GOVERNMENTAL EDUCATIONAL REQUIREMENTS AND CURRICULA PLANS FOR THE PROFESSIONAL EDUCATION AND TRAINING IN ELECTRONICS AND INFORMATIONAL TECHNOLOGIES

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Keywords: Governmental educational requirements, electronics, profession

The main goal of the present paper is to analyze the status and the problems of the Governmental educational requirements and the curricula plans in the education and the training in electronics and information technologies. The requirements of the Law for professional education in Bulgaria are pointed and the list of the professions and the organizational steps for the creation of the Governmental educational requirements are explained. The necessity of creation, confirmation and authorization of new profession Programmer with second and third stage of professional qualification has been proved. Research among employers has been made for the need of such personnel, which proved the idea for the new profession Programmer with two specialties "Software technologies" and "Embedded system programming". The need and effectiveness of the education of personnel in the profession Programmer in the professional schools has been based with arguments. The curricula plans are developed in accordance to the Governmental educational requirements. The basic idea of the authors of this paper is that they should reflect the dynamically developing trends of the ITC technologies. That is the only way to satisfy the need of work employees in this branch.

During the process of the creation of the curricula plans and course outline for the professional education in computer technologies, computer networks and programming in compliance with the State education regulations the following main goals have been stated:

- to analyze the status and the problems of electronics and information technologies professional education and training state regulations, curricula and syllabi
- to prove the necessity of introducing, accepting and approving the new profession *programmer* at the second and third level of professional qualification

The background for the development of the curricula plans and course outline in the professional education are the state documents that build the standard in the field. They are following:

- the Education act

- the Professional education and training act
- education statutes

Analysing the Professional and education act the most important statements are:

- professional education is carried out in compliance with the List of professions compiled by the National professional education and training agency
- the teaching of each profession is based on State education regulations
- curricula and syllabi are designed in compliance with the State education regulations
- professional education consists of three levels of professional qualifications; on completion of the second level a high school diploma and a professional qualification certificate are awarded
- the programmes of the unified state qualifying examinations on the theory and practice of the respective professions are drawn up in compliance with the State education regulations

The List of professions is the center of the professional education. All professions in the professional schools have to be announced according the List of professions. The employers are working with the same List. The educational process has to be realized according the requirements of the definite profession. The list of the professions had been created without coordination to the opinion and the standpoint of the leading companies and with insufficient appreciation of the ITC branch status in Bulgaria. The list of the professions contains in its base terms for profession and specialty that are hardly applicable to this branch. According to the Professional education and training act this education is to be realized in three stages in the secondary schools. . After finishing the second stage the students receive diploma for the secondary school graduation and certificate for second stage of professional qualification. The organization and activities for the stages of the Governmental educational requirements creation are presented. The development of the List of professions in our country is as follows:

- the first version of the List was accepted in May 2001 by the Board of the National professional education and training agency and approved in 2002 by the Minister of Education and Sciences
- the List was complemented but many proposals were not accepted through lack of synchronizing the work of the institutions, organizations and companies concerned with the National professional education and training agency

Each profession on the List of professions needs State education regulations for the fulfillment of the educational process in every school for that profession. The stages of creation of the State education regulations are:

- the National professional education and training agency forms a group of experts who are to make the State education regulations of each profession;

- the working group makes proposals for State education regulations which are considered by three independent reviewers;
- the proposals and the reviews are discussed by a commission of experts from the National professional education and training agency;
- the commission of experts makes recommendations and introduces the State education regulations before the National professional education and training agency for acceptance;
- the State education regulations accepted by the Board of the National professional education and training agency are discussed by experts from the Ministry of Education and Sciences and are approved by the Minister of Education and Sciences.

The profession ***Computer systems technician,*** specialty ***Programming,*** is on the list of professions approved in 2003 and is taught only at the third level of professional qualification (13 class).

The authors of the present article have made:

- a proposal in front of the working group for creating state education regulations for the profession *computer systems technician*, and a new profession *programmer* to be discussed and introduced to the National professional education and training agency and be listed, respectively the specialty *programming* at the second level of professional qualification and *systems programming* at the third level of professional qualification;
- well-found argumentation for the profession *programmer* before the commission of the National professional education and training agency.

This questionnaire (Table 1) aims at specifying the knowledge and skills essential for the young people practicing the profession ***programmer*** so that they should be competitive on the labour market.

No	**When finishing school, a *programmer* should have the knowledge and skills to:**	**Yes**	**No**
1.	Know the computer system fundamental structure and operation both as a separate configuration and work station / server in a network	X	
2.	Install, set up, and use all types of peripherals with suitable software drivers, printers, plotters, scanners etc.	X	
3.	Use the basic means of control, administration and diagnostics of the computer system and peripherals.	X	
4.	Foresee the operation of the computer system and peripherals. Identify and react adequately to the messages of computer system and peripherals.	X	

5.	Understand the computer system documentation, catalogues, reference books, company information and standardizing documents.		X
6.	Know the basic computer viruses, ways of virus infection, antivirus techniques, ways of protecting and tools of removing them.	X	
7.	Know and use the potentialities of the best known operating systems (MS DOS, MS Windows, Linux etc): file organization, use and functions.	X	
8.	Install, set up and administer various GUI and network operating systems.		X
9.	Install, set up and administer the adequate system software and applications **as** required by the customer.	X	
10.	Use word processing systems, e-tables, data archiving and presentation programs.	X	
11.	Use the basics of publishing systems, graphic editors, image processing applications, scanning program systems and processing of scanned documents.		X
12.	Master the basics of computer technology mathematics. Know the principles of coding, the various numerical systems and the informatics standard codes. Use the basic logic operations and functions.	X	
13.	Work out mathematical models in the process of creating algorithms. Use the basic types of algorithms, data structures and their implementation in programming.	X	
14.	Define various types of data, input, output, implementation of various algorithm constructions in various programming languages.	X	
15.	Create program products after a model project using procedural and object oriented programming languages.	X	
16.	Know the technology of creating and methods of testing a program product.	X	
17.	Record the work done and draw up user's program manual.	X	
18.	Administrating, supporting and making back up copies of databases. Support archive copies, find out errors in usage.		X
19.	Design and implement the structure of a database after a model project. Create a non-complicated database applications.	X	
20.	Know and use the basic Internet services (telnet, ftp, www, e-mail, chat etc.).	X	
21.	Know and use the basic tools of navigation, search, browsing, access, and downloading information from the Internet (browsers, search machines, Acrobat Reader, download tools etc.)	X	
22.	Know the contemporary WEB programming and WEB design Internet technologies and platforms.	X	
23.	Choose and justify the correctness of the approaches and the tools of the implementation of the WEB applications.	X	

24.	Create WEB systems after an assigned project using contemporary tools of WEB design and programming.	X	
25.	Know the architecture, resources and features of various family microprocessors and microcontrollers, as well as their programming models.	X	
26.	Design the architecture and microcontroller system basic components.	X	
27.	Know and apply the basic principles for creating firmware.	X	
28.	Create firmware using low and high level programming languages.	X	
29.	Use various development software platforms and hardware means for creating system software.	X	
30.	Use tools of animating and testing firmware.	X	

Table 1. Questionnaire specifying the knowledge and skills for the profession *programmer*

Analyzing the inquiries the shown in fig. 1 results have been stated. The results prove first that the proposed profession is a real necessity and second that the required knowledge and skills are approved by the employers. In that way the incorrect opinion that such education can be realized only in the mathematical secondary schools has been overcome.

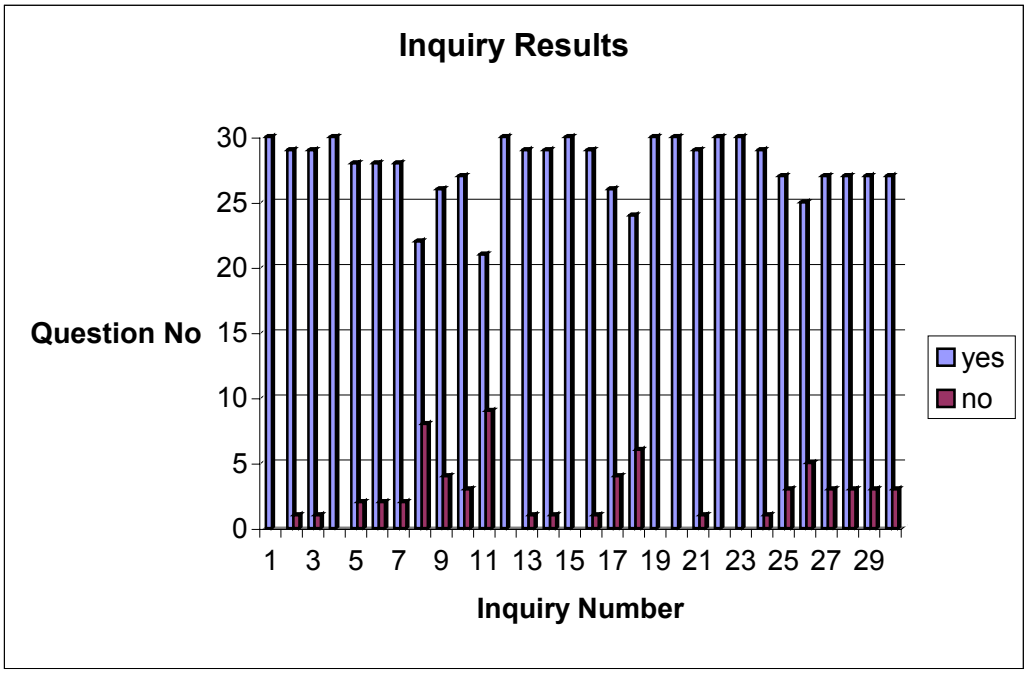

Figure 1. Results of 29 thorough enquiries conducted of employers

The arguments for the announcement of the profession *programmer* in the List of professions are as follows:

- 29 thorough enquiries were conducted of employers in the realm of computer systems, information and Internet technologies and the research indicated that the existence of a separate profession *programmer* is necessary because of the great demand of qualified specialists in the field of ICT;
- employers in the realm of computer systems, information and Internet technologies support the idea of a separate profession programmer;
- employers from all walks of life have special interest in the profession programmer;
- the content of Computer Science and ICT curriculum and syllabus is very serious and allows extension of the professional education and training and a better professional qualification of specialists in the specialty programming at the second level of professional education and systems programming at the third qualification level of professional education;
- the global tendencies, the state policy and the demand of specialists in the field of ICT require a more intensive education and training of high school specialists in programming;
- the practice of the professional education in the field of ICT in Bulgaria shows that such a qualification can be achieved at professional high schools, respectively at the second and third level of the professional education according to the Professional education and training act;
- the global education practice shows that the best time for educating and training a programmer is between the ages of 14 and 18, i.e. at the first and the second qualification level according to the Professional education and training act.

CONCLUSION

While working on the State education regulations for the profession *programmer* the authors of the present article stated that this education should be in the field of engineering and not in the field of mathematics.

REFERANCES

[1] *Education act,* State newspaper No 68 30.07.1999, last changed in No 29 31.03.2003

[2] *Professional education and training act*, State newspaper No 86 18.10.1991, last changed in No 40 14.05.2004

[3] *List of professions*, National professional education and training agency, 2004