Spolufinancováno
z programu Evropské unie
Erasmus+

Inquiry-based Learning and Teaching Across Europe

2018-1-CZ01-KA201-048113

Area of education/subject:	Polytechnical education (biology – chemistry – physics)
Title of activity:	Preparatory and motivational activity for inquiry-based learning and teaching of primary school pupils
Year:	year 9 of primary school

Spolufinancováno
z programu Evropské unie
Erasmus+

Basic information

1) Title of activity/topic: Preparatory and motivational activity for inquiry-based learning and teaching of primary school pupils
2) Target group: Primary school pupils attending the research centre of the Havlíčkův Brod Grammar School
3) Objective of activity: To introduce primary school pupils to the grammar school's environment and inquiry-based learning and teaching at the grammar school

Preparations for activity

1) Aids: Stations at the research centre of the Havlíčkův Brod Grammar School: microscopy, spectrometer, light properties, photoelectric effect, analysis of samples, digital particle camera, and relevant aids available at these work sites.

2) Methodological Information: This is an initial introductory activity that uses proven methodological procedures, through which pupils should quickly and effectively learn about the environment of the school and the research centre, overcome their natural initial reluctance, and gain confidence in teachers, who then guide them through specific research activities. The activity uses individual work and small-group group – both forms guarantee pupils' active approach in the lesson – pupils are never passive recipients of knowledge, on the contrary, they are made to be the creators and co-creators of knowledge; by presenting their conclusions in front of their classmates, they are empowered to improve their communication skills, while group work helps them to acquire the operational principle of teaching and work procedures.

3) Motivation of pupils: We know from previous experience that the pupils coming to the research centre are selected motivated pupils who are interested in inquiry-based learning and teaching and, in addition, most of them are interested in studying at the Havlíčkův Brod Grammar School in the future. Nevertheless, most of the newcomers feel naturally apprehensive about the unknown environment of the school which has the reputation of a demanding educational institution.

Course of activity

1) Expected implementation date/duration: During primary school pupils' visits to the research centre (school year 2018/19: 19 February 2019; 9 April 2019; 26 June 2019; during visits to partner schools (school year 2018/19 26 February for students of the partner grammar school in Schriesheim, Germany); the entire activity is always designed to take two lessons

2) Use of the tool (forms and methods):

    a) form: the entire activity is implemented in the form of group and individual lessons
    b) method:
        - At the beginning of the activity, pupils receive a brief welcome from the school head, complete a short tour of the different stations, and the teachers responsible for the stations are introduced (approximately 5 minutes);
        - The pupils then have five minutes to get to know the various stations individually and, with the help of brief notes, try to estimate the nature of the instruments at the given station. They should describe each station in one sentence;

- After that, they are divided into groups of three or four and, within the groups, they confront their findings and produce a single one-sentence statement for the entire group, for each station separately (this phase takes about 10 minutes)
- In the next phase, each of the groups presents its conclusions one by one for each habitat; the presentation for the given station is concluded by the responsible teacher who evaluates the different descriptions, explains how the station actually works, and briefly characterises the research activity to be carried out during the current lesson. This phase also takes about ten minutes);
- the school head, who coordinates the entire activity, summarizes it at the end, and the pupils then break up and go to individual stations, where they work in groups of two, or maximum three (approximately five minutes);
- for the next twenty-five minutes, the groups of two or three pupils carry out research activities at their stations. To illustrate, here is a brief description of the work at each station, as it takes place in the school year 2018/19:
    - **1. Microscopy:** Pupils learn to perform the micro-relief method, which is used to observe structures on the surface of opaque objects, and use it to study the surface of the body of insects, plants and other objects. During their observations, they will try out advanced methods of microscopic observation (Nomarski contrast, composite photographs) on a cutting-edge Olympus BX53 microscope. If pupils want to keep copies of the resulting micro-images, they need to bring their own USB drive.
    - **2. Spectrometer:** Pupils learn about the use of infrared spectroscopy in identifying known and unknown chemical substances. They then analyse their own samples of various types of oil, and test their skills while preparing and analysing liquid samples of more complex organic substances. If pupils want to keep copies of the images of measured IR spectra, they need to bring their own USB drive.
    - **3. Light properties:** Pupils gain an understanding of the optical system of a healthy human eye, and model it using a demonstration kit. After that, they model the optical system of a near-sighted and far-sighted eye, and propose a method to compensate for eye conditions using a suitable corrective lens.
    - **4. Photoelectric effect:** Pupils learn about the principle of the photoelectric effect. Then, they observe the properties of the photoelectric effect depending on the wavelength of the radiation source used.
    - **5. Analysis of samples**: Pupils learn about yeast ‘respiration’ – i.e. they prove the formation of carbon dioxide and ethanol.
    - **6. Digital particle camera:** Pupils are introduced to a digital particle camera and the possibilities of its practical use. Pupils are introduced to the concept of radioactivity, radioactive radiation, and its types and effects. Finally, pupils work with a teacher to study how radioactive radiation penetrates through various materials.
- this is followed by a five-minute break, after which the pupils move on to the second station, where they spend the remaining twenty-five minutes pursuing the relevant research activity

Spolufinancováno
z programu Evropské unie
Erasmus+

Methodological note on a possible alternative way to implement the activity:
With appropriate modifications, the activity can be used for students of the actual grammar school.

Identification of risks and difficulties

1. Despite all efforts, pupils may not be able to overcome their natural shyness and reluctance resulting from their entry in a new environment. Here, the only prevention is the most kind and helpful attitude on the part of grammar school teachers.
2. Pupils may not be able to cooperate in a group and present their conclusions. Here, support from and activity of the coordinator of the entire activity (the school head) is of key importance.

Information sources

For example:
Fisher, R., (2004): Učíme děti myslet a učit se. Praktický průvodce strategiemi vyučování. Portál, Prague.
Kasíková, H. (2005): Učíme (se) spolupráci spoluprací. AISIS, Kladno.
Kotrba, T. & Lacina, L. (2007): Praktické využití aktivizujících metod ve výuce. Společnost pro odbornou literaturu, Brno.
Petty, G. (2004): Moderní vyučování. Portál, Prague