#### Title of lesson: Biotechnology Lesson Plan No. 74

[Online Lesson]

#### 1. Class Particulars

Date: 10/02/2021 Time: 8:40-9.40 Duration: 60 mins Class Name: W2

Class Level: Transition Year

Subject: Biology

#### 2 Teaching Objectives of lesson

- To introduce the students to the concept of Plant Breeding and Biotechnology.
- To emphasize with the students the importance of plants in our everyday lives.
- To highlight with the students how Plant Biotechnology can be a solution to producing more food to feed a growing population.
- To introduce the term "GMO".
- To explain 'The Green Revolution' and its impact on the developing world's population.

#### 3. Learning Outcomes

#### At the end of the lesson students should be able to:

- Define Plant Breeding and Biotechnology.
- Recite the importance of plants in our everyday lives with examples.
- Highlight how Plant Biotechnology can be a solution to producing more food to feed a growing population.
- Explain the term "GMO".
- Explain 'The Green Revolution' and its impact on the developing world's population.

#### 4. Resources Used

- The food standards agency magazine with teeth
- Biology Plus (Edco) page 136
- Less Stress more success p.g 69
- Hershey's chocolate bar
- PowerPoint and Laptop
- YouTube video
- Jam Board
- Flashcard
- Kahoot
- www.wooclap.com

#### 5. Literacy and Numeracy

- Reading: students will read information from PowerPoint throughout the lesson.
- Speaking and Listening: Students will listen to the teacher and provide feedback throughout the lesson.

- To assist with literacy I will use flash cards to introduce the following key terms: Plant Breeding, Food security, Abiotic, Biotic and Biotechnology.
- To improve literacy, I will ask specific students at the end of the lesson to recap on what they have just learned and gather pupil's own summaries verbally.

#### 6. Differentiation

- Throughout the lesson, I will ensure to take into account that no two pupils are the same. Therefore, as a teacher I will take this into consideration when explaining the meaning of the term Biotechnology and Plant Breeding.
- When briefly explaining the science behind engineering and breeding plants to improve them for human needs and consumption, I will ensure to take into account that this is not an easy concept to understand. I will take into consideration that these are only 4<sup>th</sup> year students who are yet to study genetics. I will therefore ensure to make great use of the application Jam board and try and simplify the matter of genetic engineering using diagrams and drawings.
- I will be aware of the differences among my students in relation to ability, aptitude and interest and acknowledge that students learn at different rates and in different ways.
- I will establish an inclusive and supported learning environment for all students.

LESSON PLAN TABLE		
Beginning the lesson [5 mins]  • Take Roll call.		
Content	Methodology	
Introducing the topic [ 3 mins] Introduce (teaching) objectives of lesson	I will introduce the objectives of the lesson (See PowerPoint Slide 2). I will then recap on Biofortification. I will explain that we are studying how biological applications can be used to solve real world problems. I will explain that the real-world problem is: World Hunger. I will explain that we previously studied how biological applications can be a solution to micronutrient deficiencies particularly in the developing world. Golden Rice was the Case study we focused on.	
Development Food- A basic Human Right [3 mins]	I will begin the lesson by stating article 25 from the Universal Declaration of Human Rights. I will explain how everyone has the right to food (PowerPoint slide 3). I will ask the students if they are aware of the sustainable development goals. I will explain that goal 2 is Zero Hunger (PowerPoint slide 4).	
Food security [1 min]	I will then explain the term Food security. I will show the flashcard for food security and place it on my word wall which I will post to google classroom after the lesson. I will explain that food security is about more than just having access to food. It must be a reliable access that is sufficient, affordable and nutritious (PowerPoint slide 5).  I will then highlight to the students how big of an issue "World Hunger" really is. I will explain how 821 million people are undernourished and are in need of food and lack food security. I will explain that another problem we are facing is: how do we	

produce enough food to feed the ever growing human population where the world population has projected to reach 8.3 billion by 2020 (PowerPoint slide 6-7).

As this is a very topical issue, I will explain that food production is a major contributor to global climate change.

To tie everything together and explain the topic of today's discussion I will raise a question with the students, The big question (PowerPoint slide 9-10). I will explain the urgency of finding a solution. I will highlight how Plant Biotechnology can be part of the solution.

I will ask the students to create a word cloud in relation to the following question: ways we benefit from plants (PowerPoint slide 11).

I will then discuss the importance of plants. I will explain that we need them for food, clothing, energy and medicine asking the students for examples (PowerPoint slide 12-15).

Next, I will explain that although we depend on plants, they are unreliable. I will explain that they are affected by both abiotic and biotic stresses. I will explain both terms and put a flashcard on my word wall. I will then introduce the term Plant Biotechnology and place the flashcard on the wall. I will explain that it is a method of improving plants to make them higher yielding, more resistant to disease and environmental conditions (Abiotic and Biotic stresses) (PowerPoint slide 16).

I will explain that this is done through science. I will explain that Plant breeding occurs through a

#### The Big Question

The importance of Plants for Humans

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Word cloud [5 mins]

The Importance of plants

Plants are unreliable

- -Abiotic and Biotic stresses
- -Biotechnology
- -Plant breeding

technological application using living organisms. I will explain the term Biotechnology and place a flashcard on my wall. I will use the UN Convention on Biological Diversity to explain the concept (PowerPoint slide 17).

# Biotechnology Video [5 mins]

I will show students a video on Biotechnology. It quickly summarises its purpose without going into too much detail on the science behind it to confuse the students. It also gives the lower ability students a better understanding (PowerPoint slide 18).

#### **Recap on Key Points**

I will then ask the students if they have any questions. I will recap on the key points made and emphasise the importance of plants.

#### GMO [5 mins]

I will then begin to discuss GMOs. I will ask the students if they have heard of Genetically modified organisms. I will define the term (PowerPoint slide 19-20).

I will explain that GM crops have been modified to help overcome two of the major problems faced by commercial farmers, insects. Using the application Jamboard, I will briefly explain how Biotechnology works (PowerPoint slide 21).

### Case study: Golden Rice [3 mins]

I will explain that Golden Rice is an example of plant breeding where we improved the rice crop to make it more nutritious (increased Vitamin A). I will recap on the benefits of golden rice in solving hidden hunger an micronutrient deficiency of Vitamin A.

## Labelling of GM products [5 mins]

I will then move onto discuss labelling of GM products in Ireland. I will explain that GM foods are only authorized for sale if they are judged not to present risk to health or the environment, and to be of no less

## Hershey's chocolate bar [4 mins]

nutritional value than the foods they are intended to replace and that all products made using GM ingredients must be labelled as such.

I will show the students a Hershey's chocolate bar. I will ask the students to put their hands up electronically, if they have ever eaten this bar. I will then ask them to read the ingredients list on PowerPoint slide 24. I will ask the students to raise their had if they have made an observation.

I will discuss that the chocolate bar is made from Genetically modified sugar beet, corn and cane. I will explain that this is the only product on market in Ireland that has genetically modified produce. I will then explain that it tastes no different to any other chocolate bar. I will highlight how biological applications are used in our everyday life (PowerPoint slide 24).

### Advantages of Genetically modified foods [5 mins]

I will then highlight with the students that on balance the advantages of genetically modified (GM) food outweigh any dangers. I will discuss how we are in a situation where we must consider all options to increase food production to meet food demands (PowerPoint slide 25).

#### **Public opinion on GMO**

I will discuss that some of the public opinion on GMO. I will then highlight and emphasise the reality (PowerPoint slide 26-27).

### **Case Study: Green Revolution** [5 mins]

Finally, I will briefly discuss The Green Revolution. A case study that highlights the impact that Biotechnology and our knowledge and application of biology have on the world around us. I will discuss the father of the green revolution- the man who saved a billion lives. I will finish the lesson by asking the students their opinion on GMO and

	Biotechnology (PowerPoint slide 28-30).			
Debate: Breakout Rooms [6 mins]  Kahoot Quiz [5 mins]	I will then break up the students into breakout rooms and ask them to debate the following using the knowledge gained during this lesson: Genetically modifying food crops through Biotechnology can be one of the solutions to World Hunger. Using Biotechnology, we can harvest, high-yielding, pest-resistant, nutrient-rich crops to feed our ever-growing human population. I will ask each group to assign a spokesperson. I will put a timer on the board and allow the students to have a 5-minute discussion. Once the students are back in the main room, I will call upon a group to discuss their opinions with the class and gather their ideas. (PowerPoint slide 31).  Finally, we will end the lesson with a Kahoot quiz testing the student's knowledge on what was carried out in relation to Biofortification and Biotechnology. It will also allow me to assess the learning outcomes and determine the students level of understanding (PowerPoint slide 32).			
Summary, Recapitulation,  The second last slide from the end will list the Learning Outcomes for the lesson.	I will summarise the key points of the lesson and will finish with a slide listing the <b>Learning Outcomes</b> "At the end of this lesson you should be able to" (slide 33).			
	As advised by the principal, during online lessons, no homework will be assigned.			
Self Evaluation and Reflection				
QUESTION	REFLECTION			
What did I include in my lesson plan	I included:			

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to try to ensure that the learning	-Flashcards to help with literacy.		
outcomes were achieved?	The flashcards are a great resource		
	for introducing new words to the		
	students.		
	-Chocolate		
	It helped the students to understand		
	that genetically modified organisms		
	are something of our everyday life. It		
	helped to explain to the students that		
	food products that contain genetically		
	modified organisms are no different		
	to the chocolate you find on the shelf		
	in your supermarket. It allowed me to		
	make the point about how pant		
	breeding is just a method of altering		
	plants to improve them using our		
	understanding of genetics.		
	-Informative video		
	My main focus is to make my lessons		
	as interesting as possible for the 4 <sup>th</sup>		
	year students in hope that they choose		
	Biology for the leaving cert. My aim		
	is to highlight how science is		
	involved in their everyday and		
	therefore throughout the year I will be		
	showing them educational videos.		
	-PowerPoint presentation		
	As with every lesson I had a		
	PowerPoint presentation on the		
	overhead data projector. I went		
	through each part of the lesson		
	referring back to the PowerPoint		
	presentation when necessary.		
	-		
	Therefore, the learning outcomes		
	were achieved with the aid of the		
	resources used throughout the class		
Do I think that the learning outcomes	Yes, I believe the learning outcomes		
were actually achieved in the lesson?	for this lesson were achieved as		
	efficiently as possible.		
What do I feel was good about the	The previous lesson, I asked the		
lesson?	students if they would consume a		
	product such as Golden Rice that was		
	genetically modified. Some students		
	said no. After presenting them with a		
	product they are used to, the		
	chocolate bar, we had a discussion		
	and all their opinions changed on the		
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matter after they were educated on the topic of Biotechnology and Plant breeding. A lot of students become inquisitive and engaged in the lesson, the asked questions on the science behind it and the genetics involved.

They also loved the Kahoot quiz which was a great way to assess the learning outcomes.

Once again, I really liked the use of <a href="https://www.wooclap.com">www.wooclap.com</a> to allow the students to create a word cloud on the importance of plants. As expected, they had a limited view on how much we actually depend on plants. I was happy to then discuss all the different uses of plants such as clothing and medicine and not just as a food source.

This lesson followed on from the lesson on Biofortification (a biological application that can be used to solve world hidden hunger and Micronutrient deficiencies such as Vitamin A). The students were exposed to the real-world problem that is World Hunger. They were given a glimpse on just how important plants are to us and how we are dependent on them for survivalsomething which they didn't value previously. The statistics showed just how serious of an issue we are currently experiencing and how Biotechnology can be a solution to feeding our every growing human population and those 821 million who are starving. The students were given the opportunity to go into breakout rooms and debate the issue of GMO food products and Biotechnology using their informed opinions to come to a standpoint.

### CHECKLIST OF ITEMS INCLUDED IN LESSON PLAN

### **Science Pedagogy**

Title of lesson: Biotechnology Date of lesson: 10/02/2021

ACTIVITY	YES	NO
Have I included references to at least one other textbook in		
addition to the one used by the students?		
Are my learning outcomes written using the correct active verbs?		
Have I included a PowerPoint presentation in my lesson?		
Have I taken into account the constructivist approach to science		
teaching when planning the lesson?		
Have I included practical work (student practical or a		X
demonstration experiment) in the lesson?		
Have I included activities such as worksheets or crosswords or	X	
word searches or quizzes in the lesson?		
Have I included questions directed at individual students and	X	
designed to challenge them?		
Did I make use of ICT (Powerpoint or video or CD ROM or	X	
datalogging or internet) to promote active learning in the lesson?		
Did I ensure that pupils were not spending time copying down	X	
notes from dictation or from the blackboard or slides.		
Have I included STS material or a story in the lesson?	X	
Have I included flash cards or posters in the lesson?		
Have I taken into account the language and literacy problems that		
may arise in the lesson?		
Have I included group work or class discussion or peer group	X	
teaching or role play in the lesson?		
Have I planned to involve students as much as possible in the	X	
lesson?		
Have I included assessment strategies in the lesson to check if the		
learning outcomes have been achieved?		
Have I included a recapitulation of the key points of the lesson?		
Have I backup material prepared in case a fault develops in the	X	
dataprojector or computer?		

SIGNED: Farah Shaladan