**Lesson 3 –Making Potato Plastic**

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|  | | Subject: Science | | Year: (Suitable for upper KS2) | | Class: |
| Date: | | Day: | | Time/session: |
| **Topic: Litter** | | | | | Links to National Curriculum:  Working scientifically – following instructions to conduct a practical experiment. | |
| Learning objectives:  To make plastic from potatoes  NOTE: This lesson could be extended into a series of experiments to investigate how different proportions of glycerine affect the properties of the plastic produced. | | | | | | |
| Time | Lesson structure | | | | Teacher notes/structure | |
|  | **Starter: The problem with plastics**  **Video:**  <https://youtu.be/73sGgmZoMBQ> **(up to 5:35, as figures out of date)**  **Link:**  <http://www.bbc.co.uk/news/science-environment-42264788> | | | | Paired talking: Teacher asks “Why is plastic a problem?”  In explanation be sure to mention:   * Plastic is made from oil which is dug out of the ground and is non-renewable; * Plastic takes a very long time to break down, hundreds of years for one plastic bottle; * Because of this it remains in our oceans, where sealife mistakes it for food and swallows it. * We need to find alternatives – one of these is biodegradable plastic made from plant material, bioplastics. * Today we will make a starch based plastic from potato starch! | |
| Extracting the starch from the potatoes  1) Wash and peel the potato  2) Cut the potato up into cubes about 1cm2  3) Add about 250ml of water and the cubes to the blender, and turn it on high for a minute or two.  4) Strain off the cloudy water using a coffee filter or jelly bag.  5) If storing to make later, spread out on some greaseproof paper and leave to dry. This step can be omitted if using straight away.  Making the resin  1) Measure out 60ml (4 tbsp) of cold water and pour it into the beaker.  2) Measure out 10g (or about 1 tbsp) of starch from the potato and add that to the water.  3) Add 5 ml (about 1tsp) of vinegar to the mixture.  4) Add 5ml (about 1tsp) of glycerin to the mixture, more glycerin will make it softer and more flexible, less will make it harder and stiffer but more brittle.  5) If a coloured plastic is desired, add about 5 drops of the food coloring now.  6) Turn the burner on low and constantly stir the mixture. When it starts to thicken up turn the heat up to medium and stir even more. When it starts to boil, keep boiling it for 5 minutes. It should be clear and sticky.  7) Pour the "gooey" substance into a mold, or pour it onto a sheet of aluminum foil or a silicone sheet to dry.  8) Depending on humidity, it should take about 1 day to dry in a sunny place. You can dry it faster by putting it in an oven set to 90°C for 1-2 hours.  So by now you should have a glob of messy starch plastic resin that is ready to be molded, injected, shaped, and formed into anything you want. A major advantage to this plastic, besides the fact that it does not use petroleum, is that it is also 100% biodegradable! That means in the right conditions, it will decompose in months instead of thousands of years. | | | |
| Plenary:  What could we use this substance for?  Possibilities include:  -Plates and dinnerware  -Plastic bags  -Cups  -Bowls  -Pens  And whatever else you can imagine... | | | |
| Differentiation:  Make sure they are working in multi ability partners | | | | | | |
| Links to literacy/numeracy:  How can we use this – write a passage out to explain some of your ideas. Write up as a report.  How can we scale this up? Imagine trying to make a ton of plastic. | | | | | Key words/terms:  Non-renewable resource  Renewable  Biodegradable  Compostable | |
| **Ingredients:**  2 White skinned potatoes  Water  [100% Vegetable Liquid Glycerin](http://www.amazon.com/100%25-Vegetable-Liquid-Glycerine-oz/dp/B0001DTYW6/ref=pd_sbs_hpc_1/002-6548792-1367238)  [White Vinegar](http://www.amazon.com/Heinz-Distilled-White-Vinegar-32/dp/B0004MV9XQ/ref=pd_bbs_sr_3/105-0202534-3185250?ie=UTF8&s=gourmet-food&qid=1184867709&sr=8-3)  Food Coloring | | | **Tools / Supplies:** Non-stick pan  Spatula  Stove Top or Hot Plate  Knife or guillotine  Blender  Peeler  Coffee filter and stand | | Homework:  What would you use it for? | |
| Use of TA (or other adults): | | | | | Evaluation: | |