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# Computer Technology and Mathematics Teaching

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## ABSTRACT

Efficiency of application of computer in organization of independent educational activity of students is examined in the article, didactic functions at implementation of educational aims and tasks, methods of organization of rational educational process, feature of the teaching computer programs.

**Keywords:** *Computer Technology, Mathematics, Mathematics Teaching, Methodical system of teaching*

## 1. INTRODUCTION

Computers can be successfully used at all stages of studies: they have significant influence on control-evaluative functions of studies; they facilitate activation of learners' educational and cognitive activity. Computers allow obtaining qualitatively higher level of clearness of the given materials; significantly increase possibility of including various exercises in the process of teaching, while the incessant feedback supported by the thoroughly thought-out study incentives enlivens teaching process, facilitates increase of its dynamism, which finally leads to the achievement of the perhaps most important aim of the procedural side of studies – formation of positive attitude of the learners' to the studied material, formation of interest to it, satisfaction with results of each local stage of studying.

Introduction of computer as a means of teaching is a communal problem, which demands efforts and mutual understanding of the specialists from various fields of theoretic and applied knowledge. Successful introduction of computers in the teaching process is predetermined by the mutual understanding of teachers (both theorist and experts), methodologists, psychologists and programmers. Each of the named groups of specialists must formulate their problems, as well as determine and express their demands and wishes to the colleagues.

The distinguishing feature of computer teaching is orientation to the new, higher level of perception and reproduction of the professional knowledge: if traditional teaching forms as a rule give us the opportunity to obtain knowledge and its mechanical representations, computer-based teaching allows to master the mechanisms and laws of knowledge application, that is to acquire skills and techniques, which is what the high school is directed.

The more difficult the subject of teaching, the more important it is to teach the specialist to effectively manage the procedure of knowledge application, that is to think algorithmically.

To our mind, the essence of the psycho-pedagogical problems of teaching process computerization lies in understanding what and how computers can do in the teaching process; the benefits of its inclusion in the

structure of the teacher's and learner's educational activities for solving educational tasks in the most effective way; how

to best "match" an individual and a computer in the complicated man-machine system of teaching; and finally, which theories of knowledge acquisition and which psychological mechanisms of teaching must be used for the system to function effectively.

## 2. RELATED WORK

The top-priority tasks include the definition of aims and limits of applying personal computer in the process of education. The successful resolution of these tasks will allow us to soundly approach the problem of selecting the part of educational course, which must be learned by means of computers.

It is important to note that the teacher's role under the conditions of informatization remains not only leading but becomes more significant. It is connected with the fact that the teacher implements it in the new pedagogic sphere, which is characterized by application of modern information facilities. Together with this, teacher receives an opportunity to extend his influence on the learners through new pedagogical strategies and activities that are originally found in the realizable information technology of teaching. The character of his/her work changes under these conditions as the teacher must:

- plan a methodical system of teaching;
- plan didactic complex of educational discipline on the basis of information and pedagogic technologies integration;
- ground the logic of optimal organization of pedagogic interaction with the learners' both at the communicative level and at the level of users' interaction with PC;
- choose adequate forms and methods of effective management of students' cognitive activities;
- design system of control-and-evaluative materials for organization of timely monitoring of the education process.

Thus, the content and structure of teacher's activities become increasingly creative. This demand of him/her constant review and updating of his/her knowledge and professional growth.

One of the most important conditions for the effectiveness of teacher's professional activities under the circumstances of educational informatization is his/her basic information culture. This means that along with basic pedagogy and psychology a teacher must: understand the potential abilities of computer in his/her subject area and have skills of working with it; possess skills to manage learners' cognitive activities both in the display class and during the period of their independent work with the didactic complex data ware of the education discipline; be able to select, adapt and correspondingly design educational material for its realization in cooperation with programmers of electronic education objects; offer the direction of refreshing the didactic complex, and so on.

Experience of using computers in teaching shows that information technologies are effective only if an individual-oriented didactic computer sphere is created – including wholeness of methodological, methodic and technical approaches determining the structure, contents and technologies of computer teaching, which ensures conditions for personal self-development and self-realization; creates favorable conditions for realization of personal functions of the educational process subjects.

In the methodic literature, didactic functions of the computer are mostly used for completing exercises, learning educational materials, modeling, studying, testing, etc.

In our work at the Ariel University we tried to discover new methods of computer applications in the process of teaching higher mathematics. We based our constructions on the fact that application of computer in the teaching process allows to:

- activate students' cognitive activities;
- achieve more qualitative learning of educational material due to multiple fulfilling of educational tasks under the computer guidance (training), as well as due to the enhancement of the independent work organization;
- promptly trace the real picture of the knowledge, abilities and skills students have formed;
- put into practice a differential and individual approach to the learners';
- provide students with possibility of choosing forms of work for their own grade as well as opportunity of improving it;

- carry out work directed at overcoming and preventing students' poor progress.

The main focus of our scientific research is the evaluation of different forms of students' work with the application of computers.

A model of computer studies must be many-sided (polyfunctional): it must form not only knowledge but develop the learners and involve them in the sphere of diversified psychic activity. That is why the model of computer studies must also be procedural. Process is not only a change, but also a range of genetically successive stages of development, which are corresponding to the stages of computer teaching. The model must also satisfy criteria of contradictoriness and uncertainty, variability and flexibility.

As a deductive system, a model of computer studies includes a nomenclature of aims of teaching to knowledge and skills, aims of developing main spheres of an individual; aims of forming the studying activity; characteristics of contents of the educational materials, criteria of its selection for creation of pedagogic software tools, relation of the program material to the rest contents of studies; characteristics of didactic structure of the studies; its motivational provisions; indications at the forms of activity connections between a teacher and computer application and the combination of teaching methods, connected to them. The pedagogic effectiveness of computer studies depends on the range of the abovementioned factors as well as on the fact as to what extent the idea represented in its model is realized.

Currently the information sphere of computerized course of higher mathematics in the Ariel University includes:

- educational base of knowledge for the auditorium and independent work;
- bank of tests for testing the knowledge;
- results of monitoring the level of students' learning.

An educational base of knowledge includes structural and visually represented theoretic and reference source with application of modern information technologies (for example hypertext, hypermedia).

A pool of tests for testing knowledge includes a system of tasks for testing the level of mastery of subject contents of the higher mathematics course.

Results of monitoring the level of students' learning of the academic discipline represent records of students' teaching and cognitive activities directed at

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mastering the material. It contains individual results of studying concrete subjects by several parameters.

The work was carried out at several directions:

- use of computers at separate stages of studies;
- application of computers at various types of studies (lectures, practical work);
- application of means of computer control of knowledge and skills;

### 3. CONCLUSIONS

The possibility of applying computer at various stages of educational studies ensues from the educational tasks. PC can be used for analysis of students' preparation for the lesson, for revision of studied material, explanation of new material, forming of knowledge, abilities and skills. For example, if computers are planned to be used for confirmation of the studied material, than the formation of knowledge, abilities and skills based on the concrete educational material can be used as an educational task.

When computers are applied at the stage of analysis of the learners' preparation for the lesson, its application allows to test learners' knowledge of the studied subject and their preparation for the lesson. At this stage, the software tools represent a complex of exercises on the subject matter and are used as training simulators. A computer evaluates the learner's work, and a score appears on the screen immediately after completing a given number of tasks. An example of such software tool can be seen at the site:<http://www.ariel.ac.il/projects/dom/>

The program avoiding repetition of the assignments and ensures their variation. Students are continuously offered new assignments. This allows students to develop a regular demand for knowledge and skills on the given subject. In this connection, the process of studying becomes more intensive. Application of such work methods with the computer at the given stage of educational work allows to:

- increase the number of the examined students (as far as examining each student);
- obtain a genuine picture of student's formed knowledge on the subject of the given topic;
- activate students' work;
- easily introduce necessary changes in the study plan;
- apply an individual approach to each student;
- distinguish assignments according to the level of difficulty.

The methodic model we offer was specified conformably to concrete projects and courses. Based on the offered model and recommendations we created a collection

of sites containing teaching and methodical materials on various branches of higher mathematics course.

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## **AUTHOR PROFILES**

Dr. Roman Yavich specializes in informatics. He deals with the use of Internet technologies in education process. He is the author of concept of technical support in organizing of Internet Math Olympiad.