

SOFTWARE FOR CREATION OF ELECTRONIC MATERIALS

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Abstract. Educational institutions more often are using e-learning systems in the study process. Therefore, more and more students are offered learning materials in electronic format. Creation of Electronic Materials is mainly based on the knowledge of the Information technology (IT) teacher, and as a result e-learning material is usually published as presentation or PDF document. However, the e-learning environment allows the use of a much wider spectrum: HTML documents, video or audio materials, animations, etc. The research summarized software that can be used for development of electronic materials. The research offers recommendations of software selection for material development that are based on the most popular media elements: text, image, animation, audio and video. The given recommendations may be useful for teachers, who are not directly related to the IT field.

Keywords: e-learning, electronic materials, multimedia.

Introduction

Distance education and e-learning have become more popular around the world, including Latvia. Employees want to combine studies with work to achieve a higher degree of formal education or acquire new knowledge and skills. One of the most important elements in e-learning is electronic materials, therefore, it is necessary to pay more attention to development of these materials. Information in electronic materials should be presented in such a form and style so that students could understand it without the help of teachers. E-materials should be didactically planned, accessible and understandable materials furnished with multimedia and interactive elements for independent learning [1]. Visual appearance and form of electronic learning materials should support and motivate learning. In comparison with printed textbooks, electronic learning materials can be used for all the benefits of Information technology (IT), this means that without textual parts there can be also included audio, video, animations, computer simulations etc. [2; 3]. But creation of such content requires additional technical knowledge from the teacher – technology and media-related skills. In order to create materials with high quality, it is preferable to work in a team and use the software engineering approach, use methods [4], which divide development of electronic learning materials into phases and divide tasks between professionals of the team. In this way multidisciplinary competence is divided between various team members: project manager, learning coordinator, teacher, multimedia technician, and graphic designer [4; 5]. However, this raises the cost of the development process for electronic learning materials and education institutions do not have enough budget funds for it.

Electronic learning environment allows students to use more efficient and interesting lesson content and electronic materials, which are enriched with multimedia elements. When integrating media elements with each other, it is important not to overburden the student's memory with the created material [6]. Further we look at popular media elements that are used in online learning environments.

1. Text

Text is the most important element of the content presentation. Text can be displayed in any format, such as books, posters, chalk/white board, computer screen and many more [7]. It is also the easiest way of publishing e-learning material, and it is mainly used in the PDF file format. In this way the users can read the text on the screen or print it if they want to read it in printed form. Each of the options is better suited to some specific technologies and study conditions.

2. Images

Image addition is one of the easiest ways to enrich the provided information. Digital images – picture, which has been obtained with a digital camera, a scanner, can be found in the storage media such as CD-ROM or the WEB. Images attract attention and promote understanding of the given content. In addition, digital images have more advantages than printed materials, such as the ability to view the image in full range of colors. Images include illustrations, pictures, charts and icons. Images

may range from photographs of real objects, to schematic representation of the object. The graphic can serve a variety of purposes [8; 9]:

- decoration – to emphasize the content or add aesthetic appeal or humor;
- illustration – to represent an object in the real form, to create an idea of the described text;
- structuring – to visualize the structure, such as, map of thoughts;
- relations – to show the quantitative relationship between two or more variables, such as pie charts and line charts;
- interpretation – to illustrate the theory or cause-effect relationships;
- mnemonic function – to transfer the nuances of the actual information to the memory.

3. Animation

Animations can show phases or transformation of procedures. It is used to show changes of objects in time and space. It is a special form of video, because it does not show reality, but mainly illustrates abstract and complex processes, such as chemical or physical.

4. Audio

Audio includes anything you can hear, such as a person's voice, music, mechanical sounds, noise, and many more [7]. Audio can be used as a separate file, for example, in foreign language learning, or in combination with the text on the screen, in order to gather and expand key points, as well as a video component. Audio narration is more effective than printed text, providing comments on the static image, animation or video. Audio is being divided into two types: speech and music. Simple audio files (speech texts) are more appropriate to use, when it is necessary to repeat it so that the information would be more memorable. In addition, the speed of audio playback can be individually varied and adjusted to personal needs. However, the content must not be just an audio format, it should always be accompanied with a text file, because there is evidence that by only listening to text students learn it badly. Experiencing similar content from different sensory channels can encourage memory [6].

5. Video

Video is a media that allows to reproduce behavior, processes or procedures as they take place in real life. Recording of a lecture, taken with a video camera is the easiest way to obtain video of the lectures, but this type of videos has little of positive effects. This type of material makes it possible for students to repeat the lecture or listen to the missed lecture. In many cases, video can be a lot more effective than graphic material or animation. Video material includes other media: images, text and audio. Video is particularly suitable for presenting the knowledge of an expert to a wider audience, for example, appearance of a guest lecturer or for marketing. Video has an effect on two human sensory channels – auditory and visual.

The aim of this research was to examine and summarize the software that can be used for creation of electronic learning materials. To achieve the objective different types of software were analysed, based on the most popular media elements: text, image, audio and video.

Materials and methods

Monographic method has been used in this research. The information was gathered from electronic databases and printed publications, which were published in Latvia and Europe. The study analyzes the literature of the period from 2005 to 2013. Wide spectrum of scientific literature was covered on studies carried out in connection with the use of the media elements in distance learning, including e-learning handbook and guidelines for developing training material, published in Germany, Sweden, New York. Also – gathering of the more commonly used software in processing of the multimedia elements, based on the autor's last fifteen years of practical experience also and those of similar nature studies.

Results and discussion

In order to create textual electronic materials, it is sufficient of a text processing program such as *Microsoft (MS) Word*, but to include multimedia components it requires additional software, such as

Adobe Photoshop raster graphics to edit images or digital photos. For vector-based image processing – drawing and various custom graphics design *Corel Draw*, *Macromedia Freehand* and *Adobe Illustrator* can be used. For audio file editing such sound editing tools like *Sonic Sound Forge* can be used, which can cut or add part of audio fragment. Popular video editing software is *Adobe Premiere*. Electronic learning environment also allows using online tools and services. More and more teaching staff not only publish their lectures and presentations in PDF format, but also start thinking about adding multimedia elements to the material or creating interactive material, such as video lectures. It gives a question – which software to use? During the research potential software were examined that could be used in creating materials based on multimedia elements.

Text. One of the most popular software is a text editor *MS Word (Microsoft Office)* or *Open Office Writer (Open Office)*. When writing materials, it is important to use software offered possibilities, such as formatting, heading styles, navigation etc. [8].

Recommendations for the use of text:

- use bulleted lists or spaces to separate objects or focus on them;
- use the word and line spacing to improve the readability of the text [10];
- think about the text readability and clarity (use familiar words, create short sentences, do not use unnecessary phrases, etc.);
- use a single style, for example, italic is always used for the same purpose.

There is often found a situation where the teaching staff has already course materials in text format, such as *MS Word* files, and wondering – how can they be transferred to web site? In this situation there are four options:

1. Make it available as downloadable files;
2. Convert it to PDF format and make it available as downloadable files;
3. Copy it into WEB page;
4. Restructure it and create it as an HTML document [11].

The second option is more advantageous – PDF type files cannot be edited, they can be protected against copying, it always looks the same as the original file, that is, it does not depend on the user's computer fonts. If in the past PDF document protection was the benefits of *Adobe Acrobat* software, then now it can be achieved with a variety of free software, such as *PDFCreator*. With this software it is possible to forbid printing and copying the text. The third option is to separate text into fragments and copy them to WEB page. This approach is very attractive in terms of speed and little effort, but the quality of the material is low. The best solution and also the most time-consuming is restructuring of the material in the WEB page. Comfortable use of the material can be extended when using some additional features that are not always possible in printed texts:

- hyperlinks, both internal that allows to navigate to the needed text section, and external that allows to switch to other WEB sites;
- dictionary and help functions – if the reader does not understand a word, he can find the explanation or receive the necessary assistance.

Images. Creating images in graphic editor without previous experience is quite difficult, and learning of the software may take a long time. In addition, you need to have basic knowledge of technical drawing. The simplest images can be taken from *MS Office Clip Art* collection. There is also a huge amount of images on the Internet, but you have to be careful about copyright restrictions.

Images are usually edited in one of editing software. Raster graphics images are supported by almost all graphic software (programs designed for raster graphics are known as image editors). Usually they are used to make minor adjustments in the digital images or photos. With this kind of images it is impossible to manipulate with the objects, images are spacious and rapidly lose their quality when enlarged [12]. Most popular file formats: BMP, XCF, TIFF, GIF etc. Vector images, that is, engineering graphic drawings, topological maps can be created and edited only with specific software, and such is *Corel Draw* (software designed for vector graphics called vector graphics editors). Here you can manipulate with different types of objects, and the image can be resized without loss of its quality. Most popular file formats of vector graphics: SVG, CDR, AI. Screenshot images – image of all visible monitor screen, active window of software, or just a part of the active window. For

this type of image creation you can use the keyboard key [Print Screen] and *Snagit*, *HyperSnap*. If you need any additional editing, then it can be done in a raster graphics editing software.

Quality of the image affects the file size – the higher the resolution, the larger amount of data. JPG format image takes the least amount of data (for example, image with 640 x 480 pixels in BMP format takes up to 300 KB, JPG format – only 30 KB).

Recommendations for the use of graphics:

- try to avoid using graphics that have no real features for editing the textual information;
- in creating a real context, which suggests thinking of real-life situations, use digitalized photographs;
- use charts to help students perceive large amounts of verbal information;
- make sure that charts, graphics and screenshot images correspond to their descriptions.

Animation. Creation of animation is mostly carried out with *Adobe Flash* (from 2016, the new name is *Adobe Animate CC*) software. For a long time SWF file format was popular, but since not all web browsers support this format, it gradually loses its role.

Recommendations [13] for the use of animation:

- let students concentrate on one object at the time [14];
- use arrows to guide the attention on selected details or the direction;
- long or complex animation must be divided into fragments, allowing students to access each fragment and play it at needed pace (for example, by adding a button [Play] and [Stop]);
- limit the effects of animation and use of text, because they do not have use in learning.

Audio. Simple narration recording or record of lectures in learning materials is offered rarely. It also must be noted that not for all students learning materials are acceptable in audio format, but it is preferable to offer because there are students who will be happy to listen to these files being on the road. Modern computers are able to ensure that the audio can be recorded directly to a computer hard disk using the built-in sound card and software. Sound effects can be created by using a small part of a larger sound file, you can combine different sounds, create background music or sound effect that is part of the sound assembly process. Audio files are usually in MP3, WMA and WAV formats. The file size is affected by the bite rate and frequency.

Recommendations for the use of audio:

- use short audio files, preferable 7-15 minutes long files [13];
- use audio to improve visual elements on the screen, for example, during a demonstration to explain steps of animation;
- avoid unnecessary audio, that is, do not play the text that is displayed on the screen, but combine audio narration with a text summary [14];
- avoid unnecessary background music and sounds, ambient noise can distract the students' an lead to memory overload [9].

Video. To get a good quality training video material is much more difficult. Video files are usually in one of the video formats AVI, MPG, WMV and MOV. The length of the video and the level of compression affect the file size.

Recommendations for the use of video:

- video always must be accompanied by the comments that appear in written text or audio narration;
- if you have a limited network speed, it is better to replace video with images;
- desired video file length should be 7 minutes, but no more than 15 minutes [13];
- avoid that only teaching staff speaks.

Screen recording software is used to demonstrate features of other software, to create training videos or to record a sequence of actions. Free web-based tool *Screenr* can be used for small video, which shows you the recorded information on the monitor screen. The recorded material can be saved on the computer and published on the Internet.

The usage of multimedia software in the courseware contents is summarized in Table 1.

Table 1

A summary of media elements and multimedia software

Elements	Software examples			Comments
	freeware license	trialware license	commercial license	
Text	<i>Open Office Writer</i>	<i>Microsoft Word</i>		Despite the fact that <i>MS Office</i> programs are expensive, they are most frequently used.
Graphics drawings	<i>Open Office Draw, Inkscape</i>	<i>Adobe Illustrator</i>	<i>CorelDRAW</i>	Software for creating the drawn illustrations is complex and requires basic knowledge of graphic design and technical graphics. Usually <i>CorelDRAW</i> or <i>Adobe Illustrator</i> are being used in professional work.
Photographs and other images	<i>Gimp</i>	<i>Adobe Photoshop, Adobe PhotoDeluxe, Photoshop Elements, MS Paint, MS Office Picture Manager</i>	<i>Corel PhotoPaint</i>	Software for image editing takes time to become an expert. For elementary corrections you can use <i>MS Paint</i> or <i>MS Office Picture Manager</i> . You can also use the software that comes with the digital camera, but you need to make sure for compatibility with a computer.
Audio	<i>Soundation Studio</i> (web-based tool)	<i>Sound Recorder, Adobe Soundbooth, Adobe Audition</i>	<i>Soundforge</i>	For simple sound fragment editing and mixing you can use <i>Sound Recorder</i> . Sound editing software is complex and is not often used in learning material development.
Animation	<i>Animagic Gif Animator, Ulead GIF Animator</i>	<i>Adobe After Effects, Adobe Animate CC</i>		Any sort of animation requires good knowledge of graphic design and animation principles.
Video	<i>Windows Movie Maker</i>	<i>Adobe Premiere Elements</i>	<i>Movie Studio, Pinnacle Studio</i>	The simplest and intuitively more understandable program is <i>Windows Movie Maker</i> .
	<i>Freez Screen Video Capture, Screenr</i> (web-based tool)	<i>BB FlashBack</i>	<i>BSR Screen Recorder</i>	Screen recording software is intuitively easy to use, but requires large computer resources

Technical requirements. Most of the requirements are fitted by the environment of material realization itself. If the study material is created in the learning platform, for example Moodle, then it has all web-based environmental requirements. One of the most important requirements is the file size, because all media files first need to be downloaded, and only then opened. Objects that are created in the Moodle, for example, web pages, are small-sized and operate effectively on the web. However, other types of resources – files (PDF, images, audio files, etc.) can differ in size. It should be noted that the students can access the e-course also from places with a slower Internet connection speed. Reducing the uploaded file size, it decreases the usage of the server and the communication channel. It is recommended to reduced the image size to an optimal (recommended is 640 x 480 pixels). This can be done with *MS Office Picture Manager* software. Also the size of *MS PowerPoint* presentation can

be reduced if it contains correctly reduced image size. This can easily be done by selecting the feature *Compress Pictures*. It should be noted that e-learning environment only publishes the files, it does not provide opening of it.

With the development of IT technology, e-environment is able to use the web-based online tools, such as *Google Presentations*, *Prezi.com* and *Slideshare*. Prezi is a modern and latest generation presentation tool, which offers to operate on single "work sheets," where the user can place images, text and video files, then create the order of appearance of these elements. The presentation can be stored and shown in offline mode, which reduces the direct dependence on the Internet.

Conclusions

1. With the development of the IT technology, the demand for electronic learning materials in the near future will only grow.
2. It is recommended the IT knowledge of the teacher to a level, so that the electronic learning materials could be created with multimedia elements.
3. Usable software can be grouped by the types of multimedia elements (text, image, audio, video editing software) and has a sufficiently wide choice.
4. Minimal software set is *MS Word*, *MS Office Picture Manager*, *Sound Recorder* and *Windows Movie Maker*.

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