The All-Russian Olympiad on Technology among School Students as an effective model for the formation of engineering and technical professional orientation of students in the modern school of the Russian Federation

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Annotation. The multi-level Russian model of the All-Russian Olympiad on technology among school students, which effectively forms the engineering and technical professional orientation of graduates, is considered. The mechanism of a consistently arranged content of the rounds of all stages of the Olympiad which is based on the principle of professional orientation is revealed and it contributes to the winners and prize-winners` successful becoming students of a specialized university.

Key terms: technologies, a professional orientation, a theory and methods of professional education, an Olympiad, a technological order, general intelligence, a system-based mentality, a universal competency, a creativity project.

Scientists of a pedagogical world community paid special attention to a professional orientation in the XXth century. A large number of studies have been carried out, many scientific papers have been written, extensive foreign research experience and priorities of various countries in theory and practice have been studied. In countries such as the United States, France, and Sweden, the professional orientation is based on an information and consultation system and researching the student's personality [2]; in Japan, the preference is given to professional tests, and besides in the process of studying, teenagers are involved in professional tests at least 48 times gaining thus practical experience in specific professions [2].

In Russian education, the questions of theory and methodology of professional training of pupils and students were studied by M.N. Skatkin, A.G. Kalashnikov, S.Y. Batyshev, P.R. Atutov, E.D. Novozhilov, V.D. Simonenko and many others. In one of his works the famous Russian didact M.I. Makhmutov points out that «the principle of the professional orientation is fundamental of any didactic concept of organizing the process of education and upbringing» [1], especially in the system of a continuous educational process: school - university, school - secondary professional school, school - employment. For many years, this principle was realized in the Russian Federation already in a high school in the process of forming technological literacy and professional skills in the lessons of labor education, servicing labour, and later - technology.(Fig.1 Rules…) It is a well-known fact that it is impossible to teach a profession without including skills into the content of teaching process, therefore, in the 20th century, in the period of a shortage of the personnel, a high-quality vertical system of continuing education was devised, which was strengthened by the system of supplementary education, which made it possible to have a good labour force in the faces of secondary professional schools` graduates and to have excellent engineers in various sectors of the economic system of the country in the persons of graduates from universities. One should not forget about those professions that students did not practically learn, the professions about which school graduates had only a general idea, thus, the system of continuous technological education was maintained and formed. From the end of the XXth and up to the beginning of the XXIst century, special attention was paid to gifted children. The All-Russian Olympiad on technology among school students has been held since 1998 and now the participation in this Olympiad allows students to display their technological abilities on equal terms with other subjects. For 20 years, this Olympiad has changed a lot and today we can say that Russian scientists have created a qualitative constructive model which is based on existing

knowledge and makes students acquire new knowledge including an individual level of mentality and using all available sources: a teacher, a parent, scientific and special literature and others, «form» their own knowledge and use skills, successfully improving them.

«General intelligence is a combination, a system of skills» [1]. What skills should students posses in order to prove themselves in the subject «Technology»? This subject includes a large number of sections, without studying which it is impossible to solve logical technological problems, offer solutions to the problem of production, understand the properties of materials and the operation of individual mechanisms and household appliances. The Olympiad on technology is the only Olympiad in which, on the stage of a theoretical part, students must take a pencil and show the ability to practically complete a sketch or a scheme of certain technological constructive elements.

The All-Russian Olympiad on technology, as well as all the All-Russian Olympiads among school students, is conducted in 4 stages: school, municipal, regional and final, and they all are dated from November to April in each academic year. Hundreds of thousands of students are involved in all stages of the Olympiad. Students who have scored the most take part in each next stage.

The All-Russian Olympiad on technology has 3 competitive tests: a) a theoretical part (in the theoretical part 25% of tasks are offered with an increased complexity; 25% of tasks for interdisciplinary communications; 30% of calculated and logical tasks; 17-20% of simplified questions). b) the participants may have a practical task at their own choice: tasks on the technology of processing garments and on modelling garments; tasks on processing garments and decorating them on a CNC sewing machine and modelling them; tasks on mechanical, or manual metal processing; on mechanical, or manual wood processing; tasks on processing constructional material on a lathe or milling modern CNC machine, or tasks on laser engraving, on robotics, on 3D modelling (when performing practical work, the student must not only demonstrate practical skills, the contestant must choose the material processing technology, make a sketch, block -scheme or modelling according to the task, modify the proposed design with new elements and only after that perform the product with its subsequent decoration); c) to present and protect their project works in one of the seven directions of the project activities.(Fif.2 A Multy…)

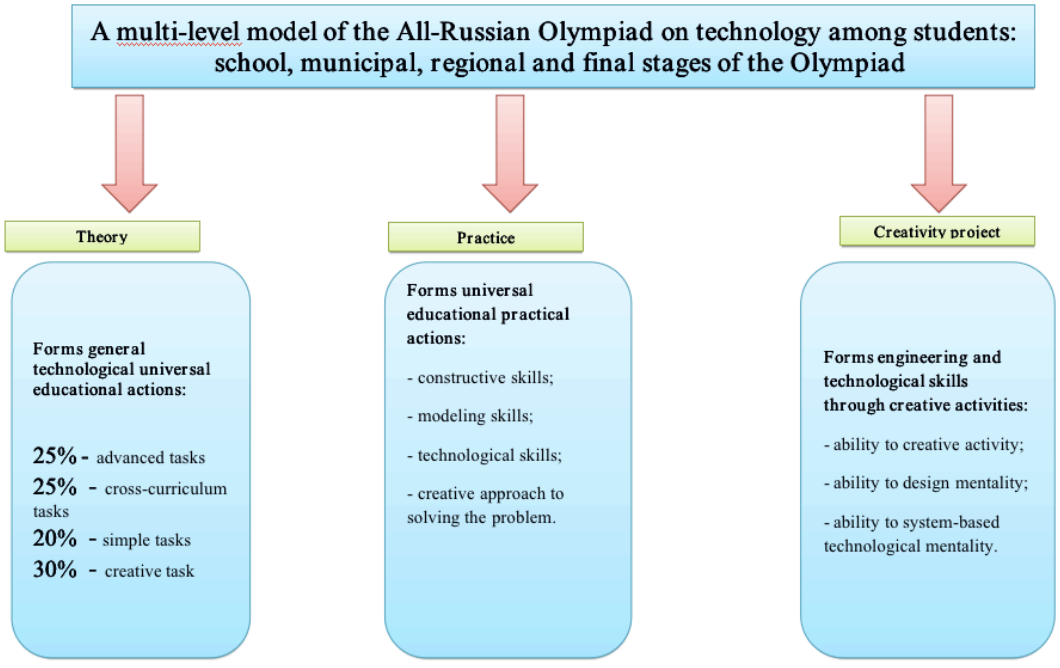


Fig.2

The last question in the theoretical part for students is the completion a creative task that includes elements which are used in the project activity by students, but they cannot be seen by experts both in the theoretical part and in practice: the technological sequence of the manufacturing process of a specific model, the implementation of a specific element using the scheme; identification of missing elements, or model details; the implementation of the sketch, or layout in the proposed material and many other options. A creative task is a complex task which is designed to include both creative and system-based thinking in a contest.

The All-Russian Olympiad on technology among school students is the only Olympiad in the Russian Federation in which high school students have the right to present their projects, on which they have worked for at least 6 months, and sometimes up to 1 -2 years.

A creative project for the discipline «Technology», aimed at developing the author's innovative product, a collection of product models and individual designs. The structure of the project is determined by the following components:

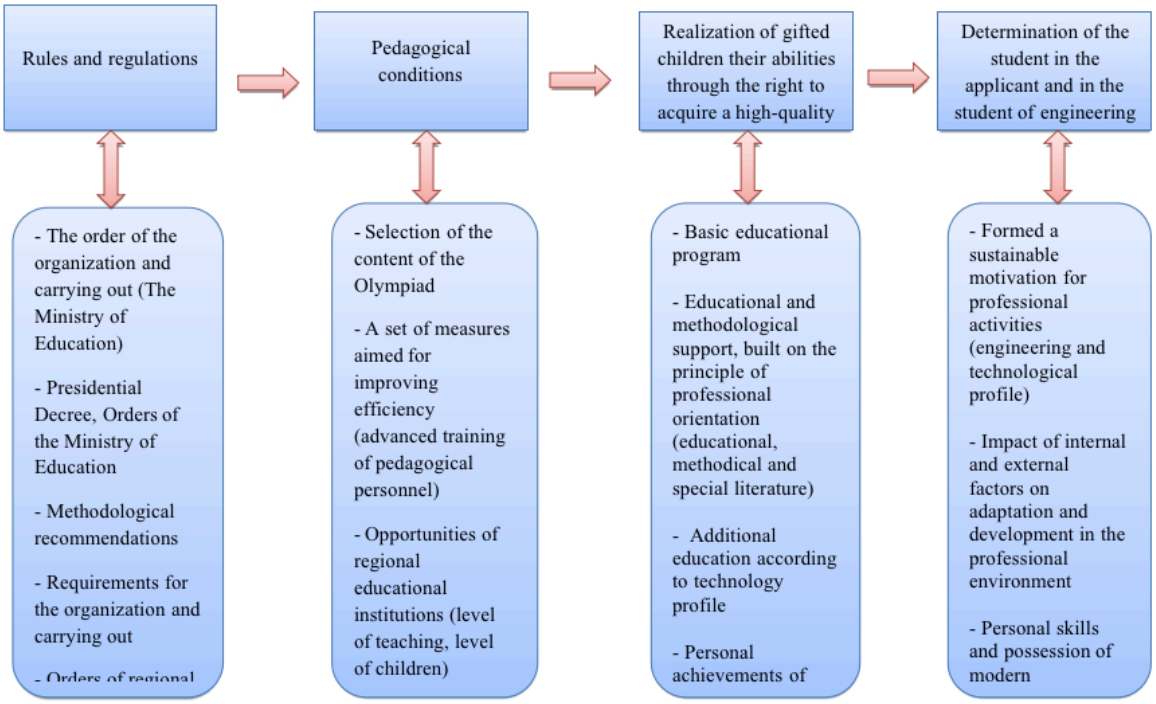
1) The preparation of accompanying documentation in the form of an explanatory note to the project.
2) The product of labour - an object, a product or a set of things, an art object, a collection of models which are made in the material.
3) The procedure of defending the project (a speech of the author, a multimedia presentation of the project).

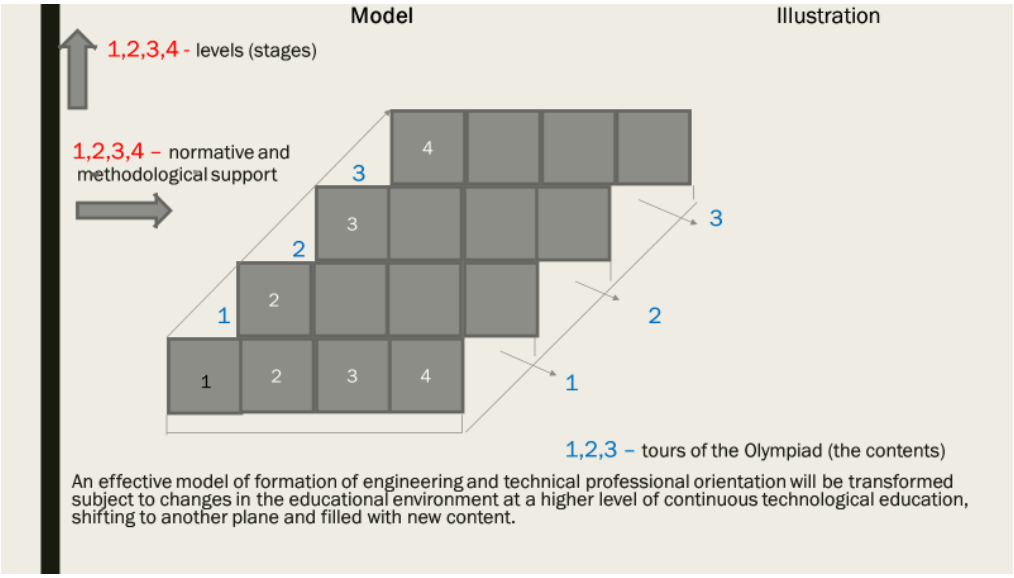
A project is a type of practical activity and when it is carried out it is always aimed at the formation of school students' metadisciplinary results. School students learn to set goals, tasks, plan the activity, which requires not only studying literature, but also interacting with specific people - professionals, with same-aged peers, communicating with whom, even at the consultation and cooperation stage, the responsibility for performing a certain part of the work is developed. Analysing the results at each stage of the project implementation, school students are involved in the process of developing communicative skills. The creation of the idea, its realization through the knowledge of the unknown from particulars to particulars, through generalizations to generals, through analysis and conclusions to the birth of a new, author's product.

In a basic secondary school, the formation of competencies is not required from graduates, but students who study the subject «Technology» and, especially, when they prepare themselves for the Olympiad, the pre-professional competencies which are called universal learning activities that students demonstrate on the basis of acquired practical experience as a solution to mini-professional tasks at each stage of the Olympiad on technology begin to form.

XXI century was marked by a rapid development of information technology. Informatization and digitalization, being a tool of education, try to oust the "principle of professional orientation" from basic general education. The content of the subject “Technology” in the secondary school curriculum contributes to the same principle. Since the beginning of the century, the subject “Technology” has undergone significant changes and it is studied in the secondary school only up to the 7th grade (2 hours per week) and in the 8th grade - 1 hour per week. All the material which is concerned with new technologies, new equipment which is related to modern mass production has already been submitted to the system of additional education. This allows only a fragmentary mastery of various professions associated with the latest equipment and technology. It should be understood that such an approach will not allow graduates to be massively prepared for a practical acquaintance with a modern production, and, therefore, will not allow them to be cost-effective on the early stages of professional activity for the technological education system and for the country as a whole. The Olympiad on technology includes 12 technological operations which a competitor can implement in practice. As it has already been mentioned, along with the traditional ones: processing of construction materials (metal, wood) by hand and machine-tooled approach, processing of textiles, the Olympiad includes tasks on robotechnics, 3D modelling, 3-D prototyping, processing on laser engraving, CNC machines

(milling , turning), textile processing on a sewing embroidery machine with CNC. Analysis of the Olympiad`s regional results and the results of the final stage of 2018 showing that due to the non-mass development of new equipment through the system of additional education (CYIC, technology parks and others), the number of participants who are able to demonstrate the ability to use new technologies is extremely small. Despite this fact, the Olympiad on technology among school students is a very effective model, since it can help school students become competent applicants, and later - students. This leads to the conclusion: professional orientation should continue to perform methodological and regulatory functions. The methodological function of professional orientation should continue to provide pedagogical impact on secondary school students by means of educating and improving their pedagogical skills in order to prepare technologically competent graduates who are familiar with the basics of individual professions, including new professions, taking into account modern software which is used in industry. These professions and universal skills must be defined. As regulative mechanisms, the structure, content, methods, means of education should be changed only with the aim of forming the professional orientation of the child's personality with full practical specificity regarding a number of professions, observing the innovative material with the traditional material in the system of modern continuous technological education.
(Fig.3)





Literature.

1. Batyshev S.Y. Encyclopedia of professional education / Batyshev S.Y., Zmoskovnaya N.V., Klimov E.A. et al. / [Text]: - M-Russian Academy of Education 1999-p.314-316

2. Fayzrakhmanova A.L. The use of foreign experience in career guidance // Young Scientist. - 2013. - №8. - p. 442-444.

3. Khotuntsev Y.L., Tatko G.N. Principles of the content`s selection of the All-Russian student Olympiad on technology. / Science and School, 2016, № 4, p. 65-73.

4. Khotuntsev Y.L. Problems of technological education in the Russian Federation: -M.: Prometheus, 2018, p. - 182.