OPEN PROBLEMS FACED BY THE ACTIVE SCIENTISTS IN BULGARIA

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"EUROPE NEEDS INDEPENDENT ARENAS FOR AN OPEN DIALOGUE ON THE ROLE OF ALL SCIENCES, INCLUDING HUMANITIES IN SOCIETY "

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Abstract

The aim of the present work is to analyse the main actual problems, faced by the active scientists in Bulgaria. This has been done by a short review about UNESCO-ROSTE activities for reconstruction of the systems of high education and S&T in South East European Countries, including Bulgaria. After the selection of suitable statistical data and short description of the vision and strategy on the problem discussed, the most important problems are an object of discussion, as follows: problems related to the students and the teaching community, problems confronting teaching materials and methodologies, problems related to training facilities and research infrastructure, problems related to financial and human resources, as well as structure- organizational and normative regulation problems. In conclusion it has been established that Bulgaria sharply needs a national initiative for scientific and cultural progress of the nation; an initiative to shape education, research, policy and practice of the national priorities in accordance with the priorities of one United Europe.

Key words: problems, science, research, education, training, Bulgaria, South East European Countries

1. Introduction

It is well known that the progress of a society is a function of execution of the national priorities. The perspectives of the development are short (5 years), middle (15 years) and long (30 years). If we treat the transition in Bulgaria from planned to market economy as a national priority, logical it is to accept that at the present moment our society is somewhere in the middle. It is not possible to analyse all the processes during the transition period after 1989. We would like to mark that new perspectives for the South East European Countries (SEEC) in the field of science and education into the European Research Area (ERA) really exist. In this context namely they can be treated as a major instrument for the development of a society in progress; a society of United Europe (UE).

It is necessary to underline, that the International Conference of experts on "Reconstruction of the scientific cooperation in South East Europe (SEE)", organized in Venice, Italy from 24 to 27 March 2001 by the UNESCO- Regional Office for Science and Technology in Europe (UNESCO-ROSTE), the Academia Europea (EA) and the European Scientific Foundation (ESF) [1] initiated a high level of impact for the establishment of new links and effective forms for cooperation in the relevant scientific fields, from one side between SEE countries and from the other side between them and European Union. The following actions are considered as urgent issues:

- To identify research priorities of national and regional interest;
- To undertake a systematic effort to reduce the "brain drain", so as to avoid shortages of competence and skills;
- To improve communication and data handling infrastructure;
- To improve joint work in multidisciplinary problem- orientated projects;
- To encourage the co- finding of projects and programs at the regional level;
- To raise the awareness of the politicians and the decision makers of the importance of science for the general evolution of the economy and society [2].

Undoubtedly, we can accept the UNESCO –ROSTE activities as useful ones increasing attention on science – society relation in SEEC, having in mind, that the science has strong and unique capacity to mobilize the intellectual potential of the nations.

Before discussion carried out about state-of-the-art of the problems, faced by the active scientists in Bulgaria, a selection of publications can be underlined in both Training & Education and Science & Technology fields in SEEC. In this context, actual data are presented in the publications for higher education of UNESCO- CEPES [3,4]. There is a special attention on European background and discussion on the influence of the financial crisis on the quality of the European high education. To be effective funding sources, funding mechanisms and funding managements are the target discussion problems in ref. [3]. Taylor and Miroiu [4] focus attention on policy-making, strategic planning and management of the high education. There is a special analysis about reconstructing the systems of higher education in SEEC, including Bulgaria. According to them and after Scott [5] the main characteristics of the process, carried out in our countries could be described, as follows: (i) the reconstruction consists of changes on a scale and at speed never attempted in other parts of Europe; new policies are being developed and implemented in a very short period; (ii) in some places, reconstruction has to be total: the legal framework in which universities operate, as well as their mission and articulation within wider systems, has to be reconsidered; (iii) the diversity across the region is immense and therefore no standard solutions can be applied; (iv) to staff is a major issue; the level and appropriateness of skills and qualifications and the mechanisms for

renewing the staffing base are central concerns for most of the universities and higher education systems; (v) the chronic under- financing of higher education and science is of utmost importance; universities have passed through the transition period with fierce financial constraints; (vi) the academic and the administrative management of the universities are not separated; most of the universities managers are elected and usually huge collective bodies as Academic Councils and etc. are involved in taking decisions. Thus the situation contributes to a largely unclear distinction between executive decisions and policy- making; (viii) the higher education systems now face new challenges, including the development of a significant private sector and the increasing role of the research in universities.

Regarding Bulgaria, there are not so much publications registered on the problem discussed. We would like only to mark some selected papers. In a special issue of the Bulgarian Ministry of Education and Science (MES) [6] a good analysis of the scientific potential of the country and discussion on the main strategic directions for industrial development is presented. Damianov [7] discussed on the priority in Bulgaria and underline that significant efforts can outcome after a scientific cooperation between the European research institutions and Bulgarian ones. Yakimov [8], describing the scientific collaborations between Bulgaria with the neighbouring countries, focuses attention on human resources, research infrastructure and research capacity of universities and the Bulgarian Academy of Sciences (BAS). He underlines' that the organization of scientific research in Bulgaria is under constant pressure for restructuring. There is a review paper about the economical factors in Bulgaria with influence on research and education [9]. Actual papers on the problem discussed, available via Internet, are presented by Voutsova and co- authors [10,11] and Hadjitodorov [12], as well.

The aim of the present work is to focus attention on the main actual problems, faced by the active scientists in Bulgaria.

2. Selected Statistical Data

It will be useful, before discussing the actual problems, faced by active the scientists in Bulgaria, to present a selection of statistical data. The statistical data will help us to follow the tendency and undoubtedly will help us for a more capable analysis carried out on the problem discussed. According to Rozenov [9] on the base of the statistical annual books of the National Institute of Statistic for the academic year 1996/1997 the total number of schools are 4 050. A decreasing effect is registered and for the academic 1999/2000 the number is 3790. Parallel the number of the teachers engaged goes down from 119251 (1996/1997) to 113009 (1999/2000). The number of the students (middle and high schools) are 1 427 909 (1996/1997) to 1 357 068 (1999/2000), overall respectively. There are other statistical data, presented in ref. [3]- Annex 1a, regarding the number of the students for the 1970- 1996 period, (including pre-

primary and primary) in comparison with selected number of European countries.

In Bulgaria the high schools and colleges are 42 (1996/1997) and 41 (1999/2000), respectively. The private high school educational units are 5, while 36 are state owned. The university teaching staff is about 23 329 specialists, engaged for the education of 243 595 students, from which 27 919 students (11.5%) are in private and 215 676 (88.5%)- state high schools. Student/ teaching staff ratio is 10.4 according to ref. [3] and the National Institute for Education in Sofia.

As a correlation in Table 1 are presented data regarding number of the students vs.10 000 inhabitants with selected number of European countries (alphabetically listing), generally industrial ones.

Table 1 Number of students per 10 000 inhabitants, according to ref. [9].

Country	**Year**	**Students**	**Students/10000 inh.**
Austria	1995/96	238 981	297
Bulgaria	1996/97	262 757	310
Germany	1995/96	2 144 169	263
France	1995/96	2 091 688	360
UK	1995/96	1 820 849	313

It is well known that the scientific research and development activities are concentrated in the universities, in the respective Academy of Sciences and in the research institutions. In Bulgaria the BAS is a powerful R&D center with high impact for scientific, technological and cultural development of the nation. The BAS covers all the scientific branches and a brief review of the existing field of collaboration can be found via Internet [13], as well. During the last year an annual report has been published [14] including useful statistical data. In short for 2002 the BAS staff in total is 8173, from which 3585 (43.9%) are scientists. The number of the Ph.D. students is 785 and with tendency for increase [14]. This tendency is a good one, not only for the Bulgarian scientific community and the domestic labor market but for the future development of the knowledge based economy on a European dimension level.

Let us follow the distribution of the researchers in Bulgaria versus scientific branches. In Fig. 1 a good view is presented for the Natural and Engineer Sciences, Medicine, Agricultural and Humanitarian Sciences.

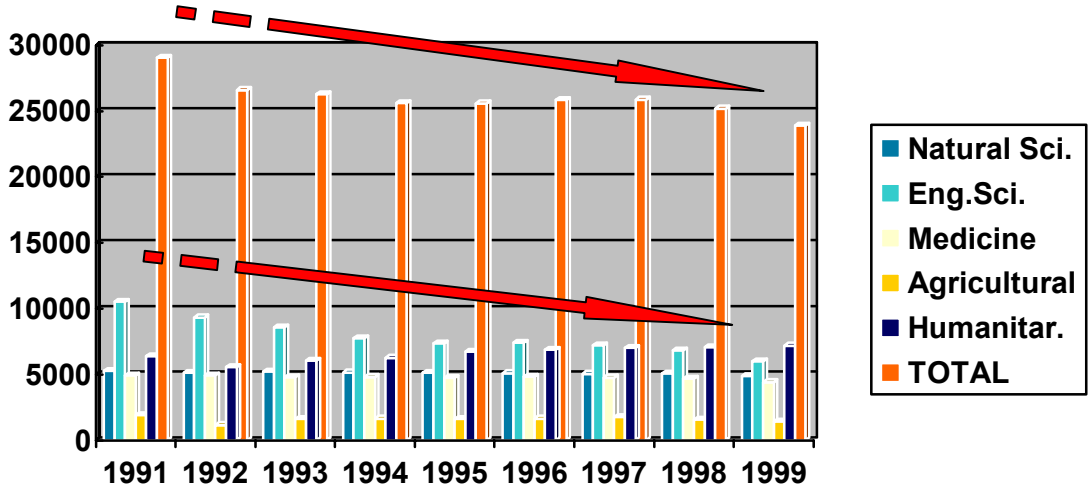

Fig.1. Number of the scientist involved, in the respective branches for1991-1999 period.

Evidently in all of the branches, (except the humanitarian sciences marked in dark blue), the tendency is for a decrease. This tendency is well illustrated by red arrows. This is a logical consequence if we follow the investments for R & D in dependence to the Gross National Product (GNP) for a period from 1996 to 2000. This is well illustrated in Table 2.

Table 2. Overall investments for R& D (in per cent from GNP in Bulgaria) [9]

Year	**1996**	**1997**	**1998**	**1999**	**2000**
Investment in R&D	0.21	0.19	0.17	0.18	0.18

It is clear that the financial crisis affecting on the investment R&D portfolio from the state and the level is extremely low. This is just opposite to the tendency in West European countries. It is necessary to underline that EU is planning next years to increase the level up to 3 % of GNP allocated to science and research, close to Sweden, Japan, USA and Canada.

3. Vision and Strategy

The policy of EU regarding the science and education is well expressed with the vision to develop a knowledge-based economy. This consensus decision begins from 2003 and practically starts after opening of the 6-th FP for R&D [15].

In Bulgaria there is an initiative for European integration of the society and industry. Practically the initiative has been confirmed after the communication of EC for integration of Bulgaria and Romania [16] planning to be accomplished in 2007. The main lines are marked in chapter 15 for the Industrial Policy, chapter 17 for Science and Research and Chapter 18 for

Education and Training. The negotiations are finished and high impact is expected to outcome from the domestic science and education. It is necessary to underline that both the education system and the national scientific benefits have to be changed in Bulgaria. In the field of high education, it means to meet the requirements of the broad- spectrum training. Regarding the scientific institutions in Bulgaria, the requirements are to generate high quality research with innovations for the future Hi-Tech society, on National, European and Global level.

Unfortunately, it is impossible to discuss in details the key factors for the further direction and progress of national science and technology, as well as of the education system. The main concepts are marked in [7] and core lines of the priorities, e.g. for BAS, are presented in [14]. They are namely (i) scientific service of the state and the society (ii) development and integration of the bulgarian scientific and research potential and research infrastructure into ERA and (iii) a progress of the society by approval of the national identity, values and priorities. In a word, they can be treated as national, Bulgarian priorities.

4. Problems Faced

The above discussion carried out and selected statistical data presented briefly show the status level of the today's science, the technology and the educational system in Bulgaria. On this background an attempt will be made to present the actual problems, faced by active scientists in Bulgaria.

4.1 Problems, related to the students and teaching community

Nowadays the secondary school in Bulgaria does not guarantee the corresponding level of the candidates for high education. It is necessary to mention that the negative demographic process will be the most important problem in future. Due to the economical problems and the high level of stagnation the number of candidates decreases and the tendency is well expressed for the natural and engineering sciences. There is insufficient motivation to choose an engineering education in comparison with humanitarian for example. Not any logical connection and high level for direct contact and interest between the industry and students. There is not much opportunity for an effective and better utilization of the students after finishing of study i.e. lack of carrier paths. Since not any well defined strategy for industrial development and priority areas for sustainable development of the state an upset effect exists for the candidates and students during their study period.

The problems for the teaching community can be underlined, as follows: (i) the existing approach for selection of teachers and lecturers is a failure; (ii) the reproduction of the teaching and university staff is destroyed and as a result no good balance exists between the scientists having academic rank and those without academic rank [14]; (iii) lack of motivation for younger staff (generally financial) and elder teaching staff (referring the adaptation to the innovative

initiatives) (iv) in general the university and academic staffs are advanced in years and (v) low piety of the university staff and scientists from the academy to contact for joint research and strengthening the transfer between the academy and the industry.

4.2. Problems, confronting teaching materials and methodologies

Regarding the teaching materials (curricula, syllabuses, textbooks etc.) it can be marked, that they do not correspond enough to the high level of education. As noted in ref. [11], the teaching documentation comes as a result of state institutions and academic staff activities. A possible explanation is that marginal conditions of development exist.

In the today's world, science and technology constitute the most important driving power for a modern society. In this context new lecture courses and books must be adequate to the global science requirements. On the contrary new lecturing courses are not- backed- up by top qualified teachers and modern equipment is not applied. Parallel in the universities lot of profiles and specializations exit (380 specializations for 1996) and no any limitations are introduced for creation of new ones.

For a qualified teaching facilitation skills and instructional supervision are necessary. In Bulgaria there is a lack of regulated supervision over the teaching process and possible control on knowledge assessment. Another problem is that there are no general vision and stimulation initiatives on quick, flexible and an effective process of introduction of knowledge for the coming Hi-Tech industries and technologies. As an example can be marked nano- science and respective technologies, planned to be involved for a future modern society in progress.

4.3. Problems, related to training facilities and research infrastructure

Let's focus first our attention on the domestic potential of the information facilities. It is well known, that the libraries are of fundamental significance. For example, approximately thousand of scientific journals are received each month in the library of Barcelona University, Spain. Due to the economical problems in Bulgaria the libraries are not actual. In practice there is no budget for books, scientific data- bases and other information products. This situation reflects on a normal work, damages the teacher's qualifications and qualities and had a very low impact on the capability of the students, teachers and researchers for self-improvements. There are on a relatively good level information facilities trough the Central Institute of Scientific and Technical Information (CISTI) and related libraries for patents and standardization.

Training facilities are very important for the modern teaching and research work. Due to the limited financing, not well-equipped lecture halls, very old laboratory equipment and insufficient level of personal computers for

data processing exist. As an outcome, in fact most of the theoretical training and miss-practical skills are characteristic for teaching and research. Only the laboratories after TEMPUS grants and EC joint projects with research units in Europe are relatively well equipped. Regarding the computer centers in Bulgaria some of them are well equipped, but there is a full lack of up-to-date data base products and adequate information services. The personal computers are not so limited in number, but are old and not in position to perform access to professional information corresponding to the European requirements and standards.

A general conclusion can be made that R&D equipment upgrade in the research laboratories and modernization of the research infrastructure is needed; a research infrastructure in position to meet the challenges of a hyper-informatics and knowledge based society.

4.4. Problems, related to resources

Due to the economical problems during the transition period, the financial state for support of R&D and E&T is extremely low. There is a lack of means to assure the normal function of higher education and high quality research. The budget for training and research is drastic reduced. This fact sharply reflects on training facilities, the research infrastructure and to the quality of up-to-date engineers and scientist. There is a low level of investment for R&T from the GNP (see Table 2) and in practice an ineffective distribution of the means [17]. The domestic R&D projects generally from the National Science Fund were under- funded and had very low impact on our economy and society.

Regarding the state of the human resources a real boom of emigration and "brain- drain" exist. The "brain- drain" phenomenon seriously affects all of the research and educational units. There are limited sources for the professional realization, the low level of salaries, parallel by the low live standards and absence of economic stability. There isn't real synchronization between the personal needs, the qualification and the society needs. The scientific consume labour- market is limited and as a result the age of the scientists is higher. Lack of rules exists for regional and international mobility of the researchers.

4.5. Structure and Normative regulation problems

The structure or so-called organization problems have origin generally from the government. Characteristically of the national policy is a permanent re-organization of the whole education system and in fact, the system is out of equilibrium. There is a lack of strictly defined and financial supported goals and priorities for research and education from the state. There are not any strictly defined concepts for national priority, so that to provide a significant impact onto education, research, economy and society, as well.

Another problem is that a lack of adequate legislation fostering environment for private and foreign initiatives and investments in the R&T

sector. For example S. Korea, according to the Ministry of Science and Technology, will invest at about US$154 M in nanotechnology and in 2002 in seeking a revision of related laws to accelerate NT projects. The government stimulates the foreign companies to invest in S. Korea's nanotech industry. The companies do not pay corporate and income taxes for the first 7 years and would receive 50% reduction for the additional three years [18].

There is no new S&T development strategy for revitalization of the S&T domestic sector and appropriate innovative research infrastructure for a sustainable development of the country. From one side the instability of the national economy leads to instability of the scientific labour market. From the other side, there is a lack of appropriate feedback between various industrial sectors and elaboration of "knowledge" products. After the significant political changes and experiments from few of governments there is a lack of vision for adequate funding and modernization of research. In this context there is no harmonization and activities with high impact for an international recognition of the skills and knowledge, acquired in Bulgaria [19].

The normative regulation problems have origin from our parliament. Very old low for "Scientific degree and academic ranks (1972)" exists. The law of "Higher Education(1995)" is under permanent reconstruction. The law foresees some procedures for control of the higher education but there are no institutions and regulations for their execution. The foreign models applied are out of accordance with the historical, social and cultural characteristics of the nation. R& D activities should have a more significant impact if any normative base for creation of Hi-Tech incubators, scientific parks and national research centers. There is no normative base for investment from the private sector side in S&T field. In addition there is a lack of tax and custom relief. Despite the unfavorable circumstances there is a new law, accepted from the parliament for "Stimulation of scientific research (2003)" where the problems for domestic financial support and co- financing of researchers granted joint projects in the 5&6 RTD EC programs are solved.

5. Conclusions

Summarizing in short, to have a high quality of research and adequate to nowadays education in Bulgaria international cooperation, net-work research activities, stabilization of the human resources and the respective financial support, parallel with the improvement of the research infrastructure, adequate normative base as well as new S&T development strategy is needed. Bulgaria sharply needs a national initiative for scientific and cultural progress of the nation; an initiative to shape education, research, policy and practice of the national priorities in accordance to the priorities of one United Europe for a future joint progress.

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