Efficient Capture of Content for Delivery in Multiple Presentation Modes
Without Killing Yourself or the Budget

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Abstract

This paper compares various presentation modes for on-campus and distance education instruction and presents a methodology which enables the instructor to overcome many of the problems encountered when teaching courses that are delivered in a variety of modes (live, videotaped, streaming video, and/or downloaded files). The methodology enables those who wish/must deliver the course in multiple presentation modes to do so more easily and economically while simultaneously accommodating the student’s ISP/equipment/learning style differences and limitations. The methodology enhances the individual modes as well as the various combinations of delivery modes.

I. Introduction

The goal of this paper is to present, assess, demonstrate, evaluate, and suggest methods to improve the following distance education/multimedia practices and methods of presentation:

- the traditional classroom presentation,
- videotape presentation, streaming video presentation,
- internet file download presentation, and
- different combinations of these modes \[7, 8\].

The test case for this paper is IEM 5303, Computer Integrated Manufacturing (CIM), a course taught by Associate Professor John Nazemetz. This course is offered annually by the School of Industrial Engineering and Management at Oklahoma State University (OSU).

This course was selected by OSU’s Engineering Extension in Fall, 1999 to be the first OSU course to be optimized for streaming video presentation. The lectures of the Fall 1999 course were (re)used in the Fall 2000 offering and new discussion sessions were produced. This reuse enabled the instructor to gain insight into the student acceptance of the streaming video mode of presentation. It also enabled him to experiment with the Fall 2000 discussion sessions to investigate, develop, and test methods that would enable the simultaneous optimization of live, video-streamed, and videotape presentation of the discussion sessions. In both of the course offerings, the students were evenly divided between on- and off-campus (distance) students. This approach recognized and demonstrated a way by which the instructor could separate the delivery, development, and improvement of the course presentation within the limited time available in the typical instructional assignment (one course ~ 25% release).

The instructor was selected for this experiment as he had a long history of interest in distance education and had demonstrated willingness to not only experiment with the technology but also to push for the its improvement as evaluated from a student viewpoint. His experience includes some of the first instructor-controlled studio productions of course lectures for videotape
delivery as well as moderation of several multi-camera full production crew presentations. Ed McCombs, co-author of this paper, took the course in Fall 1998 (classroom mode) and served as the teaching assistant for the Fall 2000 offering of the course as well as having assisted with several other live/distance courses.

II. Background - Presentation Modes and Stimuli

A variety of instruction/presentation modes are available in today’s teaching environment. They include the traditional classroom, videotapes, and videostreaming. Each presents different amounts and types of stimuli to the student. This section presents a general discussion of the amount and type of stimuli available in each mode and the ability of the student to control the type and duration of the stimuli. Presentation modes have been a subject of prior study and summary documents are available in the literature \[4,7\].

II.1. Traditional Classroom

In the traditional classroom, there are several simultaneous modes of information transfer and stimuli. For example, information can be transferred via

- The Instructor,
- Other Students, and/or
- Media, such as
  - Computer Screen Projections,
  - Projected Images and Text (Overheads),
  - VCRs, or
  - Blackboard/Whiteboard.

With the traditional classroom approach, the students can choose to focus on any of the simultaneously available stimuli in any sequence for any desired duration as well as interact with the instructor or other students. This experience sets the distance student’s experience quality expectations with regard to available stimuli and his/her control of their sequence and duration. This mode imposes no special equipment requirements on the students, although the experience is transitory and is only available at a specific time and location.

II.2. Videotape

In videotape delivery, the students receive a serial sequence of stimuli that present instructional material/stimuli from the same sources as the traditional classroom approach. By using this presentation mode, the presentation becomes replayable and the instructor selects, sequences, and controls the duration of the instructional stimuli, while the student gains independent control of the time and location of the viewing of the presentation. However, the student can only receive delayed feedback, and student input/contribution to instruction/stimuli, is limited to that which can be gleaned from the live audience during taping. Each distance student must supply the television and VCR for viewing and the tapes are only available to the students after a tape duplication and delivery delay. While it is likely that most students own a television and VCR, they may have to compete for their use with other family members.
In most instructor controlled/produced videotape lectures/presentations, the traditionally simultaneously-available instructional materials/stimuli are only available to the student one at a time and in the instructor controlled sequence and duration. If the duration, from the student’s view, of one stimulus is too long, the presentation may become boring. This situation often occurs when slides appear on the screen with long voice-overs. If the duration between visual changes is too short, the student can become disenfranchised and frustrated. This often occurs when there are rapid changes between slides or between the slides and the instructor face and torso and the student does not have a hard copy to reference or loses his/her place. The instructor can minimize problems if it is clear throughout the presentation which slide (and which point on the slide) is currently being discussed, for example by animating PowerPoint®-like slides or using the “uncovering or unzipping” of media to emphasize the point, or moving the cursor on the screen to direct the student to the point/place of focus.

II.3. Streaming Video

A streaming video presents two serial “channels” of presentation and a set of controls via the internet. By providing two serial “channels” the students effectively see parallel “channels” of information transfer, approaching the simultaneous presentation of material/stimuli of the traditional classroom. The two serial “channels” available at OSU are a video input selection and PowerPoint® slides. The instructor can select the video input to be the instructor head and torso, head shots of students present (on-campus or remote studio), imaging (camera on documents), or one of two computer screens. An example of the streaming video interface is shown in below in Figure 1.

![Figure 1. Streaming Video Interface (1999)](image-url)
The instructor must have the resources of a post-production facility to assemble the video “channel” and the slide “channel” into a single interface. In order to facilitate the assembly and synchronization of the two channels of the interface, the instructor must provide visual cues during the presentation for the technicians so that they will know when to program the advance to the next slide. This places an added burden on the instructor and may detract from the live presentation and may affects his/her ability to concentrate on and present the instructional material.

As in the videotape presentation mode, the instructor dictates the sequence and duration of the instructional material/stimuli and the student controls the timing and location of viewing (assuming the quality of his/her ISP is time of day independent). The students must provide the computer and have access to a reasonably fast and reliable internet connection to utilize this presentation mode as the quality of this type of presentation is a dictated by the student’s Internet Service Provider (ISP) speed.

The disadvantage of the streaming video approach is that, while the videostreaming students see two modes of instructional materials/stimuli, only one is captured and displayed at the time of the lecture. The video capture can be of one of following: the instructor’s head and torso, head shots of students present (on-campus or remote studio), imaging (camera on documents), or one of two computer screens. At OSU and many university studio facilities, whatever is being captured is also being displayed to the live and remote studio students. For the videostreaming interface to “look good”, the instructor’s head and torso and student head shots should be the vast majority of the capture. Unfortunately, if what is captured must also be displayed to the live students in the local and remote classrooms/studios, either

- the live presentation will suffer. The videostreaming optimization will show the instructor head and torso and the originating studio students will see the instructor and a second visual on the monitors of the instructor which provides no additional information/stimuli and the remote studio will see only the video capture image of the instructor (i.e., no slide display) or
- the videostreaming presentation will suffer. The classroom optimization will show the (static) slides and students will see the slides in both channels of the interface, effectively eliminating the stimuli advantage of videostreaming over videotaping, while remote studio and videotape students see only the slides with long voice-overs.

The result is that one of the two audiences must accept reductions in the available stimuli whenever the capture and display of these single inputs are tied together.

II.4. Observation/Hypothesis – Number of Simultaneously Available Instructional Material/Stimuli and Control of Focus and Duration of Stimuli Determine Presentation Mode Preferences

Analysis of the available presentation modes and the number of simultaneously available instructional material/stimuli they provide would lead one to hypothesize that students, with other conditions held constant, would prefer presentation modes with greater numbers of stimuli simultaneously available over those with lesser numbers of simultaneous stimuli.
Classroom display would show instructor’s face or media/slide.

Classroom Students see Instructor, Other Students, and Projected Image (Face or Media/Slide)

Remote Studio and Videotape Students see Projected Image (Face or Media/Slide)

Videostreaming Students see Projected Image (Face or Slide) and Slide

Figure 2. Stimuli Available to Classroom Students, Remote Studio and Videotape Students, and Videostreaming Students

As shown above, in the classroom, there are three sources of instructional material/stimuli simultaneously available (instructor, students, projected image) and the instructor and the students independently control the sequence and duration of the stimuli of focus. The classroom presentation mode is expected to be preferred if available and conveniently accessible.

Distance students, by definition, cannot access the classroom. Therefore, they must use either videotape or videostreaming. Videostreaming, with its greater number of instructional material/stimuli choices and its provision of control of the sequence and duration of focus on the simultaneously available stimuli to the student should be the presentation mode of choice provided the delivery (ISP) quality is acceptable.

The videotape presentation mode provides the least choice and number of available instructional materials/stimuli, the least control over which of the stimuli is presented and for how long. This mode is expected to be the least desirable presentation mode by students. It is likely to be viewed as acceptable only when it presents the only feasible/convenient method of obtaining classes and degrees.

III. The Challenge of Distance Education

The challenge is to find a way to simultaneously conduct class in the quality manner that “live” and “live remote” students expect, and, while doing so, unobtrusively produce videotape and streaming video that provides a similar experience for students who will experience distance delivery of the class. This should be accomplished without overburdening the instructor or the budget and using simple techniques. 

[3]
IV. Course Structure, Information Transfer and Student Interaction, and Presentation Mode Experiences and Improvements during the Test Case Course Offerings

IV.1 Course Structure

The CIM course was structured with two components: a lecture component and a discussion component. The lectures were captured as instructor soliloquies during the Fall 1999 offering and reused in the Fall 2000 offering while the discussion sessions were conducted with full participation of local and remote studio students. The lectures were recorded for video-streaming optimization while the discussion sessions were “cinema verité” recorded during classroom sessions. Both the lectures and discussion sessions were made available via the streaming video interface as shown previously in Figure 1.

This procedure for optimizing the videostreaming presentation via this interface required the instructor go to the studio and record a videotape of his face and upper torso as he lectured with short intervals of the slide replacing his face and upper torso when the focus of the lecture turned to the next slide. Theses short (5-10 second) intervals provided a visual cue for the editing technicians to insert tags in the streaming video to “advance the slide”, that is, make the next slide appear in the slide portion of the interface. The interface also provides some student controls for pausing and resuming the video-streaming presentation, viewing the slides as text, hyperlinking to course website, and e-mailing the instructor (intended for use when a question arises so that the student can pause the videostream and solicit additional clarification via e-mail request from the instructor).

This optimization for streaming video eliminated the ability of the instructor to simultaneously capture the head and upper torso during lecture on the videotape that would be digitized and streamed and present the material to a live class. The studio design and wiring required that what is being recorded must also be displayed to the live audience. The studio design has been based on the premise that the remote student must be shown exactly the same thing that was being displayed to the live students and that this would ensure that each group would receive the same material and similar quality instruction. Thus, any live audience would see the instructor lecturing with the in-studio monitors showing the instructor lecturing as well. As discussed above, the optimization of the live classroom experience calls for the slides to be displayed while the optimization of videotreaming experience calls for the instructor’s face and upper torso to be displayed. The solution to this was to have the instructor tape his lectures in an empty studio and require both the on-campus and the remote-viewing students to view the lectures either via the streaming video over the internet or via the videotapes. The instructor, realizing not only that the recording of the lectures had to be in an empty studio but also that the lectures could be done well in advance of student viewing, undertook the taping of his lectures well before the “official” start of the semester so that he had nearly half of the course lectures recorded before the start of the Fall semester. This provided the technicians adequate time to master the videostreaming techniques and would also allow all students (on-campus and remote) to be on the same schedule as the lectures were available to the students well in advance of the scheduled viewing date. Thus, no delivery delay and bifurcation of the class (as occurs with on-campus delivery and delayed videotape or videostreaming delivery) would occur.
The discussion component was taped in a studio setting with on-campus students and remote studio students present. The sessions were videostreamed for viewing by distance students not present and made available over the internet. Discussion sessions were recorded in both the Fall 1999 and Fall 2000 offerings of the course. On several occasions, the “discussion sessions” were pre-taped due to instructor travel and these pre-taped sessions were conducted in videostreaming optimized lecture mode. During the Fall 2000 offering of the course, the Fall 1999 sessions were made available to the students and on two occasions of instructor travel, two Fall 1999 pre-taped sessions were used as part of the Fall 2000 sessions. These videotapes captured sequences of the instructor, slides prepared by the instructor, and “head shots” of the students as they asked questions. The video sequences captured during discussion were not optimized for videostreaming and reflected the need to display (and thus record) slides and images needed in the classroom during the discussion and thus the sequences, when videostreamed, included more numerous and longer segments when both channels of the interface contained the slide being discussed (longer voiceovers) and segments during which the discussion captured and replayed from the video did not correspond to the slide in the other channel of the interface. This occurred when the classroom discussion had not been anticipated and no slides had been prepared prior to the class being held.

IV.2 Information Transfer and Student Interaction

During the Fall 1999 and Fall 2000 offerings of the course, eleven (11) different modes of information transfer and interaction were used, however, not all modes were used both years. The modes and their period of use were:

- a course website that contained the syllabus, course and university policies, schedules of assignments, class contact lists, biographical sketches of students and instructors with pictures, example papers, copies of prepared papers, copies of all slides used in lecture and discussion sessions (1999, 2000),
- the videostreaming website that contained the streamed lectures and discussion sessions (1999, 2000),
- e-mail for individual questions and individual verification of the receipt and grades recorded for assignments and for class wide updates/messages (1999, 2000),
- e-mail for submission and return of graded homework (1999, 2000),
- facsimile transmissions (fax) – used for distribution and return of examinations to/from distance students, students set up a time for the exam with a staff member and at the start of the exam the staff member faxed out the exam which had to be faxed back with the time limit for the exam (1999, 2000),
- telephonic conversations - conventional phone (1999), conventional and computer based/initiated (2000),
- instant messaging over internet using Instant Messenger® (2000),
- website facilitating discussion threads (use of the discussion thread feature of Blackboard.com®) (2000),
- face-to-face discussions with on-campus students and distance students who traveled to campus (1999, 2000),
- use of NetMeeting® to include distance student not in remote studio during taping of discussion class (2000), and
two-way audio-video discussion with distance students in remote studios before/after formal taping of discussion sessions (1999, 2000).

As the above list illustrates, the opportunities for information transfer and student interaction were extensive. It is also interesting to note that only the second and the last modes of interaction are not generally available to students in conventional classroom/instructional settings. The use of NetMeeting provides a low-cost equivalent to the studio-to-studio discussions and the showing of videotapes via VCRs in classrooms or making them available in the library is equivalent to the videostreaming (assuming the composite video production technique discussed below is used). Thus, this paper concludes that the information transfer and student interaction opportunities are no different between conventional and distance education and the focus of instructor efforts should be on the quality of the information transfer and presentation mode(s) used.

IV.3 Presentation Mode Experiences and Improvement

Presentation mode experiences can be viewed from two perspectives, that of the instructor and that of the student. The instructor experiences during the Fall 1999 course offering were somewhat frustrating and restrictive, but solutions to many of these frustrations were determined during the Fall 2000 course offering. The solutions were implemented as they were developed and became available in Fall 2000 and will be used in all subsequent course offerings. The student experiences with the presentation modes were also somewhat frustrating but were bimodal and generally determined by the speed of access and bit transfer rates available to them. The students were in unanimous agreement that the composite video production techniques developed by the instructor in Fall 2000 was a marked improvement over the previous techniques. All professional staff who viewed the composite video productions of the Fall 2000 course offering also concluded that the technique provided a significant improvement to distance education.

The instructor’s videostreaming experience began prior to the Fall 1998 offering of the course. In recognition of the time requirements for distance course development and delivery and the general underappreciation of the effort required and academic contribution of distance course development by university administration and discussions with distance education specialists at OSU, the instructor developed the following plan for course delivery via videostreaming:

- Fall 1998 – use available release time to develop and finalize a detailed set of PowerPoint Slides that could form the basis for the course during the classroom only delivery of the course,
- Fall 1999 – use the slide set developed and use the available time to learn and use videostreaming for delivery of the course,
- Fall 2000 – reuse as much of the Fall 1999 materials as possible and use the available release time to develop and incorporate improvements to the techniques used for videostreaming delivery and upgrade the weakest of the materials from previous offerings and incorporate new materials.

The Fall 1998 delivery of the course proceeded normally; the videostreaming preparation and delivery of the course in Fall 1999 did reveal significant limitations/requirements and showed
some starting assumptions to be false. The most significant limitations/requirements from the instructor viewpoint were:

- the inability to use the animation features of PowerPoint® to control the display of the information on the slides on a line-by-line basis,
- the need to record the lecture presentation in an empty classroom so that the videostreaming presentation to students over the net was optimized (although this did free the instructor to pre-tape the lectures well before their scheduled viewing date which eliminated all delivery delays to distance students, and thus enabled a single schedule to be met by all students),
- the optimization of the lecture presentation for videostreaming recording required that the recording be dominated by a “talking head” and include only limited display of slides, significantly lowering the quality the recording if used for videotape delivery of the course, and
- the need to be vigilant in providing visual cues to the videostreaming technicians who assembled the slides and video for (autoplay) viewing.

The starting assumption that proved to be false was the assumption that the distance students’ ISP would provide sufficient bit transfer rates for quality viewing of the videostreamed lectures over the internet. In the Fall of 1999, the on-campus students who viewed the videostreamed lectures through the university’s (100 Mb/sec) network had no problems with the viewing of the streams and commented in course evaluations that this was an interesting and innovative method of delivery that provided an experience comparable to a live classroom. The distance students unanimously found the viewing of the streams to be unacceptable – their ISPs did not provide the bit transfer rates needed and students reported that viewing of the streams took 30 to 50% longer than the recorded time as they encountered many breaks or pauses in the stream “due to network traffic and congestion”. Within four weeks, every distance students had abandoned the use of videostreaming in frustration and were taking the course using the videotapes recorded for videostreaming, that is, videotapes that were of observably poor instructional/stimuli quality as they consisted only of a “talking head” and short (a few seconds) displays of slides indicating when to index to or view the next slide (which would be discussed by the “talking head” for the next 2-4 minutes). Despite the use of the low quality (optimized for streaming, not direct viewing) lecture videotapes by the distance students, no differences in academic performance was observed between the on-campus and distance students who, after expressing dissatisfaction with the streaming, indicated that the videotapes, while somewhat boring, were acceptable for the lectures. As shown in the literature [2,5,6], the distance students displayed an amazing tolerance for poorer quality presentations when this is offset by the convenience of controlling the time and location of the lecture or is the only feasible means for obtaining a degree. The distance students preferred the discussion session videotapes, as they were “easier to watch”. Presumably this was due to the greater mix of stimuli (slides, instructor, students, …) and their ability to control/change their focus on the different stimuli as would occur in live classrooms.

As the Fall 2000 semester approached, the original three-year development plan had to be reconsidered in light of the lessons learned during the Fall 1999 course offering. Based on the observations that

- distance students accepted the use of the videotapes of the lectures that had been recorded for streaming,
no observable difference in academic performance between on-campus and distance students had been observed using the existing tapes and videotapes, and
• the instructor desired to spend available release time in seeking improvement in presentation methods and interaction methods rather than rerecording lectures for videotape presentation, and
• internet delivery capabilities had improved,
it was determined that the Fall 2000 offering would use the streaming video and videotapes available, that distance students would be offered the use of the videotapes, that the videotapes would likely be preferred and would be made available to students from the start of the course, and that the instructor would spend available release time seeking improvements to the methods and content of the course. A decision was also reached to rerecord the course at the next offering using any improved methods developed or delivery mechanisms that evolved or, lacking the discovery or evolution of improvements, in videotape optimized format.

The first improvement investigation in Fall 2000 was the possibility of using the internet to deliver lectures and discussions in real time to distance students who were not in remote studios by using internet conferencing. Under the criterion that the software for the conferencing had to be available to distance students at no or low cost, Microsoft’s NetMeeting® was investigated. While this and other software was found lacking in that they either could support only one two-way audio/video connection at a time (i.e., only one distance student/site can interact during the broadcast via the software) or were expensive to acquire, the NetMeeting® software did provide several interesting features. It allowed the instructor to use a camera and display an image on a computer screen, set software switches so that that image was always displayed “on top” of any other window, and any window (below the image display) could be made active and was manipulable using the mouse and keyboard independent of the image display. This dual display of an image and an underlying window(s) was dubbed a “composite video” when the computer output was sent to a projection or recording device (VCR). It was realized that the features of the conferencing software could be used to advantage to produce composite video which would enable simultaneous capture/delivery of lectures for live classroom, videotape, and videostreaming presentation and do so using a technology with which most/all instructors were familiar, their computer. This became the focus of the improvement effort.

Upon determining the method and equipment setup for the use of the composite video, this mode was tested using the Fall 2000 discussion sessions of the course. The composite video was simultaneously displayed to the students in the classroom, the remote sites, and recorded for streaming. All three audiences not only accepted the use of composite video, they embraced it.

The composite video assured that all three audiences had simultaneous access at least two instructional materials/stimuli at all times. The audiences would see the stimuli as illustrated:
Although in the live classroom situation, the students would see the (live) instructor and an image of the instructor (and media) displayed, these students did not find this disconcerting, distracting, or a sensory overload. The remote studio and videotape students regarded the composite video as a great step forward and found the composite video “more interesting and pleasant to watch”; presumably due to the doubling of available stimuli and the ability to control the selection and duration of stimuli focus. The streaming video students did not regard the slight reduction in size of the instructor’s face a significant loss. The inclusion of animated slides as part of the image actually increased the frequency of change in the visual stimuli, as during lecture, the instructor is not highly animated. As can be seen from a comparison of the relative sizes of the instructor’s face in the two modes as shown below, in the 1999 video window, the instructor occupied less than a third of the width and height of the image and the 2000 video window provides a similarly sized face and torso (~25% of image width). It is also important to note that the remote studio and videotape students see the composite image full screen and the reduction in size is less noticeable.

The use of the composite video enabled the instructor to return to the use of animated PowerPoint® slides as the advancing from point to point on the slide was captured in the video and the streaming technicians could use the slides with animation turned off to create the (static)
slide displays in the videostreaming interface. All three audiences viewed the use of slide animation as a significant enhancement; the students found it easier to focus and follow the lecture as the instructor moved from point to point, dimming the previous points to emphasize the current one. This introduced more stimuli to the scene being viewed by all of the audiences and provided visual stimuli at a much greater rate than when using static slides. Videostreaming students found the animation particularly welcome as the small display sizes of the talking head and the slide provides fewer visual stimuli than the live classroom (many stimuli) or the (larger) full screen videotape display of the composite display.

The instructor welcomed the use of composite video as it enabled him to simultaneously meet the needs of all of his audiences (on-campus, remote studio, videotape, and videostreaming students) from a single lecture/delivery. It also reduced the complexity of the production as only a single video stream had to be managed as opposed to trying the balance the orthogonal needs of videostreaming optimization (all talking head), videotaping optimization (balanced talking head and media), and the live classroom optimization (all media).

V. Setup and Equipment Needed for Simultaneous Capture of High Quality Audio/Video Segments for Distribution as Videotapes and/or Videostreaming while in a Live Classroom

The method and equipment setup needed to produce composite video is simple and relatively inexpensive. It requires a computer with

- a method for a video input (e.g., a USB camera, an RCA video-in and camcorder, or a video-S input and compatible camera)
- a video output (e.g., a second monitor, RCA output, or video-S output),
- conferencing software that allows the image to always be “on top” of other windows (e.g., NetMeeting®), and
- a recording device (e.g., a VCR).

This setup does not require a studio and can be setup in an instructor’s office for the cost of the computer, camera, and the recording device. The initial demonstration of the composite video technique discussed in this paper were produced in the author’s office using the setup shown:

![Composite Video Setup Diagram](image)

**Figure 5. Office Setup Allowing Composite Video Production**

The initial studio experiments were conducted by transporting the author’s office computer/camera setup to the studio and using the second monitor/screen display output port on his laptop to input the image to recording and transmission equipment in the studio. Upon the successful demonstration of the concept and technology, the studio wiring was adjusted as below:
The studio rewiring required only the purchase of a video switch (~$100) and use of an RCA video splitter to enable routing of the image on the “Preview” monitor to the image window of the composite video. The video switch enabled the recoding of the “talking head” in the studio while the ETS facilities recorded and transmitted the composite video for use by videotape viewing students and remote studio display. This rerouting/rewiring/splitting enabled the display in the image window of the composite video to be any of the camera inputs available in the studio that are connected through the existing AMX touchpad switch by manipulating the selection of what image was sent to the “Preview” monitor. This enables the instructor to place in the video image window

- himself,
- on-campus or remote studio students,
- one of two different computer screens, videotaped materials, or
- document images in the image portion of the composite video

and in the media window(s) one or more windows of running programs (e.g., PowerPoint®, Word®, Whiteboard Programs, Speech Recognition/ Dictation Programs, CAD Programs, Application Software, as well as connecting to and displaying from the internet).

Upon proof of concept demonstration in the course, the technology was demonstrated to various faculty and distance education support staff. All in attendance agreed that the method provided a significant improvement in production value for all of the various audiences for the class at minimal expense. As an example of the acceptance of the technology, of the six members of the faculty of the School of Industrial Engineering and Management, four have committed to the use of the technology for their next distance course offering, and another is leaning toward its use. The sixth member of the School does not use video segments in his distance/internet courses and thus sees no personal use of the technology although he stated he is likely to use the techniques if he were to begin to use video in his internet courses.

VI. Conclusions and Recommendations

This methodology maximizes the number of simultaneously available instructional materials/stimuli. It also provides both the instructor and the student the maximum latitude in
selecting which stimuli to focus upon and the desired duration of focus. As was hypothesized, students found the additional number and frequency of stimuli increased the quality of the viewing experience in all presentation modes. It was observed that students displayed the hypothesized preferences for the presentation methods, preferring the presentation modes in following order: the classroom, videoguestreaming with composite video (when sufficient bit transfer rates are available), videostreaming with single video (again, when sufficient bit transfer rates are available), videotape and remote studio with composite video, videotape and remote studio with single video, and videostreaming (regardless of composite/single video when bit transfer rates compromise viewing.

The methodology provides additional benefits as it reduced the complexities and compromises of previous production methods. The instructor, when using composite video, found that he did not have to execute the role of producer -- the use of composite video eliminated the need to cut back and forth between the instructor’s face and torso and the media in an effort to balance the orthogonal requirements of videostreaming, classroom, and videotape presentations. This allowed him to concentrate on the lecture content and delivery rather than production details. This was possible as both the image window (instructor’s face and torso) and the media (computer display) of the composite video were always available to all of the students as they viewed the lectures, regardless of which viewing mode they were using. The methodology was also used by students as they presented their final papers/research findings in the course – remote and local studio students were shown along with their slides in the composite video and the distance students sent in “talking head” videos with verbal slide changing cues and the instructor then merged the videos and the slides. These merged videos were then “played back” to the class as a whole. Thus, even for students who were never able to be in a studio (physically), they could participate and produce complete composite audio-visual presentations of their research.

It is recommended that distance educators investigate, adopt, and extend this technology.

VII. Areas for Further Research

Two areas for further investigation have been identified:

- the study of the technology as it gains broader use and the reactions and academic performance of the students using it, and
- the use of video compression techniques so that CDs or DVDs can be used for course/lecture distribution.

VIII. Bibliography


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John Nazemetz is an Associate Professor at Oklahoma State University. He holds a BS and PhD in Industrial Engineering from Lehigh University. His research interests are in computer integrated manufacturing, industrial data exchange (ISO 10303 standards development), and distance education methods. He has been active in distance education for over a decade, directs the OSU Masters of Manufacturing Systems Program, and is an ASEE member.

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