Science processes

Science

Module 1ScienceProcesses Scientific ProcessDefinitionScience Activity ObservingThe process of gathering information using all appropriate senses instruments that extend the senses. Collecting data on classmates, students walk around the classroom and make observations about eye and hair color of their classmates. ClassifyingGrouping objects or organisms according to one or more common properties. Classifying plants by features of plant life. CommunicatingRecord observations in multiple ways and present them to others.

Students can record the data found in theirobservationactivity and communicate the eye and hair colors they observed in the classroom. MeasuringMeasure variables using a variety of instruments and standard and nonstandard units. Give students various measuring tools and ask them to measure various things in the classroom. PredictingMake a projection of what the outcome of an investigation will be using data and patterns. Prediction worksheet: look at the pictures on the left side, draw a picture and write about what you predict will happen next.

InferringDescribing a potential conclusion based on observation and prior knowledge. Science Mystery Bags: Students are asked to use sense of smell, hearing, and touch to infer what is in each mystery bag. Identifying & Controlling VariablesRecognizing a system’s variables and manipulating the variables to control the system’s outcome. Bread Mold Activity: Students will identify and control the variables that cause bread mold. Formulating & Testing Hypotheses Make a statement to guide and investigation.

Test that statement for its truth. Formulate hypotheses for what conditions cause the bread to mold, and then test the hypotheses to see if they are correct. Interpreting DataRecognize patterns and associations within a system of data. Using scientific graphs to share data, as well as understand data represented in graph form. Defining OperationallyCreating a definition by describing an interaction or observation. How can you tell if plants are healthy? Students will define planthealthin effective terms. Experimenting

Scientific procedure used to test a hypothesis, make a discovery, or determine something. Students can take part in an experiment to see if they can balance eggs using salt. Constructing ModelsBuilding models to represent a mental, verbal, or physical idea or object. Students could participate in a physical science project where they are asked to make a water reservoir. In the chart above defining the twelve scientific processes, I included definitions of each as well as a science activity that students could participate in to support each process.

These processes support inquiry learning, because they provide students with the opportunity to use problem solving skills, critical thinkingskills, and logical thinking skills all at once. Students are encouraged to apply their prior knowledge to their new problem, experiment, or questions, which incorporates what they are currently learning with earlier experiences. Inquiry learning in science gives students control of their investigation and enhances their interest in the subject. Inquiry learning involves all learning strategies, including but not limited to verbal, written, and hands-on activities.

When students are actively engaged in the learning process they are more likely to stay attentive, which allows them to not only gain information, but also helps in retaining that knowledge and understanding. Theteacher’s attitude toward science has a major impact on students and how they view science. In order for teachers to get students interested and involved, they must have a positive and inspiring outlook on the subject. When students see and feel that their teacher is excited about a subject and that he or she wants to share their experience, students are more likely to fully engage in learning.

Teachers should share their knowledge by motivating students to want to learn science, and getting them excited about learning by introducing science through observation activities and experiments. Students need to see that their teacher is enthusiastic about science, and that science is a learning process that can be fun and enjoyable for the entire class! Lesson Plan: Objectives Students will •work in groups to build catapults out of everyday objects (Constructing Models); and •Demonstrate their understanding of motion and forces by using the catapults to launch objects. Communicating) Materials •Motion, Forces, Energy, and Electric Current video and VCR or DVD and DVD player •Pictures of catapults •Computer with Internet access (optional) •Cardboard shoe box (1 for each catapult) •Rubber bands (4 for each catapult) •Popsicle sticks (2 for each catapult) •Masking tape (one 6-inch piece for each catapult) •Plastic spoon (1 for each catapult) •Rulers (1 per student group) •Scissors (1 per student group) •Marshmallows (2 per group) •Masking tape (for launching competition) •Object of your choice to serve as a target Procedures . Begin the lesson by discussing motion and energy. Ask students: How do objects move? How do we calculate motion? What is acceleration? What is speed? What are some of the forces that act upon objects in motion? (Observing, Predicting, and

Defining Operationally). A good way to introduce this information is to view portions of the Motion, Forces, Energy, and Electric Current video. 2. Tell students they are going to work in groups to create catapults out of everyday objects. Explain that catapults were often used as weapons of war during the Middle Ages.

Show students some pictures of catapults and discuss how they work, making sure that students understand catapult designs and uses. (Classifying). A good animated illustration of a catapult can be found at http://en. bestpicturesof. com/pictures%20of%20how%20to%20make%20a%20catapult 3. Tell students that after building their catapults, they will compete to see whose catapult can fling a marshmallow the farthest and whose catapult can fling an object closest to a target. (Experiment). 4. Divide students into groups of five, and give each group the supplies they will need to make heir catapults (see materials list) as well as any other objects you wish to provide. Tell the groups that they can design their catapults however they please, but they can use only the materials you have provided-nothing extra. Give students time to design and build their catapults, and ask them to name their team. (Constructing Models, Identifying and Controlling Variables). 5. Once students have completed their catapults, clear an area in the classroom that can be used for the launching competition. Using masking tape, mark a starting line.

Place the target object about 10 feet in front of the line. 6. One at a time, have the student teams place their catapults on the line and fling a marshmallow at the target-their goal is to hit the target. Mark where each team's marshmallow landed with a piece of masking tape that has been labeled with the team's name. 7. As a class, determine which team was the most successful in accurately hitting (or coming the closest to hitting) the target with its marshmallow. Talk about the design of the winning catapults. Why did this design work the best? Formulating and Testing hypotheses, Interpreting Data, Measuring, Communicating). 8. Have students again place their catapults on the starting line and fire a second marshmallow — their goal, this time, is to achieve the greatest distance. Again, mark where each marshmallow lands with a piece of labeled masking tape. Once all the catapults have been fired have students measure the distance from the starting line to where their marshmallow landed. (Measuring). 9. As a class, determine which catapult was able to launch a marshmallow the greatest distance.

Ask students: Why did this catapult work best? What element(s) of its design do you think helped propel the marshmallow farther than the others? (Interpreting Data, Defining Operationally). 10. Have each student write a paragraph that answers the following questions. •What was your group attempting to achieve with its catapult design? •How did the catapult set the marshmallow in motion? •Which challenge did your catapult meet best, accuracy or distance? •What could you have done to make the catapult better? •What helped the catapult work as well as it did? What did this activity teach you about motion and forces? 11. Ask for volunteers to share their answers with the class. Discuss students' answers and the forces that work on objects in motion. Evaluation Use the following three-point rubric to evaluate students' work during this lesson. •Three points: Students actively participated in class discussions; worked cooperatively in their teams;

successfully created a team catapult; actively participated in the catapult launch; wrote a thoughtful paragraph that answered all six questions. Two points: Students somewhat participated in class discussions; worked somewhat cooperatively in their teams; needed help to complete their catapult; did not actively participate in the catapult launch; wrote an incomplete paragraph that answered only three or four of the six questions. •One point: Students somewhat participated in class discussions; were unable to use catapult materials without teacher guidance; created unfinished catapults; did not actively participate in the catapult launch; wrote an incomplete paragraph that answered only one or two of the questions.

Credits Tamar Burris, former elementary teacher and freelanceeducationwriter References Bass, Joel E. , Contant, Terry L. , & Carin, Arthur A. (2009). Teaching Science as Inquiry, 11th Edition. Pearson Education, Inc. Boston, MA. Burris, Tamar. (2012). Discovery Education. Lesson Plan Library: Motion, Forces, Energy, & Electricity. Retrieved on September 28, 2012, from http://www. discoveryeducation. com/ teachers/free-lesson-plans/motion-forces-energy-and-electricity. cfm.