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HOW TO SELECT A TOPIC FOR A PROJECT

Ivanka Marasheva-Delinova

In this paper we examine the choice of a topic for the project work of students who are not in classes with a profile in mathematics. We indicate the criteria for selecting the topic and propose sample topics and sources for development, consistent with the age and individuality of the students and their common and individual interests.

In this study we examine the choice of a topic for the development of projects by students who are not in mathematical classes.

The choice of the topic for a project in mathematics is important and at the same time, difficult process. The good choice can help the student to use and show more of his/her capabilities and to achieve better results. It may also inspire a lasting interest in the subject, and in mathematics, as a whole. That is why this question is examined by a lot of scientists, methodologists, and teachers in Bulgaria. For a student who has to orient him/herself in the vast sea of mathematics it might be difficult to formulate a precise title. He might have some preferences to specific areas, but finding the specific problem to be addressed in most of the cases is an invincible barrier. It is most difficult for students who are not advanced enough in the project activity. Therefore, the teacher is the one who should offer the students a list of relevant topics and literature to use. Surely, they may use other sources, as well. The lack of literature, however, is undesirable because Internet might become their sole source. Thus arises the same question, concerning the teacher. How should the teacher select appropriate topic and literature for each single student developing a project?

We formulate some terms (let's call them *criteria* for selecting the topic), which a certain topic should meet in order to be used for a project:

1. The topic must be consistent with the students to whom it is offered. Students have a common (class, group, etc.) and individual (per pupil) orientation. It is good that the list of topics is consistent with the overall direction, but also that it allows for individual selection.
2. Attractiveness – the topic should cause attention and intellectual curiosity, snatch students, and encourage them to study.
3. Accessibility – the topic should not be too complicated for the students, but at the same time create some problems that they must overcome. The criterion is related to the age and the individual characteristics of the students and their knowledge and capabilities at any given time.
4. Scientific and informative quality – the topic should allow for the gathering and utilization of new knowledge or complement existing one, it may systematize and summarize the knowledge, and give a new insight into the known facts.

5. To engage success: Students do not have rich experience or they have no experience at all in the development of projects. To teach them to develop these, we should give them a topic which they can access, explore and develop. While they advance in the process, we can show them that the rejection of an assumption is also an option or an answer to a research question. We believe, though, that in the initial stage it is not appropriate.

The formulation of a topic can lead to different development according to the personal view of the students who work on it. The result may be different in content, volume, structure, and form. It is important how the topic is formulated and what the possibilities for interpretation are.

Example 1: One of the favorite topics for development of projects is “Interest”. This is a broad topic. As a result of it the students offer more specific headings such as: “Problems of Interest and Capital”, “Interest. Repayment of Loans. Annuity”, “Simple and Compound Interest”, “Reporting Investment Company”, “Nominal and Real Interest Rate”; “Interest, Loan, Rent”; “Interest and its application in banking practice” and others. As a result, the projects are quite different in structure, volume, and contents. The students use different sources to develop their specific topic. Some of them use mainly their textbooks for 11th grade, others add also academic textbooks, or other materials.

Example 2: The topic of “Progressions” may give rise to subtopics as “Arithmetic Progression”; “Geometric Progression”; “Application of Progressions in Other Sciences”, and also combinations of some of the above, etc.

The teacher may pre-set requirements for the structure of the project. It may contain a theoretical part, including conclusions and generalizations; practical part, consisting of tasks and their generalizations, and applications. With the acquisition of experience the students themselves choose how to structure their projects.

In another work [4] we determine the stages in the development of projects as Introductory in 8th grade, Trial and Error in 9th grade, Basic – 10th grade and Advanced – 11th and 12th grade.

When the students are at the Introductory stage, they make their first steps in the project activity. We can offer them some topics of the curriculum, which have not been explored yet.

At the Trial and Error’s stage we offer the students topics from translation, rotation, axial symmetry, central symmetry, as well as some specialized topics of the textbook for 9th grade math-classes: Theorems of Menelaus and Cheva, Irrational Inequalities, Horner’s rule, etc. Students are directed to the relevant topic, first by preference to algebra or geometry, and then – to more specific choices. Textbooks are the major source, but they may also use others.

We offer to the students at the Basic stage topics from specialized mathematical issues that are not too large. For these the most appropriate are articles from *Mathematics*, *Mathematics plus*, *Mathematics and Informatics* journals. The list of topics is selected after a precise examination of the journals. We have chosen topics that provide new knowledge, supplement, summarize, and classify the existing one. Among the proposed topics there are some with different difficulty. Students may use these sources as a base, and also complete with other literature. It is appropriate that the selected topics come

from sources, which can easily be found in the school library. If these topics do not meet some of the students preferences, and they have different ones, they could choose another topic. In this case the teacher should have reviewed the sources that the student intends to use in advance.

The list of topics should offer a choice of difficulty of the mathematical knowledge. Projects are developed also by students who have difficulty when studying mathematics. They should have predominantly popular character.

After gaining experience in project development at the Advanced stage the students themselves choose their topics of interest to develop. At this stage, usually, they desire to participate in various forms of expression outside of school – events, contests, etc. The topics also comply with the conditions imposed by the contest’s requirements.

Example 3: Different trends in the MITE contest provoked the interest of students and one of the developments was on Fractals. Curiously, the team that made this work consisted of girls with interests outside the field of mathematics.

When the young people have a profound interest in mathematics, they have their own preferences and choose topics of particular issues. There is a large group of students who show keen interest in mathematics, intending to apply for university with exam in mathematics, but they have no preference to a specific mathematical area. In many cases they want to develop projects, but have not deepen their knowledge in a particular area. They want to assist their preparation for the entrance exams. Typically, such students find it difficult to select a topic even at the Advanced level. They need some guidance. We recommend them topics such as: “Trapeze in the Entrance Examination Problems”, “Problems Concerning Quadrilateral and Entrance Exams”, “Progress in the Test Problems at the Admission Exams Last Year”, “Systems of Second Degree in Matriculation”, and many others. In the process of development of these topics students explore the types of the given problems classify them, look for other examples, separate types of not given problems, try to identify the reasons for the choice of the specific types, make generalizations. We believe that such topics are very useful for the future students at the Advanced Level who are not in math classes and we intend to further develop the content in this area.

An unexpected aspect in the development of students from the last level is the expression of curiosity in pedagogy and interest in methodological development of lessons for young pupils. It turns out that they have non-traditional ideas. These ideas are close and accessible to children. We have made an experiment. The students have prepared to develop and conduct a lesson in mathematics in younger classes. Their work has showed us a surprisingly good reaction by the small children, high interest, and good communication. The contributes appropriate topic of the lesson, the assistance given in the preliminary training, and the support of the older students during the lesson, itself to the successful realization of the objectives. The high degree of satisfaction of the project developers allows us to suppose that this subject-matter, among other things, could increase the interest in the teaching profession.

Today many young people are intelligent, with lots of knowledge about new technologies, with broad horizons, and rich interests. In order to be a successful partner in the learning process, the teacher must be highly competent and open for the ideas that the student may offer. The teacher must have knowledge or know where to find it so

that he/she is able to properly assess the issues and their development. He/she must be able to find a rational development of each grain, and to promote student's success and inspire him/her for further achievements.

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Ivanka Marasheva-Delinova
46, Korab planina Str., floor 2, app. 6
1164 Sofia, Bulgaria
e-mail: marasheva@abv.bg

ЗА ИЗБОРА НА ТЕМА ПРИ РАЗРАБОТКА НА ПРОЕКТИ

Иванка Марашева-Делинова

В настоящата работа се разглежда избора на тема при разработване на проекти в непрофилнирани по математика класове. Посочват се критерии за подбор на тема. Предлагат се примерни теми и източници за разработка, съобразени с възрастовите и индивидуални особености на учениците, както и техните общи и индивидуални интереси.