

Good practices SCIEN_702CD_EN

Author's name and institution: **Branko Anđić, Zsolt Lavicza, Eva Ulbrich**

School of Education, Department of STEM Education, Johannes Kepler University, Linz, Austria

Description of the problem / exercise: **Modeling enzymes with Poly-Universe**

Description: Enzymes are molecules, most often proteins, which with their biocatalytic action help to convert a certain substrate (analyte) into a product. The substrate is the molecule on which the enzyme acts, while the product is the product of a catalytic reaction. Enzymes accelerate chemical reactions in which they do not participate themselves, reducing the activation energy. The substrate on which the enzyme will act must be a specific type of molecule, otherwise there is no catalytic reaction. Enzyme selectivity is based on a key-to-lock model. The lock is represented by an enzyme, while the key is a substrate.

Task: Students are divided into two groups. The first group using Poly-Universe creates a substrate, based on their role the second group creates an enzyme. The enzyme and the substrate must fit or there will be no product needed to be created in the body. The time for which the other group produces the enzyme from Poly-Universe is also measured. After this the groups change roles. The second group makes an enzyme based on the substrate that the first group will make. Some examples of possible solutions, which students can create as a model of substrate and enzyme, are presented in Figure 1.

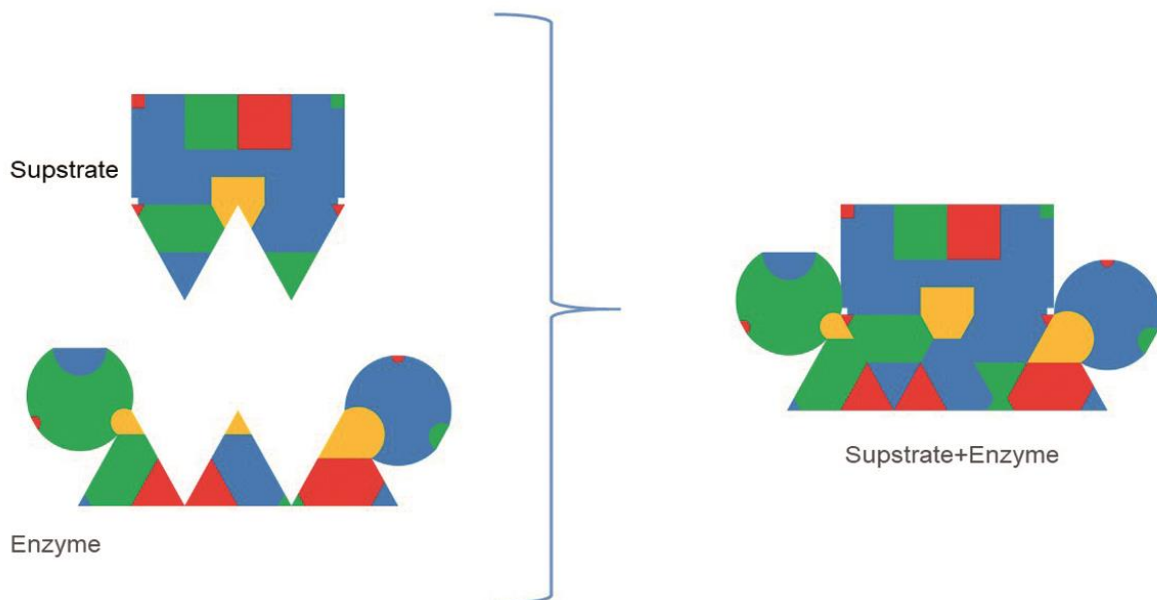


Figure 1: Examples of substrate and enzyme connection created from Poly-Universe.

- *Why this exercise is good:* This activity encourages student's creativity, knowledge implementation, increase the presence of gaming in the learning process, interdisciplinary in learning and communication between the students.

- *Level of teacher training:* Secondary school, teacher training
- *School subject(s):* Biology, math, art
- *Comments:* The teacher can adapt this activity to the students with learning difficulties if they allow them at the beginning to create the substrate, and without any additional rules. On the basis of the substrate which is created by students with learning difficulties, other peers can create the enzyme. If they successfully achieve this task, the teacher can assign them a task to create an enzyme at the basis of the very simple substrate. If teachers want to adapt this task for gifted students they can set rules in the creation of substrate and enzymes should be connected parts with the same colors, size and shape.