

TEACHING BRIEF

Quick and Dirty Multimedia

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This brief describes techniques that I have used to develop quick and dirty multimedia to support both classroom and distance learning activities. It starts by characterizing various levels of multimedia quality and identifying those that fall into the quick-and-dirty category. The enabling tools required for such development are then described. A series of practical tips for effective content development follow. The brief concludes with discussion of the effectiveness of quick and dirty multimedia using a case study of a programming course.

WHAT IS QUICK AND DIRTY?

One of the most critical decisions that must be made prior to developing multimedia content is the target quality and audience. Developing professional quality multimedia—the type that might be incorporated into a TV show—is likely to require extensive training. Moreover, for such content, the content producer role is likely to be distinct from the instructor role. On the other hand, when the quality bar is set lower, the tools become simpler and instructor-developed content becomes practical. Indeed, it often proves to be more efficient for the instructor to self-develop such content instead of turning it over to a developer. The scale I propose for characterizing content quality is presented in Table 1.

The rightmost two columns are of the greatest interest for the purposes of this brief. The “Efficiency Ratio” represents my estimates of the time it takes to produce the content versus the time it would take to present the same content traditionally. A ratio of 1 means producing content takes the same time as delivering it—for example, giving a lecture. A ratio less than 1 implies that it takes less time to produce the content than it would to present it in the normal manner. One row, “on the fly,” offers this paradoxical efficiency. It describes situations where generating multimedia content—for example, in reply to a student question posted to an online discussion group—actually takes less time than formulating and typing out a detailed response. The rightmost column describes some of the tools typically used for creating different content categories. What should be noticed is that two types of tools (animated screen capture [ASC] and document rendering) appear in nearly all the rows. Understanding these tools is critical to rapid content creation.

So what is quick and dirty content? For purposes of this brief, I define it to be content that is created: (i) using narrated captures of screen activities, rather than traditional computer-based animation techniques such as timelines and key frames; (ii) with an efficiency ratio no greater than 2; (iii) using techniques that can

Table 1: Levels of multimedia content.

Level	Description	Developer	Efficiency Ratio	Tools
Professional	Highly designed content of a quality comparable to that presented in broadcast TV or on large Web sites	Graphic designer	10–100	Animation Video Production Drawing
Packaged	Content segments sold in packaged distance learning courses or provided by publishers to support textbook Web sites	Usually graphic designer (sometimes instructor)	3–5	Animation Storyboard Animated screen capture Presentation
Reusable	Content segments (e.g., lectures) developed to a quality standard that allows reuse	Usually course designer and instructor team	2–3	Animated screen capture Presentation Document rendering
Lecture	Content that is regenerated each semester	Usually instructor, with some course designer assistance	1–2	Animated screen capture Presentation Document rendering
On the fly	Content that is generated in an ad hoc manner, typically in response to student queries	Instructor	<1	Animated screen capture Document rendering

Examples of software by categories:

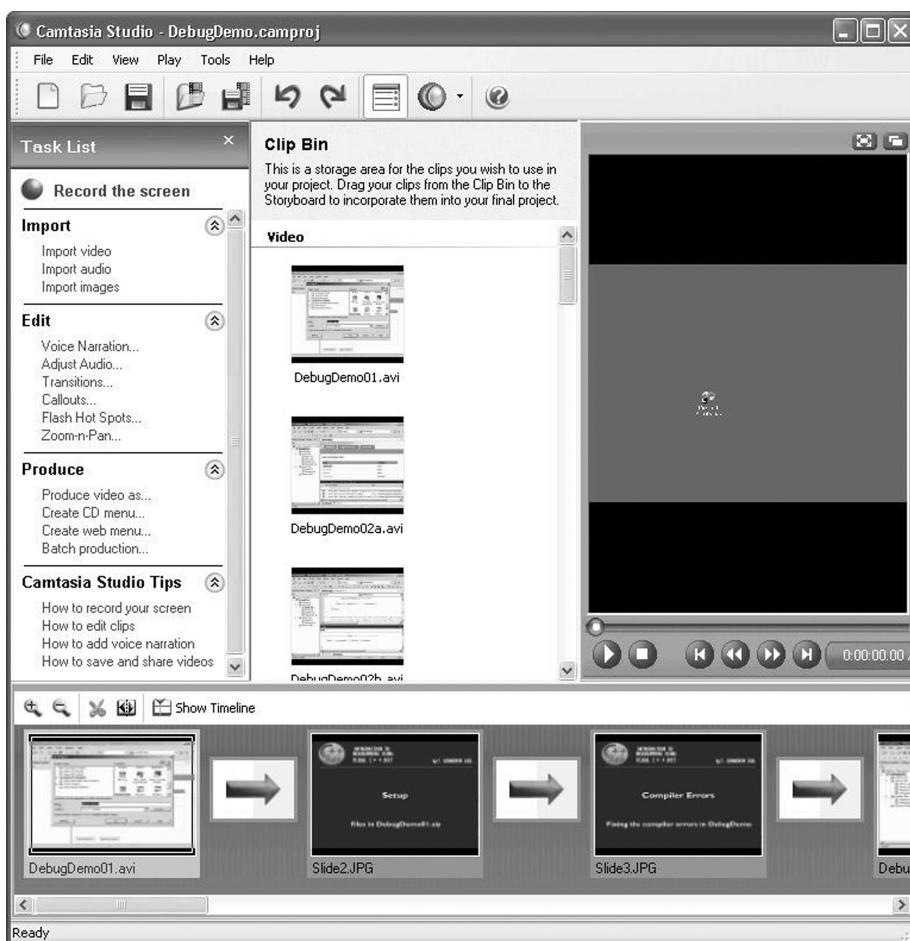
- *Animation*: Macromedia Flash
- *Storyboard*: Macromedia Director
- *Video production*: Adobe Premier
- *Drawing*: Corel Draw
- *Presentation*: Microsoft PowerPoint
- *Animated screen capture*: Techsmith's Camtasia Studio, Macromedia Captivate
- *Document rendering*: Adobe Acrobat

be learned in a few hours by a typical instructor; and (iv) in a form that is practical for emailing or Web-based delivery. The prerequisites for (i)–(iii) are reasonable proficiency using a presentation tool such as PowerPoint and an existing collection of materials (e.g., lecture slides) already available in electronic form. The costs of the basic tools required to create such content are well under \$500, at current academic pricing.

ENABLING TECHNOLOGIES

Three technologies make creation of quick and dirty content feasible: ASC, document rendering, and presentation rendering (the first and last of these frequently being bundled together). Currently, one of the most widely used ASC products is Techsmith's Camtasia Studio (see Figure 1; current academic pricing \$150, from <http://www.techsmith.com> accessed on July 13, 2005). This product allows the instructor to capture the visual activity occurring on any portion of the screen while narrating in the background. While this capability is naturally suited to creating PC-related content (e.g., software demonstrations and tutorials), it can also be very useful for slide-oriented lectures—allowing the presenter to use the mouse and screen annotations to liven up what would otherwise be a static slide image.

Figure 1: Example of video clips in Camtasia Producer.



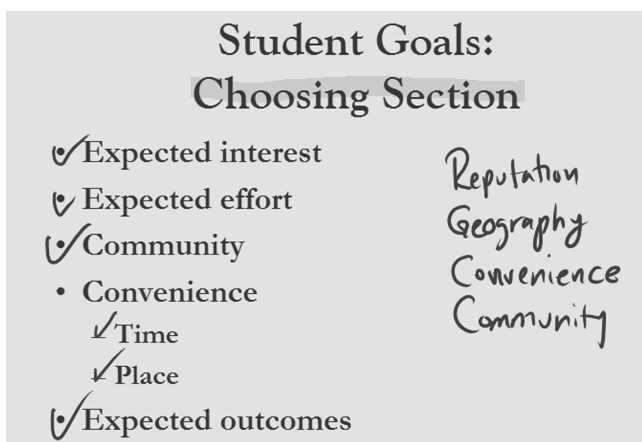
The second enabling technology is a document rendering application, such as Adobe Acrobat (academic pricing typically around \$100) or MS Journal (included with Windows Tablet PC editions). Having such a tool available provides the instructor with two capabilities: (1) the ability to transform any printable electronic content into lecture-usable form (e.g., through printing to Acrobat Distiller) and (2) the ability to annotate content while discussing it.

When ASC and document rendering technologies are combined, the instructor has a powerful tool for generating content from any existing source (including PowerPoint slides). First, the source document is rendered to a file (e.g., printed to Acrobat Distiller to create a .pdf file). It is then opened in the document rendering tool (e.g., Acrobat), where it is sized appropriately. The screen display is then captured using the ASC technology (e.g., Camtasia Studio) while the instructor narrates. As the instructor speaks, the students' attention can be directed using the mouse (which can be highlighted), by drawing on the screen (available as a capture mode) or by annotating the rendered document (e.g., drawing mode in Acrobat).

Where the instructor routinely uses drawing, a digitizing tablet (costing around \$100) can be acquired, allowing the instructor to write with a pen instead of a mouse. Where drawing is used extensively, a Tablet PC (price ranging from \$1,100 to \$2,500) should be considered. This provides the ultimate level of flexibility in fast content creation and comes with a built-in document rendering program (MS Journal). Figure 2 shows a snapshot taken during a presentation using such annotation.

The final stage of quick and dirty development is presentation rendering. In this stage, audio and video content can be edited, a presentation index can be incorporated and visual effects can be added. Once all modifications are complete, the rendering tool (e.g., the same Camtasia Studio used for ASC) takes the presentation elements and merges them into the desired delivery format, such as Windows

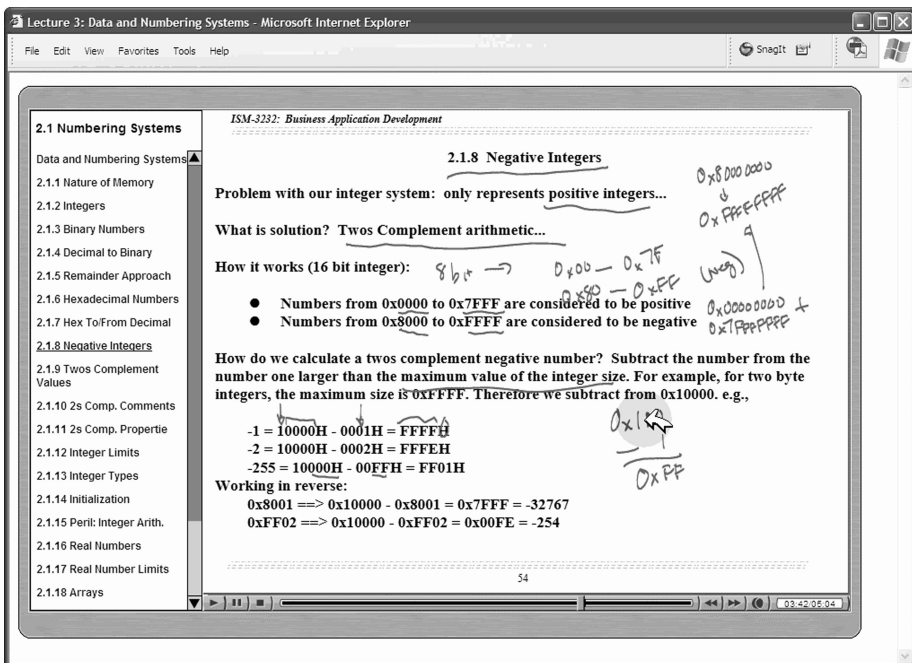
Figure 2: Annotations in a quick and dirty presentation.



Media Viewer (wmv) or Flash. Current rendering tools can take ASC content and produce very small files (mainly dictated by the quality of the audio) yet retain original screen quality—making them far superior to a TV (NTSC) rendering of the screen, sometimes used when lectures are recorded in a TV studio. Their small size makes these files suitable for nearly any type of delivery—including CD (~10–20 hours per CD), via course management system (such as Blackboard), and over the Web—even using a dialup connection.

Currently, commercial presentation rendering tools are advancing at a dramatic rate. The result has been a significant increase in the quality can be achieved within quick and dirty time constraints. In Camtasia Studio, for example, instructors can now add index markers to presentations (markers that are automatically created for recorded PowerPoint presentations). These markers are then used to render complete menu-driven Web-based presentations (see Figure 3) in a variety of formats. Some degree of interactivity, such as internal menus and SCORM-compliant quizzes, can also be added to Flash-rendered presentations from within these rendering tools. In addition, new formats and techniques for incorporating non-ASC video (e.g., video of the lecturer as he or she speaks) without dramatically increasing file size are also being introduced and refined. Collectively, these enhancements—along with similar enhancements in competing tools, such as Macromedia's Captivate (formerly RoboDemo)—are redefining what is achievable in quick and dirty content.

Figure 3: Menu-driven presentation.



PRACTICAL TIPS

Table 2 summarizes a number of practical tips for quick and dirty content development. These tips are organized into three categories: technical, presentation, and efficiency. The technical category deals mainly with the challenges of creating content that will be accessible to all users in all situations. Issues such as screen capture size may seem like trivial details but they are also among the first decisions that an instructor needs to make.

The presentation suggestions are based on my experiences in generating large quantities of quick and dirty content over the past 3 years (over 300 hours worth), principally for programming and management information systems (MIS) courses. The perfect is the enemy of the good when dealing in the quick and dirty. Experience clearly shows that listeners are much less concerned about the lecturer's imperfections than the lecturer is. The objective, therefore, should be to record once and avoid editing within a recorded segment whenever possible. The most important guiding principle for achieving this is to record small segments, then merge these segments later, in the presentation rendering stage.

The efficiency suggestions are particularly relevant as an instructor begins to develop and use such content extensively. The magnitude of the problem can be daunting (e.g., on just one of many hard drives, I identified 3,940 ASC-generated .avi files taking up 44 GB of space). In addition, small changes (e.g., recording at different sound settings or capture sizes) can cause unexpected declines in output quality. The key to managing such large quantities of content is consistency—serving both to reduce the number of decisions that must be made and assuring uniformity of output.

OUTCOMES: A CASE STUDY

I close this brief with the following question: Can quick and dirty multimedia be an effective pedagogical tool when contrasted with traditional techniques such as lectures or, alternatively, with multimedia content created using higher production values? Since first experimenting with quick and dirty techniques in the year 2000, I have incorporated such multimedia in 10 different courses, at both the graduate and undergraduate levels. One of these, in particular, offered the opportunity to contrast traditional lectures, quick and dirty content, and higher production quality multimedia as the class evolved. That course was an introductory programming class in C/C++, required for undergraduate MIS majors, and was offered in a self-paced format. It included: (1) traditional classroom lectures, (2) quick and dirty lecture content paralleling the classroom lectures but delivered through Blackboard, and (3) multimedia content I developed for a textbook (Gill, 2004) that was provided to students on a CD. The course was offered in a self-paced format in which grades were determined by the percentage of assignments completed (Gill, 2005). In this context it should be noted that, as the multimedia content was incorporated into the course, in 2002 and early 2003, requirements for an A grade were gradually increased (by 15–20%), while the requirements for a C grade were left largely unchanged.

Table 2: Practical tips for creating quick and dirty content.

	Technique	Explanation and Recommendation
Technical	Choose a lowest common denominator size for screen captures and stick with it	Do not just use how it looks on your PC in deciding how large the screen should be. Consider: (a) what your students have, (b) the projectors in your classrooms (often limited to 1024×768 or even 800×600) and even orientation (e.g., as tablet PCs become more popular, their 768×1024 resolution limits the width in portrait mode). Recommendation: size to under 800×600 as a starting point.
	Choose a format that does not require a lot of setup for students	Formats intended for Web delivery are generally best. The simplest formats are currently .wmv (Windows Media Viewer) and Flash. The latter can be more complicated but is also more reusable and flexible where interactivity is desired.
	Do not add a lot of unnecessary screen effects, such as transitions	Transitions between slides—while very nifty looking—can interfere with playback over the Web and may not look nearly as good to students. Recording over PowerPoint slides with gradient fills can actually lead to noticeably larger file sizes. Over time, the importance of this issue is likely to diminish, as new capture formats are reducing the importance of background on size.
	Plan to render the content in different forms	It often will make sense to render the same lecture in different ways. For example, a menu-based presentation used on a Web server could consist of hundreds of files—making it hard to upload to a course management system such as Blackboard—where rendering the presentation to a single file might make more sense.
	Avoid the talking head	Integration of actual video content (e.g., head shots) with screen capture content can dramatically increase content size unless screen quality is reduced significantly. In this context, however, Version 3 (July 2005) of Camtasia Studio introduced some new formats and techniques that make limited use of head shots practical.
Presentation	Use the mouse and pen to create action	Narration over a static slide can become tedious in minutes. Using the mouse to direct the viewer's attention and the pen to underscore points (just as would be done in lecture) reduces the tedium somewhat.
	Play to strengths of technology	If talking over slides describing a PC application (such as Excel), run the application itself and demonstrate it. Animated screen capture is at its best when applications are running in the capture window.

Table 2: (Continued)

	Technique	Explanation and Recommendation
	Silence is golden	When running out of things to say, or pausing to think, say nothing rather than filling the time with ah's and um's or meaningless banter. Not only will this be much easier on the listener, it will also make it easier to identify the content gap in presentation rendering software (which displays sounds as waves), allowing you to edit it out.
	Favor content that you know	If content is familiar—for example, a lecture you have given a number of times—it is much easier to anticipate likely audience reaction (e.g., “you probably have a question here”) and a livelier presentation will likely result.
Efficiency	Record short segments then edit them together	Rerecording a botched segment is usually faster than editing it afterwards unless the segment is more than about 15 minutes long. Recording a separate segment per slide is usually best—this also promotes reusability.
	Save a copy of your content in its original form	It is amazing how often you find yourself wanting to reuse content that was supposed to be a one-time recording. The main disadvantage to this is space—as raw (.avi with no compression) content is often 10–20 times larger than rendered content. The problem becomes most serious on a laptop where a 40 GB drive can fill up with alarming speed. One possible solution is to get an external hard drive.
	Develop a rational naming scheme	Even a single course can involve 300–500 slides. Naming video segments haphazardly can dramatically increase the difficulty of keeping track of them and will also make production more difficult. If using numbers, put 0's in front of them if 10 or more slides are involved (e.g., Slide04_01, Slide04_02, instead of Slide4_1, Slide4_2, because Slide4_10 is alphabetically before Slide4_2).
	Develop a consistent approach and follow it	Using the same slide size, recording settings, screen position, background template, etc. will reduce the time spent thinking about setup and will also reduce the likelihood that an incorrect setting (e.g., recording at too low an audio sample rate) produces bad content quality. Tool defaults, in general, are pretty good and should be used whenever possible.

Throughout 2003, students were surveyed regarding their attitudes at the end of each semester. On questions relating to the content delivery, the results were as follows:

- 83.9% reported being satisfied (35.7%) or very satisfied (48.2%) with the multimedia content provided with the class (112 responding).
- 83.7% reported that content supplied to them on CD was helpful to their learning in the course: moderate help (20.0%), much help (35.5%), or very much help (27.3%).
- 69.9% reported that online lectures—the quick and dirty content prepared to parallel classroom lectures but created independently—were helpful to their learning: moderate help (22.3%), much help (26.2%), or very much help (21.4%). Classroom lectures, by comparison, scored 53.7% helpful: moderate help (23.2%), much help (21.1%), or very much help (9.5%).

Because the student population being surveyed was highly diverse in many ways (e.g., 41% had never taken a programming course before, 40% had previously taken a C/C++ course; 25% were part-time students; 37% were employed full time; 30% were women; 20% were minorities; 14% were non-U.S. citizens; median age was 24 years old, with 20% being over 30) subsequent correlation analysis was performed to determine if prior computer experience, work status, or demographic factors impacted satisfaction with the different forms of content delivery—with no significant relationships being detected.

In interpreting the survey results, it is particularly interesting to note that the quick and dirty multimedia lectures actually outscored in-class lectures. Student comments seemed to suggest that two factors accounted for this: the ability to replay online lectures and the complete flexibility of viewing place and time provided by such content. The fact that online lectures were recorded to a noticeably lower standard than the CD-based lectures (created to the packaged quality standards as described in Table 1) and also scored somewhat lower in evaluations, however, further suggests that multimedia quality is not irrelevant. As a result of these findings—combined with the fact that attendance in live lectures had dropped to under 20% of enrolled students by spring 2004—the decision was made to abandon live lectures and remaster the Web-based lectures to slightly higher reusable quality standards, incorporating slide indexing (see Figure 3) and an extensive Web site developed using MS FrontPage. Since that change was instituted in summer 2004, course requirements remained constant while a gradual trend of improving yield (percentage of initially enrolled students who do not withdraw or receive grades of D or F) and overall student performance (in terms of percentage of material completed) was observed. On the negative side, instructor evaluations stabilized at a mediocre level (typically ranging from 3.6 to 4.0 on a 1 to 5 point scale, with 5 being most positive) with frequent student comments to the effect that they “were not paying tuition to be taught by a computer.” Thus, the case example presents an interesting paradox. As quick and dirty content was put in place classroom attendance dropped dramatically and yet—despite improved academic performance—the same students later objected to their lack of direct instructor contact. The implication here is that instructors planning to create quick and dirty lecture supplements may want to develop alternative pathways for maintaining

contact with students (e.g., lab sessions, moderated group exercises) or gather alternative data (e.g., student surveys, objective performance metrics) to build a case for course effectiveness beyond that provided by raw instructor evaluation results.

CONCLUSIONS

There are three central conclusions supported by the topics presented in this teaching brief. These are as follows:

1. Using ASC, document rendering, and presentation rendering software tools, it is now possible for instructors to generate acceptable multimedia content that can be delivered in multiple formats in a time frame comparable to that of giving a lecture.
2. The software tools used to create such content are evolving at impressive rates, increasing the quality of what can be produced within the quick and dirty time frame.
3. The incorporation of quick and dirty multimedia into a course can lead to enhanced student performance but these enhancements will not automatically translate to improved instructor evaluations. Thus, instructors need to be cognizant of how introducing such multimedia may influence the dynamics of a class and consider ways of minimizing the perceived lack of personal contact that may accompany such introductions.

With respect to generalizability, my own experiences—across a set of classes ranging from highly technical programming courses to qualitative MIS courses—suggest that quick and dirty content is best suited to teaching situations where complex topics are being conveyed and where students typically need to see material several times before comprehending it. It is also highly effective for any topic that involves teaching or demonstrating PC-based software. Many examples of these types of teaching situations can be found in the decision sciences, where both complex quantitative analysis and specialized software are routinely encountered.

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