E-Learning Based Teaching Material for Calculus in Engineer Training

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Abstract: E-learning and e-books, supporting e-learning appear to be finding their own place within the wide spectrum of teaching aids. Most important is its role in distance learning and as supplementary learning material, mainly used in higher education. In this paper an e-book will be presented, used at the Polytechnical Engineering College in Subotica for the basic college calculus teaching.

Keywords: e-larning, e-book, mathematics, calculus

1 Introduction

At the technical universities and colleges there are two groups of students: the first group can be included even for the developmental problems, while this other group has to be given the basic knowledge of using the known mathematical models and tools in engineering.

For this reason, an interactive learning environment has been developed around the concept of the electronic book. The architecture of the environment allows the integration of hypertext. Those aids are specially designed to serve an application-oriented, teaching approach, which involves the student in the simulation setup and the running of the application.

"E-books are commonly perceived as offering great potential for learner support but also as struggling to compete with print due to poor on-screen presentation, restrictive licencing and limited range of titles offered. The experience of a group of Irish university libraries shows that, with the right combination of product and subjects, e-books can thrive among students and faculty, while librarians can create more dynamic, relevant and flexible collections than for print. Subscription management is demanding for libraries, however, and licencing issues remain highly problematic, representing a formidable obstacle to full exploitation." [3].

E-learning, which has been much talked-about in the past decade, seems to be in a crisis these days. However, the reality is that it appears to be finding its own place within the wide spectrum of teaching aids. Most important is its role in distance learning and as supplementary learning material, mainly used in higher education.

Experience has shown that in a great number of places e-learning materials fail to substitute the direct teacher-student contact ([1]). Conversely, in many areas, such as practical informatics, the application of e-learning is indispensable.

2 Experiences

At the Polytechnical Engineering College in Subotica we have had extensive experience for more than a decade in software-supported teaching of mathematics. Certain mathemtical program packages are used to introduce students of engineering to basic mathematical knowledge vital to their profession.

For more than five years there are stationary materials in use available to students either on CD or on local network. These can be categorized as e-books in the subjects of algebra and calculus. Yet the need arose for modernizing: firstly, because students would most likely print these materials and use as 'regular' books. Secondly, the students' computer habits have changed drastically. While a survey conducted in 2002 presented the picture of about 60% of students owning a PC, aproximately 10-15% of them actively using it as a learning aid, these figures have by now changed dramatically. About 90% of the student population have a computer, with around 80% of them having all-time internet availability. [2]

Due to the higher and altered criteria in education, students solve more and more of their tasks using the PC. Another novelty is that according to the Bologna Convention all subjects have been 'resized' to fit into a single semester, which means auditory lectures had to be rationalized, focusing exclusively on the vital issues. Students have therefore been supplied with additional teaching materials to be used individually, outside the classes. This has directly caused us to alter the quality of teaching materials to make them more understandable and user-friendly. Teaching aids, and and softwer supports such as HTML Kit, and experience concerning e-learning have led to the creation of this new visualized e-book.

3 The Structure of the Calculus E-book

According to the curriculum of the Polytechnical Engineering College in their first semester, students take the subjects from college algebra, while in the second the basic elements of calculus: basic properties of series, real functions, differential-calculus, integrals, differential equations.

At the college the classes are conducted in two languages, Serbian and Hungarian. In the subject Calculus the complete learning material exists in both languages. The material introduced in this paper is the Serbian version, however, the visualization of the Hungarian stationary version is also under way.

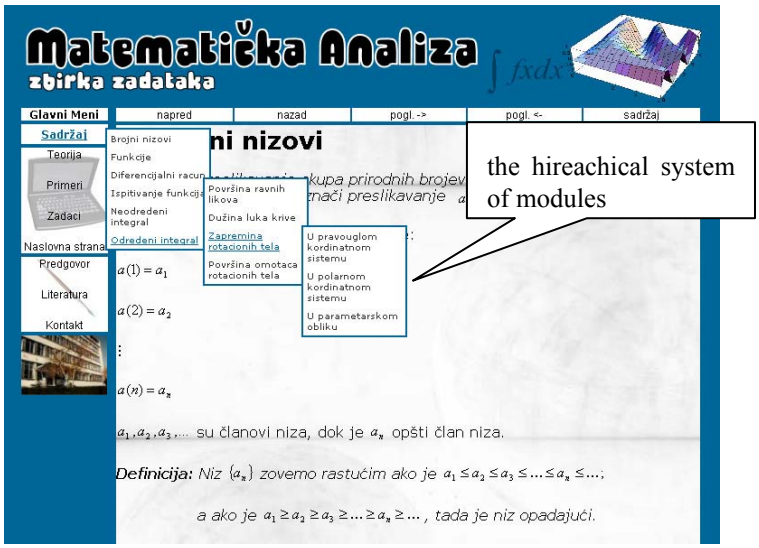

Figure 1
The task system of the e-book

The basic principle applied is that the material be accesible in the form of individual modules and keywords. Within each module there is an introduction to the theoretical basis, followed by tasks for practice. The solutions to the tasks are provided, yet placed in a separate module, thereby motivating students to work on their own.

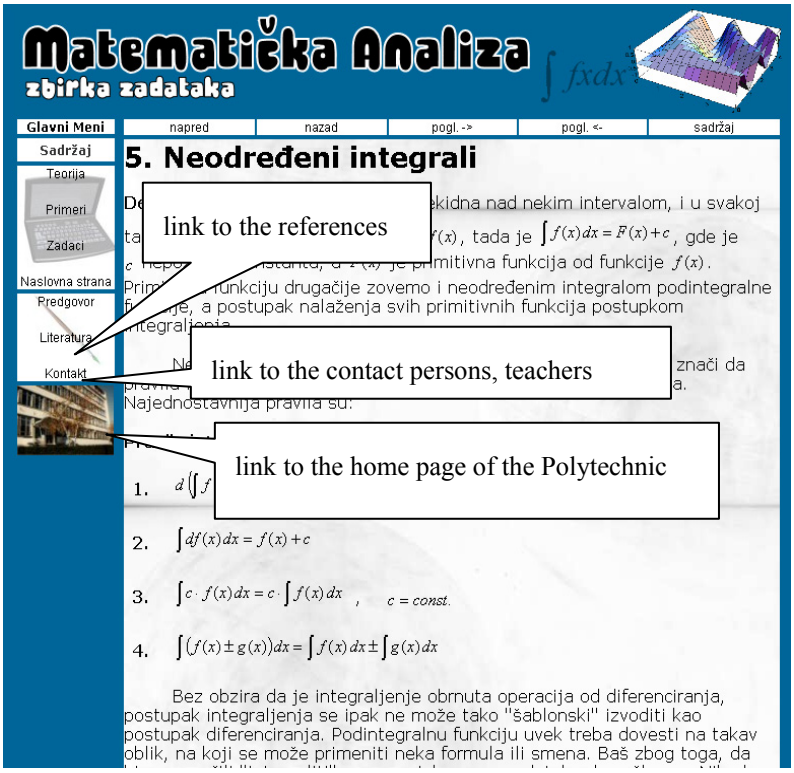

Figure 3
Modul with basic theory

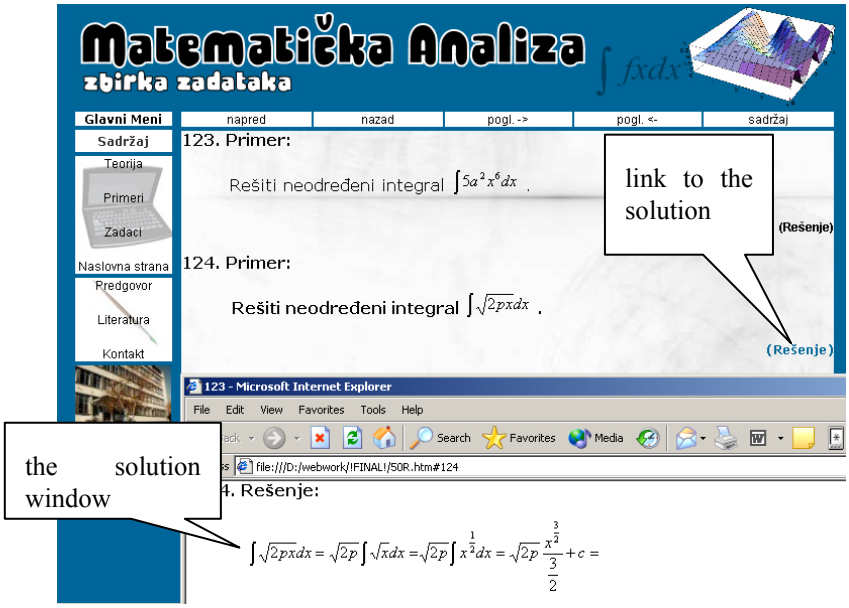

Figure 2
Modul with practice and “solution” link

Conclusions

Even though every teacher would like his students to acquire Mathematics as their basic knowledge, and to use Mathematics as their practical work, our educational system is based on preparing students only for the examinations. The next step will be a new on-line exam-system as the part of the complete calculus exam for the students.

References

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