

Gifted in the Science

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Abstract

In this paper, some aspects and examples of a gifted student's study process through high school and higher education is described. We are aware that especially gifted in science are the greatest national treasure. Therefore the focus is on the gifted science students. In the paper will be considered some issues on gifted students identification, differentiation in the classes, and their creativity development. Some aspects of an advanced science curriculum will be discussed. The gifted students want more meaningful learning, more rewarding school work, their own projects and the chance to interrelate knowledge on several levels. The influence of the globalisation processes, as for example the Bologna process, on the higher education curriculum development and implementation will be presented.

Keywords: gifted, science, curriculum, study process, globalisation.

1 Introduction

Especially in science education are educational reforms pushed because of following factors:

- an information explosion where huge amount of information refines ideas, concepts and theories,
- technology advance in observing, measuring and computing,
- necessity of higher order thinking skills for adaptability to innovation.

This has to lead to changes in the structure of the science curriculum. Both, educational and science institutions are involved. Reforms in higher education, known as Bologna process, are welcomed attempts to improve science curriculum in desired way. The need is to make science education look like science as it is actually practised. But first mistake is often made in primary schools by teachers whose expertise is limited and natural curiosity of gifted to explore and understand the world is suppressed. It is not surprise that The World Council for Gifted and Talented Children (WCGTC), decided at 19th world conference in Prague in August this year, to proclaim the 10th August as a day of gifted children.

If we consider gifted in the science in process of education on all levels of study, three important steps should be made:

- identification of gifted,
- application of appropriate curriculum and lectures given by the adequate teachers,
- care for gifted education at all levels of educational process.

We will discuss some issues on gifted students identification, differentiation in the classes, and their creativity development, to encourage teachers and professors to follow expert care for gifted education at all levels. Our main position is, that gifted are the greatest national treasure and that they need special treatment as it has been already proven.

2 Identification and Development of Gifted

The topic is extensive, so we will only mention a few facts and findings. Renzulli define gifted as those, who have high ability, task commitment and creativity (Renzulli). Gifted students stand out from their peers and demand to be instructed in the least restrictive environment. On the other hand, they often have special emotional needs that should be meet on appropriate way, if we want to encourage personal development of gifted. It is often, that gifted ask themselves questions about morality and ethic issues that their peers are not thinking about very deeply.

It seems that teacher observation of the process and the surroundings discussion is the most accurate and reliable tool for identification gifted young students. Mathematically gifted students, for example, are using multiple strategies by process of problem solving. They are solving problems by internalizing, reshaping and questioning. They see the world in mathematical way. For synthesis they use mathematical language. Often they use the graphs to show a solution (M. Hoeflinger).

Identifying gifted students and their skills, mainly in the younger age, give basis to guiding them toward programs of enrichment and advancement. Concept of being gifted does not motivate toward any special performance of gifted student per se. The identification procedure result is still passive phase of working with gifted and developing them. Science education programs that encourages creativity are programmes necessary for the gifted in the cotemporary world (Erez). Creativity is the capacity to confront a given problem in an original way. It is the capacity to look at a situation or problem from a different perspective or even from a variety of perspectives that are not derived directly from the problems definition.

3 Curriculum for Gifted

Common curriculum should allow work with gifted in classes and their holistic development. There are also curriculum dedicated to gifted – for example summer schools or summer camps for gifted. The advantage of such examples is socializing as well.

Gifted are often more subtle than their peers. Therefore programs that encourage creativity should have a precondition – freedom to raise original ideas, freedom to deal with even too complex issues, and freedom to fail. In such conditions the creativity could be developed. Freedom gives students courage to lead themselves autonomously, thereby taking responsibility for the consequences of their choices. This forces teachers

to develop different teaching methods for encouraging creativity and also alternative means of evaluation.

Teachers have to let a free space the students, that they can start thinking. Experiments carried out within the framework of the high school curriculum are usually structured experiments with predefined design. After theoretically learning a specific phenomenon, the student carry out an experiment that exhibit the phenomenon. Some experiments should put the student in a situation in which he or she does not know in advance what the result should be. Rather the student is formulating the hypothesis and the experiment specific design, without knowing the result of the experiment. In these kinds of experiments, the risk of failure at every stage is high, but the student creativity development is supported.

Some high school curriculums are designed to provide an environment for the rigorous teaching of advanced science and mathematics to accelerated students (Ngoi&Vondracek). Scientific knowledge is build around conceptual schemes. Students selected to participate in this program are bright and highly motivated. Gifted students are additional high challenged and motivated. They are separated from accelerated students. For distinguishing gifted from accelerated students they prefer to use teacher anecdotic records rather than standardized test. Gifted students are offered other curricular options to keep them continuously challenged. These options are academic and research based activities or even research studies in the physical and biological sciences. It is a typical form of student acceleration. Gifted students need more than standard classroom activities; they also appreciate a variety of additional learning activities because they have many interests that lie outside the standard curricula.

The advantage of higher education European Credit Transfer System (ECTS) is encouraging student mobility, as well as giving possibility to the students, that they choose some subjects following their interest. But this doesn't fulfilled need for curriculum dedicated for gifted students.

4 Educational Vertical and Gifted

We have to start care for gifted in pre-school age. Any school system should take care about gifted thru all period of the student education. The development of gifted is not linear in the educational period. Several factors influence on the instantaneous position of gifted, age and gender for example. Gender differences in perceptions of being good at math increases with students age. Strong influence is shown from family, their social status.

The care should continue in under-gradual and gradual level. Even after that period, is taking a care welcome in several cases. Some gifted continue to work in science, some are lost (Subotnik et. all). Their longitudinal study tries to identify the variable that lead to the retention and attrition of talented in science. It is well known, that life style of the research scientist require dedication and delayed gratification. Becoming a productive scientist also requires more than high level knowledge and cutting edge research skills. Success in science enterprise means integrating the norms and expectations of the profession. The study shows significant disparities between

male and female cohort members. Shown is importance of school subjects and teachers for life and professional development of the gifted students.

It seems the most important is the role of mentors. They are very influential on under graduate as well as graduate level. The quality of graduate programs is a major predictor in identifying winners of research grants show another study (O`Brecht et all).

5 Conclusion

Gifted students have their special needs and we have to fulfil their needs to encourage their full development. Curriculum at all levels of education must live space for gifted students. Teachers must start from assumption, that their students are more gifted than they are. They must let their students to develop, but they must guide them. The necessary condition for creative education is well defined framework of freedom. Freedom is not only the freedom to initiate and create, but also the freedom to fail. Also the interdisciplinary work is important to develop gifted students no matter that probably they will be deep specialists on their fields.

In Slovenia is interest for studying science dropping for years. Not only well prepared curriculum but also teacher's motivation of gifted will encourage science study and development of the gifted students on field of science.

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