

Towards a New Look at Streaming Media

R. Robert Gajewski, rg@il.pw.edu.pl

Warsaw University of Technology, Armii Ludowej 16, 00-637 Warszawa, Poland

Abstract

The paper presents case studies of usage of multimedia and webcasting in engineering education. Technology Enhanced Learning should not be very expensive, what is proved in the paper. According to Dale's Cone of Experience there is a big need of multimedia in education, also in the field of engineering. Multimedia in the form of podcasting (personal on demand broadcasting) can be very useful as a supplementary tool for lectures and software training, but they have one common drawback – they do not allow for two way communication. Webcasting in which media file is distributed mainly live over Internet enables two way communication. Presented case studies showing complete way in which multimedia can be used are taken from two subjects – Applied Computer Sciences and Computing in Civil Engineering. They include full set of software animations and multimedia lectures. Webcasts are used for two purposes - fully online lectures in the Internet, when students can ask a question like during classical lecture and consultations. After analysing the use of podcasts the real point of the paper is presented - a new look at streaming media in which students are asked to perform easier task at home and learn from podcasts independently. This enables to solve more difficult problems during classes.

Keywords

streaming, slidecasting, screencasting, webcasting, flipped classroom

INTRODUCTORY REMARKS

Confucius in 450 B.C. said: "tell me and I will forget, show me and I may remember, involve me and I will understand." According to many researchers individuals remember more information and for longer when they are more involved in learning process. In 1946 Dale published his famous Cone of Experience (Dale, 1946). Dale said that the cone device is a visual metaphor of learning experiences, in which the various types of audio-visual materials are arranged in the order of increasing abstractness as one proceeds from direct experiences. One of the later extensions of this idea is common opinion, that people generally remember: 10% of what they read, 20% of what they see, 50% of what they see and hear, 70% of what they say and write and 90% of what they say as they perform a task. Moreover the whole process of learning is divided into two parts: passive learning and active learning.

Blooms taxonomy proposed in 1956 (Bloom, 1984) by a committee of educators chaired by Benjamin Bloom is a classification of learning objectives and activities divided into three domains: cognitive (mental skills, knowledge), affective (feelings, emotional areas and attitude) and psychomotor (manual and physical skills). The cognitive domain, most important in higher education, involves intellectual skills and knowledge. In this domain there are six major categories listed from the simplest: knowledge, comprehension, application, analysis, synthesis and evaluation. In the mid-nineties cognitive domain was revised. Names of categories were changed from nouns to verbs and their order slightly rearranged. Bloom's revised taxonomy (An-

derson et al., 2000) reflects more active form of thinking and consists of six categories from lower order thinking skills to higher order thinking skills: remembering, understanding, applying, analyzing, evaluating and creating. This taxonomy better accounts for new behaviors and multimedia technology advances.

MULTIMEDIA ISSUES

While designing online education several issues concerning the level of multimedia should be taken into account. High level multimedia require access to high speed Internet. Moreover there are often special software requirements in order to run different components. Finally in many cases computers should be setup in a specific way for such multimedia. Mid level multimedia are moderately interactive. Video, animations and slide shows provide learners with visual description of conceptually different tasks. They are less expensive but their development in some cases requires time and expertise. Finally, low level multimedia are definitely passive but still provide learners with visual information which facilitates learning. They are definitely less expensive to produce.

There are different file formats suitable for delivery of multimedia. There are many pros and cons for each format (Follansbee, 2006). The choice is not only the matter of personal preferences. Much more important are ease of use, required bandwidth, quality and, last but not least, costs. There are three major ways to view media on the Internet. Downloading a file means saving it on a computer. Such a file can be then opened and viewed. This has some advantages like quick access to the chosen part of a file but disadvantages are bigger. The whole file should be downloaded before opening it which can cause problems in the case of long presentations. In order to give an access to such a file it is enough to provide appropriate hyperlink. Distribution of audio and video in this way is known as HTTP delivery. Streaming media works differently – the end user can start watching the file as soon as it begins downloading. The obvious advantage is that no additional waiting is required. Streaming media can also broadcast live events – this is called webcast or netcast. Such streaming should be delivered by a specialized streaming server which is the biggest disadvantage. Progressive downloading is a hybrid method in which clip is downloaded from simple HTTP server but begins playing as soon as a portion of the file has been received. Such approach is only a simulation of true streaming but has majority of its advantages. SWF, FLV and MP3 files are excellent examples of progressive downloading. Podcast is derived from two words: ‘broadcast’ and ‘pod’. The origin of ‘pod’ is explained in two ways as part of the name iPod or as abbreviation of the term personal on demand. In this paper the second explanation will be used so podcast is simply personal on demand broadcast. Such broadcast can contain audio, text, graphics and video. Division of Information Technologies has been preparing for ten years different multimedia materials in the form of knowledge clips for the purpose of two subjects taught at the Faculty of Civil Engineering at Warsaw University of Technology: Applied Computer Sciences and Computing in Civil Engineering.

SLIDECASTS – LECTURES ONLINE

In the very beginning created podcasts had a form of slidecasts – slideshow presentations illustrated additionally by audio track. Such slidecasts were prepared as learning objects and were no longer than ten minutes. They were used as explanation for classes or they were constituting lectures. Presentations were prepared by PowerPoint. Audio track was recorded during presentation. During last year more than 40 hours of lectures in the field of Applied Computer Sciences and Computing in Civil Engineering were prepared using this approach. Vast majority of them was recorded during classes. They play very important role in curriculum of these two subjects enabling to have more time during the lectures for questions and answers. PowerPoint gained a position of leading software used to illustrate lectures (Duarte,

2008). One can easily add to it audio comments but such file has tremendous size. It is also possible to publish PPT as webpage, but such presentation is properly visible only for Internet Explorer users. The best solution is conversion of PPT file into SWF format. There are many advantages of such a conversion. Flash format enables greater accessibility of presentations. Once PPT files are converted to SWF they can be easily viewed by any Internet browser equipped with Flash Player. Flash format ensures compatibility – everyone who has a computer including Macs, Linux, Solaris, HP, SGI workstations as well as handhelds can watch PPT converted to Flash. PowerPoint presentation converted to Flash has drastically reduced size up to 10% of the original size. Flash files can also easily integrate audio tracks. They can also be played at virtually any resolution and/or screen size. Due to the fact that progressive downloading of Flash files is possible such files can be easily distributed in the Internet. Flash files can contain optional embedded basic interaction controls that let the user stop or rewind the presentation. Last but not least Flash files are more secure from the author rights point of view – it is very easy to edit and copy PPT files.

There are many ways by which PPT to SWF conversion can be performed. First group of software used to do this consists of programs which should be used during presentation. They should be installed on the computer used during the lecture which could be inconvenient. Second group allows synchronizing Power Point slides with audio track recorded by external digital recorder, but such approach requires additional effort. The most user friendly group is created by a software which work offline and can convert to Flash presentations recorded by PowerPoint. There are also websites like slideshare.net or authorstream.com which can be used to convert and store PowerPoint presentations in Flash format.

SCREENCASTS – SOFTWARE ANIMATIONS

In the next step another kind of podcasts was prepared – screencasts which can be named video tutorials. They were mainly used for teaching how to use software. Like in the case of slidecasts during the last five years (Gajewski, 2006) more than 50 hours of software animations was prepared for the same two subjects – Applied Computer Sciences and Computing in Civil Engineering. They play crucial role in curriculum of these subjects because they enable to concentrate during classes on solution of concrete problems rather than on basic problems how to use software.

The type of content which people are willing to have online is in majority of cases application or software instruction. More and more online learning is related to information technology and also to engineering applications. Nearly all organizations need to provide training to software users and the Web is one of the most effective tools to do this. What we are now desperately seeking for are software animations. There are three major learning user cases: awareness training, full training course consisting of three steps – animation, simulation and test and finally performance support. Especially in two first cases software animations in the form of screencast are an excellent aid. According to Wikipedia a screencast is a digital recording of computer screen output, also known as a video screen capture, often containing audio narration. Although the term screencast dates from 2004, products such as Lotus ScreenCam were used as early as 1994.

There are three major types of authoring tools used to prepare screencast. The first group is based on hypercard tradition. In such tools designers import screen captures and assemble them manually along timeline. Second group is in the tradition of LotusScreenCam. Screen captures are taken every time user clicks on the screen and later things like cursor movements in between are animated. The third class is relatively new on the market. They look like previous group but in fact they are much more sophisticated and can understand basic interactions between user and software. Furthermore these tools are able to automatically generate “let me try” as well as “test me” simulations and in many cases also documentation.

While designing software simulations and animations one should take into account three important points. First states that simulations and animations should be chosen wisely and three questions should be addressed and answered. Which system functions do the software user absolutely need to know? Which functions are straightforward and which tasks will cause troubles? And finally what do the various functions have in common? Second point states that each task should be targeted. Each simulation and animation should be designed in such a way that it is focused on specific job task. Targeting learners to specific features helps them to stay focused on the task. Last but not least instructional techniques should be varied. Simulations and animations should be combined with other e Learning activities. Animations provide opportunities for learners to watch software in action. Printable job aids enable further training.

One can use also more practical hints like these prepared by InstantDemo.com. The most important thing is to have a storyboard and detailed plan what should be said and shown. Each demo should have a message – a beginning, a middle and an end. The beginning is an introduction to the demo. The middle part is the place where the features of software are visually demonstrated. The last part gives a sense of completion and achievement from viewing animation. Secondly timing is everything. Animation cannot be too fast because viewers could feel uncomfortable. For instance in the case of bubbled text it should be displayed for a period of time that will allow to read it twice. The last hint encourages to use visual clues to attract learners' attention. It is very important to direct viewers' attention to the relevant part of the screen. In order to do it highlights, callout or talk pointers can be used.

WEBCASTS – LECTURES AND CONSULTANCIES

The two kinds of podcasts (personal on demand broadcasts) mentioned above have one common drawback – they do not allow two way communication. Webcast (a media file distributed mainly live over the Internet using streaming media technology to many simultaneous listeners/viewers) enables two way communication and can be used for many purposes in engineering education. It is a new instructional technology enabling learners to participate in live event via personal computer. Classical lecture has been for a long time a dominant method for transmission of knowledge from lecturer to students. In the era of increased use of technology this type of teaching can limit learning. The technology of webcast gives a chance to reinvent the lecture which can be accessible in real time or from archives as podcast. Moreover webcast of lectures can be prepared successfully also in systematic manner. The interaction factor (between instructor and students, students and students as well as student and learning content) is the most important one to ensure effective learning. But webcast in education should still be treated as a possibility. One should explore its strengths (they are interactive, engaging, flexible and accessible) as well as weaknesses (they are relatively expensive, cause technical problems and are still new for the teachers). On the other hand there are many opportunities (webcasts can become a widespread interactive educational system) but also many threats because traditional systems are still strong and economic status of education sector is bad. The future of webcast in education depends on our ability to balance this technology with classical learning (Clay, 2009), (Courville, 2009), (Türmel, 2008).

A NEW LOOK AT STREAMING MEDIA

Case studies presented above are taken from two subjects – Applied Computer Sciences and Computing in Civil Engineering. They include complete set of software animations and multimedia lectures which can be streamed on demand as podcasts. Webcasts are used for two purposes. First example is set of fully online lectures in the Internet, during which students can ask a question like during classical lecture. Second ones are consultations. Students who are supposed to learn and

solve different problems sometimes need to consult with their tutors. It can be done at the university but also in the Internet using webcasts.

Questionnaires performed in academic year 2011/12 showed that having full range of podcasts not all of students were fully satisfied by them. They were pleased by the quality and ease of use as well as by their availability in the mode 24/7. Moreover they stressed positively that such approach addressed different learning styles (Sarasin, 2006). However, in additional field of questionnaire reserved for remarks some of the students complained that especially computer laboratories were boring for them because they repeated what was recorded in screencasts. All podcasts were designed as additional, supplementary and auxiliary tool and all teaching and learning activities were designed in traditional way. Students were “taught” at the university how to use software and they were supposed to solve individual problems at home. In many cases solving problems was too difficult for them.

These observations lead to idea to revert the situation. Why not to ask students to perform easier task at home and learn from podcasts independently and why not to solve during classes more difficult problems. Such situation is with agreement with Bloom’s Revised Taxonomy. Lower order thinking skills like remembering, understanding and applying are gained at home from podcasts which can be treated as recorded classes. Higher order thinking skills like analyzing, evaluating and creating are gained at the university. Such situation requires change of the role of academic staff – from teachers to tutors.

First results from academic year 2012/13 are very positive and promising. Average result from tests increased by approximately 5% and the number of students who failed decreased. General students’ opinion about two subjects – Applied Computer Sciences and Computing in Civil Engineering is better than before. As it could be supposed not all students were satisfied by this change. There is quite big group reluctant to work at home and prepare to classes by watching podcasts. The only upsetting thing is the fact, that the idea of reverting class and home activities is not absolutely new. It is known as flipped classroom and was already discovered (Bergmann & Sams, 2012).

FINAL REMARKS

One of the pressures on universities is the rapid development of new information and communication technologies for the provision of education and training. Wide opportunities in open and distance learning create new markets. Moreover the principle of life-long learning extends the age groups to which university can offer education. Additionally the principles of new techniques can be applied to traditional markets – regular intramural students.

All Polish universities willing to use modern information and communication technologies face common opportunities, threats and constraints. A constant struggle between pressure to change and fear and resistance to change is visible in Poland. Teachers’ attitudes are a major obstacle to the introduction of change. There is an internal brake on the efforts to make changes through using new technologies: resistance from people. Reference can be made to a “frozen middle” resisting attempts at change from both the top of the institutions (authorities) and from the bottom (students). Students’ demands are a powerful factor forcing universities to exploit the potential of new technologies to improve learning experience. But the question “how to change the unchanging” is still open (Gajewski, 2002).

REFERENCES

- Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., Wittrock, M. C. (2000). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom’s Taxonomy of Educational Objectives*, Abridged Edition (2. ed.). Pearson.

- Bergmann, J., & Sams, A. (2012). *Flip Your Classroom: Reach Every Student in Every Class Every Day*. International Society for Technology in Education.
- Bloom, B. S. (1984). *Taxonomy of Educational Objectives Book 1: Cognitive Domain* (2nd edition.). Addison Wesley Publishing Company.
- Clay, C. (2009). *Great Webinars: How to create interactive learning that is captivating, informative and fun*. Punchy Publishing.
- Courville, R. (2009). *The Virtual Presenter's Handbook* (First Edition.). CreateSpace.
- Dale, E. (1946). *Audio-visual methods in teaching*. The Dryden Press.
- Duarte, N. (2008). *slide:ology: The Art and Science of Creating Great Presentations* (1. ed.). O'Reilly Media.
- Follansbee, J. (2006). *Hands-on guide to streaming media: an introduction to delivering on-demand media*. Focal Press.
- Gajewski, R. R. (2002). How to change the unchanging? Restructuring Polish universities for the XXI century. W *TelE-learning, The Challenge for the Third Millennium* (ss. 297–300).
- Gajewski, R. R. (2006). Animations and Simulations of Engineering Software: Towards Intelligent Tutoring Systems. W *Intelligent Computing in Engineering and Architecture* (ss. 258–261).
- Sarasin, L. C. (2006). *Learning Style Perspectives: Impact in the Classroom* (2. ed.). Atwood Pub.
- Turmel, W. W. (2008). *6 Weeks To A Great Webinar: Generate Leads And Tell Your Story To The World*. Achis Marketing Services.

Biography



R. Robert Gajewski is head of Division of Information Technologies at the Faculty of Civil Engineering of Warsaw University of Technology. For more than twenty years his scientific interests has been focused on Technology Enhanced Learning. He published more than fifty papers devoted to this subject. His last fields of interest cover such areas as podcasting and webcasting technologies.

Copyright

This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/3.0/>