

## Activity **5**

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# Problem-based Learning In Immunology

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Activity developed at Cégep de l'Outaouais  
By **PATRICK FILLION**

## Problem-based Learning in Immunology

Date Last Tested

**Fall 2005**

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Scientific Discipline

**Biology**

Average Age of Students

**18 years old**

Course Title and Number

**General Biology II (101-EYD-06)  
and Immunology (210-513-HU)**

Duration of Activity

**2 weeks**

### NOTE

In this document, the masculine is used without discrimination and solely to make the text easier to read.

Appendices are available in PDF and Word format on the CD provided with this document.

In addition, an instructional analysis of the activity is available in the pedagogical treasures section (*Trésors pédagogiques*) on the Saut Quantique Web site at:

<http://www.apsq.org/sautquantique>.

Use of this text is authorized for instructional purposes, provided that author's name and college are mentioned.

Adherence to these recommendations will encourage authors to share their experience.



## Problem-based Learning in Immunology

### Description of Activity

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#### OVERVIEW

This activity introduces students to problem-based learning (PBL) in immunology, in two different contexts: theoretical and practical.

In the theoretical portion, the teacher explains how a PBL session is conducted and provides students with a problem situation, based on which they will have to find information on immunology.

In the practical portion, which takes place in the laboratory, the teacher explains the basics of using an ELISA plate reader, and gives students a problem situation that they must solve, using a protocol and their ability to analyze results. In this experiment, students must determine the cause of illness of their virtual patient.

Although both problem situations use the same pedagogical approach, there is no connection between them.

#### RELEVANCE AND ORIGINALITY OF ACTIVITY

With courses in a PBL format, students discover a new pedagogical approach, since most of them never had the opportunity to take part in this kind of activity. This type of pedagogical approach allows students to develop certain skills and attitudes, such as autonomy, the ability to reason, teamwork, etc.

Students must learn and understand what they are studying because they will have to present their learnings to their peers. And what better way to assimilate a subject than by having to explain it to others?

Moreover, students learn to manipulate a device (the ELISA plate reader) not often seen in pre-university courses, which provides an interesting introduction to devices and techniques used in research.

### Objectives and Relation to the Program

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#### PEDAGOGICAL OBJECTIVES OR TARGETED COMPETENCIES

Build strong basics in immunology, and make students more autonomous in their learning by letting them find information in the suggested reference material by themselves.

Become acquainted with a technique rarely used in pre-university biology labs, i.e. the ELISA technique.

#### LINK BETWEEN THE ACTIVITY AND THE PROGRAM

##### *General Program Goals Targeted*

This activity targets the following general goals of the *Science* program:

- To apply the experimental method;
- To reason logically;
- To learn autonomously;
- To work as members of a team;
- To make connections between science, technology and social progress;
- To adopt attitudes that are useful for scientific work;
- To apply what they have learned to new situations.

### *Link with Course*

This activity in immunology addresses one of the aspects of homeostatis in the *General Biology II* course.

### *Link with Other Course*

This type of pedagogical approach can be applied to most science courses in the program.

## Number of Students and Educational Support

### APPROXIMATE NUMBER OF STUDENTS IN CLASS

21-25 students

### NUMBER OF STUDENTS PER TEAM

2-3 people in the laboratory; 7-8 people in the theoretical session.

### EDUCATIONAL SUPPORT

In the theoretical portion, the teacher acts as guide and facilitator. He should intervene as little as possible. The major difficulty here lies in managing the discussions of all teams. Usually, each team has a tutor, but in a college environment, this is hardly feasible. Therefore, the teacher should look over notes taken by the secretary in each team to make sure that students are on the right track.

In the laboratory, the teacher shows students how to use the ELISA plate reader and briefly explains the principles surrounding the manipulation of antibodies.

## Conducting the Activity

<sup>1</sup> For further information on problem-based learning, please refer to the section Apprentissage par problèmes (problem-based learning) on the Saut quantique Website [www.apsq.org/sautquantique](http://www.apsq.org/sautquantique).

## CONDUCTING THE ACTIVITY AND TIME REQUIRED TO COMPLETE EACH STEP

### *Before*

The teacher looks at the problem situation (Appendix S.1), prepares the experiment protocol using Appendix S.2, and explains the steps involved in PBL<sup>1</sup>.

Students divide into teams, and name a facilitator, writer and secretary per team. (20-30 minutes)

### *During*

For the theoretical portion, students read the situation scenario (5 minutes), discuss it and highlight important points (60-75 minutes).

The team facilitator makes sure everyone gets a turn to talk, and moderates discussions. The scribe takes down the discussions and distributes photocopies of his notes to the other members of his team at the end of the session. The scribe takes notes of his team's interventions on the blackboard, makes drawings, etc.

In the laboratory, students learn how to use the ELISA plate reader during the first week. The following week, they complete the experiment (Appendix S.2). The protocol is provided, but they must draw conclusions from the results obtained. (2 hours)

### *After*

For the theoretical portion, students return home to read their material and study. At the next session, they share their learnings. (45 minutes)

The teacher may add a few pointers if any important items are missing in the students' presentations.

In the laboratory, students must prepare a report to be submitted one week after results are gathered.



### **Activity 5**

#### **Problem-based Learning in Immunology**

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## Evaluation and Required Material

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### SUGGESTED EVALUATIONS

Items learned from the theoretical problem situation are evaluated by a theoretical exam, whereas the laboratory portion is evaluated by a report that students must submit one week after the activity is completed.

### REQUIRED MATERIAL

ELISA plate reader, anti-BSA antibodies and peroxidase-labeled anti-antibody (see Appendix S.2 for further details)

### APPENDICES

#### *Teachers*

Appendix T.1 : Information on the Laboratory

#### *Students*

Appendix S.1: Situation Scenario

Appendix S.2: Laboratory Protocols

#### **Note:**

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## Other Ideas to Explore

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Basic serology tests can be done in the laboratory if an ELISA plate reader is unavailable. Students are simply put in a situation where they must provide a diagnosis.

### MEDIA DIRECTORY

ROITT, Ivan M., et al. (2002). *Immunologie*, DeBoeck Université, Bruxelles, 480 p.