

Using Microsoft Producer to Develop and Deploy Dynamic Streaming Content in Engineering Related Courses.

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ABSTRACT - Microsoft Publisher is a robust, inexpensive, readily mastered and widely available multimedia course development tool for delivering dynamic instructional content in online courses in engineering related fields. MS Producer provides high fidelity narration and music, graphics, screen capture animations, text, and full motion video, and delivers this using streaming Internet technology. Producer presentations are SCORM compatible, easily modified and well received by students. Limitations include restricted browser compatibility, streaming media server requirement, and comparatively long download time.

I. Introduction

The first widely successful Internet browser, Mosaic (soon to become Microsoft Internet Explorer) was introduced in 1994 (Wiggins, 1994), scarcely a decade ago. Technologies and pedagogies cannot have reached a steady state of best practices in that time. But that brief period has witnessed an explosion of online course deployment across the wide field of higher education, including engineering campuses. Clearly, much of this frenzied development has been spurred by administrative pressure to claim a share of an anticipated and enormous university without

boundaries, perceived pedagogical advantages notwithstanding, leading one researcher to lament that higher education was on a "...frenzied drive toward the Web-based cliff."(Harmon & Jones, 1999) Every major technology introduction, including motion pictures, radio and television, has been attended by wild claims that it will revolutionize education (Gentry & Csete, 1995; Reiser, 2002). It has been so with the Internet and, indeed, the Internet may represent a technological and cultural phenomenon unseen in recent history (Cahoon, 1998; Jones, Harmon, & Lowther, 2002).

An interesting and valuable spin-off of the rush to develop online courses is that the bandwidth limitation of the Internet precluded course designers and faculty from conducting business as usual, in the pervasive "sage on the stage" style of the traditional college classroom. It was simply not possible to deliver technically workable or aesthetically pleasing linear video or even audio recordings of lecture content. It was therefore necessary to develop online teaching strategies that the bandwidth limitation could accommodate, and approaches favoring the "guide on the side" constructivist teaching philosophy began to dominate.(Hopper, 2001) It is important to note that this trend, although positive in many respects, was

dictated by the limitations of technology for online instruction more than by a demand for positive learning outcomes. Online pedagogy has lagged far behind technology innovation (ASTD, 2002).

The highly interactive and collaborative nature of prevailing online teaching strategies is not without cost. Instructor workload in completely online courses is about three times greater than in traditional courses (Jones, Harmon, & Lowther, 2002; Schrum, 1998). It has also become evident that the nonlinear, learner-centered style of many online courses is simply not viable for some learners and some topics (Chadwick, 2002; Hopper, 2003). This may be especially true of content laden, challenging courses in the engineering curriculum. Discourse and opinion may well be viable strategies in nebulous courses such as ethics, political science, and literature, but some courses demand the expert content leadership of a scientist or engineer. If we have learned anything at all about teaching and learning, online or classroom, it is that there is no "one size fits all" approach. Jonassen (2003) wrote, "There is no unified theory of teaching and learning."

DL is often tedious, and students prefer meeting face-to-face in the traditional classroom (Simonson, Smaldino, Albright, & Zvacek, 2003). A serious and unresolved concern in fully online courses is attrition (Simonson, Smaldino, Albright, & Zvacek, 2003). Many students simply long for a human voice. And some students prefer, and thrive in, lecture-driven traditional classes (Hopper, 2003). Eye contact, body language, voice tone, and facial expression are essential aspects of instructional communication, which we should not be quick to dismiss (Fredrickson, Clark, & Hoehner, 2002).

Graduate programs in engineering related fields have approached distance learning with caution, and with due concern for pedagogy, academic rigor, and the quality of the educational experience. Some programs

have insisted on distance learning development that provides a classroom equivalent, quality lecture experience as an important element of a hybrid online-classroom course design approach, and report highly positive results (Zlateva, Kanabar, Stainov, & Braude, 2002). These authors selected a streaming audio-video technology with synchronized slide presentations, including graphics and animation, using a digital camcorder and RealPlayer server and client. Their published report of faculty and student experience is highly positive. However, the technology choices in this approach may be an obstacle for some programs.

II. Microsoft PowerPoint

Microsoft PowerPoint (www.microsoft.com) has become a staple in higher education (Elliott & Gordon, 2006). Originally designed for marketing, it has nonetheless found a useful place in teaching, and faculty find it helpful to organize and present lecture materials, and to easily provide handout resources for students. Virtually all faculty are competent, if not highly skilled, using this software. PowerPoint has become the world wide standard for presentation software (Ortega, Stanley, & Snavely, 2005). Many faculties have developed extensive lecture resources created in PowerPoint, and there is a clear advantage in an audiovisual technology that can incorporate existing PowerPoint lecture materials. PowerPoint permits audio slide narration, easily done with a desktop or headset mike, and although it provides an option to publish a presentation on the Internet, file size and download time requirements are prohibitive. Similarly, providing the original PowerPoint files for download from a website, or for email attachment, is prohibited by enormous file size. There is also the issue of faculty sharing proprietary work developed in PowerPoint, easily borrowed and modified if the source files are available.

III. Microsoft Producer

Microsoft Producer

(www.microsoft.com/office/powerpoint/producer/) is a free download and extension for Microsoft PowerPoint, and provides a streaming media functionality for PowerPoint-based lecture presentations. Producer allows the user to import PowerPoint presentations, which are automatically rendered as high quality JPEG slide images, and add high quality voice narration (or incorporate narration made with PowerPoint), music, graphics, screen-capture animations, and full motion video. Producer projects are published as websites and corresponding, highly compressed multimedia files, and these are accessed on CD or DVD, or streamed from a Windows Media server. Learners experience a user-controlled, high fidelity lecture presentation, which may be paused and reviewed at will.

Presentations are readily customized with program logos and colors, and are readily modified and refined for repurposing in other or subsequent courses.

Producer provides three development views: media, table of contents and preview. There is a project wizard that automates some operations for novice users. Development typically begins in media view, and a PowerPoint file created previously serves as the foundation for most projects. The PowerPoint file is imported followed by other project elements, including music and sound files, graphics images and motion video. PowerPoint slides are placed on a timeline, individually or in groups, a presentation template is selected, and the multimedia elements are then placed on the timeline and synchronized. (Note that files are not actually imported into the project, but rather the Producer project file places “imported” elements into virtual folders and merely points to the source files. Modifying source files outside Producer also modifies them within the Producer project.) Projects are easily tested in preview mode. However, double-clicking a

PowerPoint slide on the Producer timeline invokes the PowerPoint application, and changes are automatically incorporated.

One of the most useful development features is a capability to directly capture audio narration or video, which is automatically synchronized with the PowerPoint slides. Instructors can click through the slide images while delivering a synchronized lecture narration, with or without video capture (with a video camera or webcam). Inexpensive headset microphones result in surprisingly rich audio narration. It is also possible to import audio previously recorded in PowerPoint, or in a sound editor such as Audacity (free download; <http://audacity.sourceforge.net>). Imported sound files are then readily placed on the timeline and synchronized with slides. Producer also accommodates HTML files, and can link to external URLs. There are a number of stock templates, which are modifiable to customize them for institutional branding. Presentation scheme, including font (size, color, family, etc.) and slide background color are easily modified, including a custom color feature.

Producer also has a screen capture animation function, allowing the instructor to visually record screen action within an application, while providing synchronized narration. This feature is very useful for explaining and demonstrating complex software operations.

The table of contents (TOC) view permits rapid editing and revision of the TOC the student accesses. Producer suggests TOC text, based on slide text, but these are quickly revised, promoted, and demoted to generate a TOC that students find very useful.

Online help in Producer is useful, and Microsoft publishes a helpful primer (Lichtenberg & Travis, 2002). There are support and practice files available from Microsoft (cost for shipping, only), plus streaming sample projects:

(<http://www.microsoft.com/office/powerpoint/producer/prodinfo/demos.mspx>)

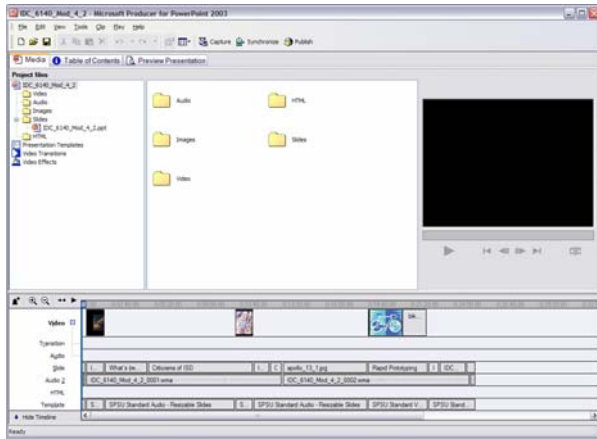


Figure 1. Producer Timeline Environment

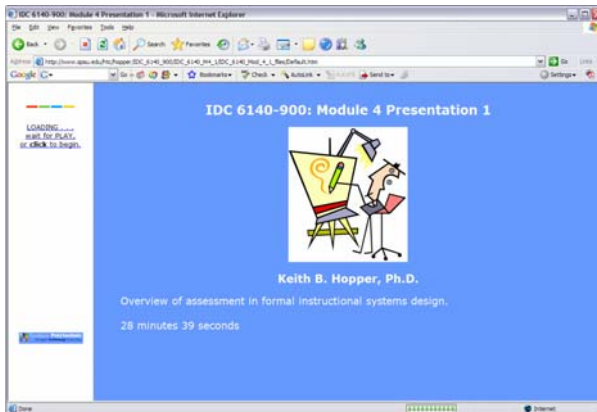


Figure 2. Producer Module Title Screen

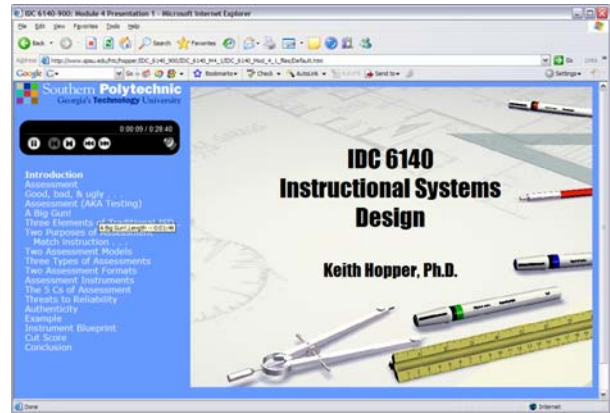


Figure 3. Producer Module Learner Screen (slide and table of contents)

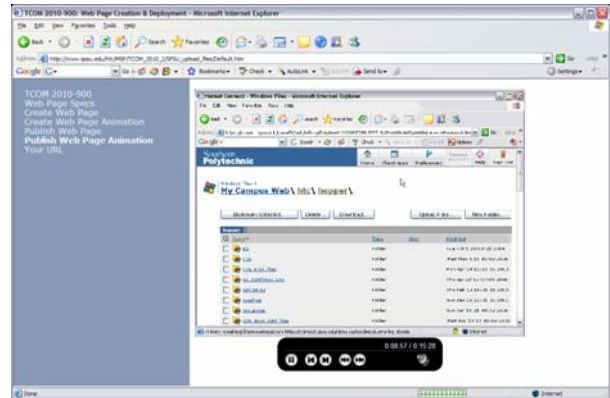


Figure 4. Producer Module Learner Screen (screen capture animation and table of contents)

Presentations may be published to the local computer (or attached storage device), a local area network, or a remote Windows Media server. Publication time depends on the multimedia elements selected, but a current PC requires but a few minutes for most projects. Students are given a URL to access a presentation, and advised to use only Internet Explorer 5.0 or Netscape Navigator 7.0, or newer. Note that Producer projects may be deployed from an ordinary Web server unless they include major audiovisual elements, particularly motion video. In this case, the presentation is published on an ordinary Web server, which accesses WMV files generated for the project and placed on a remote Windows Media server.

Producer also permits distribution via CD, and accommodates multiple Producer modules on a single CD. Producer automatically creates a CD menu, presented when the user loads the CD. An especially useful application of this feature is to create marketing CDs on program offerings, to be distributed to prospective students. This not only provides student compelling recruitment materials but showcases exemplary instructional approaches.

IV. Engineering Applications

Some innovative professional programs quickly recognized the online teaching potential of Producer. For example, medical professions such as Boston University's Anesthesiology department have tapped the rich graphics and video capabilities of Producer to generate economical but very pleasing custom instructional products (Ortega, Stanley, & Snavely, 2005). Many of these are done by medical residents, are reviewed by peers prior to a problem-based-learning session, and are then added to a growing content archive that is available 24/7 online. Similarly, reputable engineering campuses have embraced Producer, and related Microsoft technologies such as Microsoft Windows Server and Microsoft Visual Studio .NET, to fulfill a major role in online instructional development (Campbell, Garforth, & Bishop, 2004; Microsoft Corporation, 2005a; Zlateva, Kanabar, Stainov, & Braude, 2002). Some institutions opt to publish their Producer modules on CD or DVD. Some record live lectures to be synchronized with PowerPoint slides, and rendered using Producer. Some programs create very short (ten minutes or less) highly polished presentations on selected content topics known to be troublesome to many students, and reuse or repurpose them for related courses.

Producer is an important element in the growth of online academic programs for the University of Alabama in Huntsville (UAH) (Microsoft Corporation,

2005b). Founded in the late '50s to support NASA's Marshall Space Flight Center, and presently offering 42 bachelor's, 17 master's, and eight Ph.D. programs among its five campuses, distance learning plays a vital role in UAH's collaborative programs. This role has been greatly enhanced by the 2001 introduction of MS Producer, which provides the rich-media authoring tool needed for streaming lectures and materials between UAH and the preeminent French transportation engineering school, ESTACA. To provide online content for the joint aerospace engineering program, many of these lectures are recorded with USB cameras and lapel microphones, while UAH's Division of Continuing Education offers professional digital media services for highly polished products when needed. These indexed presentations of slides and synchronized audio and video—whether simple self-recorded lectures or high quality productions—are published both on CD and on UAH's intranet. Engineering isn't the only discipline using Producer at UAH; the Center for Robotics, College of Nursing, and Administrative Science College all report using Producer to create indexed media-rich presentations.

Conference speeches and symposium presentations are easily converted by Producer to audio-video presentations that can be shared online. This is how the University of Alabama at Huntsville made available as online video Dr. Robert A. Frederick's opening presentation to the AIAA Symposium on Tactile Missile Design (http://media.eb.uah.edu/demonstration/demo_files/default.htm).

Similarly Dr. David Tarboton, Professor of Civil and Environmental Engineering at Utah State University, presented a 45-minute Producer-generated video presentation, "Terrain Analysis and Hydrologic Modeling using Digital Elevation Models and GIS," for the "Consortium of Universities for the Advancement

of Hydrologic Science (CUAHSI) Spring 2004 Cyberseminar. Because Producer is flexible and easy to use, UAH is even able to supply audience members 8-hour symposium CDs of the rich-media presentations. Many conferences and cyberseminars still rely on stand-alone PowerPoint presentations. Converting these presentations to dynamic audio presentations would make it possible for anyone, anywhere in the world, to experience the conference without restrictions on time and place. An excellent example is a speech by Wendy Wigen, Policy Analyst, for EDUCAUSE, delivered at the 2005 Indiana Higher Education Telecommunication System (IHETS) Tech Summit in 2005 (http://www.ihets.org/news/events/techsummit/2005/producer/calea/calea_files/Default.htm).

Because her speech is posted on the program as a 53:03 Publisher presentation, Ms. Wigen's presentation can be shared in its entirety directly from the Internet conference program. Other presentations delivered as Powerpoint presentations may be viewed, but lacking the element that brings the presentation alive—the actual words of the presenter, the presentation remains little more than an outline of the original speech (<http://www.ihets.org/news/events/techsummit/2005/documents/11-09-05.wigenslides.ppt>).

Producer can be applied outside the academic classroom as easily as inside. Its flexibility and ease of use have given UAH the opportunity to serve its surrounding community by assisting the National Children's Advocacy Center (NCAC) in developing and distributing content for a pilot program, Academy Online. Focusing on training in prevention, intervention, and investigation of child abuse, this online instructional service serves law enforcement, child protective services, and educational, medical, mental health, and prosecution agencies across the nation. UAH and NCAC report that, so far, the cost for one online Producer-based training session is less than

half the \$11,500 cost for the satellite broadcast formerly used. In fact, NCAC forecasts a return of nearly 400 percent on its investment in the Producer-based pilot project over the next five years. For its participation in this innovative project, UAH's Division of Continuing Education was presented the 2003 "Creative Use of Technology Award" by the Association for Continuing Higher Education (ACHE) (Microsoft Corporation, 2005b).

Praising Producer's contribution to UAH outreach, Robert Middleton, Senior Research Engineer, Office of the Provost, says, "Windows Media and Producer 2003 enable us to easily make the content of UAH classes available to students through the Internet and on CDs. We have developed a very cost-effective and rapid production process that offers students high-quality educational material on and off campus. All indications show that it is actually enhancing learning by giving students what they need, when and as often as they need it"(Microsoft Corporation, 2005b). And UAH continues to plan for future needs of students. Soon the Producer-based online materials at UAH will feature synchronized closed captioning for the benefit of those students who have hearing impairments or low bandwidth connections and for those who don't speak English. To view a sample presentation with enhanced closed captioning, visit http://media.eb.uah.edu/demonstration/demo_files/default.htm.

Producer also plays an important role in the development of an engineering co-op program. The University of Waterloo's engineering school, Canada's largest, and home of the world's largest cooperative engineering program, teamed with Microsoft Consulting Services to develop an online program where class materials and courses would be available 24/7 for busy engineering co-op students. This project, The Microsoft Online Learning Initiatives (MOLI),

with the aid of Microsoft's Producer software and technologies such as .NET Framework and Visual Studio®.NET, has developed "e-learning tools and technologies such as virtual lab equipment, simulators, lecture materials, tutorials, quizzes and discussion forums"(Microsoft Corporation, 2005a). Dr. William Bishop, Director of MOLI, says the faculty estimates that 10,000 students—those in software engineering, computer engineering, electrical engineering and mechatronics—will use the online materials and courses created through MOLI. There are other unexpected successes: "We've actually exposed about 27 per cent more students to the online learning tools than originally anticipated, because Microsoft technology is flexible enough to allow us to re-use some of the tools that we'd developed for other courses.... Four of the eight courses we've added to the program leverage tools, techniques and materials developed for the other courses without placing additional financial burden upon the project." By the end of 2006 Dr. Bishop hopes that three additional courses will be online, bringing the total to 11. Students are equally enthusiastic about the new online courses. Both the high quality and the accessibility of the online materials have had a positive effect. For instance, in one representative term, the student failure rate dropped by around 40 percent and the average rose by about 5 percent. Dr. Bishop believes the success of the online engineering courses will encourage other faculties to develop similar online materials.

Another excellent model for Producer-based instruction is found in the United Kingdom at the University of Leeds School of Civil Engineering, serving around 600 undergraduate, graduate, and postgraduate research students from around the world (<http://www.engineering.leeds.ac.uk/civil>). Here, Professor Duncan Mara has created a library of 37 or more audio- and audio-video presentations as study

aides for Mechanical Engineering and Master of Science in Engineering students. Professor Mara, who teaches Civil Engineering in Developing Countries, Tropical Public Health, and Natural Wastewater Treatment and Reuse, explains that his presentations are "essentially amateur, rather than professionally polished, productions" (<http://www.personal.leeds.ac.uk/~cen6ddm/MProdIndex.html>). This, however, may be the strength of Professor Mara's presentations. With them, he addresses topics related to water, sanitation, health, low-cost waste water treatment and reuse. Students can play the presentations in "streaming" mode or download zipped files of the presentations to be played on their own computers. In addition, Professor Mara provides PDF transcripts with slides of each presentation. He also provides detailed Web instructions for making Producer presentations (http://www.personal.leeds.ac.uk/~cen6ddm/MicroProdPres_howtomake.pdf).

Other academic disciplines are beginning to discover the usefulness of Producer. Dr. Kurt Winkelmann of Florida Institute of Technology has produced a number of narrated general chemistry tutorials for online use (<http://cos.fit.edu/chemistry/kwinkel/chemed.html#genchem>). Several faculty members of California State University, Fullerton, have also developed online tutorials: "Measures of Central Tendency," by Dr. Nicholas Farnum, Information Systems and Decision Sciences; "Scoring Rubrics in the Classroom," by Dr. Lynda Randall, Secondary Education; and "Awareness Training," by Paul Gluch, Kinesiology and Health Science (<http://fdc.fullerton.edu/technology/producer/default.htm>). "ITS Newsflash," a Producer presentation by the Learning Technology team of Information Services at the University of Northampton, delivers news and

updates on website development, new IT systems, email, learning resources, and training (http://elearn.northampton.ac.uk/vid_image/producer.htm).

Again, Boston University School of Medicine's archive of Producer-based instruction modules continues to grow, due in part to the efforts of Dr. Rafael Ortega, Associate Professor of Anesthesiology (Ortega, Stanley, & Snively, 2005). Examples of his very professional media-rich presentations are "Medical Air and Other Gases," "Double Lumen Tubes," "Ethnic Variability in the Treatment of Pain," and "Basic Airway Anatomy," all carefully designed, documented, and illustrated to aid medical students in their study of anesthesiology. Dr. Ortega also chose Producer to make available online "The Use of Multimedia to Promote Safety and Disseminate New Information in the Operating Room," his speech delivered at the 1st Annual Ellison Pierce Symposium at Boston University in 2005 (http://www.bu.edu/av/courses/med/05sprgmedanesthesiology/Producer%20Lectures/Mutimedia/multimedia_files/Default.htm).

It's easy to imagine additional possibilities for Producer-based presentations: for instance, in history/political science classes, for illustrating military campaigns or highlighting geographical problems that have caused conflict between two or more countries, or for demonstrating how to set up statistical analyses or demonstrating an experimental procedure in biology. Any lab-based class would benefit from presentations that demonstrate the use of lab equipment and instruments; these presentations could be used over and over, freeing up valuable time for instructors. Explaining complex design processes, illustrating design principles, and reviewing software applications with Producer modules would provide students with 24/7 "workshops on demand." The possibilities are

endless, and the rewards for both students and instructors far outweigh the effort required to generate presentations in Producer.

V. Student Assessment

Student comments, solicited and unsolicited, on MS Producer modules range from appreciative to gushing praise. The improved student experience, compared to dry, text-only online PowerPoint presentations is dramatically improved. And students clearly prefer Producer presentations to comparable products generated with Impatica. A representative course technology evaluation comment, following an online technical writing course:

"I particularly enjoyed the PowerPoint presentations that the instructor used, not the regular plain ones, but the ones with his voice explaining each slide. I forget the name of the interface, but that was a great tool for learning, almost as good as being one on one with a traditional instructor."

VI. Lessons Learned

Perhaps the most important lesson learned in our course development experience with Producer is that instructors need not aim for professional television quality narration and presentation. Online teaching revealed one of the compelling advantages of the traditional lecture, that once given, it evaporates and there is no true record of mispronunciations, oddities of speech, or slips of the tongue. But such minor errors rendered in a streaming audiovisual presentation seem compounded and permanent, and some instructors spend inordinate amounts of time attempting perfection. We find that most narrations on the first pass are of "good enough" caliber and that best results are achieved when instructors learn to "get out of themselves" and deliver a good, but not perfect, lecture. Indeed, some students seem to appreciate this humanizing aspect of these multimedia presentations.

Producer provides an option to publish presentations at a variety of compression settings, from 800 Kbps (for CD or DVD) to 56 Kbps. Lower Kbps settings result in faster download speeds and smoother playback, but this is traded for sound and video quality. While the moderate 96 Kbps DSL setting provides high fidelity and is accessible and pleasing to most students (who have DSL), there seems to be a small but persistent number of students who continue to use dial-up Internet connections. While adding Kbps options for users doubles the media files produced for each setting, this effort is offset by user appreciation. Students with dial-up connections report dramatically improved performance of Producer streaming modules.

Similar to PowerPoint, Producer provides a “Pack and Go” option to package complete Producer projects, including all media and support files, for transport to another PC. However, using this functionality causes files to be placed in different, and often unexpected, areas on the new host machine. Our experience is that it is highly preferable to complete Producer projects on a single machine.

A final lesson learned is that some users find Producer to be relatively unstable, and we strongly recommend frequent project saves.

VII. Limitations

The primary technical limitation of Producer is slow presentation start-up (as much as 60 seconds). This is apparently a technical issue that all users encounter, and the best solution seems to be warning students in advance of long download time (we advise them to get a cup of coffee while waiting for a presentation to begin). Although annoying, it does not seem to be a serious obstacle for student users. This issue may be overcome, to a degree, by avoiding unnecessary high bandwidth media (motion video and animations) and by providing users with a range of bandwidth choices. In our experience, even students

with dial-up Internet connections successfully view Producer presentations that provide a low bandwidth option. The concomitant decrease in sound fidelity and graphics quality is within acceptable limits.

A secondary limitation is the technical difficulty synchronizing on-campus HTML elements of Producer presentation with streaming Windows media elements from another server, often off campus. However, this technical obstacle is not unduly difficult to resolve, and having devised a solution for one presentation, it will be similarly done for subsequent presentations. It is not necessary to purchase a Windows Media server as off-campus streaming media hosting is widely available and reasonably priced.

Producer is a Windows application, and cannot be used on Macintosh computers (at this writing). Producer instructional modules are poorly compatible on Macintosh computers, and require Internet Explorer (not a popular browser with many Macintosh users).

VIII. Conclusions

Implementation of Microsoft Producer streaming media technology has been positive on our engineering campus. It provides a relatively simple way to create and archive reusable course content and deliver it online reliably and on a flexible schedule. Most of all, student response to course elements developed with this technology are highly favorable.

IX. Samples

Sample MS Producer projects deployed at Southern Polytechnic State University may be reviewed at the following URLs:

http://www.spsu.edu/htc/hopper/IDC_6140_900/IDC_6140_M4_1/IDC_6140_Mod_4_1.htm

http://www.spsu.edu/htc/MSP/TCOM_2010_2/SPSU_upload.htm

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