

# Studying Sciences through the Integrated Science Modules

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## ABSTRACT

In order to stimulate students' interest for Science study, an active learning Science method of teaching was implemented, making the transition to the model based on exploration and investigation. The "PROFILES – Education through Sciences" training program oriented to improve teaching activities was organized in the frame of European Project "PROFILES – Professional Reflection-Oriented Focus on Inquiry-based Learning and Education through Science" (code: 5.2.2.1-SiS-2010-2.2.1-266589). The general objective of the training program consisted on forming and developing specific competences of Science teachers in order to develop an educational process based on scientific inquiry and integrated approach of the Sciences curriculum. Teachers have created Integrated Science Modules that were implemented in the classroom as an active learning Science method.

The present paper aims to emphasize the students' feedback after the implementation of Integrated Science Modules in the classroom. The study is focused on students' perception of Science topics related with everyday life and importance for the society.

*Keywords:* Integrated Science Modules, Profiles Project, CPD Programme.

## 1. Introduction

Changing the teaching of Sciences by making a transition from deductive form on that based on exploration and scientific inquiry meets the demanding regarding the strategies of organizing of scientific education in Europe having in view to stimulate and increase the pupils' interest for Sciences. The "PROFILES – Education through Sciences" training program was developed to response to the necessity of Romanian Science teachers on promoting reflection-oriented, pedagogical and scientific competences, Inquiry-based Science Education (IBSE) and related approaches who can be implemented in the educational process.

Inquiry-based Science Education can be seen as an useful way to teach scientific knowledge and to learn scientific reasoning and contents. This way is characterized by the fact that the learners are making sense of new experiences for themselves, being active in developing knowledge through their activities, linking new experiences to the past ones, testing ideas and reforming their own ones and using ideas from others. During the implemented process in the classroom, students make their research, discuss

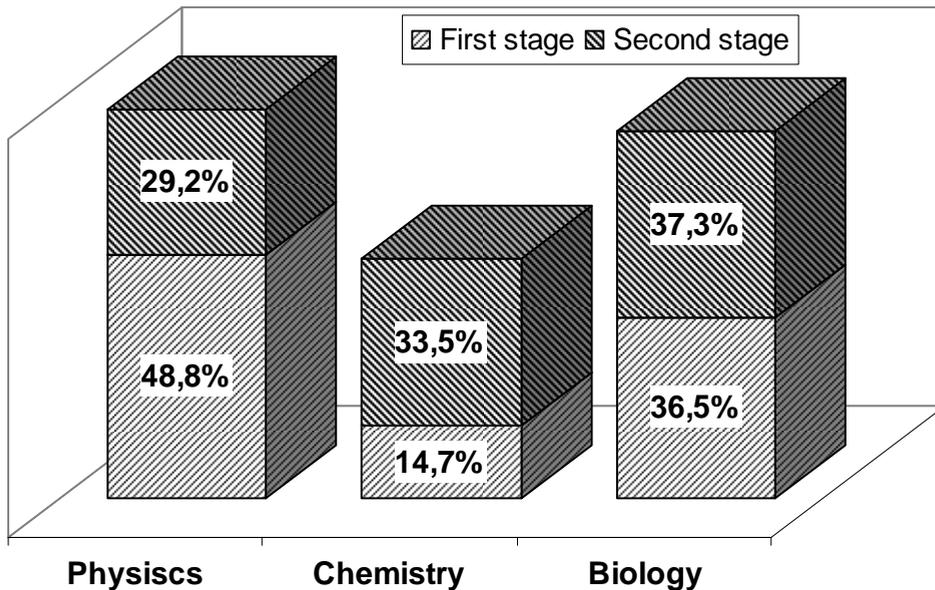
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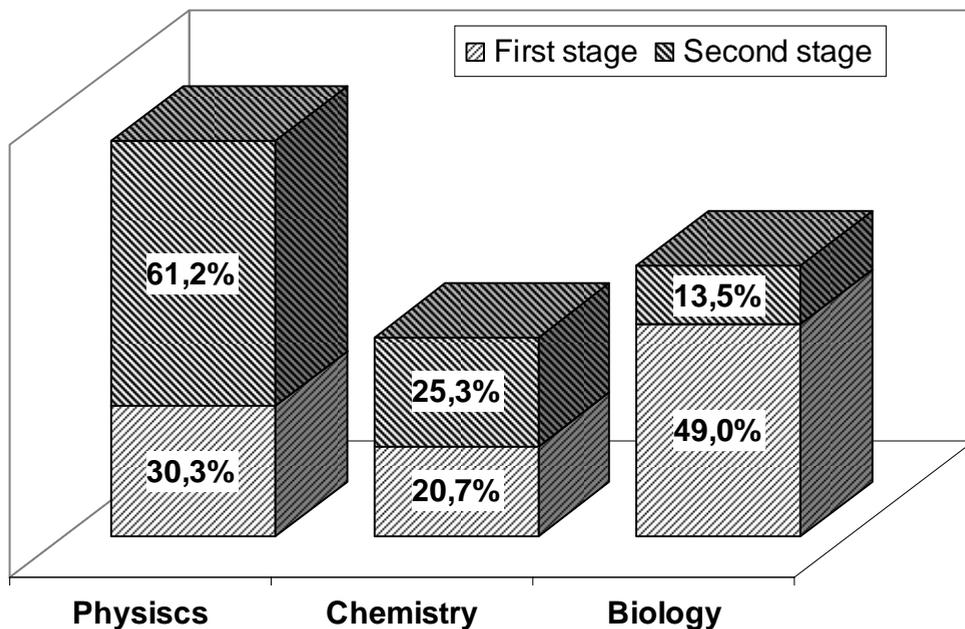
and communicate their own ideas and arguments in small groups. The learners work together in order to agree on problems that they want to answer, and use different materials and resources to draw conclusions and explanations related to particular phenomena.

## 2. Background

The “*PROFILES – Education through Sciences?*” – Continuous Professional Development (CPD) programme - was conducted in two stages who included 69 education units from lower and upper secondary level (20 units in the first session and 49 units in the second session). The distribution of the students involved in those two stages can be seen in Figure 1 and Figure 2. At the end of the training program, the teachers have developed teaching / learning materials (Integrated Science Modules) that were implemented in the classroom during Science lessons; teachers proposed contents, strategies, activities related to the students’ needs and designed learning modules according to the structure of the program.



*Figure 1. Students’ distribution during the implementation process – Lower secondary school*



**Figure 2.** Students' distribution during the implementation process – Upper secondary school

The modules were structured in five sections:

- *Introduction*;
- *Students' Activities* – describes the scenario in more detail and the tasks the students should perform;
- *Teaching Guide* – suggests a teaching approach;
- *Assessment* – gives suggested formative assessment strategies;
- *Teacher's Notes* – provides additional information about the module subject and student worksheets.

The implementation of the Integrated Science Modules has involved three stages (included in the sections of the modules):

- Stage 1: Motivating students – Social Scenario;  
In this stage the objective is to motivate the students by presenting a social scenario based on real life issues);
- Stage 2: Inquiry-based investigation;  
This stage includes web-based inquiry environment, computer-based activities, experimental activities, virtual laboratory, group discussions and debates. The teacher and the children are sharing ideas all together talking about something they are looking at, writing, or answering and asking questions in a way that thinking is available to everyone in the classroom. During this stage, students draw on a variety of information, organize their data and documents.
- Stage 3: Decision-Making Process.  
During this stage the children and the teacher are sharing their ideas, asking questions and answering them, doing activities together. The teacher orchestrate the debate,

encouraging students to present their evidence and asking them to document and explain their reasoning.

### 3. Finding and Results

The target group was constituted from 2134 students during the two stages of implementation (1022 students during first session and 1112 students in the second session) who are attending lower and upper secondary school level (1057 students from lower secondary school and 1077 students from upper secondary school level). The students have been involved to Sciences lessons (Physics, Chemistry, Biology) that were taught in different schools of Dambovită, Buzău and Teleorman Counties.

The study is based on the students' feedback from students' answers from the *Profiles Student's Questionnaire* (Bolte, & Streller, 2012). The questionnaire includes eight sections, but the present study was made taking into consideration certain aspects from the third section of the questionnaire designed to obtain the students' views after the implementation of the training modules (the other two sections of the questionnaire were designed to obtain the students' views on actual or real lessons they attended in the area of Science, respectively the ideal lessons which they would like to attend).

As can be observed from figures 3 and 4 the students considered that everyday life topics are important and must be present during Science lessons. Both for lower and upper secondary school levels, Chemistry, Physics and Biology topics are considered very important in the range of 20 to 30%. In students' opinions Science is largely responsible for a growing awareness that people share the planet with all other living creatures, that the environment is in continuous change and the human activities are presently changing this environment and threaten to change it. People interact with the environment, asking questions and seeking answers. This question and answer process is based on the essence of knowing and doing science. It is a way of knowing and thinking about the natural and physical components of the world.

In the students' view the importance of Science in our daily life may not be obvious, yet we make science-based choices every day. Science is involved when we choose what to eat, or choose products with a minimum impact on the environment or make right decisions about our health-care. Studying Science develops the ability to ask questions, collect information, organize and test ideas, problem-solving and applying what was learned.

Science is part of our daily lives, all day, every day, everywhere we go. Our personal lives are real world contexts for learning science and understanding the impact of Science on our lives. Everyone can become engaged in Science through the way of linking the daily personal experiences to Science.

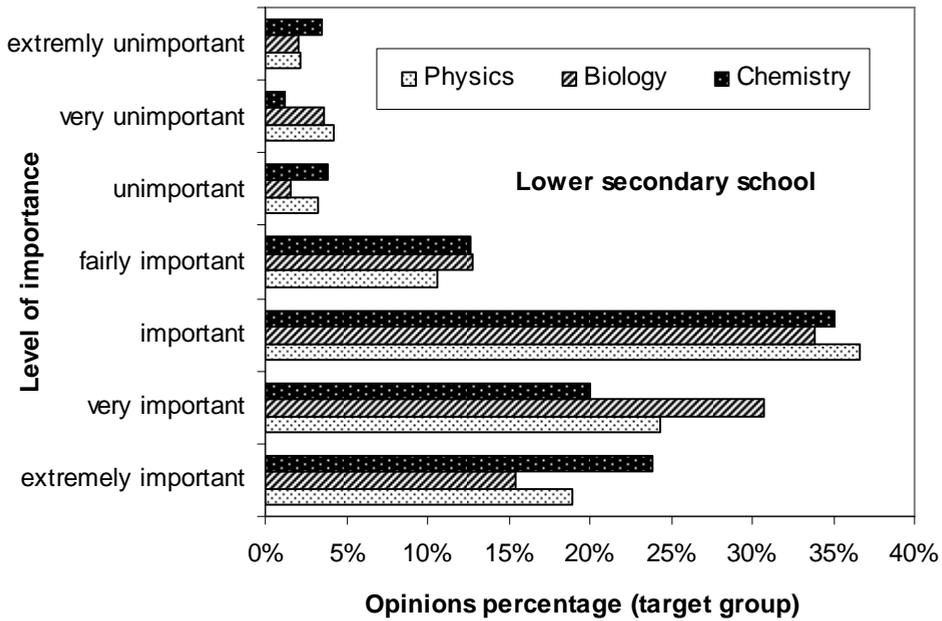


Figure 3. The importance of the lessons subjects in the everyday life topics – Lower secondary school

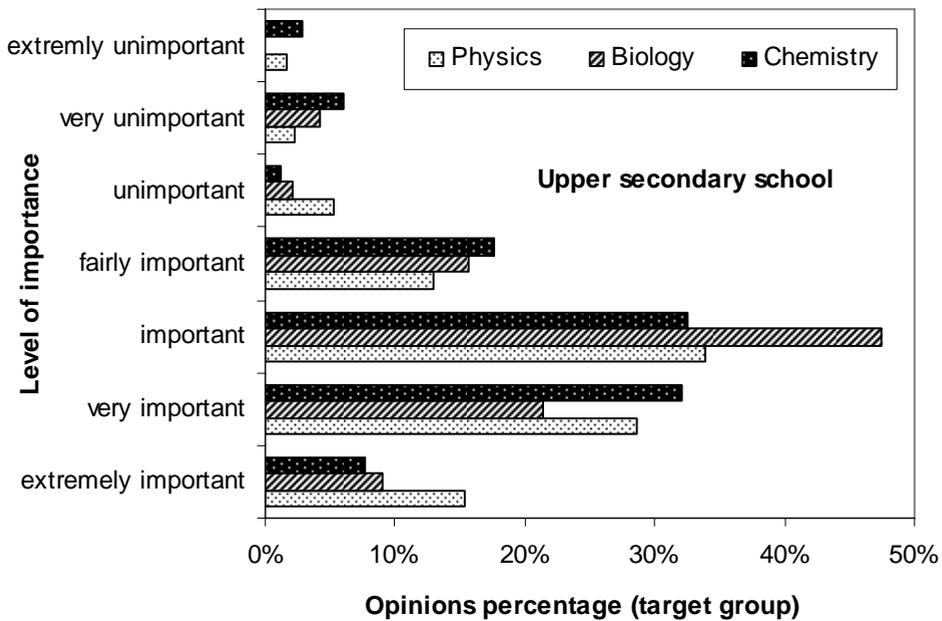
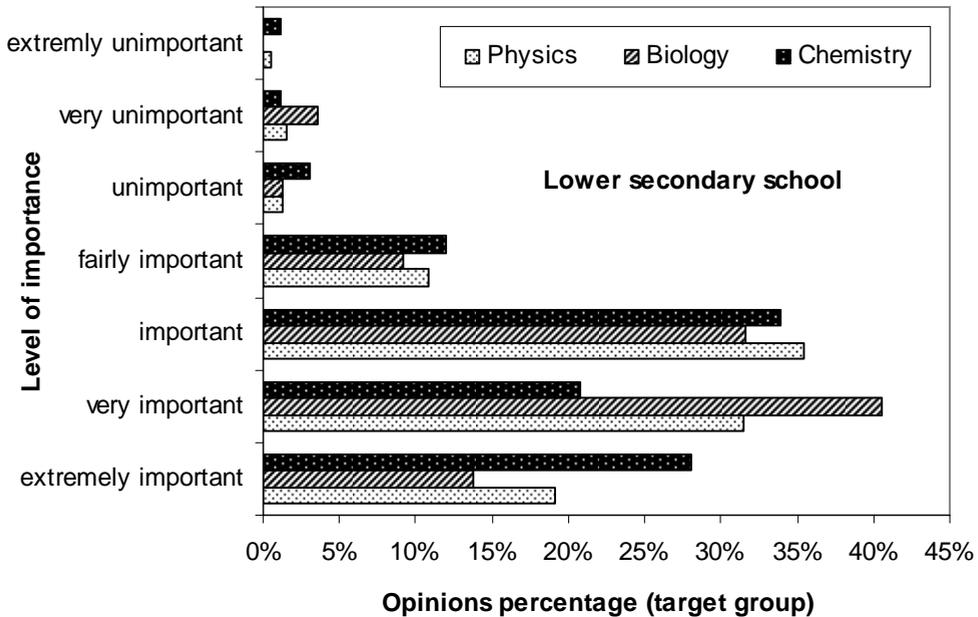


Figure 4. The importance of the lessons subjects in the everyday life topics – Upper secondary school

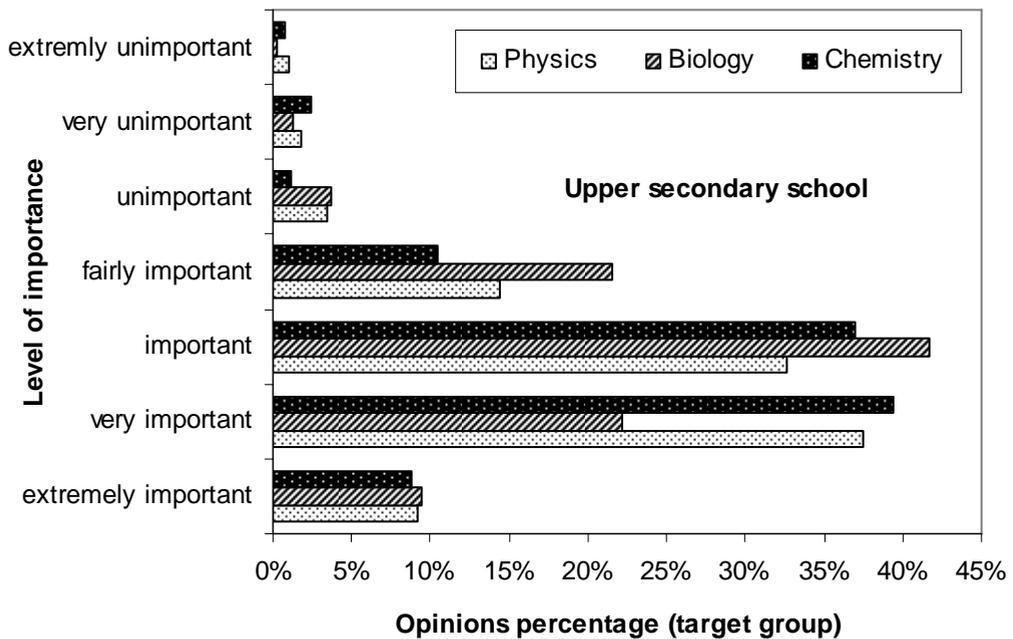
Learning opportunities linking Science to other subjects provide a rich context for integrating Science, technology, mathematics and language concepts and skills. The

world is not divided into discrete subjects and Science is not isolated from everything else in our lives, it crosses into all subjects; not only that different branches of Science interact (physics, chemistry, biology) but Science can be found in subjects like geography, history and all sorts of subjects areas.



**Figure 5.** *The level of importance for society in general of the topics approached during Science lessons – Lower secondary school*

Students accorded a high level of importance for the topics approached for society during Science lessons as can be observed in figures 5 and 6 (lower and upper secondary school level. Science in the present days, in the students view, has the responsibility to achieve a dynamically stable and sustainable ecological and economic system. Even more Science is a bridge for building confidence, developing communication skills and making sense of the world around us.



**Figure 6.** The level of importance for society in general of the topics approached during Science lessons – Upper secondary school

## Conclusions

There were made successful implementations of the Integrated Science Modules in the Science lessons, with a positive feedback from the students; After the introduction of integrated modules, the awareness of the Science involvement in everyday life and society has been increased from the students' point of view; The Integrated Science Modules help learners to understand the concepts across different subjects and make connections within a particular subject area; Integration of different sciences can help learners to connect different concepts, topics and explicitly the link between different disciplines of Science.

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