Indians, bells and whistling bottles - an inquiry-based learning unit for enhancing students' motivation, creativity and empirical skills

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Abstract. During the workshop, we will present a ready-to-use unit to introduce the learners to sound frequency, sound propagation in matter, and the sound resonator. The module is embedded into the inquiry-based learning (IBL) cycle based on everyday materials, with particular emphasis on the first phase of the cycle (Brainstorming) created as a storyline, which aims to raise students' motivation and interest in the subject. The unit consists of three parts, developed at different levels, which can be implemented at all levels of education, as a sequence or separately, depending on the student's age.

Introduction

Nowadays, more than ever, humans face rapid and massive changes we already experience and can anticipate in the future - both in our lives and globally. Currently, we are confronted with a situation in which we need to prepare learners for challenges in their lives and careers that still need to be defined. Such a conjuncture puts on teachers a great responsibility not only for developing students' competencies tailored to the XXI century [1] but also for teachers' continuous professional development since, nowadays, education more than ever depends on teachers' adaptability and responsive attitude.

When entering the education system, children are curious and motivated. However, most of them soon lose interest in learning science [2]. Thus, we must support and maintain young children's curiosity and inquisitive attitude to extend it over their lives and promote a lifelong learning attitude. The modern world increasingly depends on exact, natural, and technical sciences. Hence, there is a growing need to attract people who not only would associate their professional careers with developing these disciplines but, in general, would develop at least basic science literacy. Since these disciplines are closely related to experience and practical work, particular emphasis should be placed on developing practical research skills, basing teaching on experiments and specific references to everyday life in motivating and teaching them.

Inquiry-Based Learning

Over the last more than twenty years, the IBL approach has been proven in numerous articles to have a positive impact on students' motivation, interest, positive attitude towards science [3,4], and academic achievements [5,6] in science, also longitudinal [7,8]. At least a few models of the IBL have been developed so far [9-11], all of them emphasizing an active role of learners and the learning process involving critical thinking and reasoning, development of skills and procedures employed by scientists, as well as collaborative work. The IBL learning process occurs in repeated cycles [11, 12] of scientific inventory at different independence levels of students, among which the guided IBL has been advocated as the most effective [13]. In 2020, a revised version of the IBL method was published, emphasizing particularly the class circumstances favoring its successful implementation of the IBL. In this e-book, we advocate a significant role of the beginning of the IBL cycle in drawing students' attention and developing their ownership of learning.

Indians, Bells and Whistling Bottles

Usually, teachers attending CPD workshops seek ready-to-use materials for their classes. However, our experience gained in numerous activities organized for teachers over the last twelve years proves that to teach the IBL effectively, teachers should become the inquirers themselves.

The participants of the proposed workshop will experience a ready-to-use unit to introduce the learners to sound propagation in matter, sound frequency and the sound resonator in a way different from standard lab lessons conducted on these topics. Particular attention will be paid to the Brainstorming part, initializing the IBL cycle and creating the scene for the development of students' curiosity and creativity, thus incalculably impacting the entire learning process. The unit consists of three parts, developed at different levels of understanding, which can be implemented at all levels of education, as a sequence or separately, depending on the student's age.

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