

Biology

Enzyme action with Lego

Teaching enzyme action through a simulation game

(Netherlands)

Background

Using everyday material to simulate biological processes. Embodies simulations (ESs) are teaching and learning activities in which students simulate or enact a specific process in their own interpersonal space using tangible materials and or body actions. The simulated process is usually invisible to the naked eye and it usually takes place at a microscopic scale.

You will need:

- ✓ a mixture of Lego bricks
- ✓ 3 different coloured bricks to represent the enzymes
- ✓ a marker to label the bricks
- ✓ smaller bricks for the substrates
- ✓ 3 long thin connector bricks to hold substrate together (Image 1)



Thin connectors

Follow these steps:

1. Take 3 different coloured bricks and label each lipase, protease, amylase.



Enzymes

2. Take the other different bricks and label lipids, protein and starch. Be careful not to use all the same coloured brick for the enzyme and its matching substrate.
3. The bricks for lipids will work best as 3 small bricks as when broken down or disconnected they will represent 3 fatty acids and a glycerol.



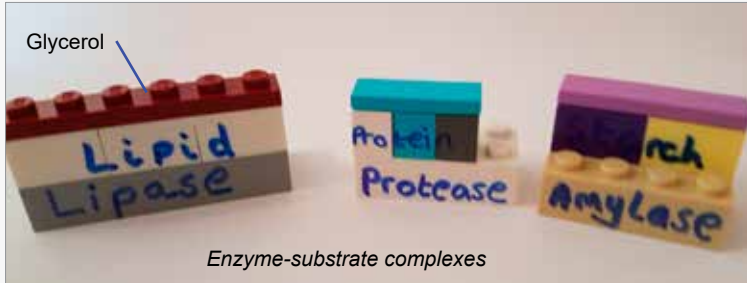
Substrates

4. The bricks for the protein will work best as 4 small bricks as when broken down or disconnected they will represent small singular amino acids, as seen in image 3 & 4



Products

5. The bricks for the starch will work best as 2 small bricks as when broken down or disconnected they will represent maltose, a disaccharide, as in image 3 & 4.
6. Ask students to match the correct enzyme with the matching substrate & connect them together, as in image 5.
7. Then ask students to disconnect the bricks of the substrate to make products as in image 6.



So what happened?

Students match the correct enzyme with its substrate. When the enzyme and substrate are connected students can visually see the enzyme-substrate complex. They then show the action of the enzyme by breaking up the substrate into products. The top of the enzyme brick is the active site and the active site theory can be discussed. The enzyme acting on the food part / substrate is a chemical reaction. The reaction is digestion where food is broken down into

smaller parts. This reaction is the metabolic reaction and an example of a catabolic reaction where large molecules are broken down into smaller molecules.

What next?

- Other enzyme examples could be added. These enzymes can be in a pile and students must place them under headings such as mouth, stomach or pancreas etc. They then must understand where these enzymes are found,

what substrate they act on and what products are produced.

- Bring in discussions explaining mechanical and chemical digestion.

Image 1. Examples of thin connectors

Image 2. Enzymes

Image 3. Substrates

Image 4 Products

Image 5. Enzyme-substrate complexes

Image 6. End products

End products

