TECHNICS AND INFORMATICS IN EDUCATION
6th International Conference, Faculty of Technical Sciences, Čačak, Serbia, 28–29th May 2016
TEHNIKA I INFORMATIKA U OBRAZOVANJU
6. međunarodna konferencija, Fakultet tehničkih nauka, Čačak, Srbija, 28–29. maj 2016.

UDK: 37.018.7:[62+004 Professional review paper

Technical and IT education challenges, fears and hopes

Zoran D. Lapčević[1]
[1]OŠ „Dositej Obradović“, Belgrade, Serbia
e-mail lapcevic@vektor.net

***Abstract**: Technical and IT education is a subject with different names so far, but with a long tradition. This is the only subject of theoretical and practical character where students acquire functional knowledge at the class applied in practice through practical work, knowledge which is applicable at different levels outside the school in real life. The century in which we live is the century of inexhaustible and spiraling development of techniques and new technologies, which is the basis of development in all fields, and the society as a whole. Without knowing the techniques and technologythere is no development of ICT and their efficient use. IT facilities in the TIE in the function of computer applications in technique. Possible separation of informatic techniques by subtracting one class of TIE and the impossibility of practical application of acquired knowledge to students wouid deny the application of ICT in education, skills development and mobility (sensorimotorics, psychomotor, fine motor skills), the development of technical creativity, creativity, the subject would lose its multidisciplinary nature .*

***Keywords:** techniques; functional knowledge; informatics*

1. INTRODUCTION

Technique is responsible for the development of any society,and dealing with technique is everyday need of people, who are surrounded by various technical means. Modern technologies, production automation, information technology, robotics, use of new energy sources, the development of telecommunications, fundamentally change the structure of society and our way of life. The intensive development of science, technology and production targets in the world brings a need for even greater implementation of content and technology in our educational system from the earliest days of schooling.

Technical literacy has always been, especially in today's modern technical and technological time, one of the most successful segments of the educational process of youth education, development and promotion of each individual and the prosperity of modern society in general. Therefore, the technique within the subject technical and IT education (TIE) should be viewed as a science rather than a skill.

A variety of programs within the framework of technical and IT education, from the fifth to the eighth grade, introduce students to the world of technigue and modern technology in an interesting and attractive way, encouraging their interest for technical creativity.

Program at technical and IT education relies on previous experiences in the classroom and in the current reality, and aims addition to the modernization and rationalization of object classes and relieving students, so the program is of evolutionary nature.

The lessons are taught through lectures (theory) and practice (practical training) primarily using methods of visual and practical presentation with the algorithmic approach to teaching, using modern teaching aids. Practical work allows students to express their own creative abilities, seek and find their own technical solutions and prove it in practical work. This approach allows the individualization of teaching, according to the talents, abilities, motives and interests of students. Selection of exercises in program content according to each student achieves personal commitment. The realization of exercises can include more students if the project is more complicated, or if it is justified, rational in relation to the objective, tasks and, if the application of this form of work has social, psychological, pedagogical and didactic justification [6].

Connecting theory and practice is achieved through the unity of theoretical content and exercises in implementation which should be intertwined and complementary. Program content provides a functional correlation with similar content in the teaching of physics, mathematics, biology, chemistry and others.

1.1. GOOD BASIS FOR DUAL TRAINING

It's largely spoken about of the introduction of dual education in Serbia. It can not be realized only by the reform of secondary education. Students in elementary school must be prepared for this kind of education, and it's the most natural thing within the context of the subject technical and IT education, because its programs already represent a good basis for the dual education.

This is demonstrated by the practice in the countries vhat we want to look up, and whose experience we want to implement. For example, in Austria, the students after the fourth grade, based on the observations and recommendations of teachers, opt for one of the forms of continuing education, with the aim of gradual introduction of the dual model of vocational education [1].

In the process of preparing students for a dual system of education the role of technical and IT education is particularly important in terms of professional orientation of students. Through practical work in this subject teachers, identify vulnerabilities and capabilities among students during their education expressed by a particular branch of technique which is taught in this course and guide them in that direction to get to know, i and easily choose their future profession.

The fact that about 75% of those who enter secondary school, enroll in our professional schools, gives more importance to the study of such subjects in elementary school [2].

The dual model of vocational education means that students enrolling at vocational schools provide a position for themselves in the companies that, along with the school for a particular profession and give them, trained knowledge and skills needed for practical work. In this way, after graduation they are fully trained to operate. An important fact is that a large number of young people leaving school establish permanent employment at the

company where they gained practice in education in Germany more than 80% of pupils from the three-year dual education find a job at the employer where they had practice [3].

All in all, technical and IT education represent a very important segment of the cycle of dual education announced in our country.

1.2. MODERN CLASSROOM OF FOR MODERN EDUCATIONAL

In order to enable students to express their creative abilities and creativity through practical work, and to enable them to prepare for further aspect of dual education in secondary school, they must be provided with favorable conditions for work, which means that they have a modern classroom for technical and IT education. This century is the century of inexhaustible and spiraling development techniques and new technologies, especially information and communication technologies. This is the reason for modern teaching TIE in functional classrooms using modern teaching equipment.

Unfortunately, many TIE classrooms are now just typical classroom with desks, chairs and a blackboard.

The reasons for this situation are, above all, lack of space and material resources for the provision of equipment, as well as the lack of interest of teachers and school principals to change this.

The Ministry of Education should as soon as possible, bring the long awaited new standard of equipment at school laboratories which must be accompanied by the adequate financial support, otherwise modern teaching and dual education won't happen.

1.3. ENCOURAGE THE CONSTRUCTION OF FUNCTIONAL SKILLS

Today it is considered that the main outcome of education should be the acquisition of functional, applicable knowledge.

Functional skills must be developed from early childhood. In the context of education, functional skills are developed by guiding learning process forwards students and his activities, as well as putting emphasis on their educational achievements including the development of linguistic, mathematical, technical, IT, scientific, artistic literacy, necessary for life and work in modern society [2].

Being functionally literate means to interpret context in which some information is given, understanding and bringing things into a particular connection and using aguired knowledge in different situations.

Reproductive knowledge of our students is high, but functional is very low, and functional knowledge of the applicability and productivity depends on the individual. Reproductive knowledge involves constant repetition of lessons, and what is learned in such way, without practical application, is forgotten after some time.

When assessing student achievement in the framework of international programs, such as the PISA (Programme for International Assessment), students are not required to reproduce the contents of the various curricula, but to apply them in relevant situations outside school.

The mere fact that in recent years we share the last places in the PISA program, and that last year we did not even appear on such a prestigious assess of student achievement, emphasizes even more the importance of acquisition of functional knowledge of TIO [4].

The program of technical and IT education encourages functional knowledge with the student and provides the ability to verify the practical application of knowledge, whereby

they have greater durability and are a better basis for further learning. In addition, the acquired knowledge and skills from this course students can apply outside of school, solving problems in real life, in satisfying their own desires and goals, encouraging their motivation and activity.

1.4. TECHNOLOGY AND INFORMATICS

We live at the age of automation and robotics, the time in which an increasing number of technical devices contain in its name the attribute "smart / i". The level of overall development has already reached the point where the technology / technologies and infarciono and communication technologies (ICT's) have become inextricably interdependent. There is no technical device in which is not installed, an information technology. Therefore, IT facilities are in the program of technical and computer education. Without knowing the techniques and technology there is no development of ICT and their efficient use.

Therefore it is hard folunderstand the effort of informatics teachers which recently culminated with reference initiative to the Ministry of Education, the National Education Council to separate techiguefrom the informatics technology. Particularly disturbing is the way how to do that without acquiring an opinion frau vocational colleges, the Society of teachers of technical culture, teachers TIO and informatics, and professional public in general.

Separation of informatics from techniques could have unforeseeable consequences on the creation and development of technical and technological competences of young generations. ICT is not just a technique, nor IT education can be a substitute for the technical and technological. On the contrary, they are inseparable and complementary. The only correct approach is inevitable technical education with specific application of information technology in various fields of the techniques that are taught in this course.

Development of the curriculum for technique without computer science technology would mean a return to the first half of the last century. Information Technology in our school program is represented in the first grade, and the technique in the fifth grade of primary school. In teaching technical and information education we have 62 hours of informatics from the fifth to the eighth grade, and information technology with specialized software for using in the context of certain techniques that are taught in this course (construction, mechanical, electrical, electronics, robotics, transport technology, etc.). That should be the real goal for studying and application of information technology in all subjects in primary school. IT facilities in the TIE are in the function of computer applications in technique, and there is no reason that such activities spill over into any other subject, not even in IT.

TIE makes the basis of teaching concept that is built on the achievements of psychological-pedagogical science and technological development, as well as the experience of other countries [3]. Because of this, the primary commitment is to keep the concept of TIE developing skills and mobility (sensorimotorics, psychomotor, fine motor skills), developing technical creativity, creativity, learning about technical materials and technology of their processing, traffic education, energy, ecology, construction engineering, mechanical engineering, architecture, electrical engineering and electronics, agricultural techniques and technologies, telekomunications, informatics, robotics, interface technology, mechatronics, etc.

Bu the reconciliation of classes of TIE to one hour per week, the most important practical part of this subject would have been completely lost, and everything would be reduced to a theory without practical work and it makes no sense.

If this hoppened, reduction at number of hours at this subject would create incalculable consequences for the technical literacy of young people, their creativity and creativity, making it impossible to acquire new knowledge of modern technologies and the right choice of professional orientation. Doing this we mould move in the opposite direction to the demands of the economy, society in general and from the announced introduction of dual education. Each flat-rate reduction of curricula to meet the form, would be disastrous for future generations of young people. It would also be contrary to the Bonn Declaration (UNESCO, 2004), which defines the "five new skills" among which, in addition to information and communication skills is technical culture on the second place [5]. The subject of the technical IT education as part of its program significantly contributes to the development of these skills and therefore belongs to the graupot modern subjects that contribute to the universal development of personality and occupies an important position in the school curriculum.

2. CONCLUSION

Technical and IT education is a subject full at challenges. Every day, having learned something new from the world of technique students you have a new challenge in to deal with, eager to learn and prove themselves. Teachers are there to direct them, encourage and train to successfully navigate the modern technical environment.

Unfortunately many years of anxiety, of the teachers of this subject, who struggle for years dedicated to work, finding examples of modern technical and technological achievements, modern pedagogic practice, the needs of the modern market economy, and, in this way trying to prove that technical and IT education has a very important role in the education of young people who will one day be the leaders of the economic development of our country.

Hopes for greater representation of modern techniques and technologies in the programs of our schools are in all of us: teachers, students, parents, teachers at vocational schools and technical colleges, business men and all those who know that modern technology pillar of development of any society. We sincerely hope that those who make the key decisions within the school system of Serbia are aw are of this fact.

REFERENCES

[1] The Austrian education system - www. biznisradionica.com
[2] Čadež M .: Education, dual magnet for the investor - Tanjug, 10. March 2016.
[3] Kostić M .: Teaching Workshop - easier to work with a dual education - the German Agency for International Cooperation GIZ, Blic - 04/01/2016.
[4] www. pisaserbia.org
[5] UNESCO (2014), Bonn, Germany, 2014
[6] Education Review, (2008), Plan and Program for Technical and Information Education, Ministry of Education, Science and Technological Development;
[7] Creative School, (2014), Encouraging the construction of functional skills
[8] S. Popov, Centre for Development and Application of Science and Technology, (2015), platform concepts of technical and IT education.