

Introduction : Diagnostic Process

The Diagnostic Process: This is one of the key parts of the Neuromatrix game. It requires inquiry and elements of the scientific process. Using their Case File, students conduct exams with each of the three nanobotized teen scientists and the Director of the facility to diagnose where the Nanobots are causing the damage. Then they go into their brains to fix the damage and get rid of the Nanobots.

The brains of the Director and three scientists at the neuroscience research facility have been invaded by Nanobots. Students enter the research facility, find each scientist, collect observations in their labs to learn more about them, and get them to consent to conducting an examination. This is called the Diagnostic Process.

Through their investigative work and use of the Diagnostic Process (DP), students are able to target the systems of each scientist's brain under attack by Nanobots. Students go inside the brain of each scientist and do a series of explorations, activities, and games on their way to confronting the Nanobots in that particular scientist's brain.

Web sites for building background knowledge and further study:

Scientific Reasoning

http://www.biology4kids.com/files/studies_scimethod.html

This site is designed to help children learn about the scientific method of reasoning. It was designed by the Andrew Rader Studios in 2006.

Scientific Method

<http://www.nceas.ucsb.edu/nceas-web/kids/experiments/scimethod/scimethod.html>

This site has a simple scientific method model for young students. It was designed by the National Center for Ecological Analysis and Synthesis from the University of California at Santa Barbara and funded by the National Science Foundation.

Scientific Method

<http://homeschooling.about.com/cs/sciexperiments/ht/cientificmethod.htm>

This is a homeschooling site developed to help parents describe the scientific method to their children.

[NOTE: unless bulleted, the follow paragraphs should end with periods]

Lesson Objectives:

Learn the elements of scientific inquiry through the Diagnostic Process.

Learn to solve problems by using the Diagnostic Process.

Apply the elements of the Diagnostic Process to target the systems of the brain.

Game Objective:

Through investigative work and use of the Diagnostic Process, target the systems of each scientist's brain under attack by the Nanobots.

Students Will Learn:

How to use the scientific method to investigate a problem in the brain.

How to choose an appropriate question for the investigation.

How to evaluate a response to the question.

Learn about the functions of identified regions of the brain and to target the systems under attack.

Major Concept:

Students will learn how to use the scientific process to investigate a problem and target the systems of each scientist's brain under attack by the Nanobots.

California State Standards:

Science, Grade 6: Earth Science

Investigation and Experimentation

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

Students will:

a. Develop a hypothesis.

b. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.

- c. Construct appropriate graphs from data and develop qualitative statements about the relationships between variables.
- d. Communicate the steps and results from an investigation in written reports and oral presentations.
- e. Recognize whether evidence is consistent with a proposed explanation.

Science, Grade 7: Life Science

Investigation and Experimentation

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

Students will:

- a. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
- b. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.
- c. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.
- d. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).
- e. Communicate the steps and results from an investigation in written reports and oral presentations.

Science, Grade 8: Physical Science

Investigation and Experimentation

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

Students will:

- a. Plan and conduct a scientific investigation to test a hypothesis.
- b. Evaluate the accuracy and reproducibility of data.

California State Language Arts Standards

Writing, Grades 6-8:

Organization and Focus

1.1 Choose the form of writing (e.g., personal letter, letter to the editor, review, poem, report, narrative) that best suits the intended purpose.

Research and Technology

1.4 Use organizational features of electronic text (e.g., bulletin boards, databases, keyword searches, e-mail addresses) to locate information.

National Science Education Standards

1. Life Science Standards levels 5-8:
Structures and functions in living systems.

2. Science as Inquiry:
Abilities necessary to do scientific inquiry and understandings about scientific inquiry.

Set:

As a class activity, the teacher lists the seven elements of the scientific inquiry method. (See handout: Scientific Inquiry Template.)

The Diagnostic Process is one of the key parts of the game and it requires that the learner use inquiry and the elements of the scientific process.

Activities:

1. Scientific Inquiry Method Activity

This is an activity that is designed to build the student's background knowledge about the scientific inquiry method.

Review one past experiment you have conducted in your class where the scientific inquiry method was used. As a whole class, refer to the four steps of the scientific inquiry method that were listed on the board in the "Set" part of the lesson. Referring to the past experiment, ask students to give a concrete example for each step in the scientific inquiry method. Write those examples on the board, next to each step.

Explain that the Diagnostic Process used in the game is the investigative part of the scientific inquiry method, which is the overarching umbrella. Students will use the investigation part of the scientific inquiry method to conduct the tests and collect data.

2. Playing the Game

While viewing the introduction of the game, encourage students to complete the Worksheet #2: Brain Diagram, where they identify each of the five parts of the brain and its function. (The introduction can be replayed multiple times if necessary.) The students can use this diagram while playing the game.

In the game, something has happened to the teen scientists. Nanobots are attacking each of them in a different part of his/her brain. Students can destroy the Nanobots if they can determine what part of the brain in each teen scientist is being attacked.

Game Objective:

Through investigative work and use of the Diagnostic Process, students will figure out the systems of each scientist's brain that are under attack by the Nanobots.

Description:

Brains of three of the scientists and the Director of the neuroscience research facility have been nanobotized. You enter the research facility, find each scientist, collect observations in their labs to learn more about them, and get them to consent to your conducting an examination. This is called the Diagnostic Process.

Through your investigative work and use of the Diagnostic Process (DP), you're able to target the systems of each scientist's brain under attack by Nanobots. You go inside the brain of each scientist and do a series of explorations, activities, and games on your way to confronting the Nanobots in that particular scientist's brain.

The Game Process:

Playing the game requires students to go through the Diagnostic Process in the steps below.

1. The player chooses a set of questions from the list.
2. The scientists respond to each question in the set.

3. The player evaluates the scientist's responses to determine which part of the brain is healthy or damaged.
4. The player's choice is either right or wrong.
5. The results are tabulated in a bar graph. a) The questions are categorized by brain system. a) An evaluation of the player's answers is given and the correct evaluation will also be given. These evaluations may differ or they may not.
6. Error warnings are given when the player makes an incorrect evaluation.
7. The student selects two systems (i.e. motor awareness and emotions) that are damaged based on observations, results, and error warnings.
8. The diagnosis page automatically puts first and second damaged systems in correct order.
9. The student goes into the brain to destroy a Nanobot.
10. The movie about a specific part of the brain follows.