Teaching Digital Multimedia as a Component of Business Education

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ABSTRACT

The growth of the Internet and the explosion of digital communication technologies in the 1990s have given rise to the importance of digital multimedia in the American economy. We define multimedia as the transmission of content through a combination of text, graphics, pictures, sound, animation, video, and hyperlinks, resulting in communication that is multisensory and potentially interactive. Multimedia has had an impact on Internet marketing, the music and motion picture industries, the education industry, and healthcare. It is therefore relevant to marketing and information systems and would seem to have a place in business curricula. The purpose of this paper is to describe the results of teaching digital multimedia in a business discipline. A review of multimedia offerings in higher education indicates that the concepts, technical aspects, and creation of digital multimedia are taught variously in computer science, the creative arts, communication, or psychology but are largely absent from the domain of business disciplines. We report on our experiences teaching a three-credit, 15-week, junior/senior-level Digital Multimedia course under the Computer Information Systems heading. Topics associated with the course include conceptual understanding of digital multimedia, business and legal issues surrounding digital multimedia, and technical underpinnings and skills in the creation of multimedia. A key component of the course is a semester-long team project on a topic selected by each group of students. Challenges in teaching the course include cost of hardware, software, and facilities; containment of the scope of topics; differing expectations of students entering the course; and availability of support materials.

Keywords: digital multimedia, computer arts, digital content, business curriculum, digital creativity

1. INTRODUCTION

The growth of the Internet and the concomitant development of digital communication technologies during the 1990's have resulted in numerous permanent changes to the American business landscape. A major component of digital communication is multimedia: the transmission of content through a combination of elements including text, graphics, pictures, animation, video, sound, and hyperlinks, resulting in communication that is multisensory and potentially interactive. Several factors have combined to increase the prominence of digital multimedia in business, including the growth of bandwidth, new data compression algorithms, the falling cost and increasing capacity of digital storage, widespread distribution of software for decompression and display of digital media, an increasingly powerful toolset for digital media creation at the desktop, and conversion of existing multimedia assets from analog to digital formats.

The impact of digital multimedia on the American economy would be difficult to estimate. The music industry and motion picture industry are developing new technologies and distribution systems and are engaged in legal challenges to deflect threats incurred from file sharing by millions of users. New categories

of products based on multimedia have been created, such as increasingly sophisticated computer games, electronic children's toys, and digital greeting cards, which have grown to be a significant competitor to conventional cards (Fatherree 2000). Marketing in the entertainment industry is now heavily dependent on digital multimedia, and the education industry is undergoing significant changes as a result of digital media for computer-mediated or on-line learning, virtual demonstrations, testing, and student project creation (Peled 2000). Macromedia Flash, which is the industry standard for animation on the web (Aguilar 2001), is now viewable by 97 percent of online users (PR Newswire 2001). Digital multimedia is affecting the healthcare industry through video-based networks that transmit on-line patient information and, eventually, control of surgical procedures (Kodama 2000).

The purpose of this paper is to describe the potential role for a digital multimedia course taught in a business discipline. The paper begins with a review of multimedia offerings in higher education and then describes the content and results of our experience in teaching a digital multimedia course under the Computer Information Systems heading. The challenges of offering a digital-multimedia business course are discussed.

2. MULTIMEDIA IN THE CURRICULUM

An Internet search suggests that in the educational arena, some aspect of digital multimedia is taught at virtually every college or university, primarily in the domain of computer graphics or the creative arts. However, aspects of digital multimedia are touched upon in fields as wide-ranging as psychology and communication. Three levels of multimedia educational programming appear to exist, although there is some overlap among these: 1) training on individual multimedia software packages, usually through continuing education programs; 2) courses that contribute to a related undergraduate or graduate degree program; and 3) centers or programs focused entirely on multimedia. As an example of level 1, Georgia Tech offers a series of courses leading to a certificate in web site design that includes vector animation and graphics. There are hundreds of such courses available in the United States, but they are generally targeted to individual learners rather than to cohorts of students who are pursuing a degree. As an example of level 2, the Rhode Island School of Design incorporates several digital media courses into its majors in graphic design and film/animation/video. Also, many programs in communication and psychology incorporate courses that consider digital multimedia in interpersonal communication and user interface design, respectively. As an example of level 3, MIT offers programs in Media Arts and Sciences and in Comparative Media Studies, and also operates the well-known MIT Media Lab as a research and graduate education unit.

Cornell's program in Computer Graphics is another example of level 3.

Teaching of multimedia in business education is far more scarce, although the importance of teaching business students to use and understand information technology is well accepted. Pearce (1999) surveyed 263 members of the Academy of Management regarding their views on business education reform. Six core issues were identified, with the number one issue being technology-assisted pedagogy. While this does not directly implicate the teaching of digital multimedia, it does show the prominence of technology as a concern in business education. More directly relevant is the incorporation of digital multimedia into related courses such as information systems, e-commerce, and Internet marketing. King et al. (2001) surveyed the content of e-commerce courses; among 44 topics encountered in the syllabi of these courses, Internet technologies was a component of nearly 50% of the courses, and web site design was found in 25% of the courses. However, teaching of the creation of digital media or multimedia and the associated underlying technology appeared to be largely absent. In a survey by Smart et al. (1999), the integration of technology in marketing courses was of more concern from the standpoint of pedagogy than from teaching of the technology itself. Not surprisingly, use of the Internet as an educational tool or as a marketing medium is the primary focus in Internet marketing courses, rather than teaching of the technology (McCorkle et al. 2001; Benbunan-Fich et al. 2001). Mohr (2000) argued the need for marketing students to have a greater level of technological understanding and skill for the high-technology industries. For example, he proposed that collaboration between marketing and software engineering is required in the development of high-tech products, and that marketing personnel need enough sophistication and understanding of technology to bring the "voice of the consumer" to the research and development process, although he stopped short of recommending the incorporation of detailed technical content into marketing curricula. Kaynama and Keesling (2000) described a Web-based Internet marketing course in which the end product was the development of a web site for Internet marketing of a product or service.

Within information systems education, only a few documented examples can be found in which multimedia is a significant component of an IS course (Passerini and Granger 1999). Generally, the IS discipline has not evolved to include the display of information in multimedia format (Simon and Wang 1999; Lethbridge 2000), and multimedia does not appear as a distinct topic in core information technology courses at AACSB-accredited schools, although it may be embedded in other topics (Stephens and O'Hara 2001).

Thus, despite the importance of digital multimedia to

current business, the topic is rarely seen as the province of business schools or of technology curricula within business schools. Reasons for this may relate to the problems associated with incorporating digital multimedia into business curricula, which are discussed later in this paper. In the next section, we discuss our experiences in teaching such a course under the Computer Information Systems heading.

3. OUTLINE OF A DIGITAL MULTIMEDIA COURSE TAUGHT IN COMPUTER INFORMATION SYSTEMS

Here we describe the content of a three-credit, 15-week Digital Multimedia course taught at the junior/senior level in the Computer Information Systems department at Bryant College, which is an AACSB-accredited Master's level business specialty school with approximately 2500 undergraduates. Two to three sections of 25 students have been conducted in this course every semester for the last three years. The course is open to all students and serves as an elective for CIS majors or minors; the only prerequisite is a three-credit core course on Fundamentals of Computer Information Systems, which, in turn, requires a one-credit seminar on basic spreadsheet, word-processing, presentation, and Internet computer skills. Students are expected to have some linear algebra and to be able to use most of the calculation features in Excel. Table 1 gives a profile of the majors, minors, reasons for taking the course, computer ownership, and career goals for students who have taken the course in one section over the last four semesters. Table 2 provides data on the students' self-identified experience levels with multimedia and level of technical expertise entering the course; because these results change every year, we have only included data for the two most recent semesters.

The course is taught in a dedicated multimedia lab with 20 high-end PC workstations and a sound system, two computer projectors, and a VCR connected to an instructor's workstation.

The overarching goal of the course is to provide students a fundamental understanding of the conceptual, technical, and legal aspects of the creation of digital multimedia. It is therefore more focused on this topic than other general information systems applications courses which contain multimedia (Passerini and Granger 1999). Specific objectives of this course are to:

- Explore the business and legal environment for digital multimedia and how it is changing the way entrepreneurial firms and individuals make profit, create wealth, and develop new business models.
- Provide students with a fundamental understanding of the technical aspects of digital multimedia and the software and hardware involved in its creation and distribution.

Table 1. Student responses to survey questions on the first day of class (N=103).

Major/Concentration	
CIS	69%
Marketing	11%
Finance	10%
Management	6%
Accounting	1%
Communication	1%
Financial Services	1%
International Studies	1%
Unknown/no answer	1%
Minor	
Communication	27%
Psychology	20%
CIS	9%
Sociology	8%
Applied Statistics	6%
Political Science	4%
Environmental Science	3%
History	3%
Japanese	3%
Economics	2%
Applied Actuarial Math	1%
Biotechnology	1%
Marketing	1%
Unknown/no answer	7%
Why are you taking this course?	
Develop computer skills/gain more knowledge/interesting	42%
Increase employment opportunities	37%
Fulfill major/minor requirements	21%
If you own a computer, list its specifications.	
Complete answer	57%
Partial answer (indicating computer ownership)	14%
No answer	29%
Do you have a personal web site?	
Yes	57%
No	29%
No answer	14%
What are your career goals?	
General computer work/CIS	17%
Web design and development	23%
Business management	11%
Specific industries (e.g. music, corporate finance, auto, fashion, international affairs)	17%
Graduate school	3%
Don't know/no answer	29%

Table 2. Student self-identified experience levels with multimedia and level of technical expertise entering the course in the last two semesters. Students were asked to rate themselves on a scale of 0 to 5 (N=50).

	Percentage of students with no experience (self-rating 0)	Mean
Do you have experience with any of these software programs? Scale: 0=none, 5=advanced user		
Image editing	37%	1.74
Flash	86%	0.29
MP3 software	11%	2.66
Sound editing	57%	0.91
Video editing	54%	0.83
Do you have experience with any of this multimedia hardware? Scale: 0=none, 5=advanced user		
Digital still camera	20%	2.54
Analog video recorder	29%	2.11
Digital video camcorder	43%	1.63
Scanner	3%	3.03
Firewire connector	89%	0.29
Rate your general technical knowledge on a scale of 0 to 5	0%	2.62

- Provide a basic understanding of the media/human interface and how the design of multimedia is tailored to human perception, memory, and emotion.
- Help students develop skills and experience with hardware and software in the creation of multimedia content including still images (graphics and pictures), sound, text, hypertext, video, and animation.

Given the multiple facets by which digital multimedia affects modern business, the scope of the course is necessarily broad. Thus, the content of the course can be viewed as covering three types of areas:

1. Concepts in digital multimedia: definitions, history, critical evaluation, planning, audience targeting, and project management in the multimedia creation process.
2. Business and legal issues: intellectual property law and current controversies.
3. Technical issues: creation of digital media; digitization of analog media; data compression, transmission, display; modification and editing of multimedia assets; and elements of human perception.

Graded activities encompass in-class laboratory exercises, two preliminary exams, a final exam, and a semester project in which teams of two to four students create a multimedia title. The topics and learning activities associated with each topic are summarized in Table 3.

Table 3. Sequence of topics and learning activities for the Computer Information Systems course on digital multimedia.

Course Topics	Learning Activities
Section 1: Introduction, Principles, Planning, and Multimedia Authoring	
Introduction to Multimedia for Commercial Purposes • Course introduction • Digital multimedia defined • Evolution and history of multimedia • Critical evaluation of multimedia effectiveness	• Select and critique a multimedia web site • Review Kennedy-Nixon debates and describe significance of audio and visual components • Classify different media as multimedia
Topic 1 Multimedia Hardware • Hardware for sourcing and digital conversion • Multimedia PCs: characteristics, load and cpu monitoring • Peripheral devices: digital cameras and camcorders, optical scanners, digital sound recorders, projectors, CD-RW and DVD drives, connectivity devices	• Experiment with peripheral devices: digital camera, camcorder, scanner • Analyze PC characteristics and load monitoring • Learn to use multimedia lab workstations, peripherals, and servers
Topic 2 Planning for Multimedia • Multimedia creation process • Ten steps for project management in multimedia creation • Planning for	• Associate people in a movie production team with the ten steps in multimedia creation • Outline and execute steps 1-4

authoring, production, quality control and distribution • Roles of people in multimedia teams • Storyboarding • Understanding the message, the target audience, and the delivery • Writing a scenario and script	for a multimedia project (presentation for a fictitious or real national park) • Select and view a television commercial, and create the storyboard for that commercial • Search for and select a multimedia job posting on the Internet • Create first draft of storyboard for semester project
Topic 3 Introduction to Multimedia Software • Overview of sourcing, editing and authoring programs for sound, image editing, and multimedia authoring • Importing digital media • Event management, timelines, transitions, pathing	• Create simple digital assets with paint program and sound recorder • Bring multiple assets into an introductory presentation about each project team • Learn basic techniques for transitions, timelines, pathing, and scenes in multimedia program
Section 2: Digital Assets	
Topic 4 Intellectual Property • Copyright law: Title 17, Doctrine of Fair Use, First Sale Doctrine, Audio Home Recording Act, No Electronic Theft Act, Digital Millennium Copyright Act • Current developments in digital music	• Analyze legality of various scenarios on people's use of digital multimedia
Topic 5 Text and Design • Importance of and guidelines on use of text • Character sets, fonts, colors, Word Art • Four principles of screen layout: contrast, repetition, alignment,	• Design exercise in creation of a multimedia resume for any person (two versions: professional and artistic)

proximity	
Topic 6 Digital Sound • What is sound • Frequency spectra of sound • How the human ear receives, processes, and transduces sound • Acquisition or conversion of digital sound (sampling frequency, bit depth, bitrate) • Sound compression formats, MP3 • Calculation of digital sound file size and downloading time • Editing sound	• Analyze spectral characteristics of digital sound • Calculate sound file size and downloading time for uncompressed and compressed files • Practice sound editing, mixing, manipulation, and effects
Topic 7 Digital Still Images • How the eye perceives images and color • Digital image representation (resolution, bit depth) • Calculation of digital file sizes and downloading time • Image compression algorithms and formats (jpg, gif, png, tif) • Editing images	• Create a digital image in Excel • Process image file compression and decompression using run-length encoding • Calculate image file size and downloading time for uncompressed and compressed files • Practice image editing, superposition, transparencies, and effects
Topic 8 Digital Video • Analog and digital video • Frame rate and other video parameters • Video compression methods and formats • Calculation of digital video file sizes and downloading time • Editing video	• Calculate video file size and downloading time • Edit video clips (incorporated into semester project)
Topic 9 Interactivity and Navigation • Navigation strategies and principles • Interactivity and user feedback • Flows, buttons,	• Create a multi-scene presentation with two or more navigation strategies

icons, pictures, image maps, hypertext	
Section 3: Animation and Multimedia Authoring with Flash	
Topic 10 Animation • Animation principles and terms • Basic image creation • Shape and motion tweening • Action control • Importing sound and other assets • Motion guides • Scenes • Mask layers • Interactivity and buttons	• Perform series of exercises to reinforce each topic

A key component of the course is the semester project. In order fully to understand the concepts and utilize multimedia, students need to experience the process of design, creation, testing, and presentation. Thus, in addition to the learning activities above, students also fulfill a set of overlay requirements for the project as shown in Table 4.

A number of topical areas for the project are suggested to students, but teams are encouraged to deviate from this list and to generate their own ideas. Typically, projects have fallen into two categories: 1) Marketing pieces for real or fictitious companies, organizations, services, or products; and 2) Projects intended to educate or entertain a target audience. Sample project titles are provided in Table 5.

Software used in the course has been a changing feature because of numerous upgrades and changes in compatibility with different operating systems. Compromises frequently are made between cost and capability. For example, although a software package may be an industry standard, its cost may be prohibitive for an entire classroom, and less expensive software may be an acceptable alternative. Table 6 lists the software currently in use for each of the multimedia sourcing, editing, and authoring activities.

Several considerations complicate the selection of software for a multimedia authoring tool, which is used to integrate digital assets and create the semester projects. Products that are easy to learn due to their similarity to PowerPoint are also not of the industrial capability needed to deal with the large file sizes that multimedia titles engender. Macromedia Flash is well known and is both an animation tool and a multimedia authoring tool, but it is more difficult to learn and so has been introduced later in the course (Table 3).

Table 4. Sequence of stages and activities associated with the semester project for team creation of a multimedia title.

Project Stage	Learning Activity
Team Formation and Topic Selection	• Students self-select into teams of two to four people around a topic of common interest • Each team submits a project proposal stating team title, names of group members, project title, 100-word description
Topic Definition, Refinement, and Focus	• Submission of detailed project proposal including title, description, message, purpose, target audience, summary of content, tentative list of scenes and assets to be acquired, planned workflow for each step
Project Planning and Creation	• Submission of storyboard showing planned content for all scenes • Teams meet as needed to accomplish tasks according to workflow
Project Previews	• Two previews of the project in process are reviewed and graded for content, progress, and teamwork collaboration
Project Presentation	• Each team presents project to class, giving description of topic, purpose, target audience, sources of assets, problems and how they were solved, and a viewing of the finished product • Rest of class assesses effectiveness of project and evidence of group collaboration
Final Project Submission	• Submission of finished title as an executable file on CD-ROM • Submission of completed storyboard reflecting final content of project

4. RESULTS OF TEACHING DIGITAL MULTIMEDIA IN A BUSINESS DISCIPLINE

Student team projects and preliminary and final examinations have been the methods used to assess student learning in the course. Projects are graded on quality, effectiveness, depth, and content, and student

Table 5. Sample titles for the semester project.

Marketing Projects
V-Dub Jetta: promotional presentation for a specific car model
Bryant Townhouses: promotional presentation for the residence hall townhouses
Choose Your Own Adventure: multimedia travel planning around various types of vacation activities
Educational Projects
Flash Forward: animated fantasy of a college student's dream of the future
End of the Road: a presentation informing college students of the dangers of drunk driving
The German Invasion of Poland: multimedia presentation created in conjunction with a history course
Picasso: the phases of his art

Table 6. List of software currently in use in Digital Multimedia course.

Purpose	Software currently in use
Operating system	Windows 2000 or XP
Sound capture	Windows sound recorder
Sound analysis and editing	Goldwave
Audio MP3/wav file conversion	MusicMatch Jukebox
Text-to-speech conversion	AT&T's voice synthesizer project at att.com
Image creation and editing	Jasc Paint Shop Pro (primary) Adobe Photoshop also available on one workstation Macromedia Fireworks
Animation	Macromedia Flash (primary) Jasc Animation Shop also available
Video capture and editing	Adobe Premiere on instructor's workstation (primary) ULead available on all other workstations
Movie file conversion between AVI format and MPEG-1 or MPEG-2 format	Free utility from cnet.com
Office software	Word, Excel
Music player and video display	Windows Media Player, MusicMatch, Winamp, RealPlayer, QuickTime, Flash Player plug-in
Multimedia authoring	Astound (primary) Macromedia Flash also used as a multimedia authoring tool

reactions to others teams' projects are assessed by way of team presentation and an assessment form. The better projects are judged to be more sophisticated in their presentation, better researched, more highly coordinated among group members, and more creatively expressed. The content of the assessment form is provided in Table 7.

Students commonly introduce technical elements into the projects that were not taught by the instructor and that challenge the limits of the software. For example, one student group used an image of a musical group to create an image map in which the user could click on each group member to learn more about that person. In Flash, this required creating an individual image cut from an outline of each person in the group picture, and overlaying these separate images as invisible buttons on top of the group picture.

4.1 Student response
Table 8 shows the results of an open-ended survey implemented on or near the last day of class in one section of the course over the last four semesters. The students were asked to describe the best and worst parts of the course. Negative aspects include feeling overwhelmed by the amount of material and the workload, a desire to focus more on Flash, and frustration with technical or team-related problems in the project. From a student standpoint, innate interest in the subject matter, ability to evaluate and understand the technical creation of digital multimedia, and the creative aspect of the project were the most frequently cited benefits of the course.

4.2 Availability and cost of hardware, software, and facilities
One of the challenges in deploying the course is the cost. A single classroom equipped with 20 workstations and two networked servers can cost $80,000, the approximate breakdown being $50,000 for computers

$20,000 for peripheral equipment, and $10,000 for software. A local area network with a high capacity server and node licenses can add up to $10,000 for the classroom. Therefore, a realistic but all-inclusive cost can be from $3,000 to $4,000 per seat, just to initiate the course. Although the price of computers decreases over time, the demand for advanced features increases. A hidden cost arises from the fact that because the technology advances so quickly, computers and some peripherals need to be upgraded every other year. Another cost is the technical support needed for a

Table 7. Content of the multimedia team project presentation assessment form. This form is filled out by other students in the class, and the results are used to help assign grades on the project.

Rate the project on a scale of 1=poor to 5=excellent.
The title's purpose was clearly evident.
Timing of scenes and actions.
Use of sound.
Overall evaluation of the project.
How **effective** was the project? Comment on its ability to reach its target audience, the use of surprise, the degree to which it was able to stir emotion and interest, and how memorable it would be.
Please comment on the group's **presentation**: how well prepared did they seem, how well organized were they, and to what extent do you think there was equal collaboration?

Table 8. Grouped responses to an open-ended survey on or near the last day of class, which asked students for the best and worst parts of the course (N=103). Results were pooled in the categories shown and are given as a percentage of those who responded. The total percentage exceeds 100% because some students cited more than example.

What were the best parts of the course?	
Subject matter interesting	56%
Experience with software	31%
Delivery style	23%
Project	22%
Hands-on labs	16%
What were the worst parts of the course?	
Focus more on Flash	39%
Amount of material and workload	23%
Technical or team-related problems	20%
Exams/grading	14%
Availability of software/access to lab	7%

peripherals need to be upgraded every other year. Another cost is the technical support needed for a multimedia computer lab. Technical problems are not uncommon due to breakdowns in equipment, the constantly heavy usage by students, and continual changes in settings and registries by installation of different and, in some ways, competing software packages. Our lab is maintained by a part-time technician in addition to part-time student support.

An added cost of teaching a multimedia course in a business discipline is that the expensive aspect of these facilities may not serve a large number of other courses. In our multimedia laboratory, Web Design and Development, E-Commerce, and Human/Computer Interaction (forthcoming) are the only other courses that make consistent use of the capabilities of the facility.

However, it is encouraging that more multimedia capabilities are being embedded into operating systems, and if this trend continues, it will reduce the cost of establishing and maintaining specialized facilities.

4.3 Scope creep and setting of realistic course goals
Rapid advances in the technical and legal aspects of digital multimedia demand that material be added to the course every semester. Tables 3 and 4 and student responses in Table 8 suggest that overload is a real hazard, and many topics cannot be given adequate treatment. A guiding principle has been to focus on the integration of digital assets and on the concepts and process of multimedia creation. In that way, the course contributes to the students' education and lifelong learning, and de-emphasizes training on specific pieces of software that may be used only in the immediate future.

4.4 Learner characteristics
Students entering the course have varying skill levels and degrees of experience with multimedia (Tables 1 and 2). In recent semesters, music file sharing and digital imaging (scanners and cameras) have become the most common out-of-class experiences that supplement the formal prerequisites. An advantage for business students in the junior or senior years is that they are fairly experienced in working in teams on semester projects.

Those students who indicate experience before taking the class with specific areas of multimedia do not generally receive higher final grades than other students. Image editing in the most common software experience for students entering the class. In a t-test comparing the final grades of those who rated themselves as having zero image editing experience entering the course and those with some experience, the t-statistic was 0.88 with N=50, yielding a P>0.10. The correlation coefficients between final course grade and self ratings of technical level (r = 0.20), image editing experience (r = 0.21), and MP3 experience (r = -0.06) were all not significantly different from zero at P>0.05. We feel that the lack of relationship between entering skills and course achievement is at least partly due to the discipline the course imposes on the creative process.

A challenge in teaching the course is that the expectations of students entering the course are usually only a subset of the entire set of goals for the course (Table 1). Students are particularly interested in acquiring skills that will allow them to enhance their career opportunities. Thus, it is essential to convey in the syllabus and on the first day of class that this is not exclusively a skills-based course, and that it primarily covers conceptual, creative, technical, and legal issues.

4.5 Availability of support materials
There is both a plethora and dearth of support materials – software, books, web sites, videos – available to

teachers. The plethora of software tools makes it difficult to select the appropriate level of sophistication for a teaching tool versus the complexity and complications in learning and deploying the software. A great deal of faculty and student time can be wasted when the software is too complicated or is incompatible with the hardware or other software installed. On the other hand, tools that are too simplistic produce frustration because of the ambitious ideas that students wish to implement.

The greatest shortage of material is in an appropriate textbook. Although there are hundreds of books relating to multimedia, spanning the range of hands-on training manuals, general concepts, and detailed technical subjects, there are few if any textbooks designed to provide an appropriate mix of concepts, skills, and exercises for a multimedia course taught in a business discipline. Part of the problem relates to the rapidly changing array of software. Some books feature particular products that may go out of date or that differ from those used in any particular course. Other books emphasize color graphics at the expense of detail and substance. Writing a textbook for this course (Records 2001) is too time consuming to be an option for most teachers.

In our view, a good multimedia textbook for business students would accomplish the following:

- Engender a view of multimedia as an aggregate that enables people to communicate information more effectively and quickly. Rather than attempt to teach students to be experts in each multimedia element, a book should strive to make students literate in all pieces that, when taken together, constitute an effective communication.
- Be at a sophisticated level without allowing detail to obscure the view of multimedia as a whole. Too much detail in the use of any form of media, tool, or software detracts from learning how to apply the tool for content creation. Too little detail prevents students from obtaining a solid understanding of the underlying concepts involved in multimedia creation.
- Reflect an up-to-date and viable toolset. Currently, multimedia tools are distributed across numerous software packages. Just as office software has converged into a single Microsoft-dominated environment, so, we believe, will multimedia software tools consolidate and become more integrated. At this point, textbooks need to be under constant revision as tools are upgraded, but a good textbook could help speed up the convergence process.

4.6 Benefits of teaching multimedia in a business discipline

Through this course, the "mystery" of digital multimedia is at least partially dissipated, and students learn to objectify their reactions to a multimedia title and understand the technology, creative thinking, and process leading to its formation. This provides a benefit to business students. It enables them to do webcasting, video streaming, and electronic resumes in subsequent courses, in co-curricular activities, and after graduation. For example, we envision the prospect that as marketing professionals, students will have a better understanding of what is possible and effective in the creation of multimedia marketing pieces. An ancillary benefit for business students is the creativity the students are able to express, the depth of which has been of surprise to us. A further beneficial aspect of the course is that students are engaged in learning principles that allow them to continue building skills in multimedia creation after the course is completed and to assess new technologies and events in news and business of relevance to this area.

Content developers and technology specialists have, in the past, been seen as two distinct groups. Increasingly, however, students who graduate with knowledge and skills in both areas are in a more competitive position. For example, marketing students who understand the capabilities and limitations of the technology are able to exploit more fully the new digital media. Based on our review of course offerings in multimedia, courses centered in graphic design lack some of the technical content that allows business students to understand issues of technology infrastructure, bandwidth, and file size considerations. On the other hand, computer science courses lack the creative component that helps students put concepts into business practice. In both fields, much of the business and legal issues associated with distribution are not covered. A business-centered course has provided a single package that addresses the major issues involving hardware, software, data compression, distribution, and creativity. While breadth of scope limits depth, we feel a business course can do a better job of meeting the broad needs of business students.

5. CONCLUSIONS

Digital multimedia as a subject taught in higher education takes several forms and is housed in various departments. While its importance to business is widely recognized, its presence in business education is rare. Our experiences with teaching such a course in Computer Information Systems suggests that it can provide valuable insight to business students and give them technological and creative skills they would not otherwise have that are relevant to Internet marketing and development of high-technology products. Significant challenges exist in the implementation of such a course, including the cost of outfitting and maintaining a laboratory with current hardware and software, containment of the scope of the course, expectations of students entering the course, and the simultaneous plethora and dearth of support materials available for such a course. Today's companies

providing internships and jobs to graduates are looking for relatively sophisticated web and creative digital content skills. Based on these findings, an introductory course in digital multimedia has been a positive and useful addition to our business offerings in this era of high technological expectations for business students.

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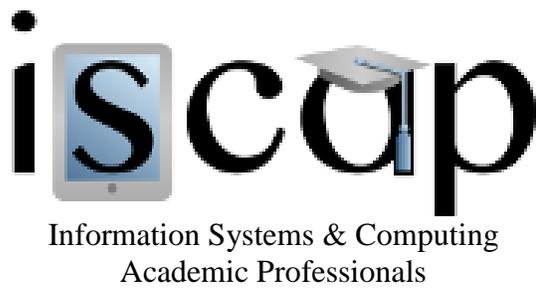
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