HIGHER SCHOOL SCIENCE IN THE SYSTEM OF EDUCATION

Eliseev Boris

The Moscow State Technical University of Civil Aviation
20 Kronshtadtsky blvd, Moscow, A-493, GSP-3, 125993, Russia
Ph.: +7-(495) 459-07-07

If one judges by numerous publications and discussions in different mass media dealing with problems of higher professional education one can notice that the centre of discussing its problems practically completely moved to the sphere of problems which are in this or that way connected with the notorious Russian State Examination. At the same time these discussions do not cover such crucial issues as determining the strategy of the State in the sphere of education, the issues of its quality, the correlation between fundamental and applied knowledge and hence the contents of education, the contents of educational literature, provision of higher education institutions with training and scientific equipment, the place and role of higher school science in acquiring, forming and popularising scientific knowledge, and so on and so forth. It is quite natural that an approach to the problem of education with the intention to take into consideration all the factors influencing it is a rather complicated task, which is unlikely to have an exact solution. Nevertheless, if one follows some general principles of development and evolution of complex systems and a system of education belongs to such systems, it will be possible to evaluate the present situation and try to work out some general recommendations and requirements to its development.

The so-called "formula of progress", which is the system of 5 inequations in differential form introduced by Professor S.A. Panarin [1] and which covers practically all the aspects of social life of any society can be used as such general approach. The formulated inequations can serve as a criterion of progress in assessing a society, and its system of education in particular [2]. Not to overload the present paper with mathematical presentation of mentioned inequations, we'll formulate them in the language understandable to any reader. It should be stressed that each of the inequations is a necessary but not sufficient condition for the development and progress of a society including its system of education.

The first inequation requires that the rate of growth of fundamental knowledge leaves behind the one of applied knowledge. When applied to education, this statement is its underlying characteristic.

The second inequation also refers to the scientific sphere, it requires a higher rate of growth of inter "trade"-oriented knowledge as compared to "trade"-oriented one.

At first glance the third and fourth inequations look somewhat unusual. The third one requires that the increment of time spent on training surpass the increment of time spent on work. In the final analysis it means that even the duration of work time is a constant quantity (the increment of time is zero), education must always be included. Otherwise stated, it implies the requirement to have a system of continuous education.

The fourth inequation requires that the increase in free time leaves behind the increase in work time [2].

And finally, the fifth inequation requires a constant increase in the number of young people in the population. As we see, all 5 inequations can be related to the problems of education, but only two of them are connected with these problems directly. Below, on the basis of the two inequations, the author's view of some problems in training specialists is given. All the contemporary history of science and technology, more than convincingly, confirms the first of the inequations given above, as the development of applied sciences, and hence success in technology and production are impossible without achievements in the field of fundamental sciences.

How can the time resource be distributed between fundamental and applied sciences in the system of education? Naturally there is no universal answer to this question due to the fact that there are no universally accepted and scientifically grounded criteria based on a great number of various factors. In the framework of modern education this problem is being solved by organizing methods. Students get fundamental training in the Institutes of classical type (Moscow State University named after Lomonosov, Leningrad State University, etc.) as well as in the Scientific Research Institutes (Moscow Physics &Technology Institute, Moscow Institute of Physics, etc.) Fundamental education is considered a priority there. Applied type of education is provided to students of "trade"-oriented Institutes (Moscow Aviation Institute, Moscow State Technical University of Civil Aviation, Moscow Power Institute, Moscow State Technical University named after Bauman, etc.)

In work [2] attention is drawn to the fact that the principles of creating a "trade"-oriented institute and those of an institute of fundamental type are different. Institutes of the first type provide knowledge of applied sciences where the main task is to meet the demands of the market as fast as possible. Education in

the field of applied sciences is based on the principle of quick coverage of expenses and is mainly aimed at training, i.e. forming certain knowledge, habit and skills.

Another type of educational institution is the Institution, where students acquire fundamental knowledge of various specialities. They are taught to study, to set a task and solve it by themselves. Hence, maximum attention must be paid to the development of students' creative capabilities, to stimulating them to generate knowledge.

Nowadays the viewpoint of "self-repayment" of higher education is more and more being advocated. It goes without saying that such approach is justified by momentary needs of the society. However, in this case the education system is losing maybe the most important thing, namely, its fundamentalization the outcome of which is implemented in future and rather far future. Nevertheless, it is the development of fundamental sciences, which determines the future of the State and thereby determines the necessity of the education system itself. And it means that organization, development and provision of fundamental research is a function and task of the State, which is obliged to create conditions for carrying out such research and provide financing the research from the State budget.

Some words should be said about the so-called "trade"-oriented Universities such as transport, medical, agricultural, juridical and others.

The peculiarity of such Universities is that the specific character of the industry itself sets such applied tasks, which require for their solution the knowledge of laws and regularities resulted from the specific character of the industry itself, which are also revealed and studied within the framework of the industry. As a result independent scientific fields and corresponding subjects only for the industry have been formed and are developing. In Civil Aviation Universities such subjects as "Air Transport Maintenance", "Technical Diagnostics", "Air Traffic Control", "Flight Safety" and others can serve as an example.

In order to create and study, and develop given subjects serious theoretical and experimental research in the field of fundamental sciences considering the specific character of the civil aviation is required. It is problematic that corresponding training could be received from outside. It means that the State in the name of the founder of the "trade"-oriented University is obliged to allocate special funds for carrying out fundamental research at such Universities, which could result in acquiring new knowledge, and not only solving momentary practical tasks. Besides, attention should be paid to the fact that underestimation of fundamental training of "trade"-oriented high schools students will not give them opportunity to adequately master the applied aspect of their education.

Proclaiming the priority of fundamental research does not mean at all under-rating applied research, which is a training ground for testing fundamental knowledge. A sensible combination of the two research directions is one of the most major tasks of higher school policy both on the part of the State and on the part of a higher school itself. When speaking of the university science one should not approach this aspect conceptually. Higher school science means, above all, scientific schools, which give rise to new knowledge and function as keepers of information knowledge. The author of work [2] notes that it takes about 100 years to set up a fundamental scientific school (three generations of scientists working actively in the field for about thirty years). It also takes 10 years to found a scientific school in the sphere of applied research. Certainly, one cannot accept a numeral estimation of the situation, but the essence of the statement is true. It is impossible to establish a school instantly only through financing. This process requires a good deal of time; but without financing, setting up an efficient scientific school is rather problematic.

It has already been stressed that special fundamental proficiency concerning "trade"-related problems arises inside the system of education. However, such approach, when it is acknowledged as absolute, is found to incur certain scientific secrecy because it is impossible to isolate science from the common torrent of knowledge. This fact, evident enough, is reflected in the second inequation mentioned above. When applied to higher school science it means the necessity of broad cooperation with research organizations and higher schools of the broadest specialization. When applied to higher schools of civil aviation, one should bear in mind a broad scientific cooperation with scientific-research institutes, design offices and other organizations engaged in the development and manufacturing of aviation equipment.

In conclusion it should be pointed out that a qualitatively different approach to higher school science is required and one should make a mental note that higher education institutions employ more than a half of doctors and candidates of sciences of the country.

References

1. Panarin, S. A. *Christian Fundamentalism against Market Terrorism.*
2. Solodova, E. A. Methodology of Investigating Complex Systems, *Dynamics of Complex Systems,* Vol. 2, No 1, 2008.
3. Eliseev, B. P. Optimization of Management Decisions in a Higher School Operating as a Commercial Organization, *Nauchny Vestnik of MGTU GA*, No 155, 2010.