

THE SIGNIFICANCE OF THE RESEARCH PROJECT IN SCIENCE EDUCATION

Tamara Brice

Riga 41st high school, Latvia

E-mail: *Tamara.brice@gmail.com*

Introduction

The old fashioned ideas of teaching all students the same things at the same time and in the same way by lecturing, telling, copying, rote learning and lots of testing as well as teaching students to be quiet and obedient doesn't seem to be working too well anymore. A student soon becomes bored of absorbing knowledge as a sponge and parroting it back when the particular activity is carried on for too long. The lack of interest results in the student actually avoids learning.

It is true that a teacher must do some lecturing, but the students have to be encouraged to talk too, to think for themselves, to ask questions, to discuss, to take active part in the learning process. Times are changing as well as people are changing, therefore, new strategies and teaching techniques that will benefit millions of students are needed.

It is the task of a teacher to successfully organize the process of learning in such a way as to develop the students' curiosity which forms the motive for work on a specific project and interest in studying in general. One way to help a student become a well-rounded person is to help him understand the interconnectedness among subjects as well as everyday life, particularly among such closely related fields of natural science as physics, chemistry and biology. When the student is able to see how the material could be meaningful in his life, his motivation is enhanced when the results of a study are also significant to the society.

The objectives of this research:

1. To popularize physics among high school students by using scientific research projects;
2. To introduce students to the scientific method;
3. To develop in the students an independent and creative thinking;
4. To popularize physics among high school students by using scientific research projects;

5. To introduce students to the scientific method;
6. To develop in the students an independent and creative thinking, help students value the role of science in the environmental, social and ethical processes;
7. Offer potential scientists the opportunity to evaluate their own abilities and interests while still at school.

Suggestions from other authors

The teacher of the modern world has the option to choose between various methods (Čehova, 2002; Žogla, 2001; Мерзон, Владыкина, 1990; Богоявленский, 1981). The main problem is to choose an appropriate method (Лейтеса, 1996; Матышкин, 1993; Пономарев, 1976). Various authors have suggested the breaking the usual dull of routine long oral lectures and introduce different practical exercises (Иванова, 1988) and games into the lesson plans (Липсон, 1972; Научное творчество, 1969; Мазин, 1995) and to test students to see who are more gifted in the class than others and who potentially can be nurtured by cultivating their talent in the particular subject (Feldhusen, 2001; Косюк, 1995). Definitely useful proposal is to perform a scientific research project:

- A problem is presented;
- A hypothesis is suggested for its solution (or appropriate literature is examined);
- The hypothesis is proven using appropriate experiments;
- A conclusion is drawn, and a generalization formulated.

So, the scientific research project is a one way to solve problems. This method is superior over the lecture format because its main purpose is to present information for memorization.

It is important that students show initiative when choosing a research topic for scientific work and express their ideas. However, the scientific research is intended for the students of upper levels as instructed by the IZM (Ministry of Education of Latvia). The students have to think in abstract concepts, draw conclusions, compare and generalize. The objective of these research projects in the natural sciences is as follows:

1. Make physics, chemistry, and biology more popular;
2. Help students to value the role of science in the environmental and social processes;
3. Help students to understand the possibilities and limitations of science;
4. Help students to see the interconnectedness among fields of science;

5. Introduce the students to scientific methodology;
6. Enhance in students the ability to communicate;
7. Observe safety precautions in experiments, ethical behaviour, and sensitivity to the environment.

My experience

I have been working as a teacher for 34 years in different public schools. In better public schools, for example, Riga First State Gymnasium (I worked there for 30 years), the students have to take an exam to get in and, when compared to other public schools that accept all students, the students are more disciplined and interested in learning. However, other public school students, although far less frequent, still have students with great learning potential in science. It is my duty as a teacher to recognize this potential and make a push in the direction of success.

First, my students get to see different experiments in lessons parallel with the theory. As a result, the lesson is not only more interesting or easier to remember but also ignites a curiosity of the students. Some students even show a desire to touch the equipment themselves and try to repeat the experiment. Students have shown interest in researching a certain topic on their own and then present it in front of the class. This helps to overcome the fear of speaking in front of other people as well as polishes their own ability to present themselves. In the end, it not only leads to interesting lesson but also greater attention from the class.

Second, my students have to do various laboratory practical works. This helps students to overcome fears of using different equipment, learn to use an equipment and also use them later in their households. At the beginning, most students are shy but with time they gain experience, it becomes clear which students will show greater interest in experimenting and will potentially choose science in the future. Therefore, these students can get extra attention from me as a teacher to help and guide them in the direction of the science and physics by presenting extra and more challenging activities. Students also get a chance to work in pairs in small groups due to the lack of equipment but this stimulates their social skills and teamwork.

Lastly, already for several years the research project approach has been required in the First State Gymnasium and the 41st high school of Riga in the eleventh or twelfth graders. Annually, some 180 to 200 students try their hand at scientific research. Of these about 20 % choose to do their project in physics. The low interest rate is due to the extended time and work necessary for these

projects which are much greater than in other fields. Work on a scientific research project can be divided in four parts:

1. Defining the research project in the school;
2. Exploratory visits at the Laboratory at LU (University of Latvia);
3. Performing the scientific research in the laboratories;
4. Defending the research findings in competitions and conferences.

As a result, the students who successfully complete their scientific research project in physics get a chance to present their work in different competitions some of them even international. Most of the students who choose to attend said events gain recognition and good results but most importantly acquire confidence about themselves and their abilities.

In conclusion, in my long teaching experience the attitude of students to both me as a teacher as well as learning in general has changed. They openly welcome different practical exercises in lessons instead of long oral lectures, even show interest to “play” with the equipment themselves. The students who choose to do their science project in physics, although a lot of work is needed, mostly successfully complete it and choose to present their work to their classmates or in different competitions and as a result acquire a confidence boost about their abilities.

Conclusions

The attitude of students to the teacher and to learning in general has changed and the old fashioned ideas of teaching don't seem to do the trick and to work very well to motivate them. The students openly welcome different practical exercises in the lessons and a chance to participate in lessons more actively. It is the teacher who should be prepared to abandon the traditional for the experimental method and teach differently. One of the experimental practices of modern teaching is a research project. The low interest rate of choosing to do the project in physics is due to the extended time and work necessary for the projects from the students. Still, many students need only a gentle push from the teacher. A scientific project develops students' independence and initiatives and combines theories with practical applications, so, the project is significant in the development of the student and in enhancing his motivation to work. Hence, most projects get completed. These projects teach the students the skill of formulating results and of presenting them. As a result, the students learn to respect precisely formulated directions and work criteria. The scientific projects also help students develop an understanding of scientific methods and their possibilities. The students readily choose to present their work

to their classmates or in different competitions and as a result acquire a confidence boost about their abilities, which may help them choose science as their future field.

Although, the interest of the students and their responsibility for their own work has increased in the last few years and the scientific laboratories are now better prepared to train and to help students with their research projects, the experiments where students themselves are allowed to participate are more dangerous and vigilance of both the teacher and the students is required to ensure safety, ethical standards and environmental protection. Since most teachers plan their teaching scheduled ahead they must not forget to give recognition for project ideas initiated by students.

References

- Čehova, L. (2002). *Izziņas aktivitāte mācības*. Rīga: RaKa.
- Feldhusen, J. F. (2001). *Education for Gifted and Talented Children*. Purdue University, USA.
- Žogla, I. (2001). *Didaktiskas teoretiskie pamati*. Rīga: RaKa.
- Мерзон, И. С., Владыкина, Е. Ф. (1990). Научное общение в творчестве ученого
Философское освоение мира деятельность учащихся при обучении физике.
Физика в школе, 1, 27–31.
- Богоявленский, Д. Н. (1981). *Пути к творчеству*. Москва: Просвещение.
- Лейтеса, Н. (1996). *Психология одаренности детей и подростков*. Москва.
- Матышкин, А. (1993). *Загадки одаренности*. Москва.
- Пономарев, Я. А. (1976). *Психология творчества и педагогика*. Педагогика.
- Иванова, Ж. А. (1988). Активизация познавательной деятельности учащихся при изучении физики – теоретические исследования как элемент творчества учащихся. *Физика в школе, 1, 42*.
- Липсон, Г. (1972). *Великие эксперименты в физике*. Москва.
- Научное творчество (1969). *Практика обучения физики как творчество: Сборник трудов научно-практической Сборник трудов научно-практической*. Москва: Наука, С. 413–418.
- Мазин, И. В. (1995). *Развитие познавательного интереса учащихся на занятиях по физике*. Санкт-Петербург.
- Косюк, Л. П. (1995). Центральная фигура ученик как личность. *Директор школы, 5*.