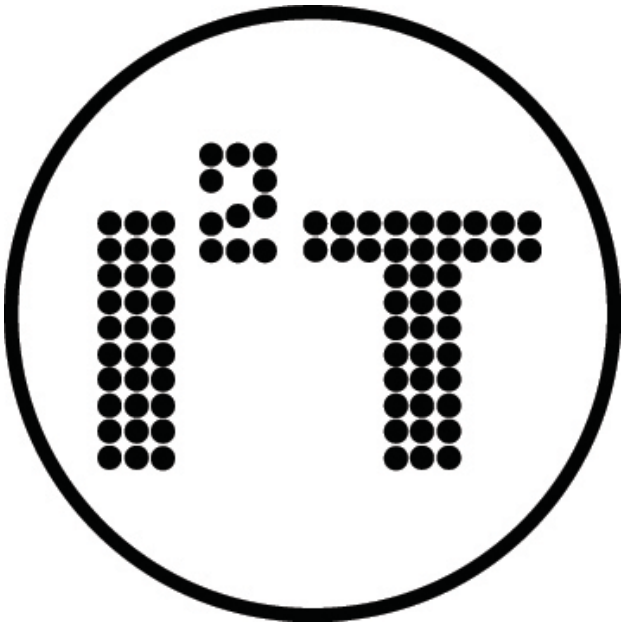
International Scientific – Practical Conference «INNOVATIVE INFORMATION TECHNOLOGIES»



PART 1
INNOVATIVE INFORMATION TECHNOLOGIES IN EDUCATION

Prague – 2014
April 21-25

К 32.97
UDC 681.3; 681.5
I 64

I 64 Innovative Information Technologies: Materials of the International scientific – practical conference. Part 1. /Ed. Uvaysov S. U.–M.: HSE, 2014, 472 p.

ISSN 2303-9728

The materials of The Third International Scientific – Practical Conference is presented below. The Conference reflects the modern state of innovation in education, science, industry and social-economic sphere, from the standpoint of introducing new information technologies.

Digest of Conference materials is presented in 3 parts. It is interesting for a wide range of researchers, teachers, graduate students and professionals in the field of innovation and information technologies.

ISSN 2303-9728

LBC 32.97

PROGRAMMING AND COMPUTER SCIENCE TEACHING IN HIGH SCHOOLS AND COLLEGES IN INITIAL PHASE

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IT specialists are very demandable at any modern business and science sphere. And there is only one reason for it: most problems and tasks are decided and automated with computers. In this article we want to talk about IT specialists teaching, especially about their first classes in Computer Sciences and discuss the uprising in this process problems. This article is based on over than 10 years authors experience at Moscow's High School and College Computer Science teaching.

Keywords: education, computer science, teaching, high school, colleges

Russia's Computer Science teaching history

High school Computer Science began in 80th, when professor Ershov declared his thesis: "Programming – the second literacy". At that time computers were not so common like now, so anyone who wanted to be an engineer in electronic machines and work with computers at all, had to study Discrete Math, Electronics, Binary Arithmetic, Programming and so on. Professor Ershov equaled literacy as cultural phenomenon and programming — technique, that makes human to think systematically. He wrote: "If the development and distribution of printing has led to universal literacy, the development and share of computers will lead to everyone's ability to program". Academician Ershov's ideas led to fact, that a new high school discipline was born. It was named "Computer Engineering Fundamentals". From that moment Programming and basics of Computer Science became a part of Russia's High School Program.

Let's take a look to the picture of that times high school student studying Computer Science Basics. At first, computers were very strange and difficult things. For involved people they compared as magic boxes. Those students were enthusiasts. The programming process was not only practice in technique, it was like a quest. Students experimented and invented new tasks, tried to solve difficult problems. Of course last remark relates to special math schools. The main reason of all this is that such students were not users, they became a real specialists in Computer Science, and many of them decided to continue their education in corresponding college or university.

Technical universities in late USSR were narrowly focused. That's why Computer Science and programming education were oriented on special machines and technologies. Of course students studied fundamental theories and algorithms – the basis, but the most view was concentrated into special things. The consequence of this is the style and methodic of educational process. For example, imagine that you're studying array arrange methods. To pass this theme you have to make a big report, containing the full description of method on your native language, description of algorithm in special language or in flowchart, your code and testing sequences. It was necessary, because student had to know every feature of the machine, he will work on in the future.

No doubt, at that time such method was very good, but it was time of "not users, but specialists", the time of "not common computers" and the time of enthusiasts. Now the time has changed, people changed, technology changed and students changed, especially in our country. So, the teaching style and technology has to change too.

Let us briefly describe the vision of such training process that, as we hope, can teach students for Computer Science basics quite well.

Modern student portrait

Let's make a look to modern student portrait. Now in Russia all students are divided in two classes:

- motivated, who really want to learn a profession
- haphazard, who may be made a mistake with his choice

But all modern students are not bad computer users. Notebooks, phones and other gadgets moved computers closer to regular user. This is their main kind making the difference between them and students of twenty century. So, computers for them are not strange and interesting things, there are quite casual.

Base on this fact, we have to change all ideology for this students teaching.

Elements of Computer Science Basis teaching

We suggest, that modern computer science basis teaching ideology should consist of the following elements:

1. Computer science theory;
2. Theory of algorithms;
3. Language practice;
4. Automatized control mechanism;
5. Computer technology, literacy, collaboration, documents making and presentation;

Let's talk about each of them.

Computer science theory or computer science essentials is theoretical course containing basis information of computer mathematics and logic, digital devices, circuit design essentials, information theory, natural information conversion, computer structure and so on. Unfortunately students have different levels of computer knowledge at their study beginning. That's why this course is not a deep learning. It's a common element, created for taking all students to the same level. It has to include a lot of theoretical blocks into itself and also it must have regular control procedures. We want to note, that this course is required for all students, studying in any IT ways.

The second element – Theory of algorithms – purpose is to teach students not just fundamental algorithmic theories such as Turing machine, Post machine, Markov's theory, different ways to define the algorithm itself, methods to calculate algorithm's efficient, but a very large array of known algorithms. Look at them:

- Numeric algorithms;
- Arrays algorithms;
- String algorithms;
- Lists algorithms;
- Recursive algorithms;
- so on

This element also includes various data structures, like arrays, vectors, lists, stacks, queues, trees. But note one most valuable thing: like the first one this element is also theoretical. That's why during various controls teacher has to ask students very detailed on each question. Student, studying this element, after it's completed, should know basic principles, usable algorithms and data structures.

The third element of Computer Science program is Language practice. One of this article authors (he teaches Computer Science theory only) once asked his students: "How many tasks did you program during this module?" And student answered: "Approximately, 10". Author was very surprised with this answer. He asked again: "Did you study programming early in high school?» The answer was: "No". No one can learn programming at any language, having done only 10 tasks, even 20, except genius. To make a little success in this art, student has to complete at least 100 tasks, but 200 are better. We used word "art" to

describe programming. That's quite correct definition, we think. Anyone who wants to be succeeded in any art should have practice, a lot of practice. Student has to understand this art on his fingertips. There is no another way.

But we have very difficult question: what language should college or high school choose for this start programming course? There are many reliable ways. But this article authors think that most of them is to start learning from language, that hides from student any specific machine and difficult things like memory working, but gives very simple syntax and forms. Also this language should be quite modern and powerful. This language is Python, or something like it. This language has free IDE's, simple and modern syntax and good facilities. It was created by mathematicians, so it has integrated all needed data structures, such as lists, dictionaries, tuples, etc. At the start it hides any memory functionality even variable definition. Some teacher can object, saying that variables definition is one of the primary programming things, but our opinion is that now we should move student's attention to technique and practice, not to detailed memory structure. We can return to this problem later.

We told above, that this element is a practice one. And reasonable question is: how can tutor or teacher control and administrate all students work, especially in a large students number way? There is only one answer – automatized knowledge control system. And this is our fourth element.

Automatized knowledge control systems has already applied in various teaching methodic, more in programmer's contests and preparing for such contests. One of this article authors successfully involved this methodic in his high school teaching process. Using this system he can give large number of different own tasks for each student. And students are practicing not only in class, but from any place, where Internet is available, because such systems are Internet based.

For theoretical elements the best way is to use Peer-to-peer review systems. Such systems involve students in common control process and there is no way to exclude from it, because each student has to not only make his own work, he must check his several colleagues work. And his total credit will consist of this to activities.

The fifth element is a common one. Our students have to learn modern collaboration technologies, such as Google Documents, have to defend their works in front of any audience with presentation support. Unfortunately, most of students know only PowerPoint and nothing else. We must teach students to combine information technologies knowledge and any other fields of science.

What next?

Let's imagine what student can learn next, after finishing this course of Computer Science Essentials. He can extend his knowledge studying Object Orientated Programming and learning languages like C++ or C# and Java. After this he can start to learn Web technologies and programming (PHP language). Another way is in microcontrollers developing and programming practice. The third way is System Programming with C language. So, we have a large field for any activity.

Conclusion

What conclusion can we make, analyzing described methodic. First, these courses are very intensive. Student, taking these classes has to spend much time to learn theoretical elements and to make practice. To make elements working, teacher has to do a lot of work.

He has to:

- Prepare presentations and synopsizes for every lecture;
- Invent large pool of different difficulty levels tasks for practice;
- Find and set up automatized control system for task checking;

- Find and set up peer-to-peer review system for theoretical elements control;

But, what we are aiming:

1. We give good knowledge to student. We are sure, that such knowledge can help student to study advanced parts of Computer Science.
2. We can "play" with element, changing their volumes for making them more flexible to each situation
3. We can extend it to Internet-based learning, what is very popular now. Just remember Coursera.com and Udacity.com
4. We can interest different students in Computer Science and Programming, even they had no idea about it before
5. We can make particular tests and rating for each student, depending on his possibilities

We think, that if we solve even a small part of these tasks, we can rise up level of our students and improve their professional and cultural characteristics.

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PROJECT METHOD IN PROFESSIONALLY-ORIENTED TRAINING OF BACHELORS SERVICE PROFILE

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The article described the method of the projects as the primary technology for educational practice in the course of practical studies for bachelors of the specialty service of home appliances and information technologies applied in practice and their relevance.

Keywords: method of the projects, practical studies for bachelors, information technologies.

A modern teacher must possess at least three languages - native, at least one foreign language and information technologies.

Information educational technologies arise when using the tools of Informatics and computer engineering.

Different approaches to the definition educational technology, you can summarize of the as a set of ways of realization of curriculum and training programs, representing system of forms, methods and means of training, provides for achievement of educational goals.

Under educational technologies in higher school is a system of scientific and engineering knowledge, methods and tools that are used for the generation, collection, transfer, storage and processing of information in the subject field of higher education. Between the effectiveness of the implementation of curricula and degree of integration of information and communication technologies formed a direct relationship [1].

Section 1
INNOVATIVE INFORMATION TECHNOLOGIES IN EDUCATION