Experience Day
Biomedical Sciences

Maastricht University

Content

Programme

Preparation

During your first Problem-Based Learning session, you will work on a case. To be able to discuss this case during the Experience Day, we recommend you to read the case in this information booklet and review the links to the literature sources. Studying these literature sources is called self-study. This is necessary to answer the learning objectives from the pre-discussion of the case.

Programme group 1 and 2

Time	Activity
13:00 - 13:10	Welcome at our Randwyck Campus
13:10 - 13:40	Lecture
13:40 - 14:15	Laboratory workshop: DNA
14:15 - 14:25	Moving to Computer Rooms for Virtual Microscopy
14:25 - 15:00	Virtual Microscopy
15:00 - 15:30	Campus tour Randwyck including Study Association Helix
15:30 - 15:45	Demo Problem-Based Learning: preliminary discussion of the case
15:45 - 16:30	Problem-Based Learning: experience yourself
16:30 - 17:00	Q&A with our student ambassadors

Programme group 3 and 4

Time	Activity
13:00 - 13:10	Welcome at our Randwyck Campus
13:10 - 13:40	Lecture
13:40 - 13.50	Moving to Computer Rooms for Virtual Microscopy
13:50 - 14:20	Virtual Microscopy
14:20 - 14:30	Moving to Lab Rooms for Laboratory Workshop
14:30 - 15:00	Laboratory workshop: DNA
15:00 - 15:30	Campus tour Randwyck including Study Association Helix
15:30 - 15:45	Demo Problem-Based Learning: preliminary discussion of the case
15:45 - 16:30	Problem-Based Learning: experience yourself
16:30 - 17:00	Q&A with our student ambassadors

Follow-up

A few days after the event, you receive an email with the follow up steps.

Problem-Based Learning (PBL)

Problem-Based Learning (PBL) offers you a different way of learning from traditional university education. You work in small tutorial groups, engage in hands-on training and attend (far) fewer lectures. Under the supervision of a tutor, you team up with ten to fifteen students to tackle real-life challenges. PBL is an active way of learning that gives you better retention of knowledge, enhances your motivation and encourages you to develop skills that are essential for the labour market in the 21st century.

In PBL you are personally responsible (under supervision, of course) for what you learn. This requires you to play an active role in the learning process.

In short: PBL is all about you, your tutors are very approachable and you learn together in a dynamic way, helping form you into an assertive professional.

Some advantages

You learn together, in a dynamic way

Because you work actively on real-life issues, the theory sticks better in your mind and you learn to apply your knowledge to all sorts of questions. The very different backgrounds of your fellow group members not only make for lively discussions, but also mean you gain experience cooperating in culturally diverse teams.

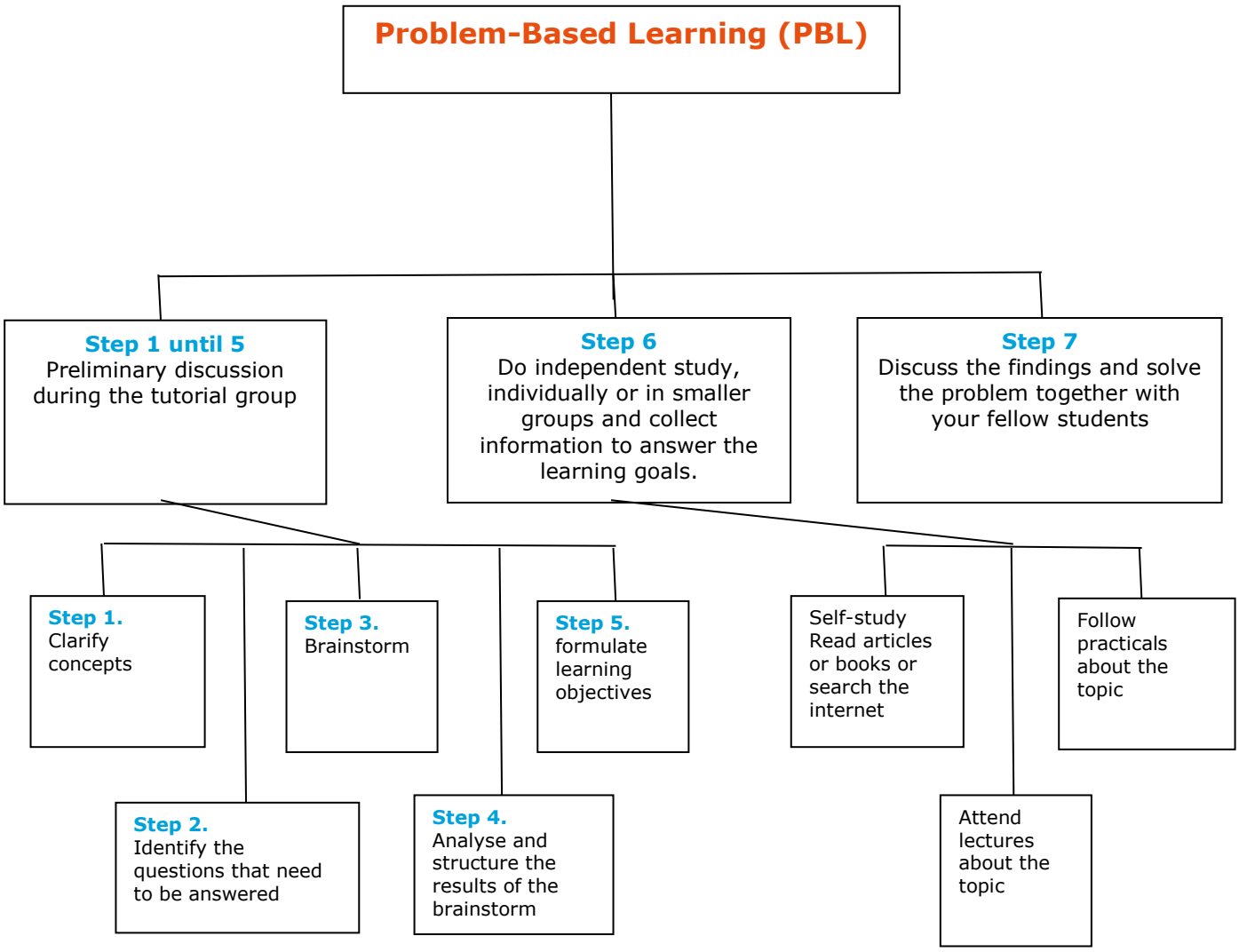
You acquire skills for life

Our graduates serve as the evidence that Problem-Based Learning is effective. They are assertive, independent and professional. They are especially skilled in analysing complex issues, gathering and structuring information, working in international teams, leading discussions, and forming and presenting ideas.

Source: YouTube: *Problem-Based Learning at Maastricht University*

The seven steps of PBL

In its essence, PBL involves seven steps that you follow with your fellow students in a tutorial group. Together with your group, you analyse a case. Often, the problems you analyse are also the subject of important academic research conducted at Maastricht University. During the preliminary discussion, you formulate learning objectives that you all have to study individually for the next meeting. You can find more information about the seven steps of PBL on the next pages.



Preliminary discussion (step 1 until 5):

First meeting with tutorial group

During the preliminary discussion, the group establishes what knowledge is already present with respect to the task set. In this way, a starting points is provided for the search for additional knowledge.

Step 1. Clarify concepts

To avoid confusion or misunderstanding, the concepts used in the task set are first clarified. This enables all participants to start from a common starting point.

Step 2. Define the problem

The essence of the task is determined in order to establish the boundaries of the topic.

Step 3. Brainstorm

Refreshing and establishing the knowledge present within the group (activating previous knowledge), followed by a process of providing as many explanations, alternatives and/or hypotheses as possible for the underlying problem.

Step 4. Analyse and structure

Classifying explanations provided in the brainstorming session, indicating their interrelationships.

Step 5. Formulate learning objectives

Determining what knowledge is still lacking and what has remained unclear. Based on this, learning objectives are formulated.

Self-Study (step 6):

In your own time

Step 6. Self-study

Based on specific questions (learning objectives), acquiring knowledge that is understood and can be applied.

- Scheduling: finding regularity and a proper balance between study time and time off, making efficient and effective use of the available time.
- Selecting sources of information: looking for relevant sources of information and selecting the appropriate ones, in terms of quality and quantity, with sufficient depth, for effective studying.
- Studying sources: acquiring new information that one understands and is able to apply in such a way that an answer can be given that is in line with the learning objectives, and the information can be applied, for example to solve the problem set in the task.
- Preparing report: looking back critically at existing knowledge, making links with the preliminary discussion and learning objectives. Based on the latter, preparing what must be dealt with in the tutorial group in order to participate efficiently and effectively.

Discussion and solution (step 7):

Step 7. Discuss the findings

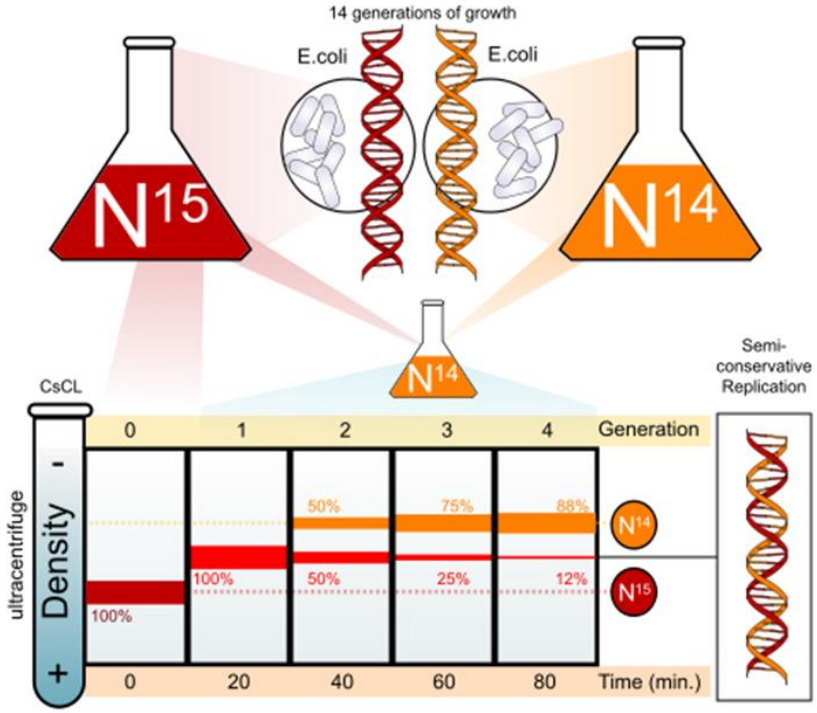
In a discussion with fellow-students, answer and learning objectives are presented, questions are asked, and unclarities are discussed. After the discussion, each student knows whether the new knowledge has been understood, the subject matters had been studied with sufficient depth, and the subject matter can be explained to others.

Case "The most beautiful experiment in biology"

Matthew Meselson and Franklin Stahl performed an experiment in 1958 which showed that DNA replication is semiconservative. It has often been called "the most beautiful experiment in biology".

Meselson and Stahl decided to 'label' the DNA by changing one of its atoms. Since nitrogen (14N) is found in the nitrogenous bases of each nucleotide, they decided to use a non-radioactive isotope of nitrogen that had an extra neutron in the nucleus (15N), which made it heavier.

E. coli were grown for several generations in a medium with 15N, making the DNA a little heavier. When DNA is extracted from these cells and centrifuged in a salt density gradient, the DNA separates out at the point at which its density equals that of the salt solution. As expected, the DNA of the cells grown in 15N medium had a higher density than the DNA of cells grown in normal 14N medium. After that, E. coli cells with only 15N in their DNA were transferred to a 14N medium and were allowed to divide (In E. coli, one division takes approx. 20 minutes). After one replication, the DNA was found to have an intermediate density (see generation 1 in Figure).



Matthew and Franklin decided to continue the sampling of cells as replication also continued. DNA was extracted periodically (up to 80 minutes,) and was compared to pure ^{14}N DNA and ^{15}N DNA. DNA from cells that completed two replications (40 minutes) was found to consist of equal amounts of DNA with two different densities, one corresponding to the intermediate density of DNA of cells grown for only one division in ^{14}N medium, the other corresponding to DNA from cells grown exclusively in ^{14}N medium. After every further cell division, the relative amount of ^{14}N DNA increased.

This experiment gave enough information to understand how DNA is formed, but does it give information about the formation of RNA as well?

Literature sources

https://www.khanacademy.org/test-prep/mcat/biomolecules/dna/a/dna-structure-and-function (DNA function and structure)

https://www.khanacademy.org/science/ap-biology/gene-expression-and-regulation/replication/a/molecular-mechanism-of-dna-replication (DNA replication)

https://courses.lumenlearning.com/boundless-microbiology/chapter/dna-replication/ (DNA replication)

https://www.thoughtco.com/dna-versus-rna-608191 (DNA vs RNA)

Seven Step Approach:

1. Clarify concepts

2. Define the problem(s)

3. Brainstorm

4. Analyse and structure

5. Formulate learning objectives

6. Self-study

7. Discuss the findings

Notes: