of mathematical topics due to a larger spectrum of approaches that are included and presented by a qualified didactical treatment of the subject.

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METHODOLOGY FOR TRAINING TEACHERS
IN BASIC AND SPECIFIC COMPUTER SKILLS

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Abstract: *This article describes methodology for training teachers in Maths, Physics, Astronomy and Professional subjects in basic and specific computer skills.*

Keywords: *teachers, IT education for teachers, methodology for training, curriculums, education process, online tests*

ACM Classification Keywords: *K.3.0 Computers and Education - General*

Introduction

The high school pupils have new requirements towards teaching style and methods. This fact requires that besides the teachers in Computer Science those teaching other subjects should be also IT competent and manage computer aided teaching. ITs are a modern tool for visualization of the taught material that makes the introduction of the curriculum much easier, more interesting, modern and comprehendible. On the other hand, ITs allow exploiting Bulgarian and world information sources as well as the contemporary communication devices in the teaching process.

The methodology offered has been developed by a team from Institute of Mathematics and Informatics under a contract with the Bulgarian Ministry of Education and Science.

Aim of the Project is to provide a methodology and training 250 instructors supposed to supervise training in basic and specific computer skills for

- teachers in Maths, Physics and Astronomy and
- teachers in professional subjects (mechanics, electronics, economics, engineering, etc.).

Curriculums

The team has prepared 40 lesson curriculums for the training courses to be supervised by the instructors. The methodology is based on the previously prepared curriculums.

The choice of the topics and programs (software) aims at informing teachers non-specialists in computer science of the basic IT principles; training teachers in the basic computer skills; training teachers in the basic principles of processing of various types of information; providing a new up-to-date tool which will help the teachers in the tuition process .

Each of curriculums comprises three modules: Introduction; Basic and Specific.

The ratio of the material in the modules is 2:4:4.

Dividing program in modules allows two courses to be organized depending on the level of the teachers:

- Beginners including the three modules;
- False beginners skipping the Introduction.

The duration of the above mentioned courses could vary and entrance level of teachers could be unequal also, but the output level of teachers should be on approximately the same at the end of the course. The teachers achieved more than 60% of the entrance test requirements will be trained in the false beginner's course.

At the end of the course the skills acquired are evaluated by a complex practice test and developing of certain Unit (connected with the subject teachers teach in their school), using the modern information and communication technologies.

The following tables show the unit contents in each module. The material foreseen in the curriculums differs mainly in the specific module. Specific module for teachers in Maths, Physics and Astronomy includes unit for notion and skills for writing mathematical and physical formulae and embedding them in a document, but specific module for teachers in Professional subjects includes unit for notion and skills for data analysis, statistical processing and chart creating.

Each unit is supplied with methodology manual, reference materials and tests and exercises.

Table 1

Introduction module

UNITS	CLASSES
Information, basic informational activities, informational processes; security, authenticity, actuality; ethical principles of using information. Computer – introduction architecture: memory, CPU, periphery; software – system and application programs. Windows operational system: windows, menus, information structure (directory and file); Windows Explorer; MS Office applications.	4
Introduction in word processing – basic activities: entering, storing, editing, formatting, printing. MS Word: creating, rudimentary editing and storing of a text document. MS Word: opening, closing of a document, selection and editing of a text in a document.	4

Table 2

Basic module

UNITS	CLASSES
MS Word: Notion for style and hard formatting, formatting of symbols, page formatting, using templates, headers and footers. MS Word: paragraph formatting, numerating and bulleting, frames and background.	4

MS Word tables and graphical objects	4
MS Excel tables and graphics.	
MS PowerPoint: Creating and demonstrating presentations, using templates.	4
MS PowerPoint: Using appropriate auxiliary means for presenting information from different application programs – sharing information between programs from MS Office packet. Printing documents created via MS Office.	
LAN and WAN.	4
Internet: Information searching and storing.	
Internet: Using E-mail; participating in Internet based discussion forums.	

Table 3

Specific module for teachers in Math and Physics and Astronomy

UNITS	CLASSES
Writing mathematical and physical formulae and embedding them in a document.	4
Skills connected with writing complex mathematical and physical formulae.	
Using MS Word Drawing - diagrams, schemes, elementary drawings etc.	4
Skills for creating complex graphical images using MS Word and embedding them into a text documents and presentation materials.	
Creating and working with graphical images of geometrical drawing using specialized software.	4
Skills for creating complex graphical images using specialized software and embedding them into text documents and presentational materials.	
Creating an integrated document	4
Summarizing discussion	

Table 4

Specific module for teachers in Professional subjects

UNITS	CLASSES
Data analysis and statistical processing	4
Skills for statistical processing and chart creating	
Using MS Word Drawing - diagrams, schemes, elementary drawings etc.	4
Skills for creating complex graphical images using MS Word and embedding them into a text documents and presentation materials.	
Creating and working with graphical images of geometrical drawing using specialized software.	4
Skills for creating complex graphical images using specialized software and embedding them into text documents and presentational materials.	
Creating an integrated document	4
Summarizing discussion	

Methodology Manual

Methodology Manual aims at assisting the instructors in tutoring the material to teachers who are not specialists in Computer Science. The manual for each group of teachers includes 10 units. Each unit is covered within 4 lessons. During their course the instructor has to present the new material, demonstrate the operations, supervise

exercises on the computers and check the skills acquired. The suggested scheme of time division is 2 lessons for a lecture with demonstrations and 2 lessons practicing.

It is advisory to check the skills acquisition twice: at the end of the unit having gone over the new material and practiced the operations, and at the beginning of the next lesson performing a more thorough check of the acquired skills via execution of particular practical tasks. Following distribution of the material in a unit is suggested (table 5).

Table 5

Distribution of the material in a Unit

Discussion and check of the skills acquired in the previous Unit	20-30 min
Introducing new material with illustrations	45-60 min
Exercises on the computer – solving problems	45-70 min
Discussion and check on the newly acquired basic notions and skills	10-20 min

The time division of the units is based on a long experience gained while teaching courses to different learners. However, this time division is provisional. It may turn out that a certain group of learners does not need so much time to master a unit while another one is much slower in their progress. This is quite probable to happen in the groups of false beginners whose level can never be the same.
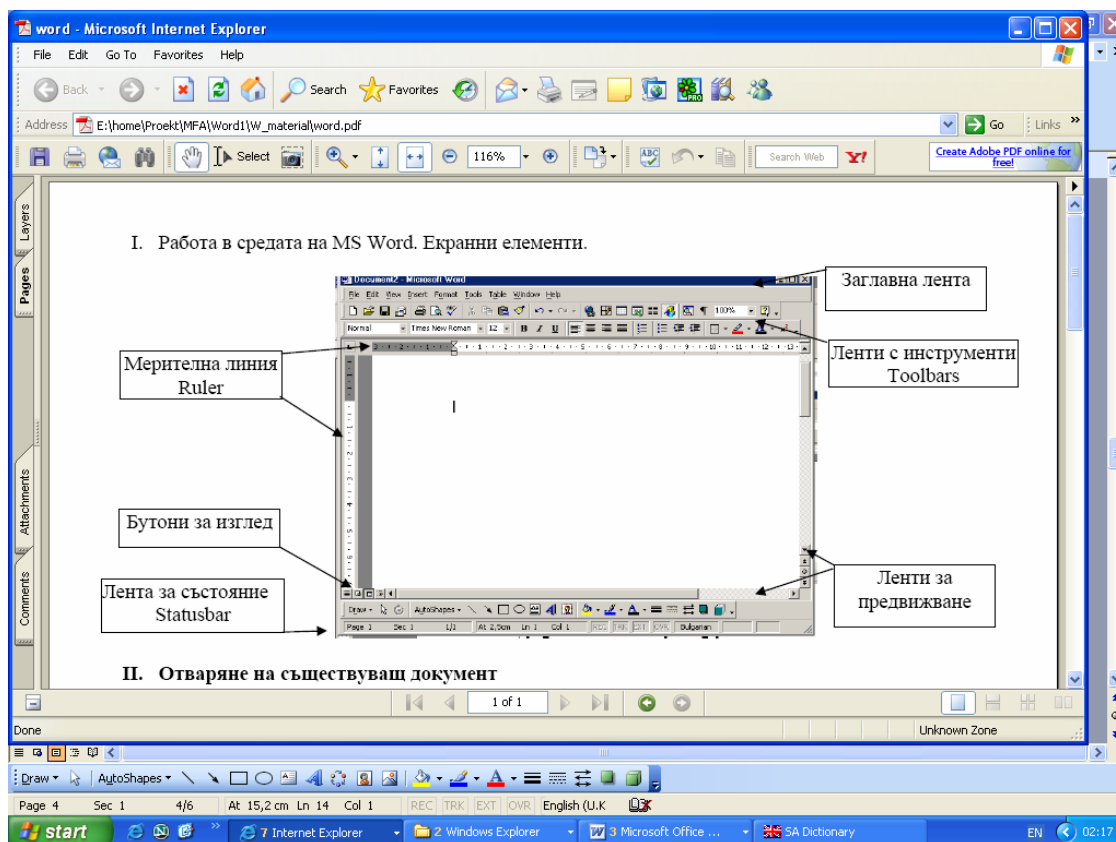

Fig.1. Part of illustrated material: main window of Word program could be seen
as well as explanatory comments.

Every unit in manual has the following structure:

- *Aims* – describes unit aims.

- *Expected results* – includes list of knowledge and skills, which teachers have to acquire at the end of each unit.

- *Educational material* (with comments and emphasis on the important specifics – see fig.1) – This section includes description of the new basic notions and terms and description of basic skills in the unit. Instructors are advised how to introduce the new notions, terms and skills.

- *Example problem* – one or two example problems with detailed instruction for solving them. Problems are selected thematically according to main subject of the teacher.

Tests and exercises

The team developed for each unit:

- *Online check of the notion and terms* – includes 10 questions for estimating the theoretical knowledge at the end of the unit. After question answering, trainees could check their results immediately. For example:

  5) 1024 KB are equal to

  ☐ a) 1 MB

  ☐ b) 1 B

  ☐ c) 1 GB

- *Self-teaching test (homework)* – problem for solving at home. Non detailed instructions are offered. The aim of *Self-teaching test (homework)* is to exercise the material and self-checking acquired skills in the unit.

- *Practice test* – problem for checking the skills acquisition at the beginning of the next lesson.

Conclusion

The developed program and accompanying methodology have already been applied. The team trained instructors. Each instructor received CD with all materials. They were obliged to train four groups of teachers from Bulgaria in basic and specific computer skills.

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