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ABSTRACT

This study investigated whether or not low-bandwidth streaming video could be useful for affective purposes. A group of 30 students in a cinema course at a public, liberal arts university viewed a 10-minute dramatic video scene by either videotape or low-bandwidth streaming video. They also took a survey to determine their affective responses and perceptions about the video they watched. Two students from each group also completed a brief interview about their perceptions of the video and medium they watched it on. Results indicated that the low-bandwidth, low-quality nature of the streaming video did impact the affective meanings that participants received from the streaming video. Participants viewing the videotape tended to rate the video higher on items concerning the overall experience than did participants who viewed the streaming video. Those who viewed the streaming video tended to be more divided in their responses than did those who viewed the videotape, and they also seemed to miss some of the subtleties of the video. (Contains 26 references.) (SM)

Running head: CAN STREAMING VIDEO CONVEY AFFECTIVE MEANING?

Comparing Streaming Video and Videotapes: Can Streaming Video Convey Affective Meaning as well as Videotape?

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Abstract

Using videotapes for various forms of instruction is a common practice. The literature suggests that regular video, while not ideal for conveying highly detailed information, can be useful for affective purposes. This study will look at whether or not low-bandwidth streaming video can be as efficient as videotape at imparting affective information. A previous study of streaming video clips found that students perceived the clips as useful for cognitive information. A brief search of the Internet reveals that many educational establishments are implementing streaming video, and research should be conducted now to determine the best use for streaming video in instruction, or possibly to determine what streaming video is not suited for. 30 students from a public, liberal arts University viewed a ten-minute dramatic video scene by either videotape or low bandwidth streaming video. The subjects took a survey to determine affective responses and perceptions about the video they watched, and two subjects from each group were asked to participate in brief interviews to further explore their perceptions about the video and medium they watched it on. Demographic characteristics measured were gender, age range, academic college, Internet access location used to watch the streaming video, either home or campus computer lab, and prior experience level with the World Wide Web. Gender, academic college, age range, and Web experience level resulted in significant Chi-Square differences on several affective survey items relating to interest and meanings. An independent samples t-test showed significant differences on affective response items relating to the overall viewing experience of the treatment mediums. Phenomenological analysis of the interviews revealed that students viewing the streaming video treatment seemed to miss some of the affective subtleties of the video, and were less unified in their affective responses to the video than students who viewed the videotape version.

Comparing Streaming Video and Videotapes: Can Streaming Video Convey Affective Meaning as well as Videotape?

A common theme in research studies is whether or not achievement scores differ due to some treatment or other, such as a 2001 study dealing with streaming video-enhanced Web-based tutorials (Cofield). The idea for this follow up study grew from a finding that streaming video clips generated a feeling of the social presence of an instructor. From that, and other literature dealing with videotape, it was decided to explore whether or not meaning could be obtained from a low-resolution streaming video clip as well as from videotape.

Affective meaning is operationally defined as receiving or responding to ideas or messages, where receiving and responding are the bottom two levels of Krathwohl et al's Taxonomy of the Affective Domain. Receiving is operationally defined as being aware of or sensitive to something in the environment, or in the case of this study, a theme, mood, or emotion in the study instrument, and responding is defined as showing new behaviors as a result of that experience, with the response being new attitudes towards the study instrument (Huitt, 2001).

Research Question

A 1983 study by Johnson noted several reasons besides instruction that teachers use video in instruction, such as motivation, emphasis of topics, and to stimulate discussion. A search of the Web reveals numerous academic sites that are incorporating streaming video as well as other sites such as IFILM (N.D.) that include more dramatic videos. In reviewing some of these uses, such as Berry College's on-line recruitment video (N.D.), which is not directly related to knowledge acquisition, the idea for a research question arose concerning whether or not low-bandwidth streaming video would be a good medium for playing videos containing

mostly affective content. Low-bandwidth streaming video was targeted for this study because while high-speed Internet connections are readily available in businesses and on college campuses, the percentage of the population in the United States who have a high speed Internet connection has still not reached 25% (Hu, 2003). This means that most users are still accessing the Web via a 56K dial-up modem, an important consideration when deciding to stream video. In light of this, the research question posed by this study is whether or not low-bandwidth streaming video can be as efficient as videotape at imparting affective information.

Assumptions

Assumptions associated with this research project are that all students who participated had access to the Web and to the tools required to access the study material. Another assumption is that the participants were representative of students at the University of Montevallo, and that they were representative of the student population with access to Web-based instructional tools at the postsecondary level. One limitation is that the study only included students from a single institution in the southeastern region of the United States. Another limitation is that the location and type of computer used by each subject to participate in this study was uncontrolled. This potentially biased the study data due to the possibility of different computers displaying the content of the study differently from what the researcher intended. Data transmission over the Internet, which is out of the control of the researcher due to the existing design and infrastructure of the Internet itself, may have introduced unintended biases, as will be discussed later. Additionally, students viewed the videotape instrument on three different television monitors, which may have introduced unintended biases.

Review of Literature

The literature is sparse on studies related to streaming video and instruction. Because both streaming video and videotape deal with moving images coupled with sound, studies looking at the use of videotape to deliver instruction and meaning are relevant.

Although the instrument in the current study compares videotape to streaming video, a 1977 comparison by Donohue and Donohue of film and videotaped content is relevant because of the quality differences between film and video, film being able to display much more information and detail than early videotape technology much as videotape can display much more detail and information than low-bandwidth streaming video. Donohue and Donohue found that the manner of display appeared to interact with the content of the instrument and the sex of the viewer affecting cognitive organization and liking for the presentation. Donohue and Donohue noted that earlier studies argued that a videotaped image has considerably less information than a filmed image. A three-minute dance scene from a rock musical was simultaneously filmed and videotaped, and the instrument was then shown to four groups of students to determine if esthetic and technical differences inherent to each mode would affect student's perceptions of the event transmitted via television. The study suggested that males perceived the videotaped segment to be more esthetically pleasing than the filmed segment, and that females saw no difference between presentation modes.

In addition to aesthetics or enjoyment, McCohon, Lo, Dang, and Johnston (2001) suggest that being able to perceive body language is an important factor in maintaining viewer interest. Body language may either be that of an instructor or dramatic player seen on the screen, and contributes to the perceived social presence or immediacy of the person on screen. Social presence may be defined as the degree to which a person is perceived as real in an online

conversation (Gunawardena and Zittle, as cited in Meyer, 2003). Immediacy may be defined as the use of immediate behaviors such as encouraging involvement, a relaxed body posture, and vocal variety (Hackman and Walker, as cited in Schwartzman and Roy, 2002). Students have noted a difference in perceived immediacy between live, in-person instructors and instructors seen and heard via a computer screen in a distributed learning situation. Students in the distributed learning environment found the instructors to have high verbal immediacy, much like the conventional classroom, but low nonverbal immediacy, which differed from the conventional classroom (Freitas, Myers, and Avtgis, as cited in Schwartzman and Roy, 2002).

A 2001 study by Verleur and Verhagen asked a similar question to the one posed by this study. Verleur and Verhagen compared videotape and video displayed on a computer screen to determine if either setting is more effective for affective responses or mood changes in the viewer, and whether or not the image size in either a television or computer display will affect the magnitude of affective responses and mood changes in viewers. The study used two to three minute segments from existing programs viewed on either a large (28") or small (14") television or a large (640 x 480 pixels) or small (320 x 240 pixels) computer video window. Segments were arranged so that each participant would view both positive and negative affective content broken up by clips containing documentary or instructional material. Verleur and Verhagen found that positive and negative affective content material could produce significant affective responses in both television display sizes, although mood changes were only significant for both types of material on the large television display. The small television display was not significant for mood changes for the positive affective content. The computer-based setting produced significant changes in mood and affective responses for the negative content video segments in both display sizes while the positive video segments showed significant effects for mood and

affective responses only on the large video window setting. A comparison of image sizes (i.e., small television versus small video window) in both settings revealed no significant differences for all but one of the tests. The large computer video window size produced significantly more impact on mood and affective response than the small television size. Interestingly, when gender was examined, females viewing the segments on the computer display showed significant greater affective responses on the large display window versus the small display window.

Factors Related To Streaming Video

Streaming video is a one-way transmission over a data network. With non-streaming video, a significant portion of the video file must be successfully downloaded over the Internet before a video clip can begin playing. Streaming video allows for live video transmission over the Internet, and it allows the server to dynamically adjust the video data transmission rate depending on the user's current connection status, whether that connection is a high-speed T-1 line or a 56K dial-up modem (Dixon, 2000). In the days before the widespread use of high-speed modems, video files would take a very long time to download, and the files had to completely download before playback would be possible. The compression technology was primitive and video quality was extremely poor (Rule, 1999). Computer and video compression technology have advanced to the point where it is now possible to play video over Internet connections in real time and with much higher quality, due to the human visual system's ability to still make sense of a video sequence that has been compressed enough to either be downloaded or streamed over the Internet (Strachan, 1996). Although streaming video is far short of broadcast television standards, it is now considered an acceptable delivery medium for a wide variety of uses (Pescatore, 2000).

Streaming video is by its nature digitized and compressed video. Compressed digital video is analog video that has been digitized, or converted from an analog signal to a digital signal (Anderson, 1982), and then mathematically scaled down to reduce redundant information and improve transmission efficiency (Ohanian, 1998, chap. 10). Video that is compressed is materially different from the original video signal. However, due to the nature of human vision, much of the information contained in a video signal can be discarded, and still result in a recognizable picture, which is how digital video compression works. Compression technology allows a full-size, full-frame video signal that requires nearly 170 megabits per second (Strachan, 1996), well beyond the capability of most computers and networks to process, to be scaled down to produce a recognizable picture capable of being delivered over the Internet through a 28.8 Kbps modem (Real Video, N.D.). This is an almost 6000-to-one reduction. At such extreme compression ratios, a logical question would be to ask what is the least amount of information transmitted for a video image to be recognizable. Ohanion (1998, chap. 3) noted that in the 1970's Bell Laboratories in Murray Hill, New Jersey, sought to ascertain how much information would have to be sent over a standard phone line for a picture phone image to be recognizable. The researchers came to the conclusion that if the intent of the image could be preserved the tendency of the human eye to blend contiguous areas and infer meaning would produce a recognizable image.

The fidelity of the audio is the most critical component of media with regard to getting the message across (Reeves & Nass, as cited in King, Harnar, & Mayall, 1999). Audio can be anything from the spoken word to music or some combination thereof. When streamed, the audio must also be compressed. Although the bandwidth and information requirements for audio are less than for video, the human ear is much more sensitive to distortions or errors in the audio

signal than the human eye is to errors in the video signal (Anderson, 1982). One such problem is asynchrony, or non-synchronization of audio and video. Verhagen (1994) pointed out that in audiovisual presentations, the visual channel and the audio channel are used simultaneously to convey messages. Hecht and Schoon (1999) noted in their evaluation of CU-SeeMe videoconferencing that non-synchronization of audio and video when using CU-SeeMe often resulted in a very confusing presentation for the students. King, Harner, and Mayall (1999) state that synchrony in media equals real life, and that asynchrony is unnatural. Synchrony is then a critical component of media. King et al. examined the effect on students of audio and video asynchrony. Using a T-1 based compressed video conferencing system, subjects were asked if they perceived asynchronous audio/video to have an effect on their performance. The subjects' self-reported attitude toward the asynchronous audio/video connection showed that the subjects did not regard this problem as serious or distracting, and their perception of their course achievement was not affected by the asynchrony.

Method

The experiment for this research study consisted of both a quantitative component and qualitative component designed to measure affective responses and beliefs about the delivery method and video instrument. The dependent variable in this study was affective responses to the delivery method and video instrument. Data collection, except for the interviews, was accomplished through the Web. Independent variables were the demographics gender, age, and academic college, and the instrument delivery method, either videotape or low-bandwidth streaming video. Additional demographics for the streaming video group were location of Internet access, either home or campus computer lab, and prior experience with the World Wide Web.

Research Population and Sample

College students who are exposed to a Web-based instructional environment were the target population for this study. The sample consisted of students enrolled in the Fall 2003 American Cinema course at the University of Montevallo, a public liberal arts southeastern United States university. This sample was used because of convenience. The course is designed to be a general education-level film studies course. All interactions with the subjects were consistent with University of Montevallo HASRC policies and were approved by the HASRC.

Data Collection

Demographics were measured through the use of a Web-based survey, developed by the researcher and administered to all subjects as the first step in the study. Affective responses were measured by a Likert-type questionnaire developed by the researcher. Although this instrument lacks proven validity, the researcher pursued acceptable face and content validity. A post-data collection reliability analysis of the survey produced a Cronbach's alpha score of .69.

Qualitative Research

Four subjects, two from both the control and experimental groups, were chosen at random and asked to participate in a brief interview. By collecting information about affective responses and interviewing random students, more was learned about the subject than merely a comparison of means (Gall, Borg & Gall, 1996, p. 603). It was expected that the individual experiences of different subjects in the sample would lead to different beliefs and interpretation that may not be apparent in other data.

Procedure

Participants were randomly divided into two sections by means of an e-mail that gave directions for each group. Students in Group 1, videotape, were directed to come to a specific

academic building to participate, and given a list of times the material would be available. If a student was unable to participate in one of the given time slots, they were directed to contact the researcher individually. Students in group two, streaming video, were given a link to a Web site contained an explanation of Web-based instruction, streaming video, and instructions on the use of the study material. Since the instrument was accessed via the Web, it was available to the participants at their choice of time and computer location, either home, lab, or work. Students were randomly divided into control and experimental groups. Students in Group 1 viewed a VHS videotape containing a dramatic scene; in Group2, students watched the same dramatic scene, except that it was delivered via low-bandwidth streaming video. Students in both sections completed a brief survey about the affective meaning of the dramatic scene, and their impressions of the delivery medium. Two participants from each group were randomly chosen for interviews to delve further into their beliefs about streaming video and videotape. All data collection was totally anonymous, and was collected through the use of on-line forms, which had no identifying information beyond group section. All materials were available on-line with the exception of the VHS videotape. Participation was on a voluntary basis, with the option of terminating participation at any time. No deceptive practices were used in this study, and the identities of the interview subjects were not recorded. No recording devices were used during the interviews.

Video Instrument

All participants viewed a nine-minute dramatic video clip entitled "Losers, Weepers." The video was about the dating lives of college students, involving a break-up and a clandestine date. The video clip was an original student script produced for course credit that the researcher shot with the help of Mass Communication majors for crew and Theatre majors for actors during

the summer of 2003. The production method was designed to make the most effective and efficient use of the medium elements, including video images, audio, and television production equipment for affective content (Zettl 2001, p. 10).

Group one, videotape participants, viewed the video on either a 27" or 13" television monitor, depending on the order of their arrival. Streaming video clips were delivered over the Internet as QuickTime movies at a resolution of 160 pixels by 120 pixels, or one-quarter of the normal resolution of a television display. This size was chosen because it is the smallest video window size normally used, and is acceptable for low-bandwidth delivery.

Data Analysis

Demographics and results from the Web-based survey were reported using measures of central tendency and variation, frequencies, and percentages. Chi-Square tests were conducted to determine if any significant relationships existed between demographic characteristics and affective responses. Mean comparison tests were performed to determine if any significant differences existed between treatment groups. The specific methodology employed in the qualitative design was a phenomenological approach, because it seemed most appropriate for this study. Phenomenology is an attempt to determine how participants derive meaning, or how the phenomena are disclosed (Gall, Borg & Gall, 1996, p. 600). Analysis of the interviews was based on data reduction and interpretation aimed at identifying categories and themes (Heath, 1997). Every attempt was made to make certain that conclusions are credible, generalizable, and dependable.

Results

The research sample consisted of 56 University of Montevallo student volunteers who were enrolled in the Fall 2003 Survey of American Cinema course. 25 students completed the

instrument, which is 50% of the total number of students enrolled in the course (see Table 1). The instrument was attempted by at least 40 students, but Web page and Web server problems prevented an unknown number of students in group 2, streaming video from attempting and completing the instrument.

Affective Response Survey

The participants in both groups were asked to complete a short survey as part of the study (Appendix A). For each statement, four responses were possible: strongly disagree (SD), disagree (D), agree (A), and strongly agree (SA). Out of the nineteen members of Group 1, videotape, 89% (N=17) completed the survey, while of the ten participants in Group 2, streaming video that attempted the instrument, 80% (N=8) completed the survey (see Table 2). For all statistical tests, an alpha level of .05 was used. A crosstabs comparison was performed to explore the relationship between the demographic characteristics of each group and the individual survey responses of the participants. Chi-Square tests were conducted as part of the crosstabs comparison to determine if any significant relationships existed between demographic characteristics and statements concerning the affective meanings of the video instrument. Of all possible Chi-Square comparisons between demographics and the affective survey questions, few were significant. Significant Chi-Square relationships and frequencies are reported in Table 3.

An independent samples t-test was performed between the videotape and streaming video group for each survey question to determine if any significant difference between viewing mode would be revealed (see Table 4). A significant difference between treatment groups was found on item 2, t (23) = 4.09, p = .000, with participants in Group 1, videotape (m=3.53, sd=.51) tending to agree that they could understand what the characters were saying more than participants in Group 2, streaming video (m=2.63, sd=.52). Participants in Group 1, videotape

(m=1.82, sd=.81), tended to disagree with item 8, the camera movement was distracting, at a significantly higher rate (t (23) = -2.14, p = .043) than Group 2, streaming video participants, who were more evenly split between agreeing and disagreeing (m=2.50, sd= .53). A final significant difference was found on item 9 (t (23) = 3.89, p = .001), the video was easy to watch, where Group 1, videotape, tended to agree (m=3.29, sd= .59) and Group 2, streaming video, tended to disagree (m=2.25, sd=.71).

Interview Results

Four random participants, two from each treatment group, were interviewed to determine which medium is more conducive for obtaining affective meaning from video images and to uncover different attitudes and interpretations of the research data. Notes of the questions asked and the answers received were made by the researcher and transcribed below in the order of the interviews. Interview questions are available in Appendix B

Subject 1, an 18-22 year old female enrolled in the College of Fine Arts, was a member of Group 2, streaming video. When asked if the small screen size of the video window affected the way she felt about the video, Subject 1 replied that it did, that she couldn't see faces that well. She was next asked if the appearance of the video, defined as the use of screen shots, the pacing of the action and the lighting on the characters, affected the way she felt about the characters, to which she answered no. For the third question, Subject 1 was asked if she would prefer to watch other movies using only streaming video. She replied that she would not, that the video was choppy, and the only time she could make out what the characters were doing was when the camera was still. Subject 1 felt that the streaming video was hard to watch, but she was able to understand what the characters were feeling, although she stated that that would have been easier if the audio were louder. The final three questions dealt specifically with the

characters in the video. Subject 1 was first asked if she felt the main character cared about her current boyfriend, to which she replied no. She was then asked for her impression of the main character's friends, to whom the main character was recounting her dating history. Subject 1 stated that she felt the friends did not really care about the main character's situation. Finally, she was asked about the main character's potential new boyfriend, whom Subject 1 described as weird and intrusive.

Subject 2 was an 18-22 year old female enrolled in the College of Arts and Sciences, who was a member of Group 1, videotape. Subject 2 was first asked if the appearance of the video affected the way she felt about the characters, to which she replied no. She stated that she was able to understand what the characters were feeling. Subject 2 was also asked about the individual characters. She stated that she did not think that the main character really cared about her current boyfriend. Of the main character's friends, she described one as mainly interested in the gossip concerning her friend, and had no impression of the other friend. Finally, she described the potential new boyfriend as someone trying to start trouble.

Subject 3, an 18-22 year old female enrolled in the College of Arts and Sciences, was a member of Group 2, streaming video. First, she was asked if the screen size of the video window affected the way she felt about the video, to which she replied no. Subject 3 did not believe the appearance of the video affected the way she felt about the characters. Subject 3 did state that she would prefer to watch other movies using only streaming video because she likes being able to get the movie on a computer with out having to turn on a TV. She was next asked if she felt the streaming video were easy or hard to watch. Subject 3 stated that the streaming video was easy to watch because it was convenient, and she did not have to stop or rewind it. Finally, she was asked a number of questions about the characters themselves. She stated that

she was able to understand what the characters were feeling. She did not believe that the main character really cared for her current boyfriend, and that both of the main character's friends were nosy, although one of them really wanted the main character to straighten things out. When asked to describe the potential new boyfriend, Subject 3 stated that he was cautious but interested in the main character.

The final interview subject, Subject 4, was an 18-22 year old male, enrolled in the College of Business. He was first asked if the appearance of the video affected the way he felt about the characters, to which he replied no, that it seemed natural. Subject 4 stated that he was able to understand what the characters were feeling, and that he believed that the main character really did not care about the current boyfriend. Subject 4 was next asked for his impression of the main character's two friends, and he characterized one as a friend who mainly wanted gossip, and the other as primarily interested in her friend's story. Finally, Subject 4 was asked about the potential new boyfriend. He replied that he could not understand how the new boyfriend fit into the picture, and whether or not he was mad at the main character, or mad at the situation the new boyfriend found himself in.

Discussion

Using video in a classroom setting has long been as easy as pushing play on a VCR. Now, because it is easier than ever to place video in a Web page ("The Multimedia Campus," 2002), instructors may be more inclined to include a video clip in an online course. However, instructors need to be confident that the video will work as they intend. Because there is such a wide variety of videos and potential uses, this study focused on whether or not low-bandwidth streaming video would be as efficient as videotape at imparting affective information.

Demographics

The sample was overwhelmingly female and in the 18-22 year old age range. Most of the participants were enrolled in either the College of Arts and Sciences or the College of Fine Arts. An examination of the demographic make up of each group shows that they are demographically similar (see Table 1).

Most of the participants in Group 2, streaming video, indicated that they attempted to access the treatment material from home. However, the researcher learned that problems with the Web page and server prevented participants from completing the instrument unless they accessed it from a campus computer lab. The researcher received many e-mails and calls from participants asking for technical assistance. Follow-up e-mails sent to Group 2, streaming video, reminding students of the opportunity to participate advised them that they could successfully complete the instrument from a campus computer lab. The researcher learned too late of problems that the particular Web server used for hosting the treatment materials would cause. In test runs of the study material from the researcher's computer, the material would work with no problem. However, when participants in Group 2, streaming video, would access the hyperlink provided in the invitation e-mail, they would see that page, but be unable to continue to the next page containing the streaming video. Students would report that the browser would be unable to find the page, or that the browser would instead display the Web page of another faculty member. This was very frustrating and confusing until the researcher finally determined that in the process of uploading from the researcher's local computer to the Web server, links were somehow changed. Unfortunately, it was the links between treatment pages, which prevented participants from viewing the streaming video. Initially, scrapping the data and starting over was considered, but ultimately it was decided that this was a great example of the limitations of the

Web. Because of the problems, the demographic of access location was dropped from the data analysis. Group 1, videotape participants all came to the researcher's academic building for the study and had no problems completing the instrument.

Only one participant described himself or herself as having a minimal level of Web experience. The vast majority of participants self-reported either novice or intermediate levels, with one participant describing themselves as having an expert level of Web experience (see Table 1). With the proliferation of online courses, the popularity of e-mail, and very public efforts by government or other groups to extend the Internet as far as possible, this is hardly surprising and may mean that current and future college students are far more willing to accept and use Web-based instruction.

Affective Survey

For participants in Group 1, videotape, gender was found to lead to significantly different responses on the affective survey only on item 5, which concerned the overall meaning of the video, with males tending to agree that the meaning of the video was the uncertainty of dating, while females were evenly split between agreeing and disagreeing. This may be due to different viewing habits or expectations of the participants regarding the direction and outcome of the video. The video was designed to be somewhat open-ended, which was hoped would encourage a wider variety of responses to the survey than a video designed solely for one message. Age was not found to lead to significantly different responses on any of the survey items. This may be because the vast majority of participants were in the 18-22 age range. Academic college led to significantly different responses on three of the items, two of which dealt with the viewability of the actors. Participants from the College of Fine Arts tended to strongly agree that the expressions on the character's faces helped them to understand their actions, while participants

from other colleges mainly agreed with that statement. Participants in the College of Arts of Sciences were evenly split between agreeing and strongly agreeing that the video was easy to watch, while participants in other colleges typically only agreed that the video was easy to watch. One participant, who was undecided about their academic college, chose disagree for both statements. These responses may be related to the production value of the video. Because it was shot and edited as a student project, the video was screened for the cast and crew, all of whom indicated that they liked it. These good reviews by non-sample students may mean that the video is actually easy to watch. The last significant survey item relationship was between academic college and the statement about participant interest in seeing how the video ended. Again, College of Arts and Sciences participants were evenly split between agree or strongly agreed; while College of Fine Arts participants were split between disagreeing and agreeing, with one strongly agree. College of Business participants agreed with that statement, and the one undecided participant disagreed (see Table 2). This split is interesting, because it may be due to viewer expectations leading into the video, or it may be due to some other factor at work.

Neither the gender nor academic college of the participants in Group 2, streaming video, led to significantly different responses on any of the affective survey items. Age of the participant did lead to significantly different responses on item 6, concerning the attitude of the current boyfriend. Participants in the 18-22 year old age range all agreed that the current boyfriend was arrogant, while participants in the 23-38 year old age range either strongly disagreed or strongly agreed. The participant in the 40-49 year old age range disagreed. Web experience level also led to significantly different responses on item 12, concerning the main character's attraction to the potential new boyfriend. Participants with minimal, novice, or intermediate levels of experience all agreed that the main character was attracted to the potential

new boyfriend, while the participant with an expert level of Web experience disagreed with that statement (see Table 2). Because of the small sample size of the streaming video treatment group, no conclusions can easily be drawn about these significant responses other than the participants are able to draw some meanings out of the streaming video.

The independent samples t-test between treatment groups produced some interesting results. Although only three of the items showed significant differences between treatment groups, the items all dealt with the clarity of the video. Participants in Group 1, videotape were much more likely to agree or strongly agree that they could understand what the characters were saying and that the video was easy to watch than participants in Group 2, streaming video, who tended to disagree with those statements. Participants in Group 2, streaming video, were evenly split between agreeing and disagreeing that the camera movement was distracting, while Group 1, videotape participants overwhelmingly disagreed or strongly disagreed that the camera movement was distracting (see Table 4). These findings are important because in order to gain affective meaning from a video, the viewer must be able to see and hear clearly the material. As previously mentioned, the fidelity of the audio is one of the most important factors regarding the delivery of a message (Reeves & Nass, as cited in King, Harnar, & Mayall, 1999). Additionally, while the eye is more tolerant of errors than the ear is (Anderson, 1982), distracting or unnecessary camera movements may negatively impact the delivery of an affective message, particularly with low-bandwidth streaming video. Typically, due to the very low data amounts transmitted over a low-bandwidth connection, and the high information amounts required for video, any movement on screen will cause large distortions or blocks in the video window for a few moments. This may be very distracting to the viewer, which could have implications for the

selection of bandwidth and video material when planning to stream a video containing affective content.

Interview Analysis

An analysis of the interviews reveals a number of interesting trends. The two participants from Group 2, streaming video were split on whether or not the small 160 x 120 video window size affected the way they felt about the video. Subject 3 said it did not, while Subject 1 said that it did because she could not make out faces that well. If a viewer is having difficulty making out action or detail on screen, it may make it hard for them to get the intended affective meaning of the video. Subject 1 also said that the streaming video was hard to watch and that she would not want to watch other movies using only streaming video because of the choppy nature of the streaming video, that she could only make out what the characters were doing when the camera was still. For low-bandwidth video, this may have important implications for choice of video and style of presentation, because videos with lots of motion or detail may not play well or at all over a low-bandwidth connection. If that were to happen, it would detract from the affective meaning of the video. It is important to keep in mind that not all subjects will mind low bandwidth streaming video, because Subject 3, on the other hand, stated that she would watch other movies by streaming video because of the convenience, and found the video instrument easy to watch.

A number of the questions were common to all four interview participants. Each subject felt that the appearance of the video, including the type and use of screen shots, the pacing, and the look of the video, did not affect the way they felt about the characters. From a video production standpoint, this is an affirmation of the video production process used because the goal of good production is to draw the viewer into the narrative in such a way that they are

unaware of the process used (Phillips, 2002, p. 224). Each subject also felt that they were able to understand what the characters were feeling, and that the main character did not really care about her current boyfriend. It is noteworthy that for both treatment groups, the subjects felt that they could understand what the characters were feeling, and agreed about the main character, because the subjects had different interpretations of the other characters in the video. Perhaps because the main character was on screen so long, her characteristics and personality were more evident. When asked their impression of the main character's friends, the subjects in Group 1, videotape described them as mostly interested in the gossip potential of the main character's story. Participants from Group 2, streaming video on the other hand described the friends as indifferent and nosy. Although these descriptions are not completely opposite, they are different enough to suggest that the viewing method may have influenced the impression of the characters on the viewer. This is more evident in comments about the potential new boyfriend. Both subjects in Group 1, videotape had negative comments concerning him. Subject 2 said that he was trying to start trouble, while Subject 4 stated that he was mad about the situation, or mad at the main character. Subjects 1 and 3, members of Group 2, streaming video, did not make negative comments about the intentions or actions of the potential new boyfriend. Subject 1 described him as weird, while Subject 3 described him as cautious but interested in the main character. These different interpretations of the potential new boyfriend are intriguing because they suggest that participants watching the streaming video version had a difficult time interpreting the affective meanings of the characters.

Conclusions

The study sought to determine whether or not low-bandwidth streaming video could be as efficient as videotape at imparting affective information. Because affective information is often

not as clear-cut as counting the number of correct answers between treatment groups, inferences were made from the study data. The results from the independent samples t-test, when combined with the Chi-Square results and comments made by interview participants, indicate that the low bandwidth, low quality nature of the streaming video did impact the affective meanings that participants received from the streaming video. Participants viewing the videotape tended to rate the video higher on items concerning the overall experience than participants in the streaming video group as seen by the significant Chi-Square relationships and overall higher means of those particular survey items. Participants in Group 2, streaming video, tended to be more divided in their responses than did subjects who viewed the videotape. Additionally, subjects who viewed the streaming video seemed to miss some of the subtleties of the video, which is not surprising considering the low quality of the low bandwidth streaming video. Although none of the statements dealing with the characters showed significant mean differences, an examination of the data in light of the interviews showed that participants who viewed the videotape tended be more unified in their evaluation of the main character's and the potential new boyfriend's relationship, viewing it in a negative light, while participants who viewed the streaming video seemed to believe they were attracted to each other. A close reading of the script reveals more ambivalence on the main character's part, which would support the viewpoint of the Group 1, videotape participants.

Limitations

This research study was subject to a number of limitations. The small sample size limits generalizibility and ability to draw inferences from the data. Additionally, Web page and server problems, as detailed previously, seriously impacted the amount of data collected from sample. These instrument problems may also mean that an unknown number of participants may have

attempted or completed the instrument more than once. Students viewing the videotape used three different television monitors, which may have impacted their responses on the affective survey. Students viewing the streaming video version viewed the instrument on an uncontrolled selection of computers, which meant that viewing conditions might have varied widely. Interview Subject 1, for example, stated that she wished the audio were louder, which may simply have been a function of turning up the volume on the display computer. However, since she did not seem to know or do that, it is possible that the low volume impacted her affective responses.

Recommendations

The results of this study suggest some interesting future directions for research. This study utilized an original dramatic video presented by videotape and low-bandwidth streaming video. Future studies might focus on the effects of various types of video containing affective and cognitive content on obtaining affective meaning. It is also recommended that future studies explore the effect of streaming video window size and data rate on obtaining affective meaning from video. Because this study was limited to low-bandwidth video, it may be that different levels of streaming video may be better suited to affective content, or that there may be a minimum level of quality that allows consistent transmission of affective content.

Another interesting recommendation for future studies is to examine whether or not different video production methods can enhance the efficiency of low-bandwidth streaming video for the transfer of affective meaning. Participants viewing the streaming video version of the video tended to see the camera movements as distracting and rate the video as hard to watch. Is there a way to use camera shot selection and video editing decisions in such a way that on-

screen motion is minimized, yet still show the same affective meaning as a video shot and edited using the dramatic Classical Hollywood Style (Phillips, 2002, p. 224)?

Due to the limited sample size and problems encountered with the streaming video Web pages, it is recommended that this study be replicated. Larger and more varied sample sizes might reveal different significant relationships than in the current study. Different demographic classifications may also reveal groups better able to obtain meanings from streaming video.

The results of this study suggest that students can obtain affective meanings from low-bandwidth streaming video. While this is encouraging, the meanings that they obtain may be different than what the instructor intends. For this reason, further study should be encouraged regarding affective meanings and streaming video.

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Appendix A

Affective Survey Items

Strongly Disagree = SD	Disagree = D	Agree = A	Strongly Agree = SA

1. The meaning of the video was clear.

SD ○ D ○ A ○ SA ○

2. I was able to understand what the characters were saying.

SD ○ D ○ A ○ SA ○

3. The video was entertaining.

SD ○ D ○ A ○ SA ○

4. The expressions on the actors' faces helped me understand their actions.

SD ○ D ○ A ○ SA ○

5. I thought the meaning of the video was the uncertainty of dating.

SD ○ D ○ A ○ SA ○

6. John Michael, the absent boyfriend, was arrogant.

SD ○ D ○ A ○ SA ○

7. The interaction between the characters was interesting.

SD ○ D ○ A ○ SA ○

8. The camera movement was distracting.

SD ○ D ○ A ○ SA ○

9. The video was easy to watch.

SD ○ D ○ A ○ SA ○

10. I thought Anna's friends really cared for her.

SD ○ D ○ A ○ SA ○

11. I was interested to see how the story ended.

SD ○ D ○ A ○ SA ○

12. I thought Anna was attracted to Anthony, the man in the car.

SD ○ D ○ A ○ SA ○

Appendix B

Qualitative Interview Questions

Questions Asked Only To The Participants From The Streaming Video Treatment Group

1. Did the screen size of the video affect the way you felt about the video?
2. Did the appearance of the video (the use of screen shots, pacing, & lighting) affect the way you felt about the characters? How?
3. Would you prefer to watch other movies using only streaming video? Why or why not?
4. Was the streaming video easy or hard to watch?
5. Were you able to understand what the characters were feeling?
6. Do you think Anna really cared about John Michael, the "absent" boyfriend?
7. What was your impression of Vicki? Of Kaci?
8. How would you describe Anthony, the man in the car?

Questions Asked To Participants From Both Treatment Groups

1. Did the appearance of the video (the use of screen shots, pacing, & lighting) affect the way you felt about the characters? How?
2. Were you able to understand what the characters were feeling?
3. Do you think Anna really cared about John Michael, the "absent" boyfriend?
4. What was your impression of Vicki? Of Kaci?
5. How would you describe Anthony, the man in the car?

Table 1

Research Sample Demographics

Variable	Number	Percentage
Treatment Group		
Group 1, Videotape	19	63.3
Group 2, Streaming Video	11	36.7
Gender		
Male, videotape group	5	26.3
Female, videotape group	14	73.7
Male, streaming video group	2	18.2
Female, streaming video group	9	81.8
Age		
18-22, videotape group	17	89.5
23-28, videotape group	2	10.5
29-39, videotape group	0	0
40-49, videotape group	0	0
50+, videotape group	0	0
18-22, streaming video group	8	72.7
23-28, streaming video group	2	18.2
29-39, streaming video group	0	0
40-49, streaming video group	1	9.1
50+, streaming video group	0	0
Academic College		
Arts & Sciences, videotape group	11	57.9
Business, videotape group	2	10.5
Education, videotape group	0	0
Fine Arts, videotape group	5	26.3
Undecided, videotape group	1	5.3
Arts & Sciences, streaming video group	5	45.5
Business, streaming video group	0	0
Education, streaming video group	2	18.2
Fine Arts, streaming video group	4	36.4
Undecided, streaming video group	0	0

table continues

Table 1 Continued

Internet Access Location, Streaming Video Group		
Home	6	66.7
Campus Computer Lab	3	33.3
Prior Experience Level With the Web, Streaming Video Group		
Minimal	1	9.1
Novice	4	36.4
Intermediate	5	45.5
Expert	1	9.1

Table 2

Affective Survey Frequencies, Percentages, Measures of Central Tendency and Variation

Item	Mean	Std. Dev.	Strongly Disagree		Disagree		Agree		Strongly Agree	
			n	%	n	%	n	%	n	%
Group 1, Videotape										
Q1	2.71	.77	1	5.9	5	29.4	9	52.9	2	11.8
Q2	3.53	.51					8	47.1	9	52.9
Q3	2.76	.66	1	5.9	3	17.6	12	70.6	1	5.9
Q4	3.06	.66			3	17.6	10	58.8	4	23.5
Q5	2.71	.69			7	41.2	8	47.1	2	11.8
Q6	3.00	.87			6	35.3	5	29.4	6	35.3
Q7	3.00	.61			3	17.6	11	64.7	3	17.6
Q8	1.82	.81	6	35.3	9	52.9	1	5.9	1	5.9
Q9	3.29	.59			1	5.9	10	58.8	6	35.3
Q10	2.81	.66			5	31.3	9	56.3	2	12.5
Q11	3.24	.66			2	11.8	9	52.9	6	35.3
Q12	2.65	.79			9	52.9	5	29.4	3	17.6
Group 2, Streaming Video										
Q1	3.13	.35					7	87.5	1	12.5
Q2	2.63	.52			3	37.5	5	62.5		
Q3	2.63	.52			3	37.5	5	62.5		
Q4	2.50	1.07	2	25.0	1	12.5	4	50.0	1	12.5
Q5	2.88	.83			3	37.5	3	37.5	2	25.0
Q6	2.75	.89	1	12.5	1	12.5	5	62.5	1	12.5
Q7	2.63	.74	1	12.5	1	12.5	6	75.0		
Q8	2.50	.53			4	50.0	4	50.0		
Q9	2.25	.71	1	12.5	4	50.0	3	37.5		

table continues

Table 2 Continued

Item	Mean	Std. Dev.	Strongly Disagree		Disagree		Agree		Strongly Agree	
			n	%	n	%	n	%	n	%
Q10	2.50	.53			4	50.0	4	50.0		
Q11	2.75	.89	1	12.5	1	12.5	5	62.5	1	12.5
Q12	2.88	.35			1	12.5	7	87.5		

Table 3

Crosstabs Comparison, Demographics and Affective Survey Responses

Variable	SD	D	A	SA	Total	X^2
Affective Item 5: I thought the meaning of the video was the uncertainty of dating.						
Gender, Group 1 Videotape Male						
Female		1	1	2	4	
		6	7		13	
Total		7	8	2	17	.025*
Affective Item 4: The expressions on the actors' faces helped me understand their actions.						
Academic College, Group 1 Videotape						
Arts & Sciences		2	7	1	10	
Business			2		2	
Fine Arts			1	3	4	
Undecided		1			1	
Total		3	10	4	17	.042*
Affective Item 9: The video was easy to watch.						
Academic College, Group 1 Videotape						
Arts & Sciences			5	5	10	
Business			2		2	
Fine Arts			3	1	4	
Undecided		1			1	
Total		1	10	6	17	.004**

table continues

Table 3 Continued

Affective Item 11: I was interested to see how the story ended.						
	SD	D	A	SA	Total	X^2
Academic College, Group 1 Videotape						
Arts & Sciences			5	5	10	
Business			2		2	
Fine Arts		1	2	1	4	
Undecided		1			1	
Total		2	9	6	17	.066*
Affective Item 6: John Michael, the absent boyfriend, was arrogant.						
	SD	D	A	SA	Total	X^2
Age, Group 2 Streaming Video						
18-22			5		5	
23-28	1			1	2	
40-49		1			1	
Total	1	1	5	3	8	.014*
Affective Item 12: I thought Anna was attracted to Anthony, the man in the car.						
	SD	D	A	SA	Total	X^2
Web Experience Level, Group 2 Streaming Video						
Minimal			1		1	
Novice			2		2	
Intermediate			4		4	
Expert		1			1	
Total		1	7		8	.046*

Note. *$p < .05$. **$p < .01$

Table 4

Results of Independent Samples T-Test For Affective Survey Items Between Treatment Groups

Comparison	N	Mean	Std. Dev	df	t	Sig.
Affective Survey Item 2						
Group 1 Videotape	17	3.53	.77			
Group 2 Streaming Video	8	2.63	.52			
Total	25	3.24	.66	23	4.093	.000***
Affective Survey Item 8						
Group 1 Videotape	17	1.82	.81			
Group 2 Streaming Video	8	2.50	.53			
Total	25	2.04	.79	23	-2.143	.043*
Affective Survey Item 8						
Group 1 Videotape	17	3.29	.59			
Group 2 Streaming Video	8	2.25	.71			
Total	25	2.96	.79	23	3.887	.001**

Note. *$p < .05$. **$p < .01$. ***$p < .001$

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