

PRACTICAL STRATEGIES OF CREATING OF E-LEARNING TOOLS

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Abstract

The paper considers application of some basic principles in creating computer tutorials with the example of authoring of e-learning tools package to illustrate informatics studies. The package includes presentations, electronic laboratory operations manual, and also computer tests.

Keywords: E-learning tools, information technologies, didactic principles and recommendations.

1 INTRODUCTION AND PRELIMINARIES

Nowadays information technologies development has resulted in a wide spread of e-learning tools. Modern computer technologies considerably simplify training process due to more evident information representation. There is a necessity to supply each subject with e-learning tools.

If we mechanically renew traditional paper textbooks and education materials with the use of new technologies we will not considerably improve quality of training. In this case it makes sense to analyze classical didactic principles and if possible to apply some of them in the new field of creating e-learning tools.

Unlike many branches of knowledge the significance of scientific activity in pedagogy is defined not only by novelty and perspective of scientific ideas, but by their implementation in real pedagogical process (Komensky, 1982). Textbook creating is often an invincible obstacle that examines viability of pedagogic ideas.

We will demonstrate main principles of e-learning tools creating with the example of authoring of e-learning tools package to illustrate Microsoft Office Excel 2003 studies.

Before representing principles, we will briefly describe structure and purpose of e-learning tools package "Microsoft Office Excel 2003" developed by the authors.

The authors had to supply "Informatics" course with electronic e-learning tools. This course is studied on the 1th year of training.

The package consists of two independently used blocks, one is intended for students (the electronic textbook), and another only for instructors and includes examination test and number of electronic presentations with self-examination tests (Fig. 1).

Electronic textbook gives detailed material on "Microsoft Office Excel 2003". The material is divided into 3 main parts: theory, self-examination tests laboratory and works.

In turn theory covers such themes as addressing in Ms Excel, graphics and diagrams, autofilling, solution of equations.

The purpose of presentations is to illustrate lectures. Some presentations used independently are developed. To make presentations the popular program Microsoft Power Point was used.

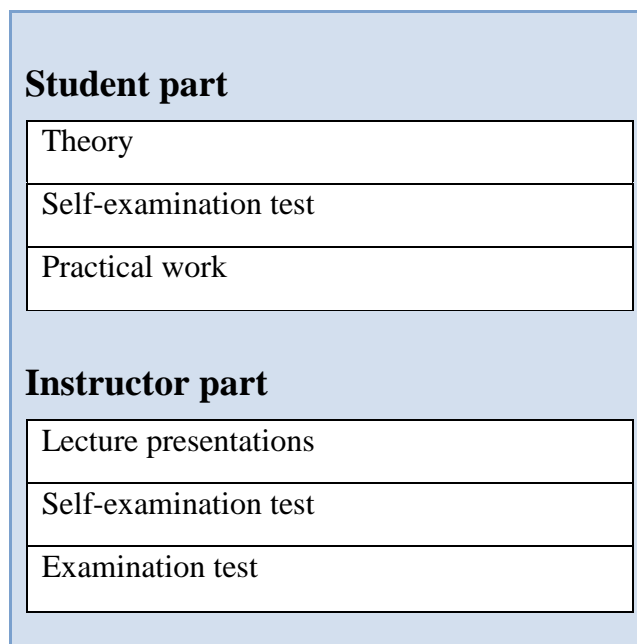


Figure 1: Structural arrangement of e-learning tools pack

Examination test is the test with random sample of questions from base. It can be used in examination, for example, as a forward estimate of knowledge in the given subject, facilitating examiner's work. This test can be used by instructor during intermediate control. Besides, the tests can be easily modified: one can add, delete questions and variants of answers; that is a big advantage of this knowledge checking tool.

All test questions are made according to the material presented in the electronic textbook. Random sample of questions allows if not to exclude but to reduce considerably the probability of cribbing, rewriting and opening ("breaking") the test. In other words, instructor gets the objective evaluation data.

HTML, Macromedia Flash MX 2004, Microsoft Power Point and JavaScript languages have been chosen as implementers.

But the purpose of this report is not advertising the product and its possibilities, but presentation the basic principles of creating modern e-learning tools with the example of the developed pack.

2 BASIC PRINCIPLES AND RECOMMENDATIONS

E-learning tools should be created, using the following basic principles and recommendations:

- visualisation;
- structural precision;
- edge;
- historicism.
- giving the user option of training speed;
- adapted interface.

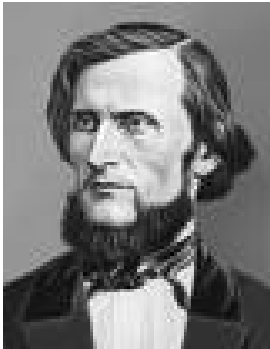
Let's examine each of these principles and recommendations.

The first and the most important is principle of visualization. Use of visualization in training is not just a wish, but an axiom. Not without reason Chinese say: “It is better to see once, than to hear hundred times (Seeing is believing)”.

This principle was the basic in the textbook of outstanding teacher J.A. Komensky «The World of Sensual Things in Pictures» (“Orbis sensualium pictus”) written as early as 1650-1654! (Komensky, 1982)

In XIX century father of Russian didactics K.D. Ushinsky wroted about visualization Table 1.

Table 1. Block quote of K.D. Ushinsky

<p><i>“.....It is important to present trainees such way of representation which would allow them to see a lot of subjects at once, and to watch them, without internal dividing. This method cannot be formed by means of language because language both written and spoken is subordinated to the sequence order. So it is useful to use maps and pictures, different schemes while teaching...”</i></p>	 K.D. Ushinsky
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According to known psychologist Dale Carnegie, “the main thing is the visual impression”. And this is because “the eye nerves going to a brain are twenty times as thick as ear ones” (Carnegie, 2004).

There are numerous schemes, photos, portraits of programmers in the pack developed by the authors (Fig. 2, 3).

Для ознакомления с техникой выполнения данного примера просмотрите ролик.

	A	B	C
1	Угол C	60	40
2	c	10	15
3			
4	Угол A	60	
5	Угол B	60	
6	a	=B2*SIN(B4)	
7	b	SIN(число)	
8	P		
9	S		
10	ha		
11	hb		
12	hc		
13			

(щелкните для просмотра в Excel примера 2)

Figure 1. Example of Web-page from the electronic textbook

ЭЛЕКТРОННОЕ ПОСОБИЕ
 ТАБЛИЧНЫЕ ПРОЦЕССОРЫ

В НАЧАЛО ИСТОРИЯ



5. В какой ячейке используется только смешанная адресация? (щелкните на правильной ячейке)

	A	B
1		
2	15	20
3		
4	=A2*B2	
5	=A\$2-B\$2	
6	=\$A\$2*B\$2	

Figure 3. Example of self-examination test

The principle of structural precision is very important to form information block, as information abundance in an unsystematized way complicates its understanding. The main thing is that all materials presented in the textbook or presentation should be interconnected. Block quotes is in Table 2.

Table 2. Block quotes about interconnected

	<p>“Father of Russian physiology” I.M. Setchenov, speaking about mnemonics, i.e. memorizing technique, confirmed that it was important</p> <p><i>«to stick together previous things with subsequent ones».</i></p>
<p>The similar thought on report construction was stated by known psychologist Dale Carnegie:</p> <p><i>«Ideally it is necessary to begin a new sentence with the last word or idea of your last phrase».</i></p>	

I.M. Setchenov

D. Carnegie

Thus, the infinite chain of words and thoughts will be created. All said above can be extended to creating e-learning tools. All said above can be extended to creating e-learning tools.

It is necessary to use the last words of the last phrase as the first words of the new one. Certainly, to connect all slides and Web-pages in such a way is difficult and not necessarily.

But, when the same idea connects some slides, it is probable to apply the following simple method. One can present a question at the end of one slide, and present the answer on it in the following slide; or answer this question in the headline of the next slide. As to Web-pages, such connectivity is the basis of hypertext technology.

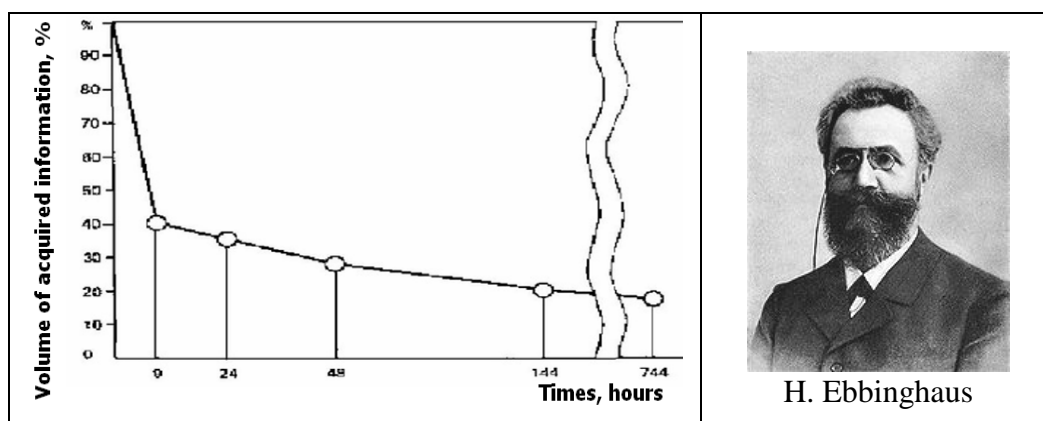
Structuring assumes short, succinct headlines. Besides, the law of structural precision demands to fill optimally each slides with training information. Too small information blocks attract and keep attention poorly; and do not provide its assimilating. Too large blocks can overtask student's mind. People badly react to situations that take a bit of doing to acquire, assimilate and memorize information (Sergeevicheva, 2002). In other words, there is a problem: to represent maximum information on minimum space.

Edge principle (or effect) assumes that information beginning or information end is better remembered. At the end of presentation (chapter) it is necessary to give resume (conclusions) in which to sum up the results, to briefly review main ideas.

Besides, it is necessary to consider, that information storage is connected with its loss. Forgetting is a rather complex and irregular process. For better memorizing it is necessary to repeat the studied material at once after one has read it. In this issue Russian teacher K.D. Ushinsky wrote in the middle of XIX century, that *«it is necessary to underpin a building when it still stands, instead of trying to repair it, when it has already ruined»*.

A little later in 1885 German psychologist Herman Ebbinghaus experimentally drew the curve (Ebbinghaus, 1885). It is interesting, that during the first hours after memorizing new material the curve drops as shown in Table 3. Volume of acquired information appears to decrease drastically from 100 to 36 % in the first 9 hours! In a month only 21 % of the studied material remains in the head.

Table 3. Result of work of H. Ebbinghaus



For better memorizing it is necessary to repeat the studied material at once after one has read it. As to training presentation or electronic textbook, probably, an optimum way to acquire material is to add self-examination test to make trainees review and memorize studied material.

The authors also took into consideration edge principle while making questions bank. In other words, there was a problem to focus attention to the material located in the middle of information block (presentation, paragraph, chapter, etc.).

For example, the part of the electronic textbook consists of seven paragraphs. Making test questions, we included in the questions bank one question to the material of the first and last paragraphs, two questions to the material of the second and sixth paragraphs and three questions to the third, fourth and fifth paragraphs (Pakshina, 2009). If the material is large, greater number of questions is made, specified above proportions are more or less kept. Making test questions, we included in the questions bank material in this proportion (see fig. 4)

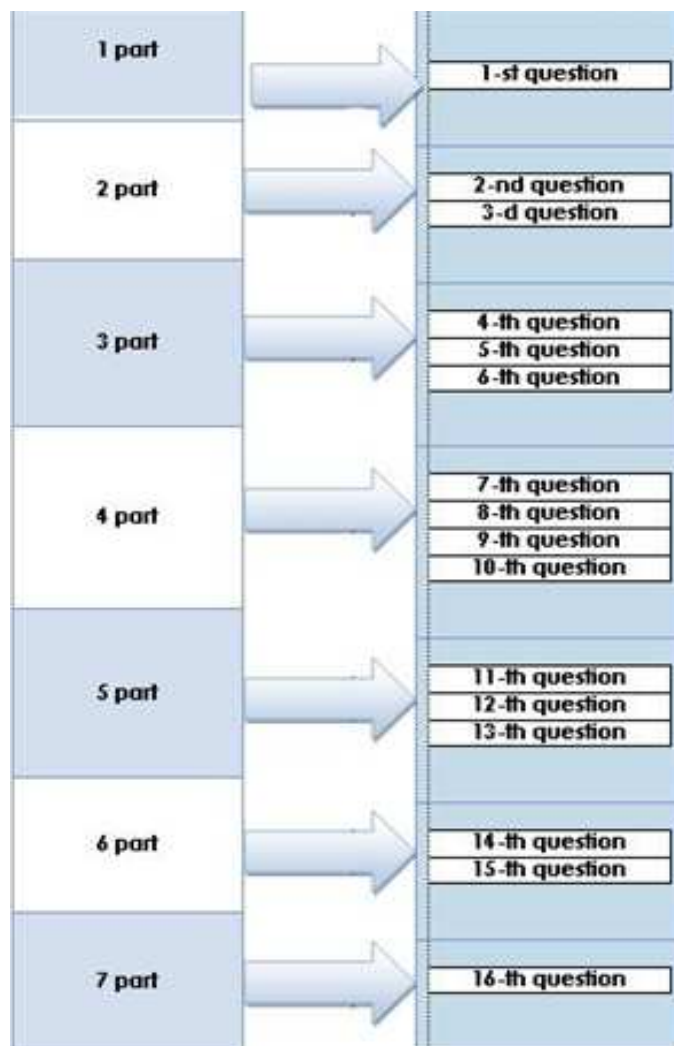


Figure 4: Principle of making question base

The majority of training systems give «a horizontal cut» of knowledge without time, but it is necessary to represent material both in connection with past, and with future. What for history in a basic course?

Including historical references to the given electronic textbook is not an end in itself. They are to intensify interest and motivation to study the subject, and also to broaden our students' outlook. Many important historical perspectives in the field of computer technologies are unknown to our students.

This idea is not new. Great educator Jan Amos Komensky (Comenius) wrote about it (tabl. 4)

Solely a modern science and technologies overstep “mechanical problems” and their history became richer. In our textbook there is historical matireal about such table processors as VisiCalc, Lotus-1,2,3, SuperCalc and others.

Table 4. Block quote of J.A. Komensky


<p><i>“..... The study of history of great discoveries should always accompany main occupation, as this is rather a pleasant feed for minds ...”</i></p>	 <p>J.A. Komensky</p>
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Figure 5. VisiCalc is first processor for electronic table

► Lotus-1-2-3

Митчелл Кэпор (Mitchell Kapor), потративший миллион долларов на рекламу системы Lotus 1-2-3.

Разработчик программного обеспечения - Митчелл Кэпор (Mitchell Kapor) и его программа Lotus 1-2-3 завоевала широкое признание, поскольку соединяла в себе лучшие качества системы VisiCalc с графическими возможностями и средствами информационного поиска

Figure 6. Web-page about Mitchell Kapor:

Except these principles, we will examine some recommendations, following which it is possible to make tutorials more effective. Text printed with vertical columns is better perceived, efficiency of information acquiring increases by 25 % in comparison with horizontal

lines. At the same time modern monitors increasingly get oblong shape. For this reason tables are used in the electronic textbook, all text and graphic information is located in the middle column, and side columns are used for decoration (Fig. 7). Besides, we've taken into consideration that all significant information is better perceived when located in the top left corner of page or slide.

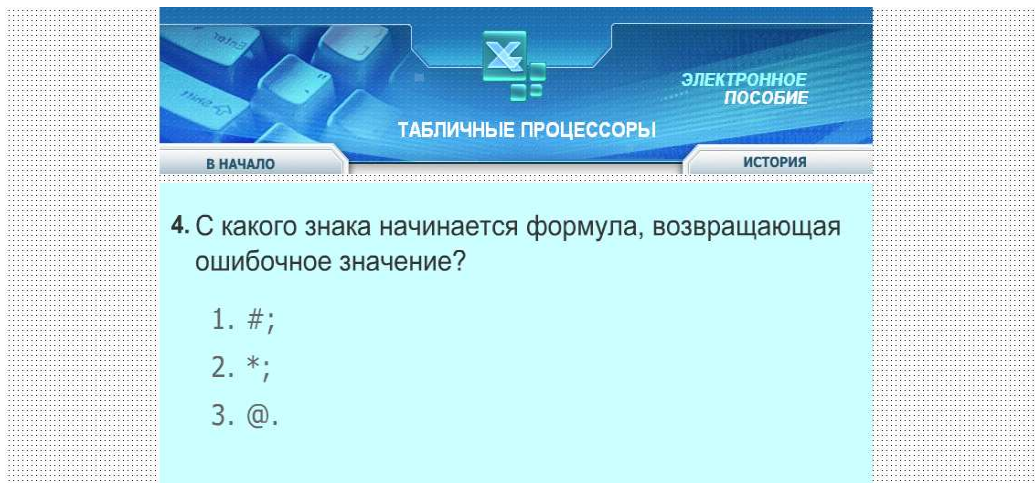


Figure 7. Test fragment

User (instructor or student) should have option to choose navigation speed working with the tutorial. Each person has individual perception speed.

It is necessary to avoid slide modes, try to navigate by mouse clicking, and also to minimize using effects of appearing and disappearing separate elements as the same effect can irritate some users because of slowness and others because of speed of appearance. Navigation by mouse clicking only is used in all presentations of the package.

Working out the design of the textbook, the test and presentations we considered not only recommendations of psychologists and experts in the field of ergonomics, but also colour preferences of students. To reveal these preferences we conducted in our institute the poll that confirmed the assumption of various colour perceptions by male and female students (Pakshina and Valov 2008).

Almost everywhere light tones are used as a background. The range of colours was chosen according to physiological peculiarities of colour perception.

3 THE RESULTS OF WORK

The executed work has allowed to reveal factors of intensification and optimization cognitive activity of students. As a result the e-learning tools package on "Microsoft Excel" has been created.

4 CONCLUSION

Observation of all requirements and recommendations undoubtedly promotes learning efficiency and information perception processes.

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