# *Plasticine investigators* Teaching and learning plan

## Learning intentions

Students will be able to:

* understand how materials can be changed by interacting physically with the material [including temperature change];
* understand and use appropriate scientific vocabulary to describe and compare properties of materials;
* measure by comparing objects, or by using informal units;
* identify and explore information and ideas;
* respond to questions, make predictions, and participate in guided investigations;
* follow instructions to record and sort their observations and share them with others.

## Suggested timeframe

The time needed to complete the *Plasticine investigators* CLE will depend on the depth of the prior knowledge of students, the time to perform the two investigations—‘What can we make with plasticine?’ and ‘Plasticine investigation’—and follow up with any further extension activities. Allow 2.5–4 hours.

[**Planning ahead and equipment list**](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Plasticine%20investigators_yr1_Planning%20and%20equipment%20list.docx)

## Safety considerations

When you and your class are completing your Risk Assessment consider the following safety points and add any other relevant ones to the list.

* Although plasticine is considered to be non-toxic, remind students of safe and appropriate behaviour with materials. They should not put the plasticine in their mouths and wash their hands with soap after using the material.
* Remind students of safe practices when they use tools such as plastic knives, pop sticks and biscuit cutters.
* Consider allergies to, for example, preservative agents in plasticine and take appropriate precautions.
* After heating the plasticine, ensure that it has cooled sufficiently before distributing to students or provide students with protective gloves.

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## Introduction

This CLE focuses on physical changes in the context of physically manipulating and changing plasticine, and links to Year 1 Australian Curriculum: Science.

## What to do

1. Engage students in the interactive quiz **‘Changing materials by bending, stretching and twisting’, *Studyladder* website,** <https://www.studyladder.com.au/games/activity/changing-materials-by-bending-stretching-and-twisting--29503>. Have students predict what will happen if materials are bent, twisted or stretched. **(Note: this interactive quiz is Flash-based and will not work on the Apple iPad.)**
2. Tell students that they will be doing investigations to find out how the properties of a material can be changed.
3. Show students some plasticine. Ask them if they can identify it and if they have used it before. Ask them what did they do with it, what did they make and what would they say are the special properties of plasticine.
4. Tell students that they will be thinking like scientists as they play with the plasticine and discover different ways of changing it. Tell students that, like scientists, they will need to use their powers of observation to notice any interesting things.

### Expected results and explanations

Objects are made of particular materials and those materials have specific properties, including how they look, feel and respond to different actions. Physical changes do not change the chemical composition of a material.

Students may confuse play dough and plasticine, as they are both flexible materials that can be used to create different shapes. However, they are chemically different and have some differing properties. For example, plasticine is waterproof, but play dough is not. Play dough will dry out and harden in the sun, whereas plasticine will soften. Consequently, it is important to use plasticine for the investigations in this CLE.

## Core

### Investigation 1: What can we do with plasticine?

Plasticine is physically changed when it is manipulated or cut into different shapes and sizes. Students think scientifically as they investigate ways they can change the plasticine by interacting with it in various ways.

### Equipment needed

Per class:

* a large three-columned chart, with headings ‘Before’ ‘After’ and ‘We think’. This could be drawn on a whiteboard or large sheet of paper; however, the information will need to be retained so it can be accessed in the following lesson.

Per group of 2–3 students:

* a digital camera e.g. iPad (optional)

Per student:

* some hard (cool) plasticine (enough to make a ball at least 3 cm in diameter)
* a plastic or paper mat to protect student desk/table
* measurement materials such as counters, pop sticks and streamers
* safe cutting tools such as biscuit cutters, plastic knives and/or spoons, pop sticks
* an A4 sheet and writing materials (or a digital alternative)
* a protective smock (optional)

### What to do

1. Organise equipment and tools so that students can access them easily.
2. Provide students with the protective paper or plastic mats for their desks/tables. Give a piece of plasticine to each student.
3. Remind students of expected safe behaviour with equipment.
4. Tell students to **gently** hold and feel their plasticine and describe how it feels. Ask them how many words can they think of to describe the plasticine. Ask students to roll the plasticine into a ball. Ask them whether the plasticine is easy or hard to roll.
5. Write the brainstormed words in the ‘Before’ column of the three-columned chart.
6. Tell students that they will be participating in some plasticine challenges where each challenge should be completed as well as they can in a specified time period (for example, in three minutes). (Digital photos could also be taken by the teacher or the students, to record results.)
7. Challenge students to make the following.

* The longest snake/worm they can

Guiding questions: How do you know which snake/worm is longest? How did you make a snake/worm shape? Is that the only way to make this shape?

* The widest snail shell

Guiding questions: Can you predict whether the longest snake/worm will also make the widest snail shell. (Ask them to try their ideas.) What did you notice? Did everyone get the same result?

* The most plasticine balls

Guiding questions: How do you make a ball shape? What happens to the size of the balls when you make lots of them? Why do you think that happens?

* The largest ‘pancake’

Guiding questions: What shape do you think you will make if you press down on the balls of plasticine? Can you make one large pancake shape without pounding the plasticine? Who can make the biggest shape? How can you tell which pancake is biggest? How else? Can you turn your pancake back into a snake/worm shape? What shape is made when you twist the snake/worm? What happens when you pinch it? What happens when you stretch it?

* Other shapes

Guiding question: How else can you make other different shapes or objects?

Encourage students to also use tools such as plastic knives, biscuit cutters, pop sticks, and rollers. Students could do a gallery walk to see the objects other students have made. Digital photos could be taken to record their plasticine shapes.

1. Ask students to tell you all the ways the plasticine was changed in these activities. Write these in the ‘After’ column of the three-columned chart.
2. Instruct students roll their plasticine back into a ball. Ask them to gently hold their plasticine ball and describe how it feels now. What words would they use?
3. Write these words in the ‘After’ column of the three-columned chart. Compare the words in the ‘Before’ and ‘After’ columns. Use question prompts such as:

* Did the ball feel the same or different?
* Are any words the same in both columns? (Circle the words that are the same.)
* Which words are different? (Use a different colour, or underline to show the words that are different.)

1. Tell students that scientists like to notice interesting things and to wonder about them. Ask them if they noticed that some properties of the plasticine did not stay the same? What do they think caused changes in the plasticine? Could anything else have caused the change?
2. Ask students to decide if they think the material is still plasticine. Ask guiding questions such as:

* ‘Has the plasticine been changed into a different material? Why do you think that?’
* Was the plasticine still plasticine when it was made into different shapes?

1. Ask students for other things they noticed, or are thinking or wondering about. Write students' comments and any questions in the ‘We think’ column. For example, ‘the plasticine got soft when we rolled it’ or ‘we can make different shapes’. These comments and/or questions will be looked at again in the next lesson.
2. After materials have been put away, students should record something that they made or noticed on a single A4 page. Collate these pages together as a ‘What can we make with plasticine?’ book. Alternatively, this could be published as a digital book.

### Expected results and explanations

In order for students to notice change, they need to have made observations and developed comparative vocabulary that will allow them to compare and contrast properties or characteristics. Plasticine can be changed physically through manipulation; for example, by rolling, tearing and cutting. Changing the shape of plasticine is a physical change since the structure of the material (plasticine) is not changed into a new material. This activity is also useful for developing student literacy and numeracy capabilities, such as the language of comparative size (bigger, smallest, longest, shorter etc.).

### Investigation 2: Plasticine investigation

### Equipment needed

Per class:

* the completed three-columned chart, with headings ‘Before’ ‘After’ and ‘We think’
* the collated student book ‘What can we make with plasticine?’

Per group of 2–3 students:

* 2 balls of hard plasticine (at least 3 cm in diameter). (Refrigerate if plasticine is soft.)
* 2 resealable plastic bags.

Per student:

* a student worksheet, [Find out about plasticine](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Find%20out%20about%20plasticine%20worksheet_yr1_Plasticine%20investigators.docx). (This can be printed as one A3 page, two separate A4 pages, or a 2-sided A4 page.)
* pens/pencils

### What to do

1. Revisit the learning of the previous lesson by reading aloud the collated book ‘What can we make with plasticine?’ made in the previous lesson.
2. Remind students of their previous thinking, by reading aloud the ideas recorded in the ‘We think’ column of the 3-columned chart. Focus on any statements that have been made about the plasticine becoming soft, by saying: ‘That’s very interesting, I wonder why that happened?’
3. Ask students the following questions.

* Why do you think the plasticine became soft?
* Why do you think that happened?
* How could you discover if your idea is right?
* If plasticine was not touched, but just put somewhere warm, would it still get soft? Or does it have to be touched as well?
* How could you test to see if your ideas are correct? (Tell students they will be acting as a scientist to find the answer to this question.)

1. Give **each group** two small balls of plasticine, with each ball in its own resealable plastic bag. (You might like to ask the students to write their names on the bags, or you could give them prepared bags already labelled.)
2. Give **each child** a [Find out about plasticine](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Find%20out%20about%20plasticine%20worksheet_yr1_Plasticine%20investigators.docx) worksheet, and pens/pencils.
3. Tell students they will be finding out whether heat causes the plasticine to go soft (this is a physical change) and that it is important to observe the characteristics of the material before and after, in order to compare them.
4. Demonstrate how Step 1 on the worksheet would be completed, using a different material, such as a piece of cloth. A ‘fishbowl’ teaching strategy where a pair of students works with the teacher to model investigating the material and answering the questions, can be an effective way to do this.

Step 1 on the worksheet asks them to:

* choose the best words to describe the material;
* draw the material;
* write any other things they notice. (For example, what happens to the material if it is gently squeezed.)

Step 2 of the worksheet asks students to discuss possible locations where they can put the bags of plasticine so they will be warmed, and to predict what they think will happen to the plasticine.

1. Each group places one of their bags of plasticine in a warm location (for example, on concrete in a sunny spot), for at least an hour. The other bag of plasticine stays in the classroom, at room temperature.

*Teacher notes:*

The following strategy is suggested to help students understand the purpose of the steps in the investigation.

* Ask students why they think they were asked to record information about the ball of plasticine **before** it was placed in the heat. How might that information be useful? Students should discuss their thinking with a partner.
* Ask students to stand if they thought recording information about the ball of plasticine before it was placed in the heat might be useful. Ask two or three students why they think that.
* Tell students that drawing the ball of plasticine before it was put somewhere warm, gives a record of what it looked and felt like. That helps us to see if it has been changed. Ask students if they can think of any other way of recording the changes. Collect and record student ideas.
* Draw attention to the ball of plasticine that was not put somewhere warm. Ask students to stand if they thought leaving some plasticine in the classroom, and not in a warm place, was a useful thing to do. Ask a couple of standing students why they think that it might be useful.
* Tell students that this ball of plasticine was a ‘control’. Scientists like to have a ‘control’ so they can see whether the changes happened becauseof the experiment—in this case heating the plasticine—or whether those changes would have happened anyway. It is also useful to have this plasticine to compare with the heated plasticine.

1. After about an hour, retrieve and distribute the named bags of heated plasticine. Ensure that the material is not too hot for students to handle.
2. Ask students to observe any changes that have occurred and discuss their ideas with their partner/group as they complete Step 3 of their worksheet.
3. Ask students to discuss whether they think the material inside the bag is still plasticine, asking question prompts such as:

* In what ways do you think it is still plasticine?
* In what ways do you think it is it not plasticine?

1. To help students notice and articulate the concept of ‘changes’ ask students to compare the words they ticked in Step 1 to the words they ticked in Step 3. Ask students the following questions:

* What words are the same? How is the plasticine the same as it was before being put in the sun?
* What words are different? How has the plasticine been changed?
* What do you think? Does heat make the plasticine softer? How do you know it was the heat that caused the change?

1. Guide students to use the information to complete the ‘What do you think?’ section of the worksheet (Section 4).
2. Ask students to speculate what might happen to the plasticine if it got very hot.

## Conclusion

Show students the video ‘Melting Plasticine’, YouTube (3:05 min) https://youtu.be/e6G\_0VZSExo

Ask students to explain what they think is happening in the video. Guide their thinking with question prompts such as:

* What happened to the plasticine? How did it change? What caused the plasticine to change?
* (Explain that the heat was made, not by a hairdryer, but by a special heat gun that would have made the plasticine dangerously hot.) Do you think the snowman shape would return if the plasticine cooled? Why do you think that?
* Do you think that the plasticine could be used again when it has cooled down? Why do you think that?
* Do you think there would be the same amount of plasticine as there was before it melted? Why/why not?
* (Emphasise that a physical change is made to the plasticine when it is moulded into different shapes, cut into pieces, or heated and cooled.) What else do you know about physical changes? What other questions about ‘physical change’ do you have now?

Students could record their ideas and wonderings on the back of the worksheet, or they could video each other asking a question or making a comment.

### Expected results and explanations

Plasticine will soften when it is warmed, for example by body heat or from the friction of being manipulated. It will melt into a liquid at about 70**°** C, (for example, with a hot air gun, in an oven, or left inside a car on a hot day). Plasticine returns to a solid state when cooled. Both softening/melting and changing shape are physical changes since the structure of the material (plasticine) is not changed into a new material. In order for students to notice physical changes, they need to have made observations before and after interacting with the material, and have the vocabulary that will allow them to compare and contrast properties or characteristics of the material.

### Additional lessons and activities about physical change:

1. Investigate what happens to plasticine when it is cooled. Students could reflect on the process used in the ‘heating plasticine investigation’, to conduct a similar investigation into the effects of cooling the plasticine (for example, by placing it in a refrigerator).
2. Investigate whether the mass of the plasticine changes when it is formed into different shapes, or cut into pieces. For example, does it weigh more as a pancake shape or a snake/worm shape, than it did as a ball?
3. Students could use different measurement tools, including electronic scales, to carry out their own informal investigations as to whether the mass of plasticine changes as a result of physical change.
4. Investigate physical change using another material, such as paper. Explore ways of changing the size and shape of paper by crumpling, tearing, folding etc.

### Assessment opportunities

Investigation 1 provides an opportunity to assess student understanding of the concepts related to physical changes, the effects of interacting physically with the material (plasticine), the appropriate use of scientific vocabulary to describe and compare properties of materials (literacy capability) and comparative measurement or measuring using informal units (numeracy capability).

In addition, the level of student achievement of the following science inquiry skills could be assessed.

* Respond to questions and participate in guided investigations.

Investigation 2 provides an opportunity to assess student understanding of the concepts related to physical changes caused by a temperature change, and their ability to identify and explore information and ideas (critical and creative thinking capability). Students performing at a high level may be able to independently make connections between the plasticine being warmed and softened by the sun and the plasticine being warmed by their hands when they played with it. In addition, the level of student achievement of the following science inquiry skills could be assessed.

* Respond to questions, make predictions and participate in guided investigations.
* Follow instructions to record and sort their observations and share them with others.