Application Aspects of Computers in Education

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Abstract: The paper deals with common aspects of computer application in the education of technical subjects. It is aimed to select more general views.

Key-Words: Education, computer application, education of technical subjects, web pages, computer in education

1 Introduction

The educational topic and its aspects seem to be current subject of discussions. It is of logical background of subjective character and therefore an absence of objective evaluation criteria. Moreover the education relates generally to forming of positions and opinions and than it is a subject of political interest. In the paper we are focused on selected aspects of technical subjects in the field of electro technology in relation to recent social trends and technical means development.

2 Educational aspects

Recently the university education is formed by several social aspects in our country:

- Requirement for higher number of employees with technical university education.
- Generally low social prestige of technical people
- High increase of demand for employees in commercial segment, dramatic decrease in research and development segment (related to the number of employees, not their qualification)
- Increase of requirements in production and use in the qualification sense.

In the field of educational process itself the following factors play a significant role:

- Progress in Informatics incl. e.g.
  - Permanent growth of amount of published information.
  - Progress in technical means (computers, ...)
  - Consequent progress in software.

  Organization of systems of research, grants, stays, causes an increase in resources but also increase in administrative.
- Inertia of system.
- Risk of system collapse under influence of fast and extensive changes
- Complexity of relations within the whole educational system.

The above-mentioned facts imply that we can evaluate the educational process from several different views – e.g.:

- Realization of education from the organizational point of view
- Realization of education in given subject or group of subjects.

3 Realization of education from the organizational point of view

Recently there is a trend of three-phase study (Bachelor, Master, PhD) at the Faculties of Electrotechnics. We can discuss this matter but as mentioned above there is a lot of opinions and we cannot decide and choose the best. It is necessary to accept this trend and evaluate its consequences. The reason of domination is clear from the mentioned list of social educational aspects. Related to the knowledge requirements there is a problem (compared to recent situation) that in the Bachelor phase it required to preserve relatively high level of general technical knowledge with significant decrease in basic theoretical disciplines (math, circuit theory etc.).

In the other two phases it required as a minimum to preserve recent level of knowledge. At the same time the requirement of high throughput of the basic phase is declared and keeping of recent length of study of all three phases. As a consequence of lower requirements in basic knowledge there are significant difficulties in the education of technical subjects. The formal assuring of education in sequential steps is not a

problem but it is in the principle approach to the understanding of topic. Taking the education from a general theoretical point of view is the full acceptation of topic. In the case that we present a simplified view and the theoretical approach the acceptation of topic is not so good. The other problem is an extent of topic. Here it is necessary to provide for better students continuing in further phases advanced subjects and enable them to get required theoretical basics in particular time interval. Otherwise the most of students would not be able to acquire relevant theoretical background at the beginning of MSc phase. We will not deal with these questions in this paper in details but we follow this idea in other parts

4 Realization of education in particular given subject or group of subjects

Related to the education of particular subjects esp. in the BSc phase it is necessary to accept lower level of knowledge in the theoretical background. In this field the exploitation of computer technology is unavoidable. One of significant and not frequently discussed viewpoints is a demanding ness of preparation for a particular exploitation form. This is a significant factor from the pedagogical point of view. We can start from the following division:

- Exploitation of web pages:

The most frequent form of exploitation is a info placement about education (remarks to lectures, files to be downloaded etc.) on a web page. In such a case we can use the files originally developed for text or other editors. This form is frequently exploited even in cases when a specialized program is available for teaching and placing various modules (data, library) on the web page. The advantage is a high operability and low time demands on a teacher. And a contribution is relatively high.

Other forms show the info presentation in the case of primarily developed for web pages. In the simplest form it is the exploitation of text nonlinearity on the web page such as selectable references, in the most complex form they are multimedia oriented pages and dynamic pages.

- Exploitation of computer in the education:
  - During the exercises students can use a problem-oriented software (eventually several programs) for solution of processed tasks. A typical use example is a program for the filter design (e.g. NAF, SNAP) [1], [2], [3] that is used for the design incl. evaluation of various solutions. In a similar way the dynamic web pages can be used [4], [5].
  - Groundwork for the education are available in a computer (as a presentation or web page, each case has its advantages and disadvantages).
  - Students use some of mathematical programs during the exercise.
- Exploitation of computer for individual work:

There is a broad variety of possibilities – from the above-mentioned variants to the exploitation of highly complex systems for independent study.

5 Pedagogical aspects of computer exploitation in education.

The formulation of basic pedagogical principles and initial opinion about the exploitation of these principles (application of computers in education) is well described in [6]. The computer exploitation for technical subject education (as other forms of educational innovations – laboratory measurements, use of audiovisual programs etc.) is a bit risky that the technical content itself will be replaced by the education of programming, use of computer etc. On the other hand the effort to eliminate this extreme leads to the fact that the computer application is a formal item having no pedagogical contribution (a student writes predefined orders in a reaction to the computer response with no understanding of sense). In such a case it is more suitable from the educational point of view to present just only results with comment that they have been provide by computer and given software. Keeping itself between these above-mentioned extremes is a very difficult and strongly subjective problem. The basic condition is a well prepared and considered concept of the computer application in the given subject. Here we have to take into account that the computer application in education in larger extent means usually very fundamental impact into the complete concept of pedagogical process. Therefore we have to consider whether this change of concept is positive. When it is necessary to acquire the computing algorithms and we use a computer mathematical program for their implementation it is not a change of concept but only the unification of technical means for computing. But when we will use for these calculations the library modules or specialized program it is already a significant impact and we have to change a concept. For example in such sense that we can focus on a calculation of several variants and comparison of their properties. It is highly demanding to a pedagogical preparation of education. Moreover it is necessary to take into account the reliability of technical and software tools used in the educational process. Teaching can be successfully realized even in the case of very low reliability if it is included in the pedagogical proposal. It is very difficult because it requires e.g. very complex approach to evaluation of student's work. On the other hand this approach leads

to higher involvement of students in a sense of positive relation to gathered knowledge and consequently to more intensive motivation to gain knowledge. The separate problem is very varying level of computer skills (both an application of technical software and standard computer control). In similar way the work with computer can motivate some students to a positive attitude to the subject itself (unfortunately for some students the negative one). An important problem is also the fact that some students are able to work with the particular software better than a teacher. It is not a problem in principle but in some cases it can lead to conflicts if the teacher cannot manage the relation to students. The result is a negative approach of teacher to computer application and in similar way the student to a subject even the primary reason is a poor managing of mutual relation.

6 Conclusion

The paper summarizes the experience with teaching using computers. It is focused to show that the high attention is paid to particular aspects of this education but not at all cases some broader aspects are respected. Especially some aspects mentioned in the previous paragraph decrease its efficiency in the practical realization of teaching. Because teaching is a subjective interactive process the relation of teacher to particular form of education is crucial for successful computer application. It seems to be questionable to press teachers to work with software packages he is not used to work with. When the software is just a support to education (its use is not a key point) it is frequently better that teachers will use different software packages in the education of one subject, obviously under condition that students can choose a particular teacher (according to a teacher's profile). On the contrary – the software unification enables an effective support e.g. in a form of libraries etc. [4],[5]. The paper extent does not allow analyzing all aspects in details. Finally we can conclude that one of important application aspects of computers in education is not only the realization of particular steps (software application, library creation, web page preparation) but also the continuous evaluation whether these particular steps and targets lead to a real optimization of education. The opinion and attitude of students have to be included as a part of this evaluation. The students evaluation has to be understood in such a way that we can accept it as correct and respect it or we have to react by a relevant explanation of reasons and intentions leading to the realization of action not accepted by students.

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