



The human body- Immune system – VEGA Teaching Scenario

Topic: Natural Science (anatomy, viruses and bacteria) – Understanding how the human Immune system works.

Subject(s): Biology/Natural Sciences/English

Age / Grade: 11+ / grade 5+

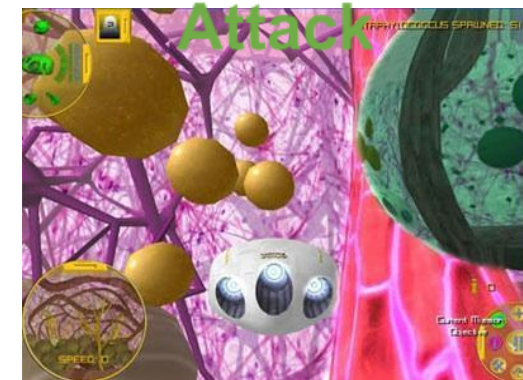
Short description of the VR game in this scenario:

Immune Attack: Immune Attack, is a game in which you play the role of the human body's defences, in each of the levels, you must eliminate the bacteria that invade the body.

Each bacterium has a way of working, therefore you must adapt your defence cells to the bacteria in order to kill them.

Navigate a *nanobot* through a 3D environment of blood vessels and connective tissue in an attempt to save an ailing patient. Teach white blood cells how to hunt and kill bacterial

Immune



invaders. Learn about the biological processes that enable macrophages and neutrophils to detect and fight infections.

Immune Attack was funded by the National Science Foundation and jointly developed by the Federation of American Scientists, the University of Southern California, Brown University, and Escape Hatch Entertainment. It teaches cell biology in a fun and engaging way.

This game is available for "pay what you want." It works on Windows XP and all later versions of Windows. For installation requirements, see [FAQ MolecularJig.com](http://FAQ.MolecularJig.com). Not available for MacOS.

Proven effective at teaching and raising confidence of students regarding cells and molecules. Get our research paper at MolecularJig.com/research.

Introduction to the scenario

In this case, students will learn how the immune system works. Students learn to identify the systems, devices, and organs involved in relational and coordinative functions, and to interpret their mechanisms of action, relational and coordinative functions, and their mechanisms of action as processes by which stimuli receive, coordinate information, and execute responses. Organs and systems have appropriate preventive processes, and each system is associated with appropriate processes to prevent sensory changes, hormonal imbalances, or hormonal or neurological imbalances.

Learning outcomes:

The students are able to:

- Reflect on what they already know about their immune system and set up goals for what they will know when the assignment is finished
- Understand how the respiratory system and the lungs work together
- See the connection between cause and effect, to see the connection between a healthy lifestyle and a good lung capacity
- Know: Knowing better the different human organs, their functioning, and their importance. Differentiate between viruses and bacteria, knowing their types.
- Know the types of bacteria and viruses. Identify the function of human organs and their functioning.

Cross-cutting theme: the importance of organ transplants. Discuss in groups the importance of organ donation and transplantation.

A selection of learning outcomes from the Spanish Curriculum

In Compulsory Secondary Education, the subject of biology is based on six blocks.

Curriculum development is based on the need for didactic programming by the teacher. For this reason, the contents and their corresponding assessment criteria and indicators of achievement are included. It should be noted that the indicators of attainment are the competency results visible to the students. This scenario is interdisciplinary as it is approached from two subjects, biology and technology. We will now proceed to the curricular development of both.

The biology contents worked on in this scenario belong to block 2, PEOPLE AND HEALTH that focuses on the study of the human body and health promotion, its determinants and the importance of acquiring healthy lifestyles. It also deals with the origin of the most common infectious diseases, their transmission and prevention mechanisms, the process of immunity and its applications,

and an assessment of the contributions of the biomedical sciences. It deals with the study of the human body, the structure of the organs, apparatuses and systems involved in the functions of the human body, the structure of the organs, apparatus and systems involved in the functions of nutrition, relationships and reproduction, relating them to their functioning and to the causes, symptoms and consequences of the most common diseases in order to prevent them.

The first block of topics covers the contents:

- Relationship functions.
- The nervous system.
- The endocrine system.
- The sense organs and sensory receptors.
- Neuroendocrine interaction.
- Common diseases and disorders, causes, risk factors and preventive measures. prevention measures.

The assessment criterion corresponding to this content is: Recognise the systems, apparatus and organs involved in the functions of relationship and coordination, and interpret their mechanisms of action, functions of relationship and coordination, and interpret their mechanisms of action as a process of reception of stimuli, coordination of information and execution of responses, associating each organ and system with the corresponding process to prevent and system with the corresponding process to prevent alterations of the sensory organs, hormonal imbalances or hormonal or nervous imbalances..

The achievement criteria related to this block of contents are as follows.

- Identifies and describes the organs, apparatuses and systems related to the functions of relationship and coordination using anatomical models, diagrams and graphs.

- Identifies the basic mechanisms of action of the functions of relationship and coordination and associates each of them with the organs involved and coordination functions and associates each of them with the organs involved.
- Illustrate with examples an event in everyday life that is the integration of the nervous and endocrine systems.
- Identifies the causes, symptoms and effects of some of the most common diseases related to diseases related to the sense organs, nervous and endocrine systems and suggests preventive nervous and endocrine systems and suggests preventive habits.

The second block of topics covers the contents:

- Types of diseases. Causes, prevention and treatment.

The assessment criterion that corresponds to this content is as follows. Differentiate the origin of the most common diseases, explain the mechanisms of transmission of infectious diseases in order to the mechanisms of transmission of infectious diseases in order to justify the preventive methods of contagion and propagation.

The indicators of achievement related to these contents are as follows:

- Classifies, according to their origin, the most relevant illnesses in today's society, based on case studies or information from society, based on case studies or information from the media or scientific documents the media or scientific documents.
- Recognises the mechanisms of transmission of infectious diseases, relating them to the diseases in relation to the means of prevention of contagion and spread.

The contents of the technology subject belonging to block 1: SOLVING TECHNOLOGICAL PROBLEMS AND TECHNICAL COMMUNICATION, the backbone of the area as it describes the set of phases that make up the resolution of a problem by obtaining a final product that satisfies our initial need problem solving thanks to the obtaining of a final product that satisfies our

initial need. Therefore, it shows what to do and how to do a complete technological project. To this block, all the aspects related to the technical communication of the project are added: from the first sketches to the standardised plans, including the different views that can be used in the project through to the different views of the final design.

- Design of a prototype that provides a solution to a technical problem.
- Knowledge of cooperative learning structures and techniques cooperative learning.

The corresponding assessment criterion is: To perform tasks effectively, to have initiative to undertake and propose actions while being aware of strengths and weaknesses, to show curiosity and interest during their development and to act flexibly in seeking alternative solutions.

The achievement criteria relate to the competences of sense of initiative and entrepreneurship, and learning to learn.

- Has the initiative to undertake and propose actions when carrying out technological tasks or projects at the level of education and acts with flexibility in seeking alternative solutions to the difficulties encountered during their development.
- Has the initiative to undertake and propose actions when carrying out technological tasks or projects at the educational level and acts flexibly looking for alternative solutions to the difficulties encountered during their development.

Students self-assessment rubric

This rubric is made to help understand what's important with games or any new media in general. An experienced teacher can run without, but this is to help new teachers to assess what's valuable.

The idea is that every ROW is just ONE variable (ex. recall, transfer, problem-solving etc.). You read the first column and give a 'grade'. The descriptions are just there to give a 'quality' if you need that.

Student evaluation rubric				
Knowledge content	1	2	3	4
Information recall	Student can't recall information covered in game	Student can recall some information covered in game	Student can recall most information covered in game	Student can recall all the information from the game well
Transfer	Student can't connect the information in game to information on books or in other medias	Student can transfer some information from the game to other medias	Student can transfer majority of information from the game to other medias	Student can connect the information in game very well to contents in other medias
Skills	1	2	3	4
Problem-solving	Student did not try to solve problems in game / during activity	Student was somewhat active in solving problems during the activity	Student worked rather actively on solving problems during class.	Student worked very actively on solving problems during class
Collaboration	Student was not able / willing to collaborate with others.	Student participated, but was not particularly active in collaboration.	Student was actively collaborating while working.	Student was very actively collaborating while working.
Creativity	Student did not actively consider / provide creative solutions to tasks or challenges	Student provided some creative ideas and solutions during the activity	Student actively considered / provided creative solutions to tasks or challenges	Student very actively considered/provided creative solutions to tasks or challenges
	1	2	3	4

Exercise completion	Student was not able to complete the tasks in the game	Student was able to complete some of the tasks in the game	Student was able to complete most of the tasks in the game	Student was able to complete all (or nearly all) tasks in the game
Engagement	Student was not engaged during the class	Student was slightly engaged during the class	Student was engaged during the class	Student was very engaged during the class

Formative assessment

Number of students: Duration (estimated time/number of lessons):

- From 20 to 30 students (2 students/group)
- 3 lessons 45 min

Prerequisites (necessary materials and online resources):

- Computer with basic configuration (game is from 2008)
- Download game from:
<https://www.sciencegamecenter.org/games/immune-attack>
- Visualize this Youtube videos to be familiar with game:
Immune attack trailer
<https://www.youtube.com/watch?v=tKgroDE4DHo>
Immune attack gameplay
<https://www.youtube.com/watch?v=0X70FxO2Nd8>
<https://www.youtube.com/watch?v=y5gydLaebv0>

Before the program begins (preparatory work for teacher):

- Teacher will introduce immune system. Dedicate a class to the introduction of the contents with audiovisual materials such as animation videos, documentaries, interactive games, etc.
- In class the students visualise the content of the following video: <https://www.youtube.com/watch?v=fSEFXI2XQpc>
- Learn how basic functions work and how you use the controllers (make a manual for the controllers if the students haven't used them before)
All material the students need is included in the assignment
- Divide students into groups of maximum two student / computer

The main part of the scenario (number of lessons):

Part one (2 lessons x 45 min/day)

Lesson 1

During this lesson students will play with the Game. Overall, Immune Attack is a shooter, then, mainly students need to understand which is the intruder point and shoot.

Immune Attack is a game in which you play the role of the human body's defences, in each of the levels, you must eliminate the bacteria that invade the body.

Each bacterium has a way of working, therefore you must adapt your defence cells to the bacteria in order to kill them.

Each bacterium gives off a series of things that you must drag your defence cells to move them in the direction of the bacterium and be able to kill it.

Student can also give their cells different roles such as capturing bacteria, killing them, or healing your own cells.

During 2 days students play an adventure inside human body:

- Exploring
- Learning
- Defending

Part two (1 lesson x 45 min)

Lesson 1

- In class the students visualise the content of the following videos:
 - <https://www.youtube.com/watch?v=zQGOCOUBi6s>
 - <https://www.youtube.com/watch?v=oqGuJhOeMek>
 - <https://www.youtube.com/watch?v=jkNxmTrrZSk>
 - <https://www.youtube.com/watch?v=N1xX49AqwQ>
- Search and collect information and material about the topic
- Prepare 1 infographic about a topic developed.

Part three (1 lesson x 45 min)

Lesson 1

- In class the students visualise the content of the following video: <https://www.youtube.com/watch?v=i0ZabxXmH4Y>
- Search and collect information and material about the topic
- Prepare 1 infographic about a topic developed.

The presentation must state:

- answers to all the questions in the assignment
- a personal reflection about what they think of their lungs now compared to before the assignment
- their personal reflection on the Immune Attack

Debrief with students in the end of the first lesson

- What did you learn that you didn't know before?
- How does the cooperation in your group work?

Summative assessment:

Grades 5-10	5	6	7	8	9	10
Content application	<p>They do not show any interest in the applications.</p> <p>They misuse them. Without understanding their functions.</p> <p>They make a synthesis that does not reflect the proposed contents.</p>	<p>They show a few interest in how the applications work.</p> <p>They discover the basic functions of the applications</p> <p>They make an extensive synthesis of the ideas obtained in the exploration.</p>	<p>Show interest in how apps work.</p> <p>They discover some relevant functions of the applications.</p> <p>They elaborate a somewhat extensive synthesis.</p>	<p>Show interest in how apps work.</p> <p>They investigate the main possibilities of the applications.</p> <p>They elaborate a synthesis with the main ones of the exploration.</p>	<p>They show interest in how the applications work.</p> <p>They investigate the possibilities of the applications.</p> <p>Produce a concise and creative synthesis of the exploration.</p>	<p>They show interest in how the applications work.</p> <p>They investigate the possibilities of the applications.</p> <p>Produce a concise and creative synthesis of the exploration.</p>
Exercise resolutions	<p>They make a presentation with a fuzzy structure.</p> <p>Their learning conclusions do not adhere to the content.</p> <p>They briefly</p>	<p>They make a presentation with a fairly clear structure.</p> <p>The conclusions of their learning are quite extensive. .</p>	<p>They deliver a presentation with a creative and clear structure.</p> <p>Its learning conclusions are quite concise,</p>	<p>They deliver a clearly structured and quite creative presentation.</p> <p>The conclusions of their learning</p>	<p>They deliver a clearly structured presentation in a creative way.</p> <p>Their learning conclusions</p>	<p>They deliver a clearly structured presentation in a creative way.</p> <p>Their learning conclusions are short and concise.</p> <p>They explain the</p>

	explain some of the ideas they have extracted.	They explain the main ideas.	and a bit lengthy. They explain the main ideas and some secondary aspects.	are brief and fairly concise. They explain the main ideas and share at least one aspect or curiosity they have discovered.	are short and concise. They explain the main ideas and share the aspects or curiosities they have discovered.	main ideas and share the aspects or curiosities they have discovered.
Skills	Does not show motivation for the activity. Is able to summarise the information needed to make the prototype. Develops cooperation and teamwork skills with notable difficulty.	Shows little motivation for the activity. Is able to synthesise the information needed to make the prototype. Develops cooperation and teamwork skills with notable difficulty.	Shows enough motivation for the activity. Is able to synthesise the information needed to make the prototype. Develops cooperation and teamwork skills with little difficulty.	Shows motivation for the activity. Can search for and synthesise the information needed to make the prototype. Develops cooperation and teamwork skills with little difficulty.	Shows a lot of interest and motivation for the activity. Can search for and synthesise the information needed to make the prototype. Develops their cooperation and teamwork skills.	Shows a lot of interest and motivation for the activity. Can search for and synthesise the information needed to make the prototype. Develops their cooperation and teamwork skills.

Activity and engagement	The student has had challenges to get the task finished. The student hasn't shown signs of engagement neither at school nor at home.	The student has only occasionally shown interest in the work and has had difficulty finding motivation.	The student has mostly shown interest in the work both at home and at school.	The student has shown interest and commitment to the work both at home and at school.	The student has shown great interest and commitment both in lessons and at home.	The student has shown great interest, responsibility and commitment both in lessons and at home.
The overall picture of the work when completed.	The student misses several parts of his work and several points are not checked in the list.	The student lacks several parts of the checklist in his work.	The student lacks certain parts of the checklist, but it is largely complete.	The student has done all the parts on the checklist.	The student has done all the parts on the checklist and you can see that the student has made an effort to include all the parts.	The student has done every single part on the checklist and it can be seen that the student has processed the content.
Images and captions	The student lacks pictures.	The student has few pictures and no captions.	The student has pictures but no captions.	The student has pictures with accompanying text.	The student has several pictures and descriptive captions.	The student has versatile pictures and descriptive and explanatory text.

<p>Showing responsibility for the completion of the work. Cooperation and peer response</p>	<p>The student had difficulty cooperating with his group and did not listen to his classmates. The student did not give a peer response and did not take into account what the group gave in response.</p>	<p>The student had some difficulties in cooperating with his group and listening to his classmates. The student gave peer feedback without following the instructions. The student did not take into account the response given by the group.</p>	<p>The student mostly cooperated well with his group. The student received and gave feedback from his group almost always according to the instructions. The response was mostly constructive.</p>	<p>The student showed responsibility and mostly a good ability for cooperation. The student received and gave feedback from his group. The response was constructive.</p>	<p>The student showed evidence of good responsibility and a good ability for cooperation. The student gave a versatile response and took the response he / she received from his / her group into account.</p>	<p>The student showed evidence of excellent responsibility and an excellent ability for cooperation. The student made an effort to formulate himself in a constructive and valuable way for the task in order to help his group further in his work. The student received a response from his group and took it into account in his own work.</p>
<p>Language learning/English</p>	<p>The student has big difficulties in learning the English words.</p>	<p>The student struggles with and has some challenges with the English words.</p>	<p>The student knows the most important concepts and words in English.</p>	<p>The student shows evidence of understanding most parts in English.</p>	<p>The student has a good understanding and has learned most of the concepts and knows all the words in English.</p>	<p>The student masters all concepts and words in English.</p>