Science Assessment System Through Course Task

Balloon Battle

Grade Levels:
7

Phenomena:
Static Electricity

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

Crosscutting Concepts:
Patterns

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

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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.

Balloon Battle Task Annotation

After making observations and collecting data about *how balloons interact after being rubbed with various materials*, **develop a question whose answer will help develop understanding for the observations** based on patterns that could lead to a causal mechanism for the observations.

Overall Intent

This task was developed with the intention of evaluating students' ability to ask questions whose answer will be useful in identifying potential cause and effect relationship of the phenomenon.

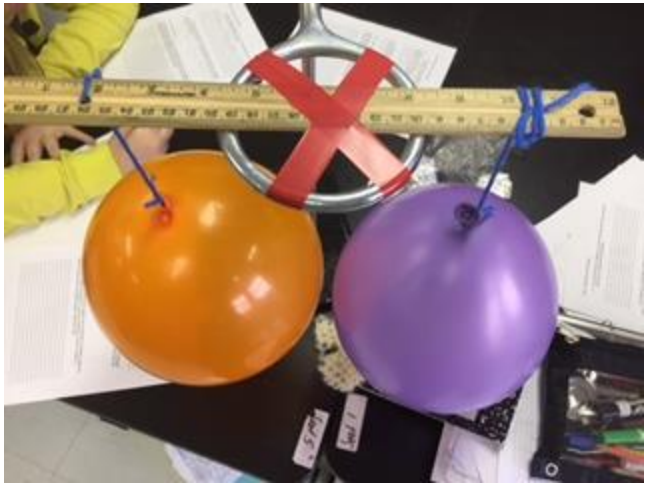
Students will perform the investigation to collect data and engage with the phenomenon first-hand. Students need to authentically consider the cause and effect relationship between the investigation materials and its impact on the balloons. This will lead students to wonder why the balloons repel/attract and what influence the different materials may have on the balloons. Once students have performed the investigation and recorded their observations, they should be able to ask reasonable questions whose answer will support the understanding of potential causal mechanisms for the observed phenomenon.

Phenomenon within the task

Static electricity results from a buildup of positive or negative charge on an object. For example, if you are wearing a wool hat on a winter day and take off the hat, some electrons from your hair move to the hat, giving it a negative charge. Your hair has a resulting positive charge (the electrons moved to the hat), and the strands of your hair repel each other, causing your hair to stick out. This task explores the phenomenon of static electricity/static charges.

Explanation of the task set-up

- Students will be provided with 2 balloons, 2 strings, a stand, ruler, wool, foil, and plastic wrap.
- Students will investigate the effects the different materials (wool, foil and wrap) have on the interaction between the two balloons.



- Students will use the provided table to record their observations that will serve as their data for this task.
- Students may need scaffolding to realize that the balloons are actually interacting with each other and not just on the materials. The teacher can develop this understanding through demonstration (pith balls, tape strands, etc.) and class discussion prior to the student-led investigation.
- The use of student prompts may help develop the cause and effect thought process. This task is intended to get evidence of causal reasoning rather than simply identifying a correlative relationship based on patterns. Scaffolding the thinking is appropriate, though the teacher may want to note which students needed this support and which students didn't. This is an opportunity to get evidence of student capacity along this continuum.

  Teacher may ask –

  - *How do you know that _____caused_____?*
  - *Does the fact that the data showed that _____ always happened [after/whenever]*
  - *_____occurred mean that _____causes _____?*
  - *Why or why not?*
  - *How can this cause and effect relationship be tested?*

Intent of the Task for Assessment

Students' observations should lead them to develop questions that address how the balloons are able to move each other without touching, while considering the effect of each material rubbed on the balloon. Students should explain how the answer to one of their questions could provide an explanation of cause and effect understanding of their observations, based on the patterns observed.

Success Criteria

Evidence of Learning Desired based on Progression from Appendices

Planning and Carrying Out Investigations:

- Students will collect data to serve as the basis for evidence to answer scientific questions. (Appendix F)

Asking Questions and Defining Problems:

- Students will ask questions that arise from careful observation of phenomena.
- Students ask questions that can be investigated within the scope of the classroom, and when appropriate, frame a hypothesis based on observations and scientific principles. (Appendix F)

Patterns:

Patterns can be used to identify cause and effect relationships. (Appendix G)

Success Criteria

Step 1: Students test and record careful observations to produce data. Data will be collected in a table to provide evidence to support their claims about the phenomena.

Step 2: Students develop questions based on observations, patterns, and reasoning from their analysis of data.

1. Students use patterns in data to develop reasonable questions.
2. Students will provide reasoning as to how their observations support the development of the question.

Step 3: Student is able to select a question that is investigable and whose answer could lead to understanding the cause for the observation.

1. Students question can be tested within the classroom.
2. Student question has reasoning that can lead to understanding.
3. Student question includes a pattern that could help identify a cause and effect relationship

Question selected shows ability to be instigated for cause and effect based upon observations made during data collection.

Possible Student Responses (these are not "look fors")

Step 1:

- "*The balloons are pushing each other away."*
- *"The balloons are going toward each other."*
- *"The balloon is sticking to my shirt."*
- *"The balloon is sticking to the side of the stand."*

Step 1: Student data table, including 3 trials, and use of 3 different materials.

Step 2:

- "*What is pushing the balloons apart?"*
- *"What impact do the different materials make on the balloons?"*
- *"Why does _____material cause the balloons_____?"*
- *"Why does it change from repelling to attracting and vice versa?"*

Step 2: Student responses incorporate reasoning and justification from observations and data. Student wondering is evident.

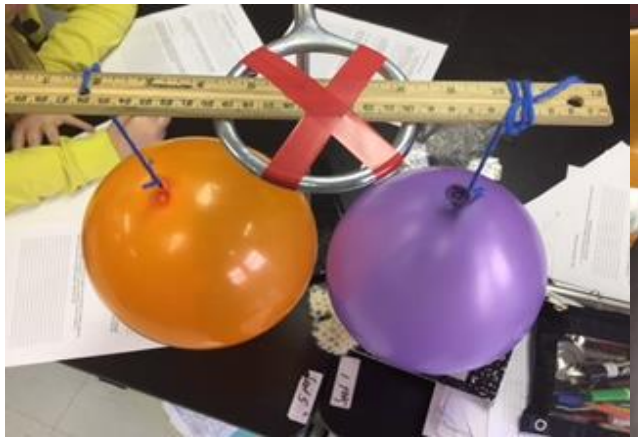
Step 3: Student is able to develop a high level question that will lead to an understanding to the cause/effect relationship to explain the phenomena. Student uses evidence from observations and data to support their hypothesis.

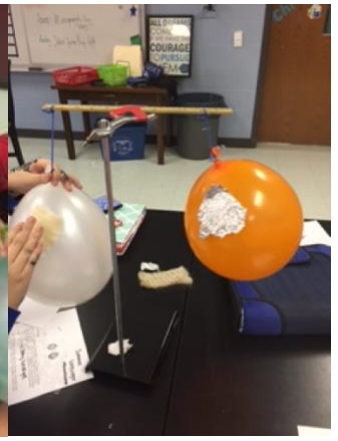
Extensions and/or other uses after the task is implemented

This task would be useful as an introduction to prepare students to construct an explanation and design a solution. Students can also modify and test variables to determine the cause and effect relationship. Furthermore, the teacher may select 2 or 3 questions and debate it, or use the strategy of "My Favorite No" to discuss student thinking and misconceptions.

Alternative Stand Setup

The Balloon Battle works best when partners work together to "battle" a different set of partners' balloon. Essentially it is a total of four students with two separate stands. If there are not enough stands, teachers may tape a ruler to the top of the stand and hang a balloon off each end. It is less desirable, but the activity would also work with a teacher demonstration; however, it would be less engaging to students and they would miss the unmeasured reactions of feeling and exploring the phenomenon.





Reflection

Administering the TCT to my students proved very insightful. Ultimately the jump from the phenomenon to the cause and effect relationship was too far for my students to make, and I chose to modify the original TCT. The outcome now is for the students to develop a well thought-out, high-level question that will lead them to determining the cause of the phenomenon. Teacher observations also provided useful feedback to help in identifying what went well and possible extensions for the task. Overall, students were engaged and higher-level questioning was developed by the students as evidenced in the lists of questions that were developed.

Resources for Static Electricity

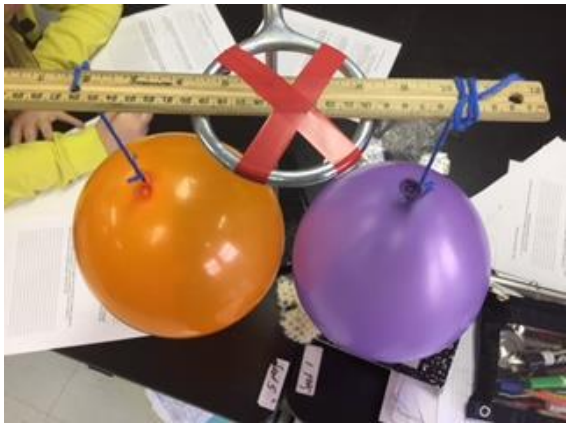
https://phet.colorado.edu/sims/html/balloons-and-static-electricity/latest/balloons-and-static-electricity_en.html (PhET Interactive Simulations, University of Colorado Boulder, https://phet.colorado.edu)

https://phet.colorado.edu/en/simulation/balloons (PhET Interactive Simulations ,University of Colorado Boulder https://phet.colorado.edu)

Through Course Task – Balloon Battle

Procedure:

1) Set up a ring stand and attach 2 balloons with a string to a ruler that has been attached to the ring stand. The balloons should not be touching.
2) Rub each balloon with the same material for 30 seconds and record the effect on the balloons. Record your observations in the chart below. *Be certain to rub the entire balloon and not just one side!



Trial #	Wool	Foil	Plastic Wrap
1			
2			
3			
Based on your observations, did the balloons attract or repel each other?			

Observations and Questions

A) Look over the data you collected in your trials. Generate at least three questions based on your exploration/observations. For each question, explain how your observations support the development of the question.

1)_____

_____

_____

_____

_____

2)_____

_____

_____

_____

_____

3)_____

_____

_____

_____

_____

C) Identify which question from part A has the most testable potential to determine what is causing the observed effects. You may modify your question from part A if you like. Explain why you think the answer to this question will help you understand why the balloons responded as they did, by connecting your observations to your question.

_____

_____

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_____

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