhead and explain how the columns relate to each other. If students are not familiar with decimals, explain that each time listed is less than a second. **Students will need to estimate the reaction time for some measurements.** You should model how to estimate the time for distances not found on the chart. For example, 12 cm is missing from the chart, is the reaction time 0.15 or 0.16?

2. INTERPRET the data. Which of your subjects had the fastest reaction time? What factors do you think contributed to the different reaction times?

Teacher notes: Students might discuss these prompts first with their partners, or in writing, before engaging in the class discussion.

3. SHARE findings with class. Compare findings of different groups.

   a. Did you notice any similarities among the people with the fastest reaction times?

Teacher notes: Provide students the opportunity to informally share their results. Begin your discussion by posting the following questions:

   - Did all your subjects have the same reaction time?
   - Which of your subjects had the fastest reaction time?
   - What factors do you think contributed to the different reaction times?
   - Encourage students to look for any patterns that might exist among those whose reaction times were fastest.

   b. Record observations and questions for further investigations. **These questions will be used for students to explore during the inquiry investigation (and possibly during research to answer the “why” questions).**

Teacher notes: Guide a class discussion by charting students’ observations and wonderings about what might affect reaction time. Classify the charted questions into those that can be answered by doing a fair test (TESTABLE QUESTIONS), and those that could be better answered by finding information in a book (RESEARCH QUESTION) or on the internet (e.g., “Why are some people faster with their left hand?”) Keep a visible record, such as a t-chart, of observations and questions.
Examples of investigable questions include:

- How does hand dominance affect a person’s reaction time?
- How does sight affect a person’s reaction time?
- How does a person’s size (height) affect their reaction time?
- How does gender affect a person’s reaction time?
- Does practice affect a person’s reaction time?
- How does age affect a person’s reaction time?
- How does the amount of background noise affect a person’s reaction time?
- How does the amount of light affect a person’s reaction time?
- Does the kind (color) of ruler affect a person’s reaction time?
- Do the response times change if the subject isn’t watching the researcher’s hand?
- Can you decrease your response time by repeating the task many times?

▲ If needed, inspire students’ curiosity by asking open-ended questions, such as:

- “I wonder what will happen when…”
- “What do you know about…”
- “Show me how you are....”
- “Tell me more about…”
- "I’m noticing…"
- “What else did you notice?”
- “What else are you wondering?”

You may ask students to share their questions with the class and have the group discuss which ones are investigable (TESTABLE QUESTION) vs those that are researchable. For example, “Does a person’s reaction time improve with practice?” is an investigable question. “Why do some people react faster than others”, however, is a question that is better suited for research in books or the internet.

Discuss with students all the variables that could be tested or changed during an investigation. (The chart below reflects some typical student responses.) Remind
students that only one variable is changed or tested during a FAIR TEST. All other variables should then remain the same for a fair test. For example, if you are testing or changing the gender, then all other variables should be the same such as:

- Same testing location
- Same testing procedures
- Same age
- Same amount of sleep
- Same amount of practice
- Same amount of background noise, etc.

### Variables That Can Be Investigated

<table>
<thead>
<tr>
<th>Variables that we can test or change</th>
<th>What will we observe (measure)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>• Different reaction times (distance then converted to time)</td>
</tr>
<tr>
<td>Size</td>
<td></td>
</tr>
<tr>
<td>Left-handed vs. right handed</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Practice</td>
<td></td>
</tr>
<tr>
<td>Amount of light</td>
<td></td>
</tr>
<tr>
<td>Amount of noise</td>
<td></td>
</tr>
<tr>
<td>Etc.</td>
<td></td>
</tr>
</tbody>
</table>

How does ______ affect a person’s reaction time?

Have students copy the revised TESTABLE QUESTIONS or investigable questions into their notebooks. Groups will chose one (or more, time permitting) question to investigate during the next part of this investigation.
INQUIRY INVESTIGATION

What Affects Reaction Time?

During the inquiry starter, you may have noticed that people have different reaction times. What conditions do you think might affect how fast someone can react? You will now be identifying a question you want to explore to find out more about ONE factor that might affect a person’s reaction time.

You may consider using an investigation template and/or scoring guides with students: See pages 21 - 31 for samples.

Facilitate students through their inquiry investigation by guiding them through the following steps:

1. DECIDE on an investigation question. Record the question in your science notebook.

   Teacher notes: Encourage students to discuss and write several possible questions of interest to them concerning reaction time.

2. DESIGN a plan to conduct your investigation.

   Teacher notes:

   Explain to students that a scientific community critiques and confirms the work of its members in order to assure validity of claims. To do this, scientists must record their procedures in sufficient detail so that anyone could replicate the experiment and obtain similar results. You may want to have students draft their experimental plans, then have the students view each other’s plans and provide feedback.

   Help students to design a fair test, where they are testing or changing only ONE variable (independent variable). For example, if they want to test whether a person’s
reaction time is faster in the morning compared to the afternoon, they should keep all other variables the same such as the same: age, amount of sleep, sex, kind of ruler, starting technique, etc. When doing experiments with humans it is very hard to ensure a fair test by keeping all the variables the same. However, students should think about the ideal conditions and try to plan accordingly to keep as many other variables the same to work towards a fair test.

3. CREATE a data table in your science notebook that will help you keep your measurements organized. You will also want to record any unexpected observations and questions.

Teacher notes:

You may want to model how to set up a sample data table, using a different question that no one is investigating. You may also refer students to the data collection tables they used during the initial inquiry starter.

4. CONDUCT your experiment. Collect and record data for each trial in your notebook.

Teacher notes:

As children are conducting investigations, reinforce the concept of FAIR TEST. They need to remember to keep other variables or factors constant (the same). As children conducted investigations, they had to be reminded to be consistent with their testing…some subjects couldn’t stand while others sat, ….some subjects couldn’t use a red ruler while others used a wood ruler, etc.

If your students are inexperienced in conducting fair tests, this may be a good time for a mini-lesson about the importance of repeating a test several times (doing more than one trial). Facilitate a class discussion to stimulate student thinking about doing multiple trials in order to increase confidence in the data. Multiple trials can highlight “inconsistent” data within a pattern, and can help identify experimental errors.

5. CALCULATE the average distance it took for each subject to catch the ruler. RECORD the average reaction time for each subject in your data table (use the table provided to covert distance to seconds).
Teacher notes: This is a good opportunity for students to understand the practical application of “average” in order to eliminate extreme highs and lows in a data pattern. If students are familiar with averaging decimals, they can complete this portion on their own. If not, you may want to provide calculators and/or do a mini-lesson on the skill. Allow children to check their answers using a calculator.

4. DRAW a bar graph that compares the average reaction times of your subjects for the factor you tested.

Teacher notes: ▲ If students are familiar with bar graphs, they can complete this portion on their own. If not, you may want to provide a mini-lesson on some of the elements of constructing a bar graph. You may differentiate this step by providing some or all of the graph components. For example, provide students with unlabeled axis and expect them to draw and label the axis correctly. Or, you can use this as a mini-lesson on scaling a graph. Allow extra time for this step if bar graphs are a new concept.

A mini-lesson on how to modify the intervals on the axis to show the data more accurately may be needed. For example, instead of counting by 10’s students may need to count by .1 or .05 when labeling the axis.

5. INTERPRET the data. What conclusions can you draw based on the graph? Did the factor you investigated have an effect on the reaction times of your subjects?

Teacher notes: Students might independently reflect in writing, before engaging in the class discussion. While facilitating, assess for students’ ability to formulate a logical conclusion based on data. Help students understand that in science, data is interpreted as evidence that either supports or does not support an assumption. It is not bad when the evidence does not support the original assumption because new understanding comes to light. There is no “correct” answer for this investigation since the outcomes depend largely on carefully controlling the variables in the experiment. Students should be guided to consider how reliable their data are. For example, was the ruler dropped the same way each time? Was the measurement taken in the same way each time? Encourage students to develop a respect for data, even when it supports a conclusion that was unexpected. Unexpected results lead to new questions, which have led to most of mankind’s advances in scientific understanding!
6. Present Your Findings

Work with your partners to make a poster that summarizes your investigation. Use the poster to make a presentation to your class to share the results of your investigation. They will want to hear what you found out in during your investigation. Some of them may have done a similar investigation, and you will want to know if their findings were similar to yours.

Your poster should include:

- The question you were investigating;
- A brief description of how you did your experiment;
- A bar graph showing your findings; and
- The conclusion that is supported by your data.

Be prepared to tell your class about any data that you collected that might not be “accurate” because of unexpected things that happened during your experiment.

*Teacher notes: Each group should present for a short amount of time. You may have the rest of the class take notes, such as suggestions for ways the investigation could be modified or improved, or things that were interesting or innovative about the investigation. You may also allow a brief period for questions after each presentation. If possible, highlight questions or ideas that may relate to the nonfiction research project.*
Optional
INVESTIGATE THROUGH RESEARCH - EXPLAIN

** This section is optional, depending on what type of questions students still have and how much pre-teaching you did on the nervous system.

Learn more about what’s happening inside your body during the reaction test. Do some research on the internet to find out more about how your senses get information to your brain, and how your brain responds.

Write a reflection that explains your understanding of how the brain and senses work together to help you “react” to catch the falling ruler.

Teacher notes: This research can be done in class, in the media center, or as homework. This research can be done mid-way through the inquiry investigation, before or after the inquiry. See the “Resources” section of the Teacher Manual for some excellent kid-friendly websites about the nervous system. Students should learn about the major structures and functions of the central nervous system: the brain, spinal cord, and nerves.

Teaching Resources
Human Body Systems:

Brain and Senses Info for Teachers:
http://www.hhmi.org/senses/a110.html

Further Brain Explorations for Students:

http://42explore.com/brain.htm – an amazing collection of websites with abundant information and activities for adults and students related to brain science.

Learning About Brain and Senses for Students:

http://faculty.washington.edu/chudler/introb.html#bb
http://faculty.washington.edu/chudler/bookse.html

Nonfiction Text Resources:

Kids Discover: Brain


WHAT IS A CURRICULUM EMBEDDED PERFORMANCE TASK?
(revised from CSDE)

Curriculum-embedded performance tasks are examples of teaching and learning activities that engage students in using inquiry process skills to deepen their understanding of concepts described in the CT science framework. Developed by teachers working with the Connecticut State Department of Education, the performance tasks are intended to influence a constructivist approach to teaching and learning science throughout the school year. **They will also provide a context for CMT questions assessing students’ ability to do scientific inquiry.**

The elementary performance tasks are conceptually related to Content Standards. The elementary performance tasks provide opportunities for students to use the Inquiry Expected Performances for Grades 3 to 5 (see Science Framework B.INQ 1-10 skills) to understand science concepts. The middle school and high school performance tasks provide opportunities for students to use the Inquiry Expected Performances for Grades 6 to 8/ 9-10 to understand science concepts.

**Teachers are encouraged to use the state-developed curriculum-embedded performance tasks in conjunction with numerous other learning activities that incorporate similar inquiry process skills to deepen understanding of science concepts.** Students who regularly practice and receive feedback on problem-solving and critical thinking skills will steadily gain proficiency.

HOW ARE THE PERFORMANCE TASKS STRUCTURED?
Each performance task includes two investigations; one that provides some structure and direction for students, and a second that allows students more opportunity to operate independently. The goal is to gradually increase students’ independent questioning, planning and data analysis skills. The elementary performance tasks introduce students to understanding and conducting “fair tests”. The middle school
performance tasks focus on designing investigations that test cause/effect relationships by manipulating variables.

Mathematics provides a useful “language” for quantifying scientific observations, displaying data and analyzing findings. Each curriculum-embedded performance task offers opportunities for students to apply mathematics processes such as measuring, weighing, averaging or graphing, to answer scientific questions.

Not all science knowledge can be derived from the performance of a hands-on task. Therefore, each curriculum-embedded task gives students opportunities to expand their understanding of concepts through reading, writing, speaking and listening components. These elements foster student collaboration, classroom discourse, and the establishment of a science learning community.

A useful structure for inquiry-based learning units follows a LEARNING CYCLE model. One such model, the “5-E Model”, engages students in experiences that allow them to observe, question and make tentative explanations before formal instruction and terminology is introduced. Generally, there are five stages in an inquiry learning unit:

- **Engagement**: stimulate students’ interest, curiosity and preconceptions;
- **Exploration**: first-hand experiences with concepts without direct instruction;
- **Explanation**: students’ explanations followed by introduction of formal terms and clarifications;
- **Elaboration**: applying knowledge to solve a problem. Students frequently develop and complete their own well-designed investigations;
- **Evaluation**: students and teachers reflect on change in conceptual understanding and identify ideas still “under development”.

The performance tasks follow the “5-E” learning cycle described above. However, the teacher can decide the role the performance task will play within the larger context of the entire learning unit. Early in a learning unit, the performance task can be used for
engagement and exploration; later in a learning unit, the performance task might be used as a formative assessment of specific skills.

**HOW ARE THE PERFORMANCE TASKS RELATED TO THE CMT?**
The Science CMT for Grades 5 and 8 (starting 2008) will assess students' understanding of inquiry and the nature of science through questions framed within the CONTEXT of the curriculum-embedded performance tasks. Students are not expected to recall the SPECIFIC DETAILS OR THE “RIGHT” ANSWER to any performance task. The questions, similar to the examples shown below, will assess students’ general understandings of scientific observations, investigable questions, designing “fair tests”, making evidence-based conclusions and judging experimental quality.

Here is an example of the type of multiple-choice question that might appear on the Grade 5 Science CMT. The question is related to the “Soggy Paper” performance task:

| Some students did an experiment to find out which type of paper holds the most water. They followed these steps: |
| 1. Fill a container with 25 milliliters of water. |
| 2. Dip pieces of paper towel into the water until all the water is absorbed. |
| 3. Count how many pieces of paper towel were used to absorb all the water. |
| 4. Repeat with tissues and napkins. |
| If another group of students wanted to repeat this experiment, which information would be most important for them to know? |
| a. The size of the water container |
| b. The size of the paper pieces * |
| c. When the experiment was done |
| d. How many students were in the group |
NOTE THAT THE CMT QUESTIONS DO NOT ASSESS A CORRECT “OUTCOME” OF A PERFORMANCE TASK OR STUDENTS’ RECOLLECTION OF THE DETAILS OF THE PERFORMANCE TASK. Students who have had numerous opportunities to make observations, design experiments, collect data and form evidence-based conclusions are likely to be able to answer the task-related CMT questions correctly, even if they have not done the state-developed performance tasks. However, familiarity with the context referred to in the test question may make it easier for students to answer the question correctly.

RELATED CT State Department of Education CONTENT STANDARDS:

<table>
<thead>
<tr>
<th>CSDE Content Standards (CSDE Science Framework 2004)</th>
<th>CSDE Primary Expected Performances (CSDE Science Framework 2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structure and Function – How are organisms structured to ensure efficiency and survival?</strong>&lt;br&gt;5.2 - Perceiving and responding to information about the environment is critical to the survival of organisms.&lt;br&gt;The sense organs perceive stimuli from the environment and send signals to the brain through the nervous system.</td>
<td>B21. Describe the structure and function of the human senses and the signals they perceive. (ear for sound)</td>
</tr>
</tbody>
</table>
Observation Starters

Think of the five senses
• What kind of information does your five senses tell you? Size, shape, color, lines, texture, smell, weight, patterns, sound, behavior
• I observed.........
• I noticed.........

Connect it with what you know.
• It reminds me of _______________ because ____________.

Observe and record cause and effect
• When I ________________, it _________________.

Note any changes
• It changed after ________________, and now it _________________.

Be curious and full of wonder.
• I am curious about _____________.
• I wonder what would happen if _________________.
• I wonder what would happen if _________________.

Source: Seattle’s K-5 Inquiry Based Science Program, Betsy Rupp Fidwiler, March 2002
Investigation Template

**Question Investigating:**

**Materials:** List ALL of the items you will need.

**Prediction:** What do you THINK will happen?

**Hypothesis:** I think ______ will happen because ____ (use prior/background (what you already know) to make this logical guess) ____________.

**Plan:**

o What will you DO with the materials?

o How will you use the materials?

o What STEPS will you follow?

o Describe what you will DO.

o Use sequencing words (first, next, then, afterwards, finally…)

o **Someone else should be able to conduct the SAME investigation based on the specific details in your plan.**

**Observations:** How will you show/collect all of your DATA?

o Table? Graph? Chart? Detailed drawing/illustrations?

o ALL observations should include SPECIFIC labels/sentences/titles to help explain.

**Conclusions:** (What are the RESULTS of what happened?)

o We conclude that (answer the question) happened because in our investigation we found that ______ (your results).

**Next steps or NEW questions:** Because of this investigation, what are you still wondering or what do you still want to find out?
Preparing to Share Results

What was your question?
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

What variable did you test and how did you test it?
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

What did you find out?
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

We think this happened because
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

Prepare to share your investigation and results with the class. Consider what you think would be an effective way to communicate your results (by talking, making a poster, a chart or graph, etc.)

Source: Exploratorium, Increasing Inquiry in Kits and Hands-On Curricula, 2004
Scoring Guide

My investigation includes ALL of the following:

5 4 3 2 1   a TESTABLE or investigable QUESTION

5 4 3 2 1   All of materials listed

5 4 3 2 1   A PREDICTION

5 4 3 2 1   a PLAN which includes:
            5 4 3 2 1   Sequencing words (at least 5)
            5 4 3 2 1   Specific details
            5 4 3 2 1   How to use the materials
            5 4 3 2 1   Scientific words used properly (variable, constant, data,
                           increase/decrease, subjects, researchers, etc.)

5 4 3 2 1   DATA RECORD SHEET which includes:
            5 4 3 2 1   A table, chart, drawing
            5 4 3 2 1   Observations drawn from data collected
            5 4 3 2 1   Presentation of DATA Collected
            5 4 3 2 1   Graph with titles

5 4 3 2 1   Preparation (guidelines) of how we will present

5 4 3 2 1   Data analyzed/interpreted (2 sentences)

5 4 3 2 1   CONCLUSIONS which include
            5 4 3 2 1   The results of what happened with details to explain
            5 4 3 2 1   The answer to the investigable question
            5 4 3 2 1   Next Steps/New Questions
            5 4 3 2 1   A complete sentence explaining what we still want to find out or
                           are still wondering
## Science Notebook/Journal Assessment

**Name:**  
**Topic:**  
**Date:**

**Assessment Scale:**  
1-Work in Progress  
2- Meets Expectations  
3 - Exceeds Expectations

<table>
<thead>
<tr>
<th>Process</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Organized Notebook</td>
<td></td>
</tr>
<tr>
<td>2. Managed time wisely throughout the unit</td>
<td></td>
</tr>
<tr>
<td>3. Communicated efforts with teacher throughout the unit</td>
<td></td>
</tr>
<tr>
<td>4. Participated during class discussions</td>
<td></td>
</tr>
<tr>
<td>5. Worked independently during unit</td>
<td></td>
</tr>
<tr>
<td>6. Worked cooperatively with others during unit</td>
<td></td>
</tr>
<tr>
<td>7. Portfolio demonstrates knowledge learned during unit.</td>
<td></td>
</tr>
</tbody>
</table>

**Total Points: **________/21=_______%
**Investigation Topic:**

**Name:**

**Date:**

**Assessment Scale**
- 1 - Work in Progress
- 2 - Meets Expectations
- 3 - Exceeds Expectations

<table>
<thead>
<tr>
<th>I used these skills ....</th>
<th>Self</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 I worked well with my partner(s) and respected all materials.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 I raised questions to be investigated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 I predicted the outcomes of my experiments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 I formed a hypothesis (explanation) based upon my observations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 I planned my investigation with my partner.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 I used the skill of observation (see, touch, smell, or sound) often during my experiments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 I used my best discussion skills to communicate my observations and results.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 I used my best writing skills to communicate my observations and results.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**I completed these activities.......**

<table>
<thead>
<tr>
<th>I completed these activities.......</th>
<th>Self</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 I explored with materials to help me raise questions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 I carried out my investigation with my partner.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 I kept careful record of my learning in my science notebook by using scientific words, pictures, and charts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 I evaluated my learning by asking the question, “What did I learn through about this topic?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 I appropriately used science material.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
14 I connected my learning through literature related to my topic.

15 I connected my learning through mathematics related to my topic.

16 I connected my learning through research (library and web sites) related to my topic.

Teacher’s Comments:

Student’s Comments:

1. The best thing about this investigation was

2. One thing that I learned during this was

3. Something that motivated me was
Use the plan in the box below to answer questions 1 and 2

1. The “human subject’s” forearm lays flat on the desk with fingers extending over the edge.
2. The “dropper” stands in front of the human subject and without any warning, the dropper releases the ruler and the human subject tries to catch it as quickly as possible.
3. The dropper then checks the ruler to see how many centimeters it fell.
4. The dropper will use the chart to convert centimeters to seconds and record the seconds on the data table.
5. The dropper will test three different males and three different females.

1. What is the testable question that this group is investigating?

2. Explain two ways the plan above could be improved.
Use the following chart to answer questions 3-5.

<table>
<thead>
<tr>
<th>Name</th>
<th>Trial 1 distance (cm)</th>
<th>Trial 1 time (sec)</th>
<th>Trial 1 distance (cm)</th>
<th>Trial 2 time (sec)</th>
<th>Average TIME (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexia</td>
<td>25</td>
<td>.23</td>
<td>15</td>
<td>.18</td>
<td>.205</td>
</tr>
<tr>
<td>Savannah</td>
<td>27</td>
<td>.24</td>
<td>10</td>
<td>.14</td>
<td>.19</td>
</tr>
<tr>
<td>Sara</td>
<td>3</td>
<td>.08</td>
<td>2</td>
<td>.07</td>
<td>.075</td>
</tr>
<tr>
<td>Mark</td>
<td>30</td>
<td>.25</td>
<td>25</td>
<td>.23</td>
<td>.24</td>
</tr>
<tr>
<td>Tom</td>
<td>29</td>
<td>.25</td>
<td>26</td>
<td>.23</td>
<td>.24</td>
</tr>
<tr>
<td>Kevin</td>
<td>33</td>
<td>.27</td>
<td>32</td>
<td>.27</td>
<td>.27</td>
</tr>
</tbody>
</table>

3. What conclusions can you draw from the data table above?

4. Use a calculator to calculate the AVERAGE DISTANCE for each of the subjects in the chart below. Show your work for one person.

<table>
<thead>
<tr>
<th>Name</th>
<th>Average Distance (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexia</td>
<td></td>
</tr>
<tr>
<td>Savannah</td>
<td></td>
</tr>
<tr>
<td>Sara</td>
<td></td>
</tr>
<tr>
<td>Mark</td>
<td></td>
</tr>
<tr>
<td>Tom</td>
<td></td>
</tr>
<tr>
<td>Kevin</td>
<td></td>
</tr>
</tbody>
</table>
5. What might have caused the different results in trial one and two for Savannah?

6. Explain what a “fair test” is.

7. Identify each statement as an observation or opinion. If you think a statement might be both, select the best answer.

a. Jake’s hand was shaking as he was waiting for the ruler to drop. ________________
b. I think that short people have a faster reaction time than tall people. _____________
c. Sam improved each time he caught the ruler. He caught the ruler at 15 cm, 10 cm and 8 cm. ________________
d. We predict that wood rulers are easier to catch than plastic rulers. _______________
e. When Sue caught the ruler it was crooked. ________________
8. Identify which questions are **testable** and which questions are **research** questions.

a. How does sight affect a person’s reaction time? ________________________

b. How does a person’s size (height) affect their reaction time? ________________

c. Why do girls have a faster reaction time? ________________________________

d. How does a person “see” so fast? ________________________________

e. How does the amount of light affect a person’s reaction time? ________________

f. Why does my heart start to beat faster when I get scared? ________________

9. Dave’s group wanted to if test toddlers, middle aged or elderly people have the fastest reaction time. In order for his experiment to be a “fair test”, what are some things (variables) that he should keep the same or constant? Explain three things that Dave should consider keeping the same.

10. Explain two improvements this group should make on the graph below.

```
<table>
<thead>
<tr>
<th></th>
<th>0.2</th>
<th>0.18</th>
<th>0.16</th>
<th>0.14</th>
<th>0.12</th>
<th>0.1</th>
<th>0.08</th>
<th>0.06</th>
<th>0.04</th>
<th>0.02</th>
<th>0.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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