

**GO WILD FOR WILDLIFE:
EXEMPLIFYING ACTION THROUGH
THE USE OF DIGITAL VIDEO**

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B.Ed., University of Lethbridge, 1984

A One-Credit Project
Submitted to the Faculty of Education
of The University of Lethbridge
in Partial Fulfillment of the
Requirements for the Degree

MASTER OF EDUCATION

LETHBRIDGE, ALBERTA

September, 1995

For Mary-Ann and Christopher

Abstract

This study suggests that the learning curve to develop professional looking presentations is very steep. Without the necessary background in computers or video production, not all teachers will be able to act alone to accomplish each stage involved in the creation of digital video productions. The pre-, post- and production stages of video development are discussed as it relates to the study. Although it would be commendable if teachers were able to develop their own multimedia presentations, the cost and time investment for teachers is considerable. Experiences and recommendations regarding the creation and use of digital video are provided.

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Purpose of the Project

This one credit project investigated the value of educators' construction of a presentation using multimedia and digital video development tools. Much has been said about the value of using computers to assist with the communication of information. Ideally the computer should assist the developer of the presentation by making the construction simpler which should result in less time to create projects than one would expect using conventional tools. On the other hand, the technologies involved with developing computer mediated communication require similar planning and implementation skills, and strategies.

Media technologists and computer technologists may take delight in criticizing the various methodologies and approaches used as part of this study. However, educators are constantly being bombarded by goals and objectives which state that they and their students should be familiar with this technology and be able to integrate it into their daily curriculum. The question is not whether such an expectation is valuable but is it an expectation that is fair and reasonable to ask of our educators. This study is a journey to find an answer which is based on experience and not rhetoric.

Rationale for the Study

The importance of this study is found in its relevance to the Alberta curriculum, particularly that portion which is addressed in the Career and Technology Studies (CTS) program. The creators of the CTS program foresee students actively engaged in the production of multimedia materials using technology. Adobe Premiere™, the backbone of this project, is recommended as one of the software programs to be used in the communications technology portion of the CTS program. Furthermore, in order to provide relevancy to the curriculum, the foundation for the content of this study's material was derived from the Wildlife Strand of the Natural Resources courses within the CTS program. The content deals with an evaluation of a program called Go Wild for Wildlife (GWFW) which was designed to increase youths' awareness and involvement in improving our environment. The video was intended to illustrate the effectiveness of the GWFW program and show the "kids in action" helping to preserve wildlife.

One of the greatest benefits of using the computer to develop media is the ease at which it can be modified. Assume for example that a video clip for use with social studies had been created on the computer before the fall of the Berlin Wall and contained clips of area maps. The project could be quickly updated to reflect the political changes by replacing, inserting or deleting only those elements which needed modification. Since the computer based material is digital, the quality remains the same no matter how often the material is edited. In contrast, a videotape based production would need to be recompiled using the original master tapes in order to maintain picture quality. Each time a video tape is used the quality of the recording is degraded because of the mechanical transport used to play the tape.

Another reason for choosing digital video production tools is cost. Broadcast quality video tape editing equipment is very expensive and usually requires a great deal of

physical space. An equivalent production suite using digital editing tools is approximately one third the cost of videotape equipment. The actual cost of a production depends on the type of equipment used and level of quality desired.

Most people think of a video as something that you watch after capturing moments of your vacation with a Handicam™. This is the simplest notion of a video. No titles, fades or transitions. In essence it is just an hour watching Aunt Stacey, Cousin Bill, and the kids at the lake. However, when it comes to events such as weddings, people are tending to expect a little more from a production than a hand held camera swinging back and forth between the bride and groom. The television and the motion picture industry contributed to these expectations. Multiple camera shots, transitions, video overlays, on-location shots and special effects are the norm for most productions. Special effects have become the cornerstone of many of today's top motion pictures. Jurassic Park, Forest Gump, True Lies and Mask are just a few of the many recent motion pictures which have relied heavily on computer based special effects. Your local television station probably uses special effects as an opener to their evening news broadcast.

The number of transitions and special effects used by MTV (without regard to content) quickly sets these types of productions apart from the old Encyclopedia Britannica films of the 1950s. Audiences have come to expect the quick paced event filled video. Advertisers know this seems to be the only way to get the attention of today's audience long enough to get their message across.

What then does this mean for education? We have a different audience in the 1990s and it will continue to evolve into the 21st century. Educators must compete for students' attention. 1950s films are no longer effective. Today's student audiences are more cognitive of the technology and the production techniques commonly used in video productions. Consequently, the standard by which students judge the value of

information may also be influenced by the method used to convey it. Boring, lecture style presentations imply correspondingly boring and stale content which is therefore viewed as not worth attending to.

Therefore, if educators want to avoid the 'turn on the projector, turn off the mind' types of presentations, they must either acquire media created in the new formats or create it themselves. There are many very good questions for an educator to ask before initiating a multimedia production. What resources will it take to produce educational materials using digital editing tools? How much time will it take? How much will it cost? Is it easy to do?

The Project

This study is based on the construction of a 15 minute digital video using similar computer technology and video equipment as would be used by students in the various CTS modules in multimedia. The content of the video is not the focus of the study. It is the process of creating the video which is of interest. However, it is acknowledged that a presentation is not divorced from its content and some examples will be provided which illustrate this.

The actual concept for the project evolved from a series of discussions with Dr. Rick Mrazek regarding the potential integration of digital video with various presentation and multimedia software tools. Knowing that temporal sequences provided through animation and video can often provide more relevant information to the student than text-based materials alone, Dr. Mrazek was eager to incorporate video into his presentations. A further requirement was that these presentations could be loaded into a laptop computer and taken to conferences and other institutions.

After examining many computer magazines, 'surfing the Internet', and viewing products demonstrated at conferences, it was decided that the Faculty of Education could benefit from digital video production tools. These sources indicated that the Macintosh computer was capable of creating and playing digital video at acceptable rates for CD-ROM. In fact, at an Apple conference in the fall of 1993, Adobe was demonstrating their video editing software Premiere, along with the Radius VideoVision Studio digitizing hardware, on a Macintosh Quadra 900. This system was demonstrating full-frame, near-broadcast quality video which requires a rate of 30 fps (frames per second) and 60 fields. To obtain near-broadcast quality, the video itself must have been captured at a screen resolution of 640 by 480. However, the fastest Macintosh computers with audio-visual capabilities at that time were only capable of capturing video at less than 10 fps in a 240 by 180 window with a similar playback rate. The VideoVision Studio hardware was seen to be essential at this point. In the summer of 1994, Apple announced that the Power Macintosh was capable of playing Quicktime video clips at 30 fps in a window 320 by 240. It was at this point that it seemed possible to incorporate video clips into presentations. A Power Macintosh 8100/100av was acquired through the University's Academic Development fund and with its AV (audio-visual) capabilities, this computer seemed capable of creating multimedia presentations which could include digital video of reasonable quality.

In the meantime, more serious discussions with Dr. Mrazek began regarding the possibility of creating a presentation for an organization called Earth Force based in Arlington, Virginia. The idea was to develop a presentation which could be used both for Earth Force and for his classes at the University. As a spin-off, the various files created during the construction of the video could be used by his students who would be creating their own presentations. The initial discussions centered around the production of a CD-ROM based presentation which included various video clips and digitized photographs.

However, somewhere along the line, it was decided that creation of a videotape from these files would be a simpler and more accessible technology as a first effort. A VHS videotape could be much more easily utilized at another institution than a computer based presentation. If any changes were required, the computer presentation could be easily modified and another VHS tape could then be made with the updates.

This turned out to be the obligation to Earth Force - the creation of a 15 minute video highlighting the evaluation of the GFWF campaign - with a delivery date in two months. Time slipped quickly by, the report upon which the video was to be based was not ready and Earth Force had not forwarded any video clips or photographs. As the deadline approached, Dr. Mrazek and I had several meetings to discuss the creation of an outline for the video with the software package called MORE. Finally, we sat down and spent five hours constructing an outline of what we thought the video should incorporate. It was also decided that the existing hardware was insufficient for creating the video since we wanted a VHS tape of respectable quality. Dr. Mrazek and Dr. Greene ordered the VideoVision Studio system under a cost splitting arrangement. At this point the financial cost of the project rose significantly.

Description of the Tools Used

Video Equipment

The video camera used was a Canon model UCS5 8 mm camcorder which features Hi8 format, S-Video and stereo sound. Other features included auto focus, auto color balance and auto exposure. The Hi8 format in combination with S-Video allows the camera to record with greater screen resolution (400 lines vs. 300+ lines) which results in better than average quality recordings. This is desirable since each time a tape is copied, the resulting quality of the copy is always less than the original. For us, this would mean that

we could have one pass of "tape to tape" dubbing which would still result in a version suitable for VHS playback. For example, if the digital system could not handle long segments of video we would be able to insert segments directly from the original video tape. However, we would not have an "edited master" of suitable quality from which to make further copies.

Since it was anticipated that the narrator would be walking into or out of scenes, a wireless microphone was chosen in order to provide a greater degree of flexibility for recording the audio. The wireless microphone eliminated the possibility of entanglement and other problems with being tethered to the camera. Normally, in professional productions, the audio is recorded using high quality microphones carried on "booms" which are held just outside of the camera's view. These microphones can be very sensitive and selective in their recording of a scene. Omni-directional microphones pick up sound from all directions whereas parabolic microphones are used to pin-point sounds to very localized areas. For example, an omni-directional microphone would be used to pick up the sound of the crowd at a football game; the parabolic microphone would be used to isolate the voice of the referee from the crowd noise. The Azden wireless microphone used in this project used a design which was somewhere in between and was designed to be sensitive to only the voice of the person wearing it. Its small size and light weight also contributed to its selection.

The third major video component in the project was the Sony CVD-1000 computer controlled Hi8 videodeck. The Sony CVD-1000 is also capable of Hi8 and S-Video for higher quality recordings and is directly compatible with the tape made in the Canon camera. Known more commonly as the Vdeck, this unit can be remotely operated by a computer program. Any of the functions you would normally associate with a remote control unit such as play, rewind, and fast forward are addressable from a computer. The

Vdeck uses Sony's proprietary protocol called VISCA which translates computer code into the internal signals used for operating the tape transport and functions of the video deck. Communications with the computer is accomplished via a compatible cable connected to the serial port.

Adobe Premiere is able to take advantage of this capability through the use of plug-in modules. The result is an on-screen representation of the controls of a video recorder. The computer operator can operate the video deck by clicking on the screen buttons which correspond to the functions of the connected deck. Another feature of the Vdeck is its ability to use SMPTE (Society of Motion Picture and Television Engineers) timecode which identifies each frame on the video tape by a numerical description of hours, minutes, seconds and frame number or HH:MM:SS:FF format. The computer is able to 'read' this number as the tape is playing and can therefore locate any given frame on the tape. Since this provides a way to search for frames and segments on the tape, the Vdeck could also be used as a database of visual information that could be randomly accessed, albeit at a much slower speed than may be expected if the video clips were stored on disk.

The last piece of the video equipment used was a Sony SLV-757 VHS video deck for creating the "digital copies." Once the video was digitally mastered on the computer, the resulting composition was recorded directly to VHS tape using the Sony VHS deck.

Computer Hardware

The computer which completed the bulk of the production was a Power Macintosh 8100/100av equipped with 40 MB of RAM, dual 1.7 GB (gigabyte) internal hard drives, internal double-speed CD ROM drive, external 1 GB hard drive, and a 17" color monitor. In addition, the unit was also equipped with a DigiDesign AudioMedia II sound card, VideoVision Studio and Studio Array.

The VideoVision Studio is comprised of the VideoVision video digitizer and monitor card along with a proprietary video compression daughter card. VideoVision provides a custom monitor output port as well as a port to connect the interface strip. The interface strip is much like a powerbar except that the connections consist of two sets of audio and video inputs, one set of audio and video output jacks, one set of audio-mix inputs and one external sync connector. The input and output a-v connectors are standard consumer "RCA type" jacks supplemented with S-Video connectors. The VideoVision board is capable of full-motion video at 30 fps and 60 fields but the audio is limited to 22 kHz sound and 8-bit stereo. The Audiomedia II card on the other hand is capable of CD quality sound at 44 kHz and 16-bit stereo.

The Studio Array is a pair of 2 GB hard disk drives which, when configured as a disk array, work in tandem to create a continuous 4 GB hard drive for the storage of large files. Its accompanying manual estimates that a 2 GB volume will hold approximately 16 minutes of reasonable quality digital video.

Apple's Color OneScanner flatbed scanner was used to capture images from photographs to be included in the production of the video. Using a program called Ofoto, we were able to select only those portions of a photograph for use as a clip file. The scanner is capable of single pass scanning at a resolution of 600 dpi (dots per inch) with a 24-bit scanning depth.

Software

Adobe Premiere 4.0 was the backbone which pulled together the video clips, audio and title tracks. Adobe Premiere is a powerful video and audio editing tool intended for use by the novice and professional alike. Used to create desktop video, Adobe Premiere is the choice of many professionals for video editing, creating Quicktime movies for

presentations and CD-ROM. Source material can be existing Quicktime movies, computer picture files, animation and illustrations. In addition, Premiere is capable of capturing video and audio within the application itself. Premiere provides the bulk of editing features normally associated with expensive dedicated video editing equipment. Premiere comes with many pre-defined A-B transitions such as fades, zooms and wipes, however, the user is free to design their own should they choose. Premiere also uses the concept of plug-in filters which can be applied to video segments to create special effects. For example, there is a plug-in filter which takes a video segment, converts it to black and white, adds the effect of scratches and dust, and then makes the frame jittery. The visual effect is similar to viewing an old 16 mm film from a poor projector.

Adobe Photoshop 2.5.1 was used to crop and re-size the still images digitized from the photographs. In addition, the image resolution was cut down to 72 dpi with no noticeable difference on the screen. Once this was done, the original file sizes of 20 to 50 MB from the 600 dpi scans were reduced to a consistent 900K for each image. Photoshop was also used to create the composite images where a number of images were re-sized and combined onto a single frame.

Digital Pipeline's ProVTR plug-in module was an indispensable tool in the production of the video. ProVTR is the computer software which allows remote operation of the Vdeck by Premiere. This software allows the video editor to create a low-resolution version of the project. All video clips are captured in a small Quicktime window with low quality sound. The project is built much quicker since the small file size allows the previews to be created much quicker. This is a significant time saver. Since the software keeps track of all the in-points and out-points for each clip in a batch list, the clips can be replaced with the higher resolution once the project is finalized. To capture the higher resolution clips, Premiere is reset to capture video at the new resolution. Then Premiere's batch

capture function is activated and ProVTR simply runs the Vdeck playback using Premiere's batch list timecodes thereby capturing the clips using the exact segments as before. Trying to do this manually would significantly increase the time spent replacing the clips and cropping them to the same length as the miniatures.

Materials Investment

Although it was suggested that CTS students would be using this type of equipment, it should be pointed out that the computer used in this project is considered to be at the upper end of the price/performance scale for personal computers. This is not to say that teachers and schools will never have access to this level of computing. On the contrary, with the continual trend by manufacturers to improve hardware and software while making them more affordable, we will soon expect this higher standard as the minimum within 3 years.

The final configuration and value of the computer system used to create the videotape is shown in Table 1.

Table 1
Final Digital Video System Cost

Item	Description	Cost
Hardware	Power Macintosh 8100/100av, 100 MHz	\$ 8000.00
	40 MB RAM memory, 256K cache	
	Dual 1.7 GB internal hard disk drives	1199.00
	1.0 GB external hard disk	999.00
	VideoVision Studio with	
	4 GB Hard Disk Studio Array	11200.00
	AudioMedia II Professional Sound Card	1459.00
	Sony CVD-1000 Computer	
	Controlled Hi8 videodeck	2400.00
	Canon S5 Hi8 Camcorder	1900.00
	Apple Color OneScanner	1214.00
	Sony CDE-900E CD-ROM recorder	8400.00
	Azden wireless microphone	150.00
Software	Adobe Premiere 4.0.1	795.00
	Adobe Photoshop 2.5.1	895.00
	Adobe After Effects	595.00
	Digital Pipeline ProVTR	286.00
	17 CD-ROM recordable disks @20 ea.	340.00
	Blank tape - 8 mm & VHS	20.00
Total		\$ 39852.00

Educators may be shocked at these figures but video producers are accustomed to much higher costs associated with productions and the necessary equipment. Furthermore, these figures are not representative of all of the tools commonly employed by the video producer. We have not used any special equipment such as studio lights and outdoor reflectors or any special microphones and recording equipment. However, for most of what will be done in schools the investment in equipment will probably be limited to a \$3000 computer, a \$700 camera and the \$800 Premiere software for a total investment of less than \$5000 for each multimedia station. This is just enough to give the students a taste of multimedia.

Additionally, issues such as copyright will add to the cost of productions. It is often unclear what is considered to be fair use. A one second clip from a song or voice may violate fair use. This has been the case with sounds attributable to Disney characters or cords from popular songs as identifiable as the first strum of the guitar in the Beatles' "Hard Days Night." This study included music and a video clip from external sources. The music cost 115 dollars for a duration of less than five minutes. It is important to make sure you have written clearance on all non-original material.

Process Used in the Production

Before the project had been implemented, roughly 30 hours had been spent planning, experimenting and trouble-shooting existing faculty hardware and software for digital video. All attempts to do this in the full-frame format had been unsuccessful. However, a good working knowledge of Adobe Premiere and the hardware was being developed. The following exposé reveals the development process used to arrive at the final product.

Video Suite Configuration

Originally, the project began on a Macintosh IIvx with 8 MB of RAM and a 400 MB hard disk drive. This unit was used to explore the capabilities of Adobe Premiere 2.0 and Quicktime 1.0. The video capture board used to capture the video clip, a SuperMac VideoSpigot for NuBus, was unable to capture sound simultaneously. We soon moved to Adobe Premiere 3.0 and Quicktime 1.6 enjoying much greater reliability and quality of our captured video segments but sound was still a problem.

Impressed at the promise of the technology we migrated to a Macintosh Quadra 840av in order to capture both sound and video at the same time. Even though the new computer was faster, the capture board was just as slow because of the addition of sound to the digitizing process. Our frame rates for capture remained relatively the same. However,

we moved forward and purchased a Multimedia Authoring bundle from Apple including the SuperMac DigitalFilm card which was theoretically capable of capturing full-frame video. Just after we installed the card, the Vice President Academic reallocated the computer to the Instructional Technology Services division of our Library. However, there were promises to replace the unit with a newer model. Several weeks went by without a dedicated computer.

In the meantime, we transferred all of the data collected up to that point into the Communication Lab's Power Macintosh 8100/80. During this time we obtained Adobe Premiere 4.0 and Quicktime 2.0 and began to achieve better results with the built-in hardware. Although Premiere 4.0 provided a noticeable improvement in the playback speed, dropped frames still resulted in jerky playback. However, full-frame video was still not possible with the built-in hardware so it was decided to install the DigitalFilm card. The card had just been transferred into the Power Macintosh 8100/80 when the logic board failed. Several weeks went by without the Power Mac 8100/80.

Once the replacement logic board arrived and was installed we found that the hard disk drive had also been damaged. None of the files were recoverable. An interim drive was installed and nothing was done on the project until its replacement arrived. The replacement drive was received in less than 10 days and was installed and updated with the necessary programs the day it arrived. However, once all the parts were re-connected it was found that the DigitalFilm card could not be used. After 2 days of attempting all possible combinations of software set-ups, it was discovered that the card's ROM chip was incompatible with the Power Macintosh computers. The upgraded cards were backordered with an estimated ship date of 5 to 6 weeks. To compound the problem of acquiring the upgrade, SuperMac had been purchased by Radius Corporation and in the

transition the person we had originally given our upgrade order to was no longer with the company. The order had also been misplaced. The updated card has yet to arrive.

However, within a couple of weeks, the VP Academic provided a Power Macintosh 8100/100av to replace the Quadra 840av. Interestingly, the Quadra 840av is still considered to be the better machine for video productions than the Power Macintoshes with the Quadra 900 as the preferred platform, both of which have been long discontinued. Even with the increased processor speed the AV board was still inadequate for video capture of the quality we were looking for. Two weeks later, the VideoVision Studio arrived and was installed.

The VideoVision Studio card worked flawlessly, however, the Studio Array Drive did not. More time was lost to troubleshooting which ended in the discovery of a tiny bent pin on the SCSI cable used to connect the array drive to the computer. It took another day tuning the system for Adobe Premiere before we were set to begin. This included updating Adobe Premiere to version 4.0.1, updating the system software to version 7.5.1, and installing the Apple Multimedia Tuner 2.0.1. The total time spent establishing a usable video configuration was 17 hours.

Pre-Production

Pre-Production is the stage at which preparation for the video takes place. The primary component for any video production is the script or storyboard. A storyboard is multi-columnar document which outlines the audio, video, set and narration considerations. At the very minimum a storyboard consists of a two column format with the scene transitions on the left side and the narration script on the right. A video script commonly adds several more columns for each of the SMPTE timecode, the audio track contents, transitions and the video support files. The transitions column serves a dual purpose by

indicating scene or set changes along with the type of effect used to introduce the new scene.

We had a general idea of what the video was going to cover but since the report for Earth Force was not complete we did not have enough information to start writing the storyboard. We had several discussions on what form the video would take and in two hours created an outline using the program MORE. The outline gave us a general direction that the video would follow: Who is Earth Force? What is the GWWF campaign about? What did the survey results say? What is the next step based on the results?

Since the video was to serve a dual purpose, as a summative report and as a teaching tool, we wanted to include as many images and examples as possible. This included several proposals which would make the statistics more relevant to the viewer. Animated bar charts and multiplying images were all considered as a means of making the statistical information 'jump out' at the viewer. With all the multimedia tools at our disposal, we thought this would be relatively easy to create once the data was analyzed. It would have been wiser to have created some templates, tried them out before hand, and then substituted the correct data when it became available. However, our attention was turned to the photographs and video supplied by Earth Force which had to be returned as soon as possible.

We spent roughly two hours sorting through the photographs, letters and drawings deciding on a 'short-list' to include in the video. The selection was based on the desire to show kids in action: doing something for the environment. Photographs of kids walking on a nature walk were rejected, although it was one of the activities proposed by Earth Force personnel as becoming more in touch with the environment. The image did not reveal any affective interaction with the environment; you could not distinguish this activity from one of walking to reach a destination. However, soon after we had made

our selection, our contact, David Ashton, from Earth Force came from Virginia for a project meeting which took roughly four hours. He reviewed the choices and questioned why we had rejected several photographs. We revised our selection to include photographs identified by Mr. Ashton. Further discussions with Mr. Ashton resulted in some significant changes to the outline for the video project. The focus on kids in action remained. However, the sequence was altered and the concept for the presentation changed. The intended audience for Earth Force would be board members who probably would not be too impressed with an MTV style of presentation featuring Rap Music (Hip-Hop) to help jazz up the statistics.

Over the next several days, Dr. Mrazek's assistant, Trevor Woods, used the Color OneScanner to digitize 115 pictures, drawings, and letters. We even scanned sections of an Earth Force T-shirt to obtain logos. Since we did not know how or where the photographs were going to be used, it was decided that the images be scanned into the computer at a resolution of 600 dpi even though 72 dpi was all that was necessary for video. By scanning the photographs at the higher resolution, we would be able to use Photoshop to select a smaller section of the photo, crop and enlarge the new image without losing a great deal of detail. This was particularly important since we would not have access to the photographs to re-scan them. However, this decision resulted in an average of 20 minutes to scan an image or a duration of roughly 40 hours to scan in all of the images. An additional 8 hours was necessary to re-size all of the images in Photoshop to fit within the 640 by 480 pixel format.

Concurrently, the video segments were captured onto the disk array from the tapes provided by Earth Force. Because of an error on the part of the author all of the clips were recorded with poor quality sound (8-bit mono at 11 kHz). This resulted in more files fitting on the disk but left us with an unusable sound track. To compensate, the

audio track for each video file was re-digitized at 44 kHz in 16-bit stereo and saved to separate files. These files could then be matched to the video in the post-production stage.

In keeping with the "kids in action" theme, we decided to capture the voices of children reading letters which had been scanned. Even though the voices were not of the actual letter authors, the sound of children's voices would add a nice touch to the production. Trevor and David Walters, a graduate student, volunteered some of their young friends to make the recordings. Armed with a Fisher-Price tape-recorder, Trevor and David were able to gather two readings of each letter. Although they did not keep track of their time, based on the length of the recordings they would have spent approximately two hours with the children.

By this time the final report was completed and the statistics calculated. The author took the report and spent five hours drafting a storyboard using the MORE outline previously created and the report itself. Over a period of six hours, Trevor and Lisa Halma, another of Dr. Mrazek's assistants, then created several dozen pie charts to help visualize the statistics. Since most of the statistics were in the 90% range, most of the pie charts looked like full moons, and therefore were ineffective as visual aids.

As the video clips, audio, pictures and graphics files were collected they were recorded to CD-ROM disks since there was not enough room to store them all on the hard disk drives. After mastering fifteen CD-ROM disks, all 9 GB worth of files were safely backed up. At the current hard drive cost of \$1400 per GB it would have needed an additional \$12,600 for on-line storage. However, the benefit of having these files on CD-ROM was that they could be easily stored or transported to different computers. This stage added another twenty-nine hours onto the pre-production time bringing the running total to 87 hours dedicated to this project.

Production

The production stage of the project is where the actual footage used in the video is shot. It was decided that for an environmental video on location outdoor shots would seem most appropriate. In preparation for the on-location shots, Trevor prepared several flip chart pages of the script for Dr. Mrazek to refer to for the narration. The narration segments themselves were shot on the University campus grounds at various locations.

The opening scene was chosen as a juxtaposition of the demise of the buffalo with the city development in the background. The scene had the camera panning back from the city to reveal the symbolic silhouette of a buffalo. Dr. Mrazek walked into the scene towards the buffalo while introducing the video (Figure 1).

There was some trouble with the audio. The wireless microphone was picking up some electrical noise caused by the camera zooming in and out. The slight buzzing noise was more noticeable when the camera was zooming to a wide angle. Consequently, it may be noticed that there are very few scenes with a 'zoom out.' However, we were fortunate that it was a nice sunny day with very little wind as wind noise could have been potentially more distracting than the buzzing. The slight breeze did make it difficult for Trevor to hold the flip chart pages without them rustling.

The first scene was shot several times because either the microphone was turned off, the cameraman was not ready, or the narrator had forgotten what he was going to say. After that, we made sure that we made at least two shots of every scene in order to maximize the use of that particular setting while minimizing unwanted distractions.

The second location was chosen to provide a sense of depth to the background (Figure 2). Furthermore, this background gives you a sense that the scene may have been recorded in the foothills rather than in the coulees.



Figure 1: Opening Scene



Figure 2: Rock and Coulee Scene

Without the rock, the scene tended to look "flat" because of the close subject and the distant background. The rock serves as a third element which provides an intermediate object between the subject and the distant background. Compare Figure 2 with Figure 3

and you will notice that the grassy background gives the scene the look of a two-dimensional portrait.



Figure 3: Grassy Knoll Scene

Two other intermediate locations were used; one with the camera looking into the trees at the golf course in the river valley and the second with a background of grasses waving in the breeze (Figure 3). This was followed by a number of scenes shot in the breezeway area of the University. Some of these shots gave the impression that our narrator was standing in the clearing of a forest (Figure 4).

With the focus on kids in action it seemed appropriate that a playground scene (Figure 5) could best be used to emphasize that portion of the script which referred to boys and girls clubs, nature centers, and zoos. One of the shots had kids playing on the equipment, however because of a problem with the way the camera zoomed in, the clip could not be used.



Figure 4: Pseudo Forest Scene



Figure 5: Playground Scene

The final location used the river valley as a backdrop looking upstream through the draw (Figure 6). The location has a very open, peaceful look to it and, because of the implicit

lines in the slopes and river contours, it draws your attention continually back to the narrator.



Figure 6: River Valley Scene

The production stage took place over two days. The first day took six hours to complete and the second day took an additional 3 hours to re-shoot several scenes from the first day. Some of the first days scenes did not have sound or both of the scene shots were unusable. Add these nine hours to the 87 hours of pre-production and the total was now 96 hours.

Post-Production

Once all of the raw materials had been acquired, it was time to assemble the video clips, pictures and audio in Premiere. As a first pass, all of the video clips including the ones provided by Earth Force were examined in terms of their applicability. On a second and third viewing of the videos, the in and out-points were noted on the storyboard for each of the clip segments which would be used. This process took four hours. Another seven

hours was spent searching for appropriate opening, background, finale and credits music. It was decided that background music would be inappropriate for the content matter and type of presentation. Any background music that was tried was too distracting and a poor match to the video. Another hour was spent reviewing the digitized photographs and determining the order of their presentation. This was done by matching them with the narration so that there was relevance between what was said and the clip shown on the screen. Recall that these photographs were not intentionally designed as part of the script but were being made to fit the script.

Digital Video Editing. The digital editing process was ready to begin. All of the supporting materials, with the exception of the on-location clips, were ready. The on-location clips would be imported directly into Premiere from the videotape using the Vdeck. However, we ran into another problem at this stage. The VISCA driver supplied with Adobe Premiere was incompatible with the Power Macintosh. Localizing the problem to the driver resulted in several calls to Sony, Apple Computer and Adobe. It was Adobe that had the solution - ProVTR. ProVTR was immediately ordered from Pipeline Digital in Hawaii, and arrived in two days by FedEx courier. We were then ready to capture the video clips.

ProVTR provides the operator with user interface which allows remote control of the Vdeck from within Premiere. This allows total control over the Vdeck functions without having to use the manual controls on the front of the Vdeck (Figure 7).

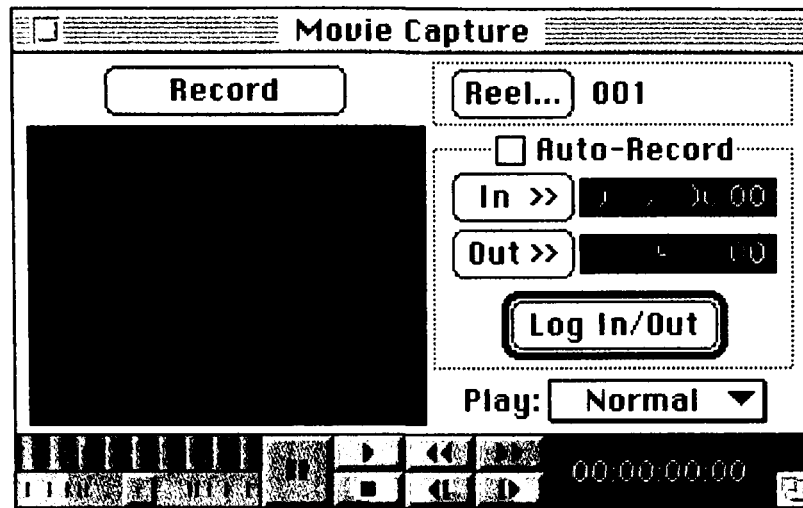


Figure 7: ProVTR Interface

In order to make the editing process much simpler, batch capture is used to capture the first set of clips. The ProVTR interface locates the beginning (in-point) and end (out-point) of the clip to be recorded. First you locate the in-point and click on the "In>>" button. This enters the time code into the computer. The "Out>>" button is pressed to mark the out-point. Then the operator clicks on the "Log In/Out" button. These points are then entered into the Batch Capture List (Figure 8).

Batch List: EF Batch List Aug24					
✓ Reel Name	In	Out	File Name	Comment	Settings
✓ 001	00:00:13:00	00:00:30:17	001 - 00,00,13,23		
✓ 001	00:02:02:18	00:02:27:25	001 - 00,02,02,18		
✓ 001	00:02:39:13	00:02:57:14	001 - 00,02,39,13		
✓ 001	00:04:12:02	00:04:25:09	001 - 00,04,12,02		
✓ 001	00:04:35:27	00:04:49:27	001 - 00,04,35,27		
✓ 001	00:05:22:07	00:05:30:25	001 - 00,05,22,07		
✓ 001	00:05:46:28	00:06:01:05	001 - 00,05,46,28		
✓ 001	00:11:55:04	00:12:13:06	001 - 00,11,55,04		
✓ 001	00:12:26:14	00:12:38:20	001 - 00,12,26,14		
✓ 002	00:16:50:14	00:17:16:14	002 - 00,16,50,14		

Add... Delete Sort Capture

Figure 8: Premiere's Batch Capture List

Once all of the clips are logged, the Capture command is issued from the batch capture list window. ProVTR then rewinds or fast forwards the tape to the first segment and plays it. Premiere starts capturing the video clip when the counter meets the in-point and stops capturing at the out-point. Premiere then saves the video clip to disk and calls for the next video segment. This is done automatically for all clips in the list.

So far, all of the clips, pictures and sound elements are individual files on the hard disk drive. They must now be entered into Premiere and assembled together in the Construction window (Figure 9). This is the main work area of Premiere where the sequence of video clips are combined together with sound files, pictures, titles and special effects. There are two main video tracks and two audio tracks as a default but additional audio tracks may be added when required.

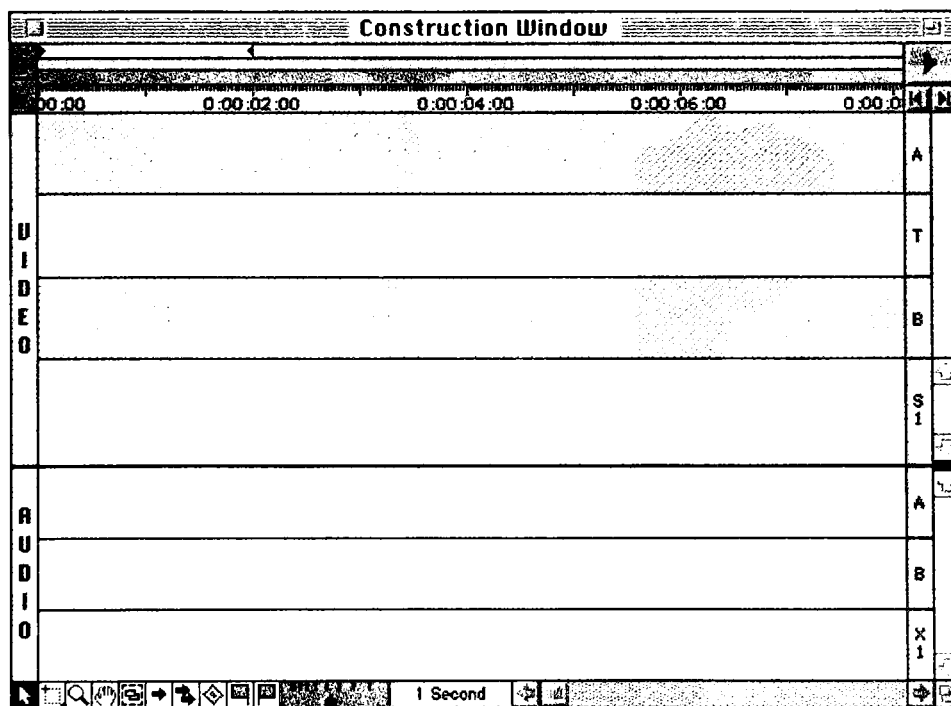


Figure 9: The Construction Window

Both the video tracks and the audio tracks are marked with the letters A and B. The A track of each will correspond to the main video track. Track B is an alternate which allows the editor to switch when necessary. The files are imported into the Project window which will hold all of the files for the presentation. When a video clip is needed in the construction window, its icon is pulled over from the project window onto the construction window's timeline (Figure 10).

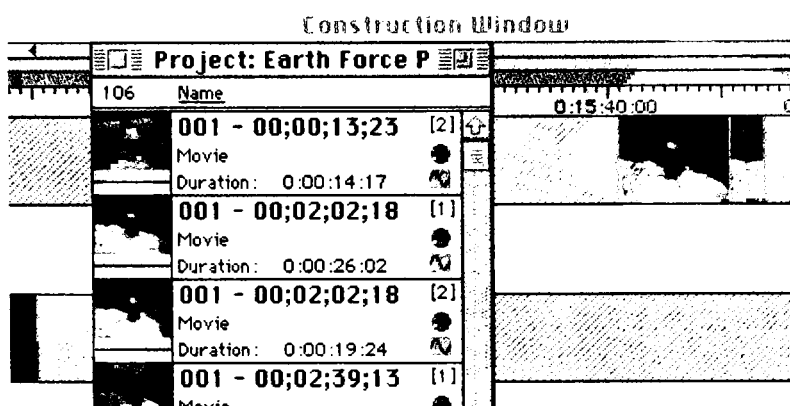


Figure 10: Project Window and Construction Window

The T track is used for transitions such as fades, dissolves, and cube spins between tracks. Transitions are accomplished by overlapping the clip on the A track with that of the B track. The transition is then inserted by dragging its icon from the transitions window onto the T track (Figure 11).

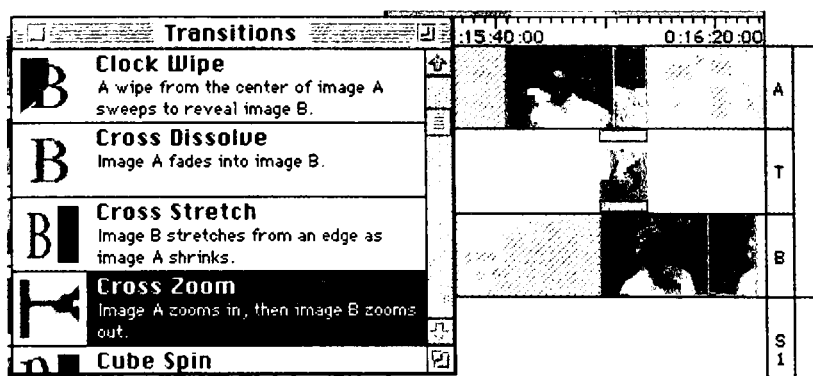


Figure 11: Transitions Window and Construction Window

Figure 11 shows a "cross dissolve" from track A to track B which when played back would result in the video fading from clip A to B. The duration of a transition is adjusted by the changing the length of the transition applied and the amount of overlap available on the video clips. When clips are changed quickly with transitions the process of creating the timeline can be quite time consuming. In addition, timelines with numerous transitions slow the scene preview option and the time it takes to build the movie. Figure 12 shows the weaved appearance of the sequence of photographs as they fade from one to another.



Figure 12: Photograph Sequence

Figure 13 shows the construction window for the entire GFWF video project using a 2 minute scale for the timeline.

Figure 13 also shows the completed soundtracks for the video. It should be noted that applying a dissolve to the video tracks does not affect the audio tracks. The editor must manually edit the audio for any overlapping audio tracks by adjusting the audio level in the audio fade area. "Handles" are created by clicking on the middle line in the audio fade area. These handles can then be moved up to amplify the volume or pulled down to reduce the volume. Figure 14 shows the volume adjusted on an A-B cross dissolve. As track A fades out to zero volume track B fades in to a normal volume level.

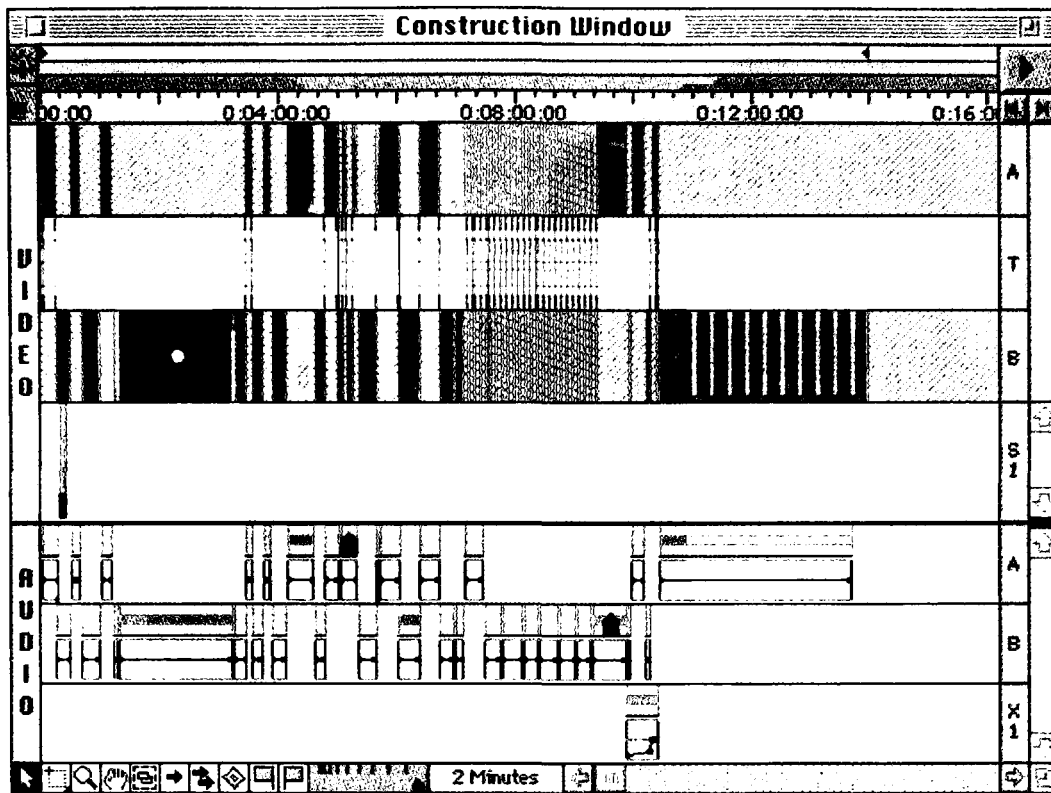


Figure 13: Go Wild for Wildlife Video's Timeline

At various stages of development it is possible to preview the video. This is often used to test the effectiveness of the transitions or any other editing decision.

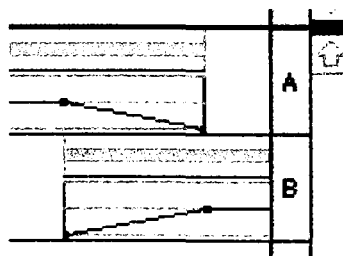


Figure 14: Audio Fade Area

In this particular project, previews took roughly 10 minutes to build for every one minute of video to preview. As a consequence, it took a long time to ensure that each video clip, sound and transition was correctly lined up and working properly. However, once a

section is previewed, the preview files are then saved in order to save time creating the actual movie.

Once the video editor is satisfied, the video miniatures can be replaced with the proper sized clips. The batch capture list is activated once more and the capture parameters are set to the new resolution and sound quality. The capture command is activated and all of the previous clips are replaced by the new clips. The movie can now be compiled from all of its elements. At this stage the editor chooses the final frame size, video compression algorithm, sound quality and compression, and the location where to build the movie. The video clip for this study had a duration of roughly 14 minutes and took approximately six hours to compile. The post-production stage took twenty-six hours to complete. Therefore, the overall production took 134 hours to complete.

Critique of the Video

The computer's contribution

The previous description of the post-production process is not the entire story. Besides being a mechanical process of moving icons around on the computer screen there are an incredible number of editorial decisions being made.

Furthermore, the process wasn't without its technical difficulties as well. This was not a full frame production. Everything was built using a 320 by 240 format with the final video created by doubling the video output. The result is a flattened or washed out appearance. Why? The final movie with a duration of 14 minutes compiled to a size of 1.5 GB of storage space. The current operating system is only capable of addressing a 2 GB file size. Had the movie been created in the 640 by 480 format we would have required four times the storage space. Therefore a full frame video on this system would have to be less than four minutes in length. The project could have been divided into four

segments but the post production time would have increased four-fold as well. The reason for this is not only the increased compiling time but the additional time it would take to erase the current working files and load all of the files for the next four minute clip. As it is, it takes nearly three hours to re-load all of the files from the CDs for the current project. The first attempt at a full frame movie from the 14 minute project resulted in a system crash after three and a half hours of compiling. The computer had reached the 2 GB limit and ran out of memory.

Another problem with digital video is hard disk management related to optimization. To ensure the files played back at the best possible rate it was important that the hard drives be optimized at all times. This meant that before every movie compilation, a program such as Norton Utilities Speed Disk had to be used to ensure that the files were contiguous. A fragmented movie file would "stutter" during playback and the sound could quickly get out of sync with the video. This added approximately 15-30 minutes time to the process.

Before one session the hard disk drive did not come up on the screen. Repeated attempts at restarting the computer did not help bring it back. Norton Utilities was used to re-mount the disk image on the screen. Fortunately, the files were recoverable to another drive whereupon the drive in question was reformatted and prepared to be used again. Had the drive failed, all 2.5 GB of files would have been irrecoverable. Digital video editors should make a back up of their files frequently. With diligent hard disk management you will avoid risking a lot of time and effort to replace lost files.

A second attempt at creating a full frame movie also failed not because of hard disk storage, although this was still a factor, but because of poor transitional effects. An option called horizontal interpolation was activated in order to reduce the amount of storage space for the movie. This process takes adjoining pixels, the dots that make up

the image, and averages their colour and luminance into a single value and stores it. The result is that it takes approximately half the amount of space to store the movie.

However, upon playback the single pixels are expanded out into two pixels but the resulting pixels are not the same as the original two. Consequently, the movie loses quality which is quite noticeable during A-B transitions.

The video editor's contribution

Most of what follows will explain the rationale and the compromises used to arrive at the final video. The video begins and ends with the Earth Force logo, however the music used with each of the logos are quite different. The first clip has a southwestern haunting quality which gives the impression that there is "something here to discover". The music with the end logo is designed to give the logo a dynamic punch that says "look out, there's more to come." The final credits roll with music entitled "The Road Home" which adds a folksy sound that also gives the impression that there is more to come. Coming up with such a scheme is not very easy for a person who is not trained in music. It was more a case of listening to over 25 CDs and developing a theme, then choosing those titles which would complement the theme. Thus, in doing so, it was determined that background music would detract rather than enhance the narrative portions of the video.

The video would have been a lot easier to put together if there were fewer video segments used. However, longer scenes would have been much more difficult for the narrator. As it turned out, quick cross-dissolves were used to connect distinct video segments back into the flow of the script. Some cross-dissolves worked quite well and were barely noticeable. Several cuts were used to remove sections of the narration that were undesirable. For example, there was one scene where the narrator quickly turned to one side while speaking. Unfortunately, the alternate clip was unusable as well, therefore that section need to be cut. The narration which read

"Well, based on what we've seen already with the Go Wild for Wildlife campaign and its successes, one can only speculate how much of an impact Earth Force will have..."

soon became...

"Well, one can only speculate how much of an impact Earth Force will have..."

with only a minor skip in the pace of the clip.

The use of photographs helped to provide a change of pace to the video and added support to the narration. At certain points, the clips seem to punctuate what is being said.

Although most of the narration involves quoting statistics, it was decided not to use the pie charts to support those figures. This was done primarily because the statistics were so close to 100% that displaying a pie chart was virtually meaningless; it would look like a full moon on the screen. Alternatively, repeatedly displaying a percentage with an explanatory phrase would be annoying considering the number of statistical data cited. Instead, the viewer was shown "kids in action" and was given the address of Earth Force to order a copy of the report.

Conclusion

This study required similar planning, implementation skills, and strategies as that used in conventional video production. The only skill set which differed was the use of the computer editing tool Premiere. However, the digital editing process still used the same editorial metaphors such as tracks, fades and wipes. Almost everything else was the same from the planning stage, to the storyboard, to the on-location videotaping. Overall, the planning, pre-production phase was the longest portion of the project.

As this study demonstrates, the learning curve to develop professional looking presentations is very steep. Educators must be aware of the many aspects of computer technology and video production which force the producer to constantly problem solve. Problems with hardware, software, script, and location are only a few of the many troubles which are abundant in this field. Some of these problems are easily resolved but others are not. Of those that are solved it is often the case that a compromise constituted the solution.

In light of the difficulties we encountered, be prepared to deal with numerous problems, especially when the project is under a time constraint. A number of recommendations are provided which should help educators minimize the difficulties associated with digital video.

First, when working with digital video it is preferable to utilize a computer which has a fast processor, a large amount of processing memory (RAM), a large amount of active storage and supplementary "off-line" storage. Digital video is one application which pushes the limits of current computer technology. For example, to record an uncompressed video directly to a hard disk requires a system which can handle 27 MB per second. However, most systems are only able to sustain a transfer data rate of 3 to 5 MB per second. If a system could handle 27 MB/s, with no video compression, a 2 GB drive would be filled within one minute and 14 seconds. Processor speed is also important when dealing with large files. The time it takes to build movies and movie previews is inversely related to the speed of the microprocessor. This was clearly evident when the project migrated from one computer to the other.

Second, it is important to develop a routine for hard disk management. Although it may seem obvious, it is important to ensure that there is enough disk storage available before beginning a project. For this study, it would have been impossible to have kept all 9 GB

of the project files on the attached hard drives. Fortunately, we had a CD-ROM recorder available and could save the project files on several CDs. Hard drives should be optimized frequently in order that previews and movies are compiled quickly and play back is as efficient as possible.

Third, use teams or partnerships to develop your projects. Given the experience of the author, it appears that construction of a digital video presentation requires a great deal of time and knowledge. This project had a ratio of 536:1 for the development time of 8040 minutes to the product time of approximately 15 minutes. This is well beyond what one would expect for the preparation of a 15 minute lesson which would commonly have a ratio in the opposite order. Without the necessary background in computers or video production, not all teachers will be able to act alone to accomplish each stage involved in the creation of digital video productions. Therefore, should educators choose to develop their own multimedia and digital video presentations they will need to pool their resources in order to leverage the skills of their peers and students.

For example, since the duration of the CTS Communications Technologies modules average 25 hours, students working with digital video projects will need to be supplied with video footage created in advance. This could be done by maintaining a library of "stock" materials, or by coordinating with teachers and students in other classes to collect the video footage, digitize photographs, create artwork, or write scripts.

Although, working with 'stock' footage may accelerate the process of learning the mechanics of digital video tools, it also takes away from the excitement of creating original material. There is also a loss of control and continuity in a project when using 'stock' material. With 'stock' material you must be willing to accept a compromise in order to blend it with the material in your existing base. Recall that the photographs from Earth Force were not intentionally designed as part of the script but were being made to

fit the script. As a consequence, they supported the video's theme of 'kid's in action' but did not provide visual support for the narrative's content. Supporting materials that work best together are designed to work together.

One should be cautious when suggesting that teachers should be integrating multimedia into the classroom. This could mean that teachers should develop their own multimedia materials, or that teachers should use available multimedia materials, or both. If multimedia presentations are already available, the likelihood of integration is much greater than if we suggest teachers develop their own materials. Although it would be commendable if teachers developed their own multimedia presentations, the costs and time investment for teachers would be considerable. Should these presentations be developed at the district level, the cost and development time can be distributed across a number of schools provided teachers use the end product.

It would be fair and reasonable to assume that some educators will utilize these technologies with our students. And, based on the progress of computer based technologies, it would be safe to assume that in the future, tools which are more powerful and more cost effective will be accessible by educators and students. One of the biggest questions that remains is that of cost effectiveness and the value of spending the time learning these skills. Compared to conventional video editing, the answer is yes. Compared to other components of the curriculum, the answer is maybe. The power of the technology is not in where you are, but in where you want to be.

Very powerful messages can be delivered by the simplest of tools; the simplest of messages can result in powerful tools.

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