Scenario Script Template_P4S12Y2

1st teaching period

1st Activity: **Anthocyanine enriched blue tomatos**
Time: 30 min
Type of activity: warming up - engagement
Class organisation: Whole group
Actions/Tasks: Speaking Board. Reading a text: "Genetically-modified purple tomatoes heading for shops"

Language: elicit vocabulary
What is the difference between organic and non-organic crops?
What is a MGO? Are all non-organic crops transgenics?
Are they common or uncommon in the products we consume?
Where do our vegetables come from?
Does MGO affect ecological values of our natural heritage?
Read a text, underline unknown words, ask some questions and sharing with the rest of the class

2nd Activity: **What is an GMO?**
Time: 30 min
Type of activity: activating prior knowledge
Class organisation: Groups, whole group
Actions/Tasks:

Scaffolding strategy: Think / Pair / Share: Individual / Pair work / Group work. Writing. Board.
Language: we think..., we believe..., because..., it comes from ...
What is a MGO? How is a MGO built up and which molecular biology procedures are needed? Which are the pros and the cons related to MGO production, according to your opinion?
Students think individually what they know about the matter and write down as many words as they know. In pairs, they put the information together and write a resulting sentence. In groups of 4 the students share what they have written and write a longer sentence or two. A speaker of each group reads the resulting sentence to the rest of the class. All the information is written on the board and commented by teacher and students.

2nd teaching period

1st Activity: **Welcome to the molecular biology (virtual) lab. How to extract DNA?**
Time: 1h
Type of activity: Exploration. Virtual simulation. DNA extraction
Class organisation: In pairs
Actions/Tasks:

The students will work in pairs while doing a serial of virtual simulations of different molecular biology procedures commonly used in genetic engineering.
First one is the DNA extraction, which can be followed at
https://learn.genetics.utah.edu/content/labs/extraction/
Scaffolding is based in visual images, animations, interaction with the animations, pair working, etc.
During this simulation the students will learn and apply the main contents and language involved in the unit.
In order to allow a proper scaffolding, some of the procedures are asked to write what are they doing and which is the objective of doing that for each step.

3rd teaching period

1st Activity: Obtaining multiple copies of a target sequence: PCR
Time: 30'
Type of activity: Exploration. Virtual simulation. Polymerase Chain Reaction
Class organisation: In pairs
Actions/Tasks:
The students will work in pairs while doing a serial of virtual simulations of different molecular biology procedures commonly used in genetic engineering.
The second one is the Polymerase Chain Reaction, which can be followed at
https://learn.genetics.utah.edu/content/labs/pcr/

(*Unfortunately, Adobe Flash is no longer supported in modern web browsers, so owners of simulation are converting it into new formats that will be supported into the future. They hope to have PCR virtual Lab back online in Spring 2021*)
Alternatively, this activity can be substituted by watching videos like this one https://dnalc.cshl.edu/resources/3d/19-polymerase-chain-reaction.html and complemented by an interactive activity like https://dnalc.cshl.edu/resources/animations/pcr.html

Scaffolding is based in visual images, animations, interaction with the animations, pair working, etc.
2nd Activity: Time to sort molecules: Gel electrophoresis
Time: 30'
Type of activity: Exploration. Virtual simulation. Gel Electrophoresis
Class organisation: In pairs
Actions/Tasks:
The students will work in pairs while doing a serial of virtual simulations of different molecular biology procedures commonly used in genetic engineering.
The second one is the Polymerase Chain Reaction, which can be followed at
https://learn.genetics.utah.edu/content/labs/gel/

Scaffolding is based in visual images, animations, interaction with the animations, pair working, etc.

Language for 2nd and 3rd teaching periods: most of language FOR, language OF and language THROUGH is presented at the table:

<table>
<tr>
<td>Language OF:</td>
<td>Nouns:
DNA sequence, genome, lysis (solution), enzyme, cellular debris, strands of DNA, Polymerase Chain Reaction (PCR), primer, nucleotides, DNA Polymerase, target sequence,

Laboratory materials:
Buccal swab, Eppendorf tube, micropipette, Thermal Cycler,

Verbs:
to isolate, extract and purify (DNA), to lyse and burst cells, to centrifuge

Verb Tenses: Present Simple, passive, present perfect

Connectors: First, then, after that, finally, thus, in order to, etc.</td>
</tr>
<tr>
<td>Language FOR:</td>
<td>(In this example students are asked to explain de procedures follow while doing a virtual DNA isolation. Therefore, the language needed will be focused in describing and reporting, as well as explaining what are the purposes of the actions held during the simulation, as shown in the table).

<table>
<tr><td>Step</td><td>What do we do?</td><td>Why do we do it?</td></tr>
<tr><td>1</td><td>Grind a piece of leaf in an eppendorf tube</td><td>To obtain the cells contained within the leaf tissue</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Describe the steps followed to isolate DNA from a biological sample. Students will use some verbs, like:
to drag, to grind, to add, to release, to place, to clump, to balance, to invert, to heat, to cool, to attach, to target,
Since is the activity consists in the completion of a virtual simulation, all the language is scaffolded by images, animations and actions.
Explain what the purpose of each step is:

Examples:

The lysis buffer is added to the Eppendorf tube in order to burst the cells and release the DNA to the solution.

The salt concentrated solution causes proteins and other cellular debris to clump together, thus separating DNA.

Finally, you obtained purified DNA ready to be stored in a freeze or to move on your next experiment.

After thirty cycles there are over a billion ..... You now have a solution of nearly pure target sequence</td>
</tr>
</table>

Language **THROUGH:**	*How can I get a copy of an isolated single DNA sequence?* *What does buffer mean?* *How can I use the micropipettor?* *Can you please tell me how.....?* *OK, I understand now…* *I believe…., I think...., I don't know.....* *I don't quite understand.....* *Oh, I see now! I didn't know that, etc....* *So, I can say that.....* *etc.*

4th teaching period

1st Activity: Genetically Modified Organisms in Europe
Time: 1h
Type of activity: Research - Elaborate
Class organisation: work in pairs
Actions/Tasks: Do a small research about the MGOs authorised by the European Food Safety Authority, visiting its website: https://ec.europa.eu/food/plant/gmo_en
Make a list of some authorised (registered) GMOs indicating: species and variety, Company owner of the patent, genes introduced and/or characteristics, and authorized use. Share this information in a collarborative padlet.

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Suggestions for future development and expansion of the scenario

The scenario introduces the basic concepts about genetic engineering and the main methods involved. It also wants to show how the European Union regulates the utilization of MGO related to food safety throug the European Food Safety Authority.

This scenario can be expanding by introducing other areas where MGOs are involved, through different readings, leading to acknowledge of the MGO controversies and ending with a class debate or essay writting

Differentiation

Europeanity is included in this scenario by showing how the European Union leads the initiatives for very important aspect of our lifes, such can be the food safety.