



Inquiry Teaching in Science - Problem Based Learning (PBL) in Astronomy

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Problem Based Learning (PBL) is a teaching methodology based on the Inquiry Teaching approach, which consists in finding a solution to a problem that requires the use of higher-level cognitive skills. It's best carried out in small groups.

The scenario or problem must lead the student to ask questions and to find solutions through research. This methodology is a research-oriented approach, because it starts with questions (asked by the students after being introduced to the problem), it encourages the search for solutions, it develops scientific reasoning, and it helps students to learn about key aspects of scientific research, such as gathering data, finding evidence, looking for solutions, discussing and presenting findings. In PBL the teacher has the role of facilitator.

In the study of the Solar System, the study of the Moon's craters started with the observation of photos, which led the students to ask questions like "What determines the size and shape of the craters?". To answer this question the students hypothesized about the size, speed and distance travelled of the object that hit the Moon. The students then planned and carried out an experimental activity to validate their hypotheses, using balls of different sizes and materials. The diameter and depth of the craters were estimated using Salsa J. With the data obtained in this experiment, the students did a Gowin's V diagram.

In order to determine the relation between the characteristics of the celestial bodies and the craters formed, both on the Moon and on the Earth, we studied the Earth's craters. We used Impact Calculator, a program that estimates the effects of an impact on the Earth, using several variables, such as the size and density of the meteorite, and the speed and angle at which it impacts the Earth's surface.

Another problem started with the film Visions of the Cosmos. It raised questions such as "Is there a relation between the Earth's past and the origin of the Solar System?" "How are the bodies of the Solar System distributed over the Universe?" "What characteristics can be inferred from the position of the bodies of the Solar System in relation to the Sun?" The students searched for answers using Stellarium, a program that shows and identifies images of different celestial objects, such as planets, stars, nebulae and galaxies.

In order to assess this teaching methodology and tools the students answered a survey, and we drew important conclusions from the results: 74% of the respondents said that PBL encouraged the search of solutions to the problems being analyzed. In answer to a different question, 96% agree that PBL allows them to acquire scientific knowledge, and 89% say that it developed their reasoning ability.