

Journal of Contemporary Medical Education

available at www.scopemed.org

Original Research

Rapid multimedia content development in medical education

Alaattin Parlakkilic¹ and Yildirim Karšlioglu²

¹Department of Medical Informatics, ²Department of Pathology, Gülhane Military Medical Academy, Ankara, TURKEY

Received: June 26, 2013

Accepted: August 05, 2013

Published Online: November 30, 2013

DOI: 10.5455/jcme.20130805071707

Corresponding Author:

Yildirim Karšlioglu,
Department of Pathology, Gülhane
Military Medical Academy, Ankara,
Turkey
ykaršlioglu@gata.edu.tr

Keywords: Rapid e-learning, Rapid multimedia in medical education, Video content production.

ABSTRACT

The development of multimedia e-learning content has been labor intensive process, requiring a team of web designers and developers responsible for the technical development of these resources, thereby limiting its widespread adoption. Recent advances in technology have made delivering multimedia content easy. Building a rapid development environment suitable for medical training is challenging. However, now it is possible for instructors to develop multimedia content and to publish on the web with minimal technical skills and assistance with rapid multimedia development as in Rapid eLearning Authoring and Development. This paper presents how to produce and use video based multimedia instruction materials into a rapid e-learning course by pruning storyboarding step in ADDIE (Analysis, Design, Development, Implementation, Evaluation). Rapid multimedia content development method needs less effort than traditional e-learning course development. Thus it is possible to develop high quality, and educationally effective materials in short time.

© 2013 GESDAV

INTRODUCTION

The Internet is increasingly becoming a platform for the publication and delivery of educational resources. The development of multimedia content has been a labour-intensive process, time consuming, requiring a professional team of web designers and developers responsible for the technical development. But, it is now possible for instructors to use tools that are easy to use and rapid to develop multimedia rich e-learning content and to publish on the web with minimal technical skills and assistance [1].

In medical education, if there is no perceptual knowledge-based, students can only be on paper. Multimedia teaching can provide perceptual knowledge and it can be the actual specimens of information; in the mechanism for teaching complex, difficult, and experimentally high cost courses [2]. With rapid development of multimedia learning materials combined with effective use of the Rapid eLearning Authoring and Development (RELAD) is possible to

create multimedia course materials and content effectively in short time [3]. In this study it is aimed to construct and deliver multimedia content easily and effectively by teachers and course assistants.

LEARNING WITH MULTIMEDIA

Multimedia based learning, Multimedia Learning Theory, proposed by Mayer, can be used to design material to optimize learning with a combination of auditory and visual, words and images to minimize cognitive load and maximize learning in terms of retention and transfer of knowledge. Mayer delineates three views of “multimedia” for learning:

- In terms of the medium of delivery,
- In terms of its presentation modes,
- In terms of the sensory modalities used to process the material.

The delivery media is obviously “technology-centered” rather than human-centered. The latter two views are “human” or “learner-centered”. The presentation modes and sensory modalities are based in cognitive theory on how people learn and what drives the design. These two views take a constructivist learning ideology, i.e. that knowledge is actively constructed rather than transmitted and passively acquired. Mayer’s cognitive theory specifically ascribes to a “Dual Channel Assumption” basically assumes that humans have separate information processing channels for verbal and pictorial information. Mayer also brings up theory of cognitive load that includes understanding cognitive limitations and the optimal load for processing information [4].

It is known that actively engaging rather than passively taking information is more effective. Educational studies have shown that with the use of multimedia the retention rate can reach as high as 75%. Multimedia courseware on the web allows the user to obtain cross-references directly and to control pace of learning for optimizing classroom time [5].

In multimedia learning, learner control shows number of positive gains, such as motivation, increased self-determination and knowledge gain. Learners can navigate the contents and select what they want to learn and plan their own learning experience. Animations and sounds reinforce the text and make it clearer for the learner to visualize the concepts more than in a book.

RAPID DEVELOPMENT

Rapid development depends on quicker system development by using rapid authoring tools. Overall timescale gets compressed and lessened by reducing and pruning useless steps and the timescales on each development phase. ADDIE can be used and applied to develop rapid e-learning. But this implementation and its outcomes are very early to say if it’s the optimum and useful approach for rapid e-learning design [6].

There are some weaknesses of ADDIE in order to use for rapid development. After the Analysis and Design steps, a storyboard must be produced. The Development step will then construct assets and compose them into sharable content objects and lessons as specified in the storyboard. Thereafter, it will be followed by the Implementation and Evaluation steps. Here it can be late to discover that the final e-learning has not met the user expectations. Then, a lot of rework is necessary to correct the content. Otherwise, it would be impossible to deliver the lessons as demanded by the users. Consequently, most of the e-learning projects

would result in project cost overrun and delay. To remedy this situation, a new development life cycle paradigm was proposed by Punyabukkana et al. [7]. This development life cycle is known as Rapid eLearning Authoring and Development (RELAD) as shown in Figure 1.

ADDIE in Figure 2 consists of Analysis, Design, Development, Implementation, and Evaluation. The production of the storyboard is in the design step so as the development step can be carried out. In RELAD, no storyboard is to be produced. Process would entail joint-user and in-class explained course materials development by which content is segmented and fed into e-learning authoring tool as segmented text frames. Then the instructional designer will work with user to specify the engaging elements, the creative presentation, the composition of objectives and the authoring of assessments. The authoring and development processes are well integrated, and the e-learning frames will be used as the storyboard with live presentation. RELAD improve the production time by eliminating storyboard and replacing the production model with live-interactivity and real digital assets. The production meet the user expectation since it is joint-user and in-class explained course materials development.

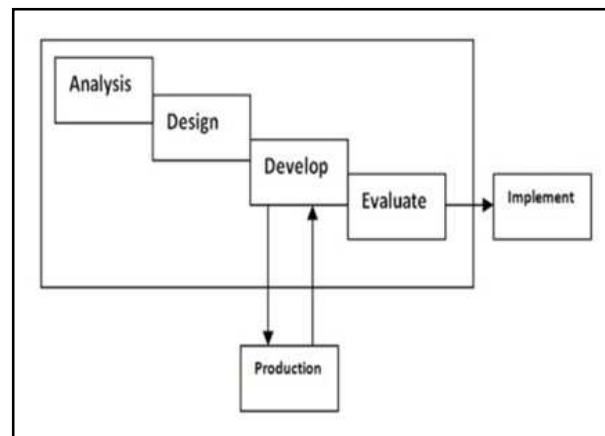


Figure 1. The Rapid eLearning Authoring and Development (RELAD) Model

In rapid development the discussion is on the facts and the results which are more important than theories and prejudices against technologies. A shared understanding among the professionals should be made to build trust and to avoid following two pitfalls [8].

- The 'quick and dirty' effect,
- The non-fast prototyping case.

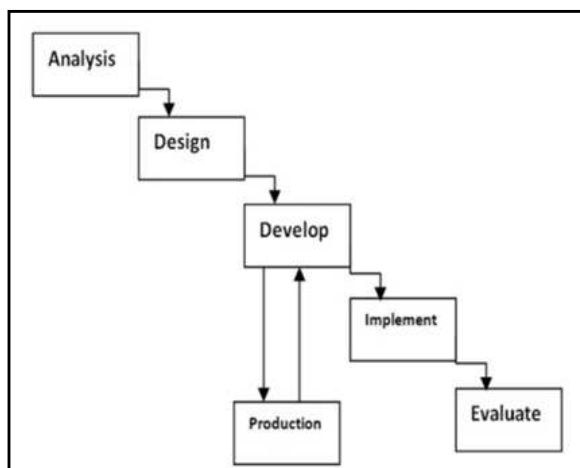


Figure 2. The Analysis, Design, Development, Implementation, Evaluation (ADDIE) Model

MULTIMEDIA FOR RAPID DEVELOPMENT

Multimedia generally refers to the integration of text, graphics, audio, video and animation. In Internet environment, Web browsers can display multimedia content in three ways:

- Native, inline-display media directly on the web page without any programs or viewers.
- Helper applications –download multimedia content to hard disk and then display in player application,
- Inline with external code modules -the external "mini-programs" enable to play back content directly on the web page [9].

A multimedia development combines different media elements-images, sounds, text and animation into a coherent project in which the user explore. The presentation tools for multimedia development can be divided into three categories.

- Slide Presentation Environments
- Interactive Presentation Environments
- Authoring Environments.

In this study authoring is the most worked environment. Authoring can be described as creating interactive applications in which the information can flow from application to user and from user to application. With multimedia authoring tools, audio and video applications can be created with very little expertise [10].

Rapid multimedia popularity is due to increase in the demand for video. It is important to have a basic understanding of the different video formats, frame rates, streaming, and how to get the best quality for

web delivery. The goals for the video based multimedia presentation are as follows:

- The video presentations should give the student an oral presentation of the entire content,
- The video presentations should give a closer relation to a human being behind the e-learning material,
- The video presentations should make it easier for the teacher to point out clearly important parts of the learning material, and emphasis core issues,
- The students should be able to go through the material with their own paces [11].

Regarding the video presentations, Riley stated some amendments and thoughts of new pedagogical approaches while converting lecture materials for e-learning course. These are:

- Keep projects small – no more than a single learning goal. If necessary break lectures down into a number of separate packages,
- Give the learners the greatest level of control possible of their interface,
- Introduce interactivity, even very simple interactivity wherever possible.
- Include web links and resource links,
- Consider including self assessment elements and align to learning materials [12].

Web Multimedia Enhancements

The web is increasingly becoming the standard platform for the publication and delivery of educational resources. It is now possible for instructors to use tools that they are already familiar with and needs minimal technical assistance [13].

Probably the easiest way to create multimedia rich web pages is using Flash. Flash files are linked to HTML pages and look to be an integrated part of the web page. Flash movies are actually running in their own little 'sandbox' that are very separate from the web page. If the only need is to listen to or to see some audio or video clips, and no interaction between the video and the audio with the rest of the page/presentation, then simply flash files can be used. For straight 2D animations, sound and video interact with each other in web delivered Flash multimedia presentations. If interactive 3D environments or objects are required then tools like Macromedia's Director can be used [14].

HTML5, JavaScript and CSS can be used in web dynamically. The problem with HTML5 based animations is that it needs some technical knowledge to create and to program. On the other side there is no

question that PowerPoint is the easiest way to go when it comes to creating slide shows with simple transitions and some video and audio elements. PowerPoint is widely used and readily accepted by most audiences very quickly [14]. Although PowerPoint is a powerful authoring tool, it is lacking the publishing capabilities needed to produce e-learning content for online delivery. Articulate Presenter is a PowerPoint plug-in that provides these features in an easy-to-use manner. It is seamlessly integrated with PowerPoint, allowing users to easily enhance their presentations with audio and multimedia and to publish them to the web [13].

Streaming can be used for continuous delivery of time-based media, such as video, audio and animation in a client machine in real-time. Before viewing the content the user doesn't have to wait for the file to be completely downloaded. The remaining portion of the file is downloaded from the server in the background while the media plays on the client machine. Internet data is packet-based, which means it is sent asynchronously in discontinuous chunks. The system can't know when each discrete chunk of material will arrive at its destination; each chunk will bounce around the Internet looking for the best path until it finds the right one. This is why there are sometimes slow connections and gaps during playback. To avoid this, a dedicated file server can be used to implement continuous playback [9].

Plug-ins are ways to extend the capability of web browsers so that they can view a wider variety of file types. The capability of a plug-in and a helper application may be the same, but a plug-in will display a non-HTML document within the main window of the web browser. With the proper plug-ins, a web browser can directly display QuickTime or RealPlayer movies, PDF documents, animations, 3D molecules, and even interactive Java applications or games. Plug-ins are usually distributed for free by the software developers [15].

Podcasting is an automated way to distribute audio and video files on the web which can then be played on user's computers or portable devices. Although there has been a lot of hype over podcasting, the format has two main benefits for the learner.

- Subscription: learners can subscribe to podcasts so that they can instantly be updated when additions or changes to the content occur,
- Portability: Podcasts can be played on a computer or transferred to a portable device so that material can be reviewed regardless of time and location [13].

As digital equipment becomes smaller and more portable there is an increasing integration between

traditionally computer based technologies and mobile communication devices.

M-learning (mobile learning) is supported by a growing trend for medical students and young doctors around the world to purchase the latest mobile smart phones or PDA's for use in a hospital or clinical environment where bulky laptops are not practical and where wireless networks are available. Generation Y (known as the *Millennial Generation*) students are highly knowledgeable about these technologies and are adopting mobile technology and new software applications that are quick, easy-to-use and medically relevant for practicing medicine in a hospital environment where students, doctors and patients are constantly on the move. Tomorrow's doctors will need to be aware of and familiar with using a wider range of such devices, particularly when working in rural or remote areas of the world [16].

METHODS

In our study the multimedia course content was prepared as videos by recording presentations while teacher was giving the regular course in Pathology laboratory. For this purpose a system was established like in Figure 3. The teacher lectures and at the same times a microscope with camera transfers and save videos with sound to the server. After recording the course on the server, the videos are edited, useless parts are pruned, timescales are given and the file is converted to available formats to be published on the web. Here while giving the course there is no special storyboard prepared in advance.

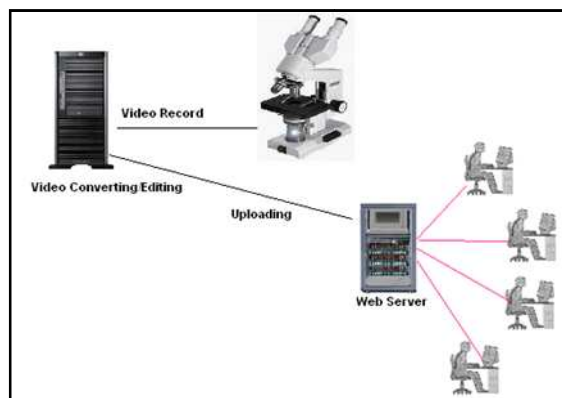


Figure 3. Course recording and delivering system.

The steps for multimedia content creation and publishing on the web can be described as follows:

- *Video Recording:* For Pathology course a computer connected to microscope can record with CamStudio. CamStudio (Freeware/

Windows) is able to record all screen and audio activity on your computer and create industry-standard AVI video files and using its built-in SWF Producer can turn those AVIs into lean, mean, bandwidth-friendly Streaming Flash videos (SWFs).

- **Video Editing and Converting:** In this phase the raw video material were edited in order to produce the main course video material. The first task is to put the individual clips together on the timeline. The next procedure is usually to erase the material that contains mistakes or unwanted parts. At this phase iMovie was used as a free editing program to give timeline, polishing and burning images for recorded videos. This easy-to-use yet powerful video editing and disc authoring software is aimed at the consumer who wants a

simple way to get videos and pictures off a camera, do some editing to polish it, and burn it onto a disc that will play well and look good. It is very important to consider the added value of the different effects before using for video multimedia products. But editing process can be quite time consuming if too many effects are used.

- **Uploading to Web Server:** After editing and converting it is required to make it available to publish course videos on Web page. Thereafter, prepared course video contents were uploaded to a web server on which web course page was resided. Each course module after editing and pruning was between 10 and 20 minutes. Then course videos were linked to related course modules and offered to students to use. It would be a great help to make the handouts for the video presentation available for downloading in the same web course page.

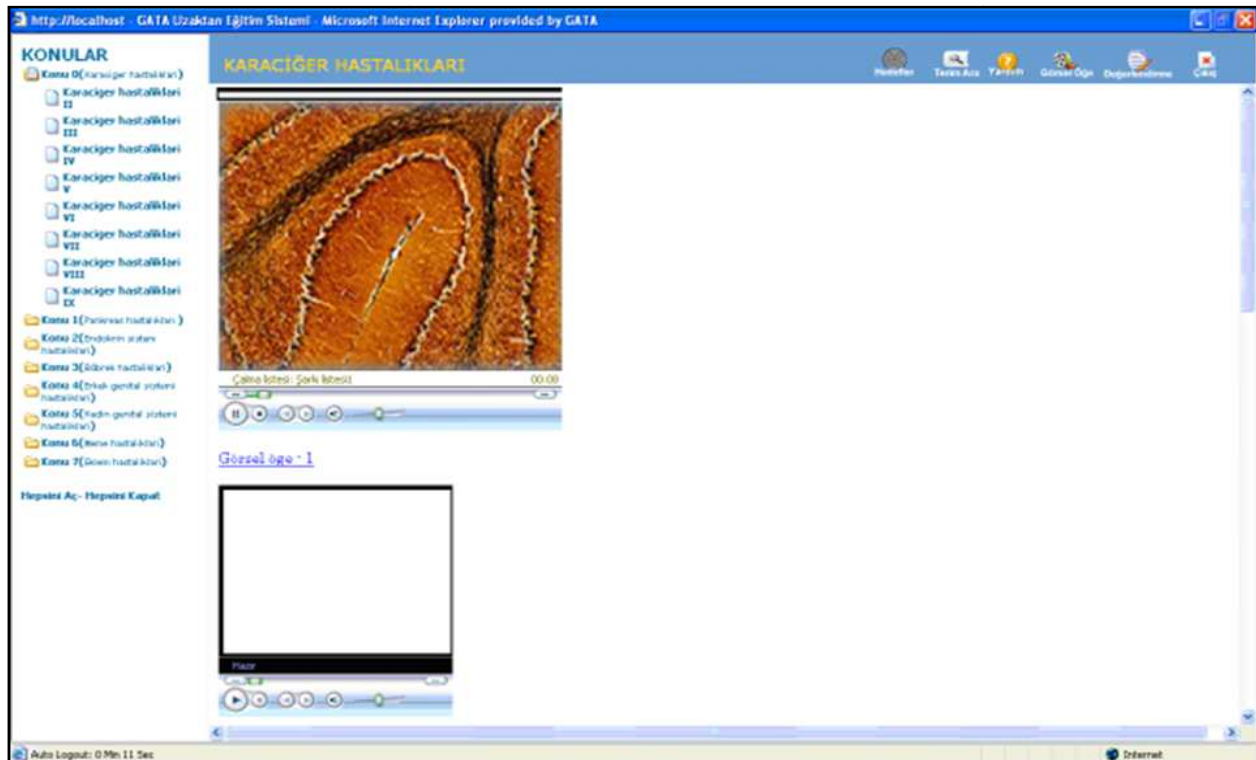


Figure 4. Example of video presentation course web page

RESULTS AND DISCUSSION

The course was offered in internet and every student could access by his/her login name and password. After login to course, students can select any module to review from anywhere by any internet connected computer. In Figure 4 the course web page is shown. On left side menu there are modules and on right side pane there are related video content of the course.

The course was consisted of eight modules and the period was 12 weeks. The course was taken by 112 students. In this study three points were important; first one was rapid multimedia course material production, the second one was utilizing of the course by students and the third one was student opinions about the using the system.

Rapid multimedia course material production: While developing multimedia course material no storyboard was produced. After setting up the system teacher gave his course and at the same time it was recorded. Then the assistant (the assistant was capable of doing multimedia basic works) performed editing, pruning and timing of video material. After development of the material it was uploaded to web server for use. The authoring and development processes were well integrated and the production were replaced with live-interactivity and real digital assets. The production met the user expectation since it was joint-user development.

Utilizing of the course: The course was taken by 112 students of Pathology course. While analyzing course usage it was seen that;

- The students had not review all modules from beginning to end,
- The students had reviewed modules' even parts which they couldn't understand well,
- Average time for reviewing for each student was 12 minutes per module.

Student opinions about course and videos : In order to get students' opinions an interview was made. Student opinions were as follows:

Access and using the system easily: All of the students said it is easy to access and using the system does not need any training.

The performance and response time of the course platform: The system was working with average speed and moderate but the students said that they faced with uploading and downloading problems during rush hours.

Adequacy of content and materials in course platform: The students said that the course materials were enough and thus asking questions and time consuming processes such as mail, asking to experts were no more used.

Course review: Students said that they could review on their own peace, from anywhere and at any time. Before examinations it was a good asset to study.

CONCLUSION

The use of multimedia based teaching material enhances students learning and increase productivity. It is therefore important for faculty, not only understand the concepts behind the development of multimedia but to also have a good grasp of how to implement some of the processes involved with courseware production. Rapid eLearning Authoring and Development

(RELAD) was implemented and it was seen that it was applicable. We have pruned unnecessary steps in development process and did not use storyboarding, instead teachers used their due course class notes while giving the course and all were recorded during classes as videos. Authoring and development processes were well integrated in production process. We have seen that video based course content was effective for students and students were glad about using this system. Students used and reviewed course contents effectively in a constructivist learning environment according to their self understandings.

REFERENCES

1. Mikalsen AB, Klafstad B, Horgen SA, Hjeltne T. An integrated multimedia e-learning model for vocational training. Proc 6th Int Conf Networked Learn. 2008. p. 270–7.
2. Arulsamy S. Multimedia in medical education. Wyno J Med Sci. 2012;1(1):7–12.
3. Kuhlmann T. What Everybody Ought to Know About Instructional Design [Internet]. Rapid ELearning Blog. 2012 [cited 2013 Nov 25]. Available from: <http://www.articulate.com/rapid-elearning/what-everybody-ought-to-know-about-instructional-design/> (Accessed date: June 25, 2013).
4. McMahon M. A case study on mobile multimedia learning and basketball coaching. 2009 [cited 2013 Nov 25]; Available from: <http://ulir.ul.ie/handle/10344/438> (Accessed date: June 25, 2013).
5. Lim CS, Chua CK, Leong KF, Lau ML, Tan KW. Enhanced learning of rapid prototyping systems through multimedia. Int J Mech Eng Educ. 2004 Apr 1;32(2):115–25.
6. McNeill A. Introduction of rapid e-learning development within an international geospatial company. ISPRS XXXVIII-6W7 E-Learn Tools Tech Appl [Internet]. Potsdam, Germany; 2009. Available from: http://www.isprs.org/proceedings/XXXVIII/6-W7/Paper/19_McNeill.pdf (Accessed date: June 25, 2013).
7. Punyabukkana P, Suchato A. RELAD: A Rapid eLearning Authoring and Development Model. Third Int Conf ELearning Knowl-Based Soc [Internet]. 2006. p. 43.1–43.2. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?rep=rep1&type=pdf&doi=10.1.1.118.7563> (Accessed date: June 25, 2013).
8. Boulet G. Rapid Prototyping. An Efficient Way To Collaboratively Design And Develop E-Learning Content [Internet]. Navy e-Learning Center of Excellence; 2009. Available from: http://www.guyboulet.net/site/docs/Rapid_prototyping.pdf f. (Accessed date: June 25, 2013).
9. Roache J. Developing multimedia rich web courses. Int

- Conf Technol Educ ICTE [Internet]. 2001. Available from: http://www.ictc.org/T01_Library/T01_214.pdf (Accessed date: June 25, 2013).
10. Vedyadhara Open Resources. Open Learning Environment: Unit 3 Multimedia Authoring Tool [Internet]. 2009. Available from: <http://vedyadhara.ignou.ac.in/wiki/images/7/77/B3U3cit-003.pdf>. (Accessed date: June 25, 2013)
 11. Verhaart M. Multimedia:Development. VirtualMVs Michael Verhaart Wiki [Internet]. 2013; Available from: <http://www.virtualmv.com/wiki/index.php?title=Multimedia:Development>. (Accessed date: June 25, 2013).
 12. Riley F. Rapid E-Learning: Pedagogical considerations [Internet]. Educ. Technol. Healthc. Educ. 2012 [cited 2013 Nov 25]. Available from: <http://sonet.nottingham.ac.uk/resources/rapid/pedagogy.php> (Accessed date: June 25, 2013).
 13. Allcock A, Tomalty L, Chen B. Rapid Development Of Multimedia Learning Objects. MEDTech Queens Univ Sch Med [Internet]. 2006. Available from: http://meds.queensu.ca/medtech/assets/poster_rapid_mlo.pdf (Accessed date: June 25, 2013).
 14. Mischook S. Creating Multimedia Content [Internet]. 2011 [cited 2013 Nov 25]. Available from: http://www.killersites.com/articles/articles_CreatingMultimediaContent%20.htm (Accessed date: June 25, 2013).
 15. Jackson J. Teaching with Multimedia — School of Medicine at the University of Virginia [Internet]. [cited 2013 Nov 25]. Available from: <http://www.medicine.virginia.edu/education/medical-students/ome/edtech/teachingWmultimedia-page/> (Accessed date: June 25, 2013).
 16. Raymond G, McKimm J. Medical Education And E-Learning Opportunities In The South Pacific. Samoa Med J. 2010;2(3):32–40.

This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.