**STUDENT ACTIVITY: Family resemblance: traits through generations**

**Activity idea**

In this activity, students simulate the passing of traits through 3 generations. The students work in groups of 4 ‘siblings’ and compare their combinations of traits.

By the end of this activity, students should be able to:

* explain what a trait is and give examples
* describe the basic concept of inheritance: that parents pass genes (within chromosomes) on to their children
* explain why there are similarities and differences within families.

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**Introduction/background**

Although we are all unique, there are often obvious similarities within families. Maybe you have the same nose as your brother or red hair like your mother? Family similarities occur because we inherit traits from our parents (in the form of the genes that contribute to the traits). This passing of genes from one generation to the next is called heredity. Simple organisms pass on genes by duplicating their genetic information and then splitting to form an identical organism. More complex organisms, including humans, produce specialised sex cells (gametes) that carry half of the genetic information, then combine these to form new organisms. The process that produces gametes is called meiosis.

For more information, see the articles [Meiosis, inheritance and variation](https://www.sciencelearn.org.nz/resources/208-meiosis-inheritance-and-variation) and [DNA, chromosomes and gene expression.](https://www.sciencelearn.org.nz/resources/206-dna-chromosomes-and-gene-expression)

Before beginning the activity, address any [alternative conceptions](https://www.sciencelearn.org.nz/resources/216-alternative-conceptions-about-genetics) about how we inherit traits. For example, discuss as a class what a gene is, where genes are found and their role in determining our traits. Ask the students how genes pass from one generation to the next. It may be helpful to use these images as part of this discussion:

* [Cell, chromosomes and DNA](https://www.sciencelearn.org.nz/images/198-cell-chromosomes-and-dna)
* [Phases of meiosis](https://www.sciencelearn.org.nz/images/200-phases-of-meiosis)

**What you need**

Per group:

* A copy of the student worksheet: [Inheriting traits](#student)
* 6 paper cups, envelopes or small containers
* 24 coloured objects such as counters (4 different colours – 6 of each) – ideally, all groups will have the same 6 colours
* Coloured felt pens/pencils (the same colour as the coloured objects)

**What to do**

1. Ask the students to explain what they think a trait is. Can they give examples?
2. Explain that they are going to use coloured objects to represent traits in an activity that simulates inheritance.
3. Divide the class into groups of 4. Hand out the materials and ask students to complete steps 1–6 on the student worksheet.
4. Ask the students what they think this represents. (The objects represent the traits the Mother and Father have inherited from their parents.)
5. Ask the students to complete step 7 on the student worksheet.

**Discussion questions**

* Did any of the children in your ‘family’ share the same combination of traits?
* How do you think this would be affected if you were working with hundreds of traits instead of 6?
* If the traits were real, which other ‘sibling’ in your family would you most look/act like? Why?
* How many traits do you share with each of your ‘grandparents’?
* Are there any traits that your ‘parents’ have that you didn’t inherit?
* Why did we take 3 objects from each parent?
* How are traits passed from one generation to the next in real life? (Discuss the similarities and differences between this simulation and real life. It may help to record the students’ ideas on a table on the whiteboard.)
* What other factors influence the traits we display? (Ask students to give some examples. Discuss the case of identical twins, who inherit identical DNA yet show differences in their phenotypes.)

**Extension ideas**

* Ask the students to circulate around the room and see if they can find another student with an identical combination of traits. Discuss the outcome. Keep in mind that all ‘children’ in the class have come from the same grandparents.

**Inheriting traits**

1. Label your containers: Grandmother 1, Grandfather 1, Grandmother 2, Grandfather 2, Mother, Father.
2. Divide the coloured objects up so each grandparent has 6 objects of the same colour.
3. Colour your diagram for the 4 grandparents.
4. Take 3 objects from Grandmother 1 and 3 objects from Grandfather 1 and place these into the container labelled Mother.
5. Take 3 objects from Grandmother 2 and 3 objects from Grandfather 2 and place these into the container labelled Father.
6. Colour your diagram for Mother and Father.
7. The 4 of you now represent the 4 children of the Mother and Father. Choose 1 person to start and take turns to:

* take 3 objects from Mother without looking
* take 3 objects from Father without looking
* colour your part of the diagram
* put the objects back.

