A POSSIBLE STRUCTURE FOR A WEB-BASED TUTORIAL

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ABSTRACT: The communication technologies based on computers offer, more than ever, the support for spreading information rapidly, easily, accurately and, considering the performance, at a very good level of cost. Due to many advantages, in the digital era, the instructional process in all type of organizations but specially in educational institutions is going to change radically. The expansion of Internet, the development of intranets and the usage of information technology caused dramatic transformations. The Web become very popular and familiar. Virtually anybody can use it because it has a simple interface and it gives access to huge informational resources. In order to "subscribe" to global integration, the Web is the ideal place where to store/access courses and other kind of teaching materials, all being included in so-called multimedia and sometimes, hypermedia.

This article is about to explain a possible structure for a Web-based tutorial and the results achieved by using it with the students. The tutorial itself is written in Romanian for Romanian users, but the structure is applicable for many disciplines and topics. Placed in intranet, initially it was developed in 1999 (version 1.0) for Faculty of Business internal use only. During the years, the tutorial was appreciated by our students and, according to suggestions it was enhanced, improved and upgraded to version 4.01. The tutorial can be placed in the Internet as well.

THEORETICAL CONSIDERATIONS

It has to be underlined from the very beginning that the education has progressed very much and this is reflected in didactical technology. One of the latest method in education is known as *Computer Based Training* (CBT). In mean time, life-long learning become a strong need to all levels. As a consequence, the computer has to be integrated in the educational process, both in schools and other organizations. Some arguments are:

- the explosive development in the past 10 years of computer industry with its two major components – hardware and software;
- advanced countries have developed a strong computer infrastructure and associated courses in specialized institutions;
- the companies, the networks of radio and TV broadcasts, telephony, transport etc. are developing and implementing informational, communication and decisional processes based on computer applications;
- Internet became a global communication environment;
- the education institutions have to reach high standards in order to be accepted in the system and supply activity sectors with well "rounded" specialists.

In education, the computer is the most versatile equipment because:

- it works with special written programs;
- it can process texts and/or numbers;
- it generates text, numeric and graphic information from spreadsheets and databases;
- it can process images from different sources – compact disks, traditional and digital cameras, camcorders, video cassette recorders, cassette player and TV;
- it can play and/or process sound from audio compact disks, microphones, radios, cassette players, other audio-video equipment and TV;

- it can play and/or process digital video;
- together with a projector it can replace any of traditional visual equipment;
- integrated in networks, it can offer facilities of obtaining/sending information from/to any user – the relevant example is the Internet environment.

The computer alone is not sufficient in the educational process: it has to be "helped" by other technical instruments such multimedia projectors, LCD and overhead projectors, photo and audio-video equipment.

In order to elaborate a computer program for educational purposes, in particular a tutorial, it is necessary to take into consideration the following steps:

- Pedagogic Analysis
- Validation of Pedagogic Analysis
- Elaboration of Didactic Scenario
- Validation of Didactic Scenario
- Media advertising
- Validation of enclosed information
- Testing
- Correction
- Distribution
- Evaluation

When preparing a computer program to be used for education purposes, it has to follow a certain model for its internal structure. Without going into details, the internal structures can be linear, hierarchical, non-linear and composite. J. Forester underlined four reasons to learn the fundamental structure of a subject:

- the understanding of basic principle of a subject makes it intelligible;
- if no detail shows in a standard model, this is rapidly forgotten;
- to understand something as a particular example of a general case – which means to understand its essential structure – mean to know of not only a certain thing but also a model of understanding other similar things;
- the material has to be continuous examined in order to shorten the distance between advanced and elementary knowledge.

The author of a computer-based tutorial has to have a complete strategy in order to put the right things at the right place. The design of the content consists of finding possible answers to the following questions:

- How much do the students know about the subject?
- What is the students' level of education?
- What is the students' professional orientation?
- What do you want the students to learn or to be able to do?
- Are the objectives realistic and attainable?
- Do the electronic page contents relate the objective?
- Does the electronic page present a clear and direct concept?
- Are the subjects and/or electronic pages in right order?
- Are the information understandable?
- Does the program contain a printable version?
- What can be improved?

WEB-BASED TUTORIALS IMPLEMENTED IN INTRANET/INTERNET

What is a Web-based tutorial implemented in intranet/Internet? Some possible answers are:

1. Information on specific subject can be found in computers (servers and workstations), storage media and available in printable version;
2. Same information as above can be retrieved in more than one language, the user decides which is to be used;
3. All documents from computers and/or storage media are developed to be accessed with browsers running on different platforms (operation systems);
4. Diagrams, graphics and animation can be retrieved with browsers and/or other specific (integrated) software packages;
5. Static information is completed with sound and digital video, all together meaning multimedia or, in particular cases, hypermedia;
6. Any file type can be send/received via e-mail or upload/download processes;
7. The lessons and their related parts are to be accessed/studied both inside and outside organization (in particular inside and outside schools).

The components of a Web-based tutorial implemented in intranet/Internet are:

- The professors
- The pupils/students
- Educational materials
- Hardware resources
- Software resources

The professors

The professors and their ability to deal simultaneously with pupils/students and resources is the key factor for a successful Web-based tutorial implemented in intranet/Internet.
When speaking about the Web-based tutorials recommended/indicated by professors we have to find answers to the following questions:

1. How much of the course content have to be memorized?
2. How much of the course is based on practical demonstrations?
3. What kind of individual/group activities are used?
4. What is the primary method of instruction?
5. What level of interaction occur in the relational field?
6. What kind of previous knowledge is involved?

When speaking about the professors we have to find answers to the following questions:

1. Which is their professional experience and their preferred instructional style?
2. Which is their experience in respect with taught subjects?
3. How many professors are part of the team?
4. Which is their competence in information technology?
5. For how long are the computer systems/network used by professors?
6. What kind of advantages have they by using Web-based tutorials?

The pupils/students

The education system is more and more dependent of the specific market demand. The pupils are the target market segment and the system has to fulfill their requirements while the traditional methods don't work properly anymore. The only way of having a competitive education system is to integrate the computer and to use the technology from intranet/Internet in order to assure the continuous education.

When speaking about the pupils/students we have to find answers to the following questions:

1. What is their present level of education?
2. What languages know they?
3. What is their preferred study method?
4. What communication methods are preferred?
5. What are the advantages of using intranet/Internet technology?

Educational materials

Due to the specific of intranet/Internet technology, any Web-based tutorial has the following type of pages:

1. Home page
2. Index pages
3. Content pages
4. Study pages
5. Evaluation pages

When speaking about the educational materials we have to figure the following elements:

1. Specify the general and specific objectives;
2. Specify the implementation methods;
3. Specify priorities;
4. Specify the structure of educational materials;
5. Set the pages format and aspect;

In multimedia programs, special attention will be given to:

- Text characteristics
- Graphics and animations
- Sound
- Digital video
- Virtual reality

Hardware resources

When using a Web-based tutorial implemented in intranet/Internet, the information is stored in one or several servers and storage media. The pupils will access the information by using local area networks (LAN's), local resources, local storage media or distance resources based on client-server applications/technology.

When speaking about the hardware resources (equipment) we have to find answers to the following questions:

1. Which is the structure of the network?
2. What are the characteristics of the server/workstations?
3. Are the server/workstations reliable?
4. What is the server/workstations operation systems (platform)?
5. What software resources are on the server/workstations?
6. What rights do pupils/students have in the system?
7. What services are available?
8. What is the level of security in the system?

Software resources

The biggest part of the traditional educational material consists of books with a combination between text and graphics. Rarely compact disks are attached. When referring to *Computer*

Based Training (CBT) the simple observation shows us that it is multimedia, in other words a combination between text, graphics, sound and digital video. To "produce" multimedia programs it is needed, besides specific knowledge, many software resources.

The market offers a great selection of software packages, more an more integrated. Some of them are used to build the tutorials and some are used only as auxiliary resource. A possible classification of software resources together with relevant products are:

- **Operation systems**: DOS, Windows, Unix, Solaris, Linux.
- **Word processors**: Word Star, WordPerfect, Word, QuarkXpress.
- **Spreadsheets**: Lotus 1,2,3, QuattrePro, Excel.
- **Database Management Systems**: dBASE, FoxPro, Access, Paradox, Oracle.
- **Graphic and Presentation packages**: Astound, Bravo, Asymedia, Charisma, Power Point, WordPerfect Presentations, Freelance Graphics, SmartDraw Pro, Corel Draw, Macromedia Action, Persuasion, Stanford Graphics, Adobe Illustrator, Macromedia Freehand, ABC Graphics, GSP Design Works, Windows Draw.
- **DTP** (DeskTop Publishing) **software**: Xpress, PageMaker, Ventura, Page Plus, Publisher, Frame Maker, Canvas, ipublish, PressWorks.
- **Voice Recognition software**: Voice Type Simply Speaking, Via Voice, Voice Command, Dragon Dictate, Naturaly Speaking, Voice Pad.
- **Digital Video software**: Adobe Illustrator, Adobe After Effects, Ulead Media Studio.
- **OCR** (Optical Character Recognition) **software**: Inovatic Easy Reader, OmniPage, Recognita, TextBridge, Ocron Perceive Personal.
- **CAD** (Computer Aided Design) **software**: AutoCAD, CorelCAD, Corel Visual CADD, Design CAD, Drafix CAD Pro, MicroGDS Pro, Xcad.
- **Browsers**: Internet Explorer, Navigator, Opera, HotJava Browser.
- **Remote connection software**: LapLink, Carbon Copy, pcANYWHERE, CoSession Remote, ReachOut.
- **Videoconference software**: Captivator, Intel Proshare Conferencing System, Net Meeting, VideoLogic.
- **Visual Programming Languages**: Java Workshop, Visual J++, Delphi, Optima, Power Objects, Power Builder, Visual Basic, Visual C++, Visual FoxPro, Visual Café, JBuilder, Visual Age.
- **Antivirus software**: BitDefender, Dr. Solomon's Home Guard, F-Secure Anti-Virus, IBM AntiVirus, McAfee VirusScan, Norton Antivirus, PC-cilin, VDS Pro, VET Antivirus, Sophos Antivirus.
- **Multimedia Authoring software**: IconAuthor Net Edition, ToolBook II Instructor, MacroMedia Authorware, MacroMedia Director, CBT Express, Click & Create, Illuminatus, Dazzler, MatchWare Media8or, Multimedia MM 200, Immedia.

Information Technology (IT) has a great future and it will be implemented, sooner or later in all human activity sectors. This is the reason that educational institutions have developed Curricula where IT related topics are placed on important positions. But, during the teaching process it could be observed:

- if students are IT beginners and the teaching process is mostly theoretical, they can learn with difficulty;
- the teaching by text/drawings only on the blackboard is inefficient and causes absenteeism;
- the connection to Internet caused a high demand of access time and more places in the computer network classrooms; students are very interested in surfing the Web.

Base on the above observations were elaborated the following hypotheses:

- interactive approach of IT causes enthusiasm and performance;
- the learning process is easier if educational materials are illustrated and/or contains demonstrative digital video;
- the learning time is shorter if the educational material is structured, stored in the computer/network/Internet and has associated practical exercises.

As written in *ABSTRACT*, for practical reasons and to be used by students, I developed a Web-based tutorial, with terminology in Romanian for Romanian users, who teaches the basic concepts for well known word processors. All English terms have explanations in Romanian. The tutorial was enhanced, improved and upgraded to version 4.01. In 2004, I added a tutorial for spreadsheets (v. 1.0) and company intranet concepts (v. 1.0). Because the Faculty of Business network has Windows '98 or a higher version of Windows, the tutorial is optimized to run under Internet Explorer. It can be used on personal computers, intranet and Internet. With some limitations (no video sequences), it runs under other browsers also, such as Netscape Navigator and HotJava Browser (Windows) or Mozilla (Linux).

TUTORIAL'S CHARACTERISTICS

The Web-based tutorial can be seen and analyzed as the system shown in fig.1.

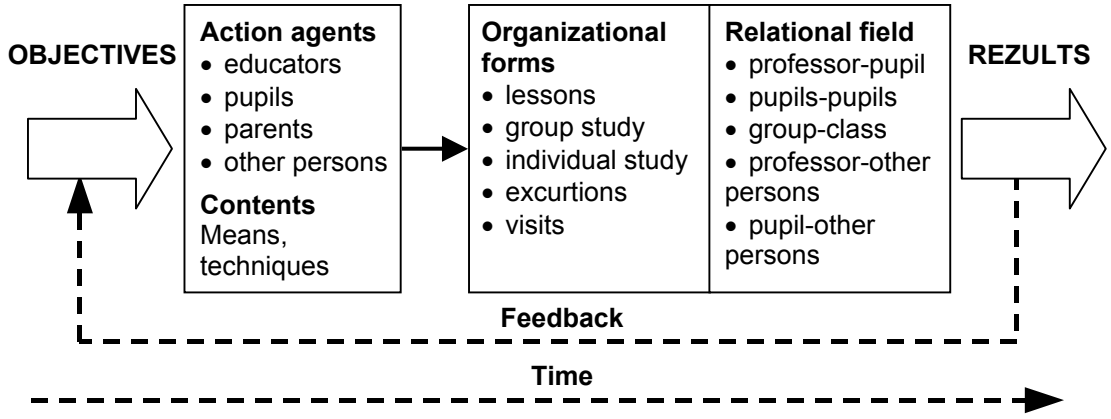

Fig.1. Principal components of the educational process seen as a system
(M.Ionescu, I.Radu, *Didactica Moderna*, 1995, pag.3)

Objectives

- when pupils/students use the tutorial, they are able to learn rapidly and easily specific terminology due to comparative approach;
- theoretical study in parallel with practical exercises develop rapidly and steadily the abilities to work with word processors and spreadsheets

Action agents

- **Professors** – the tutorial can be used by any professor who teaches IT in general and word processors and/or spreadsheets in special;
- **Pupils/students** – the tutorial can be used by any pupil/student who has to or wants to learn a word processor and/or spreadsheets;
- **Parents** – the tutorial can be used by any parent for himself, in order to work with or to understand word processors and/or spreadsheets;

- **Other persons** – if placed in Internet, the tutorial would be accessible to any person willing to learn a word processor and/or spreadsheets.

Tutorial content

- the tutorial contains basic concepts from the majority of today's word processors, spreadsheets and intranet terminology being based on the following sources:
  - WordPerfect 5.1 & 6.0 for DOS User's Manuals;
  - Word 6.0, '97 and 2000 User's Manuals;
  - Microsoft Excel, Corel QuattroPro and Lotus 1,2,3 User's Manuals;
  - articles about intranets and over 10 years of teaching experience.

Means

- hardware resources used to "build" and distribute the tutorial:
  - Intel Pentium MMX, 200MHz, 128MB RAM, 10GB HDD, Philips Brilliance 1520 monitor, keyboard, mouse, MSI CD-RW MS8348;
  - HP Scanner for scanning the books specified in the bibliography.
- software resources used to "build" and test the tutorial:
  - Notepad and WordPad (for big files) under Windows '98 operation system to edit HTML and JavaScript codes;
  - CorelWordPerfect Presentations for screen captures and drawings;
  - Microsoft Camcorder for digital video sequences;
  - several versions of browsers – Internet Explorer, Netscape Navigator, Opera, HotJava Browser, Mozilla (Linux) to test the tutorial;
  - McAfee antivirus package before distibution.
- the tutorial runs on any computer with frames compatible browsers;
- the tutorial is optimized for Internet Explorer, but it can run under other browsers;
- the tutorial can be installed on a host server.

Techniques

- the tutorial takes full advantage of Internet Web service;
- the tutorial has a composite structure for the units of interactions.

Organizational forms

- the tutorial can be used as part of the lessons in the education system;
- the tutorial can be used outside the education system;
- the tutorial has: home page (fig.2), index page and study pages (fig.3), content pages, summary pages and evaluation pages (fig.4 and fig.5) illustrated on next two pages.

IMPORTANT: The Web-based tutorial is published on CD-ROM with all papers presented to the E-COMM-LINE 2004 CONFERENCE. Therefore, I consider to illustrate only the mentioned screen captures. The tutorial's structure can be analyzed when run from the CD.

Advantages of the tutorial:

- the structure is open and flexible;
- beside HTML and JavaScript, it can contain other codes as in PERL, C and VRML;
- it can be accessed full-screen or with frames – index on left, all other pages on right;
- the pupils/students can evaluate themselves or can be evaluated;
- the pages can be larger (in both directions) than the screen;
- the content can be printed.

Fig.3. The tutorial's home page

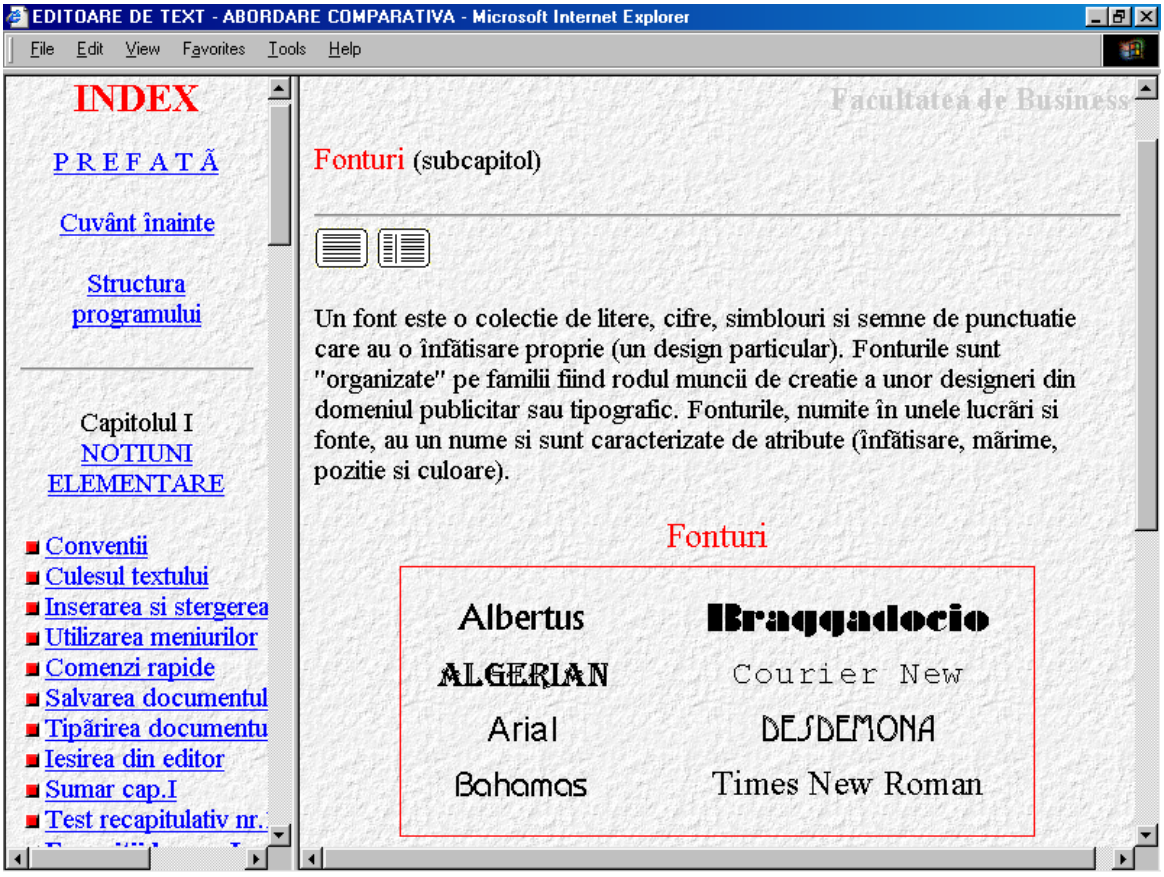

Fig.3. The index page (left) and one study page (right) from the tutorial for word processing

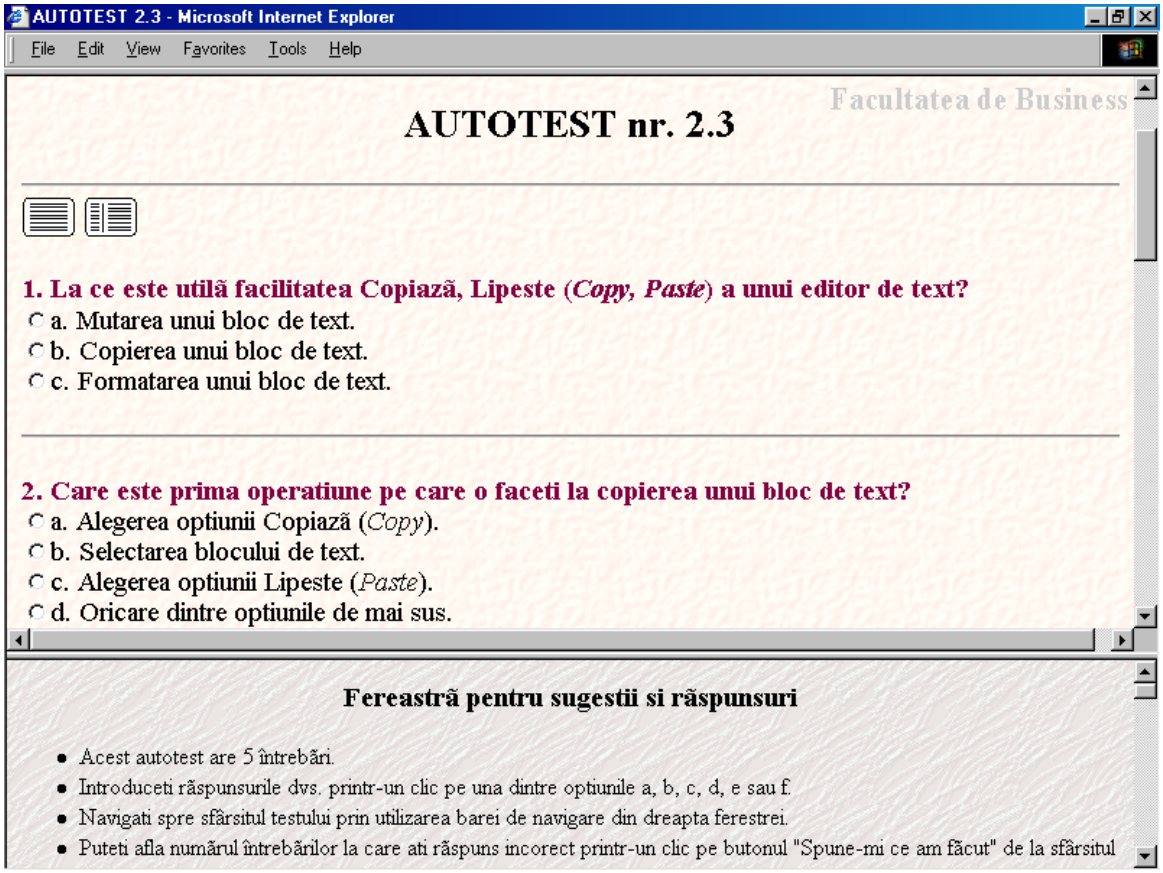

Fig.4. One type of tutorial's evaluation page

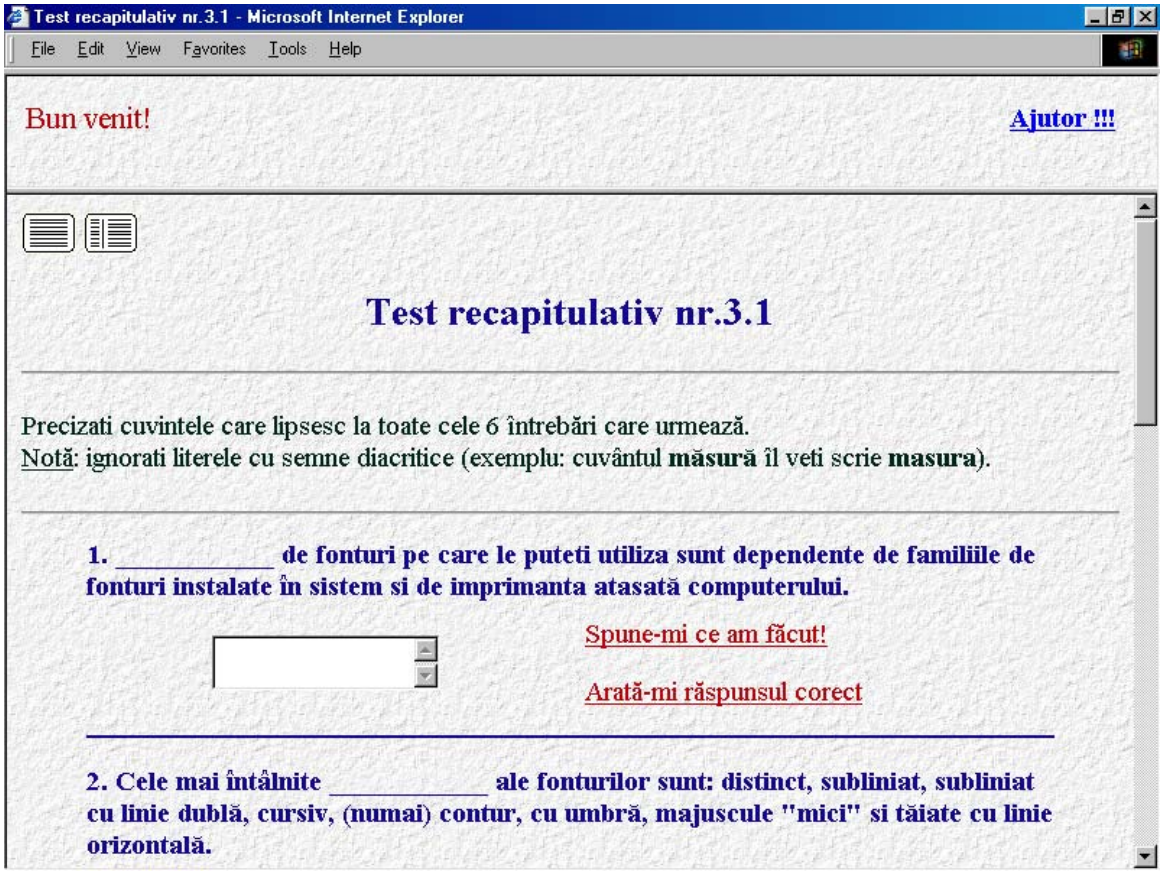

Fig.4. A second type of tutorial's evaluation page

Disadvantages of the tutorial:

- the pupils/students can access both the HTML and JavaScript codes and copy correct answers of the evaluation pages – this disadvantage can be eliminated if the program is installed on host servers (JavaScript codes are not accessible);
- due to the subject, the photo and audio techniques were not used.

Relational field

- the relation professor-pupil is simple because the study is interactive;
- when studied in group, the program determines discussions regarding the perception of the content and comments regarding solutions.

Results

- the results are positive and superior because students understand rapidly the concepts and the terminology;
- the pupils/students can work better with the tutorial and the applications (word processor and spreadsheet) because multitasking facility of the operation system;
- if concepts are forgotten it is no longer necessary to consult manuals – digital videos can be used instead.

CONCLUSIONS

The usage of computers in general and a Web-based tutorial in special determines a better understanding of many subjects. The development of information technology enabled computers to handle multimedia information (text, graphics, sound and video). Multimedia and Internet are realities and the globalization of communication offer hidden surprises.

The education through Web-based multimedia tutorials implemented in intranet/Internet is the most flexible. The instruction is focused on the pupil/student and traditional rigid methods are eliminated. The biggest part of the information goes rapidly towards pupil/student via computers or is stored on high capacity storage media.

The advantages of an Web-based tutorial implemented in intranet/Internet are:

- the integration of computers in education;
- the simplicity of the interface;
- temporal and geographic independence;
- it assures the core level for distance and life long learning;
- it increases the level of knowledge and the level of flexibility
- it is easy to update;
- it becomes platform independent;
- it increases offer/demand of educational materials.

Because there is no one single answer and no one has all the possible answers to solve the aspects of a Web-based tutorial, it is appreciated that on building such an educational program, the structure described in this article is limited to the example given. Any other structure similar to this one is to be adapted to the concrete subject, to take into consideration the resources (financial, hardware, software etc.) and integrated into the organization system with a specific existing culture. The support, the access, the performance, the security and the information presented in the tutorial is depending on organization policies.

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