

Cells on t-shirts

Secondary: (ages 11 – 14)

Science (biology)

The purpose of this activity is for students to apply and deepen what they already know about cells in order to create a print for a t-shirt. The requirements for the activity are that the design needs to be appealing and encourage people to buy the t-shirt and it should represent a departure from the typical sketch of a cell that is found in text books. Accordingly, students are compelled to highlight aspects of cells that they deem more important than others and express them in a creative, appealing manner relating concepts in a critical fashion.

Time allocation 3 lesson periods (plus homework)

Subject content Develop knowledge of cells as fundamental unit of living organisms
Observe, interpret, and represent cell structure
Understand structure of Prokaryotic and eukaryotic cells

Creative and critical thinking This unit has a **creativity** focus:

- Make connections between the structure of cells, aesthetics, and a successful t-shirt design
- Generate and play with unusual ideas to produce a representation of a cell on a t-shirt
- Reflect on steps taken to create t-shirt print of cell

Other skills Communication

Key words cells; structure; prokaryotic; eukaryotic; evolution; design

Products and processes to assess

Students are asked to reflect on cell structure - and on different types of cells and their behaviour - and to be able to draw a characteristic from the cell which can be transformed into an appealing design for a t-shirt. At the highest levels of achievement, the product is imaginative, shows a high level of personal features and risk taking in its formulation, techniques, composition or content, fully meets the requirements of the task, and goes beyond the knowledge and rules expected to be mastered by the student in more than one aspect.

Teaching and Learning plan

This plan suggests potential steps for implementing the activity. Teachers can introduce as many modifications as they see fit to adapt the activity to their teaching context.

Step	Duration	Teacher and student roles	Subject content	Creativity and critical thinking
1	Lesson periods 1 and 2 (with possible homework)	<p>The teacher: explains the characteristics of the various types of cells (prokaryotic, eukaryotic), the evolutionary relationship between them, and their structure.</p> <p>Students can be asked to research different characteristics of cells and find several different visual representations of cells. They can then reflect in writing or in discussion on what these different representations allow us to understand about cell structure and cell characteristics, as well as their aesthetics.</p> <p>One possible pathway for this activity is that the teacher facilitates a comparative discussion at this point about the merits of the different ways of representing cells that students have found – Which representations allow us to understand the most about cell structure and why? Which representations look the most beautiful or create the most wonder and why? Which criteria is the most important for what purpose and audience or is it possible to have both?</p> <p>Teacher then explains that for homework students should build on this discussion and create a t-shirt print of a cell or a characteristic of a cell (this can also be done in class time as appropriate to the teaching context)</p>	<p>Developing knowledge of cells and cell structures</p> <p>Identifying cell structure and cell characteristics</p> <p>Using scientific language and reasoning to discuss different ways of representing cells</p>	<p>Making connections between cell structure and aesthetics</p> <p>Considering and comparing different perspectives and ways of looking at cells</p> <p>Appraising representations of cells according to a number of different criteria and identifying relevancy, strengths, and limitations of different methods of appraisal</p> <p>Generating and playing with unusual ideas to create a meaningful representation of a cell on a t-shirt</p>
2	Lesson period 3	<p>The students present the results of their activity, being asked to reflect on why they have made their choices and what criteria they have used – What were they trying to show scientifically about cell structure and cell characteristics? What did they want to communicate about the beauty or wonder of cells? How were they able to do that creatively? What were they not able to show and how important is this missing information? Students can be asked to give each other feedback and look at the relative merits of each design.</p> <p>The teacher can then facilitate a closing reflective discussion on what were the most different, novel, and unusual ways of representing cells, cell structure and cell characteristics, whether and how this enabled to understand aspects of cells they hadn't previously seen, and what students feel they learned from the activity.</p>	<p>Clarifying and developing knowledge of cells and cell structure, as appropriate</p>	<p>Reflecting on the chosen (scientific and aesthetic) approaches relative to possible alternatives and considering the links between beauty and science</p>

Resources and examples for inspiration

Web and print

- Science after class website (<https://sites.google.com/site/scienceafterclass/>)

Other

- Computer with Internet access and projector

Opportunities to adapt, extend, and enrich

- This can be complimented by asking students to make additional 2D, 3D, and computer-generated models and representations of cells.

Creativity and critical thinking rubric for science

- Mapping of the different steps of the lesson plan against the OECD rubric to identify the creative and/or critical thinking skills the different parts of the lesson aim to develop

	CREATIVITY Coming up with new ideas and solutions	Steps	CRITICAL THINKING Questioning and evaluating ideas and solutions	Steps
INQUIRING	Make connections to other scientific concepts or conceptual ideas in other disciplines	1-2	Identify and question assumptions and generally accepted ideas of a scientific explanation or approach to a problem	
IMAGINING	Generate and play with unusual and radical ideas when approaching or solving a scientific problem	1-2	Consider several perspectives on a scientific problem	1-2
DOING	Pose and propose how to solve a scientific problem in a personally novel way	1-2	Explain both strengths and limitations of a scientific solution based on logical and possibly other criteria (practical, ethical, etc.)	1-2
REFLECTING	Reflect on steps taken to pose and solve a scientific problem	2	Reflect on the chosen scientific approach or solution relative to possible alternatives	2