Science Assessment System Through Course Task

Junk Drawer Finds

Grade Level:
2

Phenomena:
Properties of Matter

Science & Engineering Practices:
Asking Questions and Defining Problems
Planning Carrying Out Investigations

Crosscutting Concepts:
Patterns

Designed and revised by Kentucky Department of Education staff
in collaboration with teachers from Kentucky schools and districts.

Preparing to implement Through Course Tasks in the Classroom

What is a TCT?

- TCTs are 3-dimensional tasks specifically designed to get evidence of student competency in two dimensions, Science and Engineering Processes (SEPs) and Crosscutting Concepts (CCC), untethered from Performance Expectations (PEs)/standards. Tasks are sense-making experiences.
- Tasks are to be used formatively. The goal is for both students and teachers to understand areas of strength and improvement for the SEP(s) and CCC assessed within the task.

How do I facilitate a Through Course Task (TCT)?

- TCT facilitation is a collaborative process in which teacher teams calibrate understanding of the expectations of the task and refine strategies to be used during task facilitation.

Before the task:

1. Complete the TCT as a learner – compare understanding of task through the lens of success criteria (identified in the task) in order to understand expectations.
   Success criteria include:
   - What is this task designed to get evidence of?
   - What is the task asking the students to do?
   - What might a student response look like?
2. Identify the phenomenon within the task. Consult resources to assure teacher teams have a deep understanding of associated science concepts.
3. Collaborate to generate, review and refine feedback questions during facilitation.
4. Identify potential "trouble spots" and plan for possible misconceptions.

During the task:

5. Collect defensible evidence of each student's competencies in 3-dimensional sense-making for the task.
6. Ask appropriate feedback questions to support student access and engagement with the task in order to elicit accurate evidence of student capacities.

After the task:

7. Reflect on the task as a collaborative team.
8. Review student work samples to identify areas of strength and areas of need.
9. Determine/plan next steps to move 3-D sense making forward through the strengthening of the use of SEPs and CCCs.

Using the materials included in this packet:

- **Task Annotation:**
  - The task annotation is a teacher guide for using the task in the classroom. Additionally, the annotation gives insight into the thinking of developers and the task overall.

    - Each task has science and engineering practices, disciplinary core ideas, and crosscutting concepts designated with both color and text style:
        - **Science and Engineering Practices**
        - *Disciplinary Core Ideas*
        - Crosscutting Concepts
- **Student Task:** The materials to be used by students to complete the TCT.

Junk Drawer Finds Task Annotation

After making observations to identify similarities in *the properties and functions of given objects*, **develop an investigable question and corresponding investigation** that, if conducted, **will produce data to serve as a basis for evidence to answer the question**.

Phenomenon within the task

Matter has properties (density, mass, volume, color, texture, shape, hardness, odor, elasticity, luster, absorbency, etc.). Matter can be sorted and grouped according to likeness of properties and function. Scientists observe matter and ask questions that lead to investigations related to the usefulness of matter.

Overall Intent

The overall intent of this task to elicit evidence of student ability to formulate investigable questions based on observations of matter properties (items in a junk drawer) and to develop a plan for a logical investigation that, if facilitated, would produce information useful in answering the proposed question.

How the phenomenon relates to DCI

Properties of matter is first addressed at grade 2 (PS1A). Students explore how matter can be described and classified based on observable properties. Prior to grade 2, students explore that matter can vibrate to create sound, has specific properties that allow for varying degrees of light to pass through and that matter can change position and/or speed when force is applied. At grade 5 students begin to study the particle nature of matter which is further developed at middle and high school as students study matter at the atomic and subatomic levels.

What information/data will students use within this task?

Prior experiences:

- Making observations
- Sort objects based on like properties or similarities in function
- Recording data

- Asking investigable questions (distinguishing investigable from non-investigable questions)
- Collaboratively developing and carrying out investigations

Data in the task:

- Photograph of given junk drawer filled with common items
- Optional- teacher developed drawer of object to observe and sort

Ideas for setting up the task with students

This task consists of multiple parts that support student engagement. As students engage in the parts of the tasks, all students should have equitable access to the content through practice identifying similarities in the properties and/or function of provided objects. Often students sort objects by color or shape or other simplistic attributes. To foster an awareness of other attributes, consider having student view some video clips that pertain to properties of matter (flexible, rigid, rough, curved, etc.). Several clips can be found on YouTube and Teachertube. Consider viewing video clips and have students create an anchor chart that lists characteristic or attributes of matter. This anchor chart could be used throughout the task as a resource for attributes/characteristics/properties of matter.

It is essential that students have experience identifying variables and have some understanding of the role of variables in an investigation. The concept of a variable might be new to your students so it will be important to explore the concept through multiple experiences. Young students may not consider variables when applying steps in an investigation. For example, when testing the bounciness of balls, they may not drop each ball from the same height each time which would affect the data outcome of the investigation. Asking students about what needs to stay the same in an investigation and what is it that we manipulate or change is a good introduction to this concept.

Intent of the Task for Assessment

This task was designed to provide evidence of each student's ability to group items according to similar physical properties, characteristics or function/purposes, develop a valid investigable question about the group of items, and then develop and document the steps to a simple investigation that could provide data to answer to their question. This is a fairly involved task that will provide evidence for a wide range of skills; thus, a similar experience is approached collaboratively, modeled by the teacher and discussed in a whole group setting, prior to the students engaging in the task independently, so that all students have equal access to the task.

Success Criteria

Evidence of Learning Desired based on Progression from Appendices

Asking Questions and Defining Problems

- Ask questions based on observations to find more information about the natural and/or designed world.

Planning and Carrying out investigations

- Plan an investigation to produce data to serve as evidence to answer a question.

Patterns

- Recognize that pattern in the natural and human designed world can be observed, used to describe phenomena and used as evidence.

Success Criteria

Students develop an investigation that, if carried out, will provide data that can be used to answer a scientific question based on:

- Identification of a defined grouping for items based on physical properties, characteristics or function of the objects in the group.
- Development of an investigable question.

Possible Student Responses

Possible questions are extensive based on testable properties of matter shown in the drawer.

Some examples are:

- Which type of ball will roll the farthest down a ramp with the same amount of force starting at the same point?
- Which ball bounces the highest when dropped from the same distance from the floor?
- Which type of string makes the loudest sound when cut to the same lengths?
- Which clip will hold the most copy paper when picked up?
- Which type of paper towel will absorb the most water without tearing?

Student investigation look fors:

- Logical, sequential steps that leads to data collection (Step 1, First)
- Materials list

- Possible variable to look out for

Other information teacher teams might find useful when preparing to use this task in the TCT process
Students had no understanding of variables when conducting investigations or the need to repeat investigations to ensure validity. Teachers might want to use iPhone video slow motion to record bounce heights (or others objects that move very quickly).

Extensions and/or other uses after the task is implemented
Students may conduct their own independent investigation using the plan they developed. Once students truly understand how to conduct valid investigations, they should be given the opportunity for more experiences to practice and find answers to questions they have about the world.

Junk Drawer TCT: Suggested facilitation plan

Consider any time constraints and student ability when planning to implement the task. It is likely that you will choose to implement the task over multiple sessions. Each part is designed to provide teachers with multiple opportunities to gather evidence of student abilities, as well as provide students with equitable access to the information needed to complete the task. The following is a recommended procedure for facilitation of the task, which could be modified, if needed, as long as the task integrity is maintained. Additionally, Parts 1-3 may be scaffolded, as appropriate, provided the intent of the actual task question is not compromised.

Part 1: Hands on sorting of matter/investigable questions: Place students in small groups and ask them to sort objects based on observable properties. (What do the objects have in common? Why did you group specific items together?)

At the end of the sorting experience, have students look at all of the objects and brainstorm questions that could lead to investigations. For example, there may be multiple types of "objects that can roll" that could be grouped together to create an investigation about which object would roll the farthest off of a ramp. There may be many objects that could bounce that could lead to an investigation about which object could bounce the highest. Other features of items include those that could be weighed, stretched, the variety of textures, etc. Capture students' questions on chart paper.

Conduct a whole group discussion about actual investigable questions versus questions that could be answered by Google, or questions that have too many variables/unknowns (this is typically higher level thinking so students will need guidance). The teacher should take extra effort should to ensure students understand two important ideas about their questions: 1) what a valid investigable question is, and 2) whether the question will lead to an investigation that can be answered with data collection.

Part 2: Making observations, identifying properties and usefulness of materials: Provide students with a picture of drawer (see provided resources) or create a junk drawer from items found in class (see photos within the annotation doc for examples). If creating an actual "junk drawer", it is important to be intentional when selecting items for the drawer to ensure that there are common characteristics.

Ask students to make observations about the items in the drawer. Collaboratively (whole group with teacher guidance), have students observe the items in the drawer and then suggest ways to sort them into groups based on observable properties, characteristics (able to bounce, roll) or function/purposes (can be used to cut, measure).

Next, have students brainstorm investigable questions (see Questions Anchor Chart) and eliminate questions that could be answered through a search engine or

questions that are not valid. Have students choose one valid question, and then the teacher will model how to conduct a step-by step investigation with write up (see Investigation Anchor Chart). Variables need to be discussed and modeled how to be handled correctly/incorrectly.

Step 3: Collaboratively develop investigable questions and plan investigation: Put students into small groups and ask them to rethink the sorting groups from prior days' experience. Pose questions to stimulate thinking. Possible questions are:

1) What is another way to regroup the items that _____ (stretch, bounce, etc.)
2) Can you think of another function for _____.
3) Is that something you can/should test more than once?
4) How can you narrow your thinking?
5) How do you plan to record your results?
6) How would you share your findings?
7) Would you change anything?
8) Do the items have a different purpose than the class first thought? If so, what?

Give students plenty of time to complete this task because the thinking involved is very important to obtain accurate information of the students' abilities.

Next, have each group of students choose one of the group of items that have been sorted based on an identified attribute to investigate. Each group should come up with one investigable question that their group can agree on. Use clarifying questions that guide students in determining if their question is truly investigable (best to pre-plan these questions).

Have each group collaboratively generate a materials list and plan for for an investigation that would answer their questions. Before the teacher lets students begin planning an investigation, he/she should talk to them about the variables associated with their proposed investigation. What will they change? What will they measure? What should be kept constant? It may be a good idea to encourage groups to write down steps as they conduct investigation.

It is suggested that students actually conduct this investigation if they have not had many investigation experiences. This will promote greater understanding of necessary component of an investigation as well as provide the teacher with valuable information to determine if students are able to proceed with the independent work. Encourage groups to think about the many ways there are to collect data (iPad video slow motion, making charts and tables, drawing pictures and/or through notes, etc.).

Step 4: Independent work, complete TCT student questions: Give students a new junk drawer (photo or one that you create) and have them identify objects with similar properties. Have them develop an investigable question, and then plan an investigation that would provide necessary data to answer their question. It is not necessary to conduct this investigation because you are wanting evidence of their ability to plan the investigation, not implementing the plan. Obviously, students could execute their plans after completion of the TCT.

Possible “Junk Drawers” for use with task. Enlarge if necessary or show on whiteboard.

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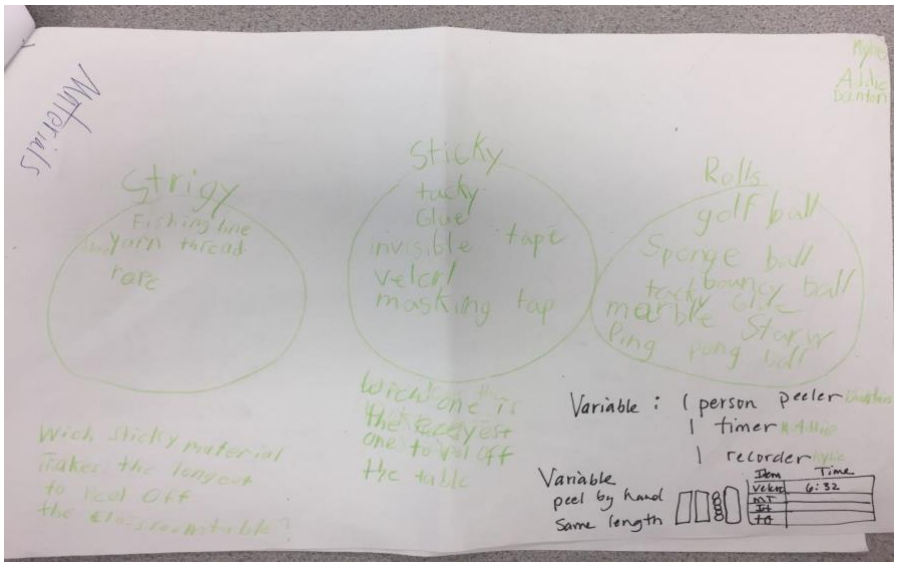
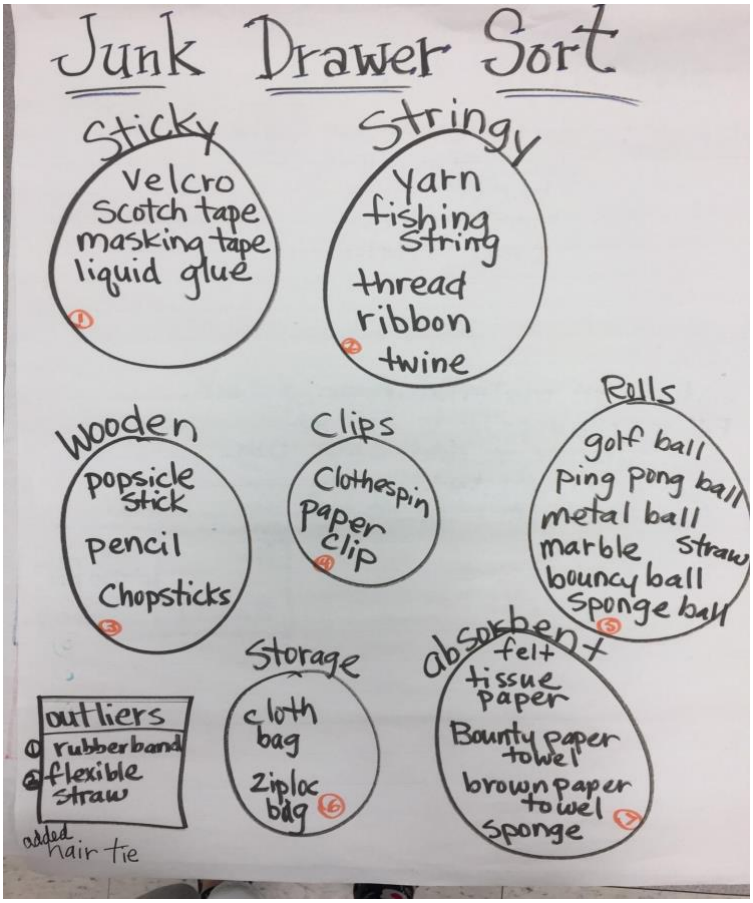
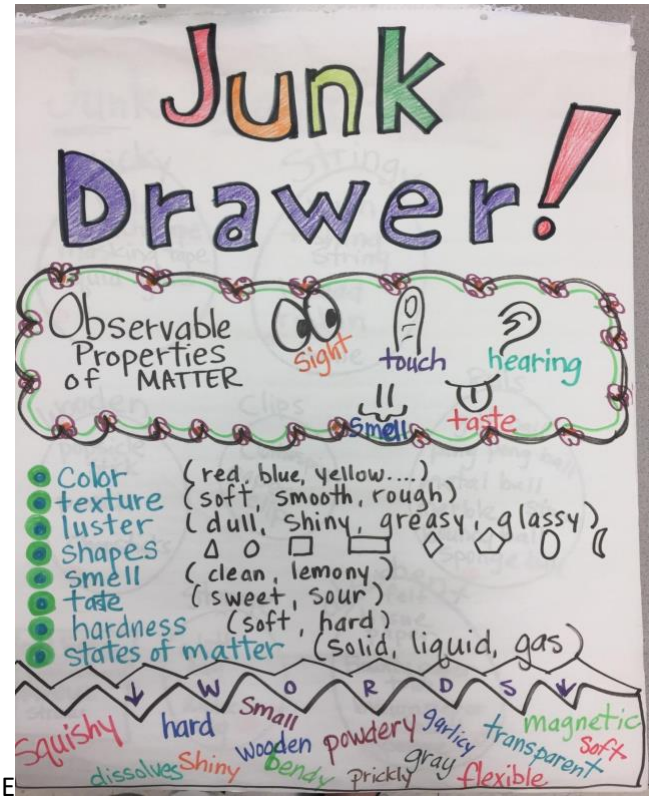
Examples of class sorting experience.

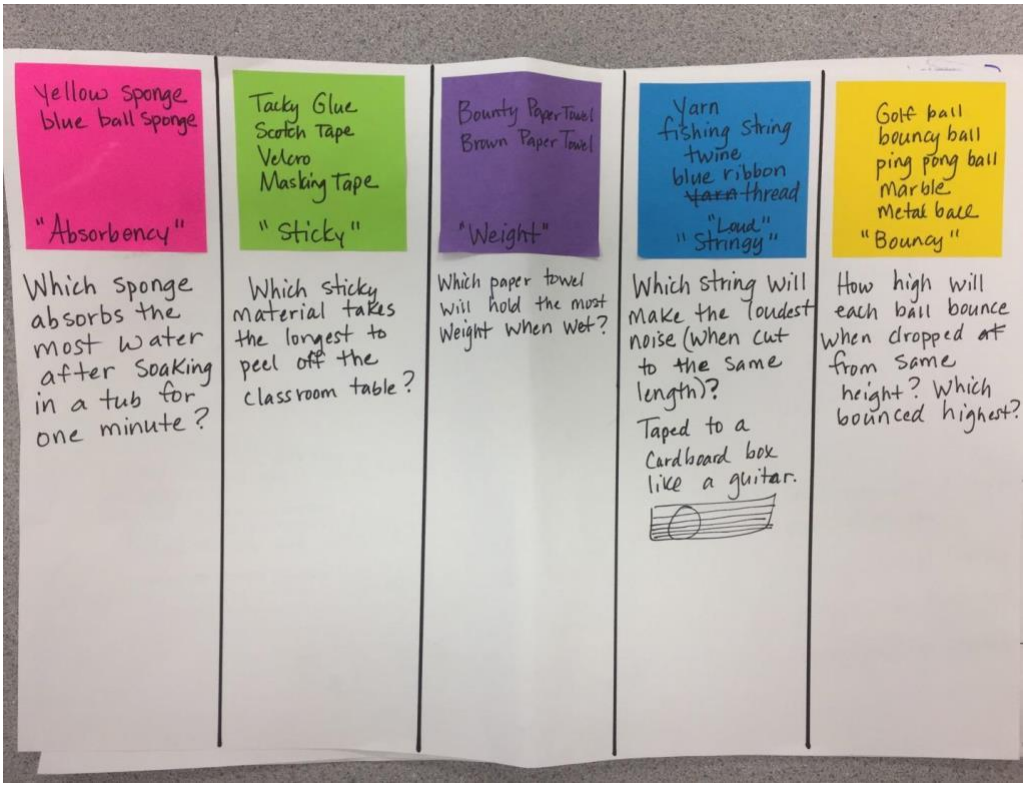


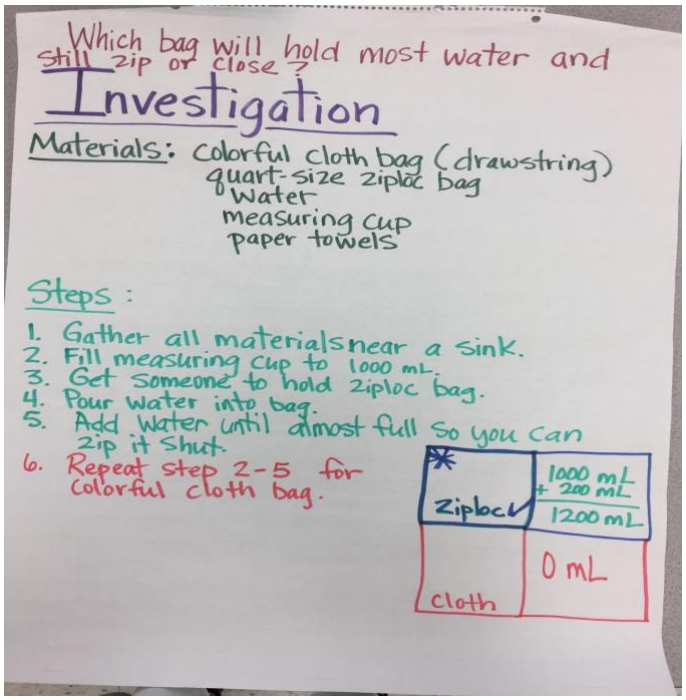


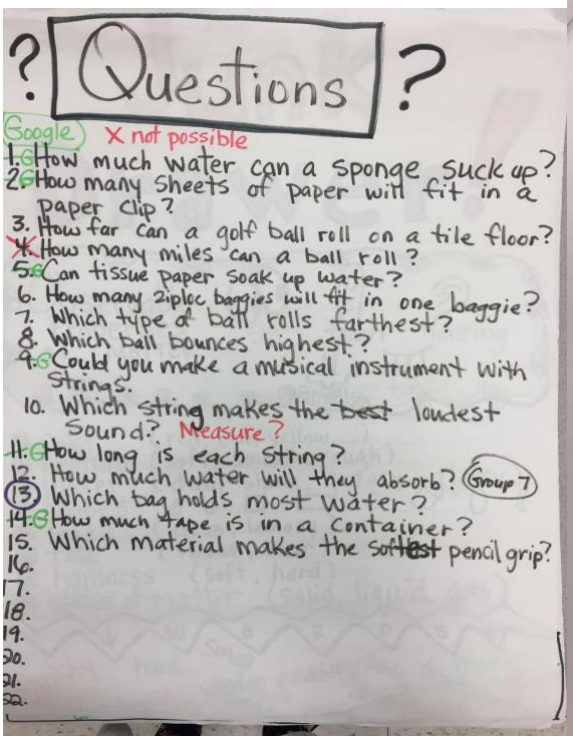
Example anchor chart

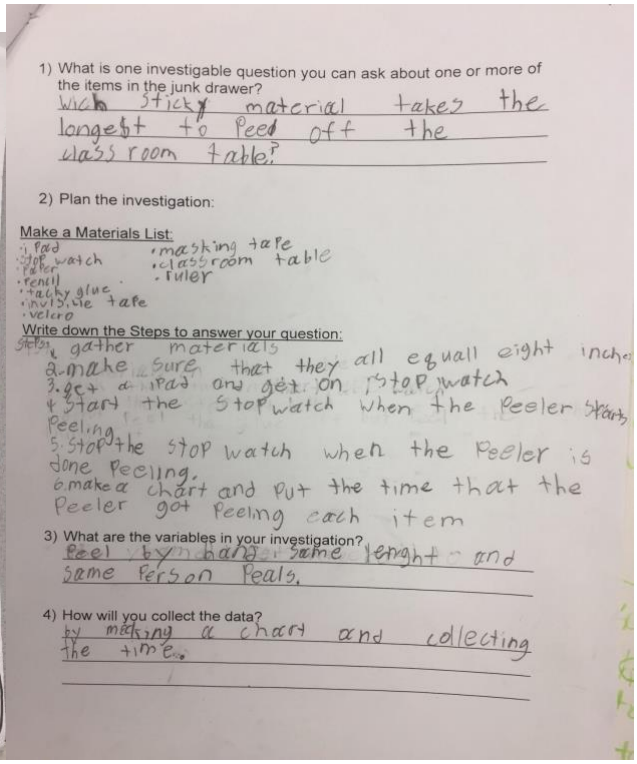


Example investigable question




Which bag will hold most water and still zip or close?
Investigation
Materials: Colorful cloth bag (drawstring)
quart-size ziploc bag
Water
measuring cup
paper towels
Steps:
1. Gather all materials near a sink.
2. Fill measuring cup to 1000 mL.
3. Get someone to hold ziploc bag.
4. Pour water into bag.
5. Add water until almost full so you can zip it shut.
6. Repeat step 2-5 for Colorful cloth bag.
Ziploc
1000 mL + 200 mL
1200 mL
cloth
0 mL


? Questions ?
Google X not possible
1. How much water can a sponge suck up?
2. How many sheets of paper will fit in a paper clip?
3. How far can a golf ball roll on a tile floor?
4. How many miles can a ball roll?
5. Can tissue paper soak up water?
6. How many ziploc baggies will fit in one baggie?
7. Which type of ball rolls farthest?
8. Which ball bounces highest?
9. Could you make a musical instrument with strings.
10. Which string makes the best loudest sound? Measure?
11. How long is each string?
12. How much water will they absorb? Group 7
13. Which bag holds most water?
14. How much tape is in a container?
15. Which material makes the softest pencil grip?
16.
17.
18.
19.
20.
21.
22.


1) What is one investigable question you can ask about one or more of the items in the junk drawer?
Which sticky material takes the longest to peel off the class room table?
2) Plan the investigation:
Make a Materials List:
• pad
• stop watch
• paper
• pencil
• sticky glue
• invisible tape
• velcro
• masking tape
• classroom table
• ruler
Write down the Steps to answer your question:
Steps
1. gather materials
2. make sure that they all equall eight inches
3. get a pad and get on stop watch
4. start the stop watch when the peeler starts peeling
5. stop the stop watch when the peeler is done peeling.
6. make a chart and put the time that the peeler got peeling each item
3) What are the variables in your investigation?
Peel by hand same lenght and same person peals.
4) How will you collect the data?
by making a chart and collecting the time.

Through Course Task – Junk Drawer Finds

Student Name_____ Date_____

What objects did you choose to investigate?

_____

What property do the objects you chose have in common?

_____I

dentify your investigable questions (What is it you want to find out?):

_____

_____

Your investigation - What are you going to do to get information to answer your question?

Make a list of the materials you will need for the investigation.

_____

_____

_____

_____

_____

_____

List the steps you would take when conducting your investigation.

_____

_____

_____

_____

What data will you collect to help you answer the question?

_____

_____

_____

How will you share your findings?

_____

_____