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Abstract

This article traces the historical roots of YouTube™ and online video to examine it within the context of educational motion picture history. The current state of online video is discussed first followed by a thematic analysis of the history of educational motion pictures from silent film to YouTube. The historical literature reveals recurring themes and issues, which include: (1) the intrinsic advantages of motion picture technologies, (2) differing opinions about the benefits of film and video, and (3) access and equipment issues. Previous historical accounts fall short of addressing how these themes connect to online video. The potential future of online video is discussed in the conclusion.

Keywords: YouTube, film, video, history, online, digital

In the age of new media, characterized by digital content and the Internet, it may appear to some that an era of unprecedented novelty is at hand, meaning that new media really is new. Certainly YouTube™ with its video-sharing capabilities is new, first appearing in 2005 (YouTube, 2009b). However, the novelty of the Web 2.0 video-sharing phenomenon is in some respects only partial. When tracing the historical roots of YouTube™ and the growing spectrum of online video services, it soon becomes apparent that certain aspects of this manifestation of new media can be traced back to much older forms of motion picture technology. For example, video is created using a sequence of moving images regardless of whether it is stored online or on a film reel. This corresponds to the idea of media renewability, which suggests that fundamental attributes of media as a vehicle for communication are renewed, or reintroduced in similar forms of media invented over time (Peters, 2009).

Discussions about motion picture technologies (i.e. film and video) in education have an extensive history, which tend to exhibit their own form of renewal as certain themes are revisited a multiplicity of times through the years. The historical literature reveals that the evolution of motion picture technology inspires some to strongly support it based on its intrinsic advantages as a visual medium, while others engage in debate regarding the actual educational benefits (Saettler, 2004). The practical necessity of obtaining adequate equipment and access to good educational film is another issue that has surfaced repeatedly over the decades (Cuban, 1986; Saettler, 2004). These are themes that not only persist, but also impact the current manifestation of online video and video sharing found on sites like YouTube. However, previous historical accounts of educational motion picture technologies written after the creation of the Web fall short of discussing how online video adds to the historical record (See Molenda, 2008; Reiser, 2001; Saettler, 2004).

This article traces the historical roots of YouTube™ and online video to better understand its place within the history of educational motion picture technologies. The information is organized thematically rather than chronologically so that the parallels from past to present are more clearly demonstrated. First, the current state of online video is discussed to establish what is presently occurring with YouTube™ and online video. The next three sections explore the following themes: (1) the intrinsic advantages of motion picture technologies, (2) differing opinions about the benefits of film and video, and (3) access and equipment issues. Each of these three sections reviews the historical literature and draws connections from past to present. The final section is a conclusion where the potential future of online video is discussed.

Given the magnitude of the literature in the field of film and video, it was necessary to limit the scope of analysis. Within the boundaries of the article,

we explore the educational use of motion pictures, meant in its literal sense. Next, the article accounts for only those motion pictures found in prerecorded (not live) film or video. Finally, because of constraints on accessing articles in languages other than English, and due to the fact that both motion picture and online retrieval innovations enjoyed their greatest growth in the United States, this article focuses on the context of North American education.

The Current State of Online Video

In recent years, the growth of online video production and viewing has been meteoric. According to Nielsen Online (2009), during the years spanning from 2003 to 2009 the online video audience grew 339% and the amount of time spent viewing video online grew 1,905%. Much of the growth in online video can be attributed to YouTube, which is currently ranked as the third most popular website according to Web traffic statistics from Alexa (2009). In March 2009, it was announced that YouTube™ had surpassed 100 million U.S. viewers for the first time (comScore, 2009). In addition to a substantial viewing audience, YouTube™ receives a steady stream of new video content uploaded from computers and mobile phones around the world. As of May 2009 video was being uploaded at the rate 20 hours of video per minute (YouTube, 2009e).

It is evident that online video has permeated the Internet and become popular among its users. What may seem less apparent is how this phenomenon applies to serious academic endeavors. *The 2008 Horizon Report*, a collaborative publication of the New Media Consortium and the Educause Learning Initiative, listed several key technologies likely to be adopted for use in academic institutions. It was predicted that grassroots video, produced with inexpensive equipment and distributed through video-sharing sites like YouTube, would be adopted by academic institutions within one year. In fact, this prediction has already begun to come true. In March 2009, YouTube™ EDU, located at http://www.youtube.com/edu, was launched as a central hub for videos from leading college and university partners. At the time YouTube™ EDU was established, there were over 20,000 videos and 200 full courses offered for free through the site (YouTube, 2009d). In addition to YouTube™ EDU, it is possible to find many YouTube™ user sites, called channels, which contain content with potential educational value. It is beyond the scope of this article to list every possible YouTube™ channel containing educational videos, but a selection of examples is provided in Appendix A to illustrate this point. Additional examples of channels and individual videos can be found by searching the YouTube™ site.

Beyond YouTube, a spectrum of video sites have emerged that serve

educational or specialized academic interests. For example, *SciVee,* which is located at http://www.scivee.tv, supports an online community of scientists who share and discuss research with video and audio enhancements. Another site called *TeacherTube,* located at http://teachertube.com, was created to host and share instructional videos deemed safe and appropriate for K-12 classroom use. In addition to SciVee and TeacherTube, there are numerous other sites containing free online video that may be tapped into for various instructional purposes. A selected list of examples, organized by topic, is provided in Appendix B.

If online video can be thought of as another form of educational motion picture, then the advantages it brings as a visual medium are likely to parallel those of earlier forms of similar technology. An examination of the history of educational film and video reveals that numerous similarities do indeed exist. The next section provides a brief history of North American educational motion picture from silent film to YouTube™ that focuses on the theme of intrinsic advantages that have long been associated with film and video.

The Intrinsic Advantages of Motion Picture Technologies

The invention of motion picture technologies in the late 1800s ushered in a wave of enthusiasm for the new visual medium. The first public glimpses of the wonder of moving pictures occurred in public exhibitions during this time period. For example, the Kinetoscope, a device for individual viewing of motion pictures, was publically demonstrated at Edison laboratories in 1889, and a motion picture projection system called the Vitascope was exhibited in 1894 by inventors Thomas Armat and C. Francis Jenkins (Saettler, 2004). It was not long before the educational possibilities became apparent and the motion picture entered the classroom. The earliest use of classroom film in the U.S. is believed to have occurred in the Rochester, New York, public school system in 1910 (Saettler, 2004). At that time silent films provided educators with a new mechanism for making instruction more concrete, realistic, and visual. Through film, students could see faraway lands, visit dangerous places, and witness natural phenomena while seated in the classroom. Film provided a dynamic representational format that allowed teachers to bring the world to their students in a manner not possible through textbooks and blackboards. Thomas Edison, one of the inventors of motion picture technology, stated, "The moving object on the screen, the closest possible approximation to reality, is almost the same as bringing that object itself before the child or taking the child to that object" ("Edison on educationals," 1919, p. 47). A similar sentiment was echoed by the authors of one of the first teaching manuals for educational film:

The cinema has disclosed a whole new world for observation and

> study. It has brought the miracles and wonders of nature to the pupil, has shown him the microscopic life of the ocean, life in the arctic and antarctic regions, how a plant unfolds, how a caterpillar becomes a butterfly and many of the long hidden mysteries and secrets of Mother Earth. (Ellis & Thornborough, 1923, p. 5)

The arrival of the educational motion picture sparked considerable excitement because of what it could do to augment classroom instruction. Publications disseminating thoughts about the new medium and its role within education began to appear in the early 1900s. One of these, *The Educational Screen*, began publishing in 1922. It was an independent magazine that supplied educators with a steady stream of intellectual critique, instructional ideas, and news regarding visual education and educational film. Over time, it merged with several related publications and soon became the primary source of information about audiovisual media (Saettler, 2004). At the time of this writing, the first volume of *The Educational Screen*, and subsequent volumes published from 1922 through 1962 may be found in digitized form on the *Internet Archive* website at http://www.archive.org. These volumes illustrate much about the opinions, controversies, instructional practice, available film titles, and equipment sold to schools during the first few decades of the educational film. The advantages of motion pictures for teaching were frequently written about in *The Educational Screen*. For example, the educational advantages of slow motion film were discussed by Orndorff (1923), the use of foreign talking films in language instruction was touted by Freeman (1933), suggestions for designing an appropriate lesson plan to guide teaching with film were proposed by Wilkinson (1947), and an approach for using motion pictures to help learners bridge the gap between concrete and abstract ideas in mathematics was described by Amsden (1951).

One of the most compelling advantages of the motion picture is the capacity to record and preserve the past. Online digital archives provide access to some of the oldest video clips available for modern day examination. Some of the films advertised in *The Educational Screen*, can be found online today in digital video format. For example, clips from the 1922 film *Nanook of the North*, advertised in the February 1923 edition of *The Educational Screen*, can be found on YouTube™ by searching for the title of the film. Similarly, a film called the *Three Little Kittens* (ERPI Classroom Films, Inc., 1938) is featured in Wilkinson's article, "Teaching with the Aid of Motion Pictures," from the September 1947 issue of *The Educational Screen*. These films have historical relevance as artifacts of the early days of teaching films. As such, they have educational value within courses where the history of educational film is studied.

Many other clips from the early days of film can now be viewed online. Because of this, history instructors and their students now enjoy the advantage of easy access to a collection of historical video clips. For example, Rees (2008) described how he turned to YouTube™ to find short video clips for his history classroom including,

> Einstein explaining the theory of relativity (in English), a newsreel announcing Mussolini's execution (which includes footage of the firing squad doing its work), a 1917 speech by Lenin, and a collection of file footage depicting Mao Zedong at various stages of his career. (para. 5)

These historical clips bring history to life, providing a present day view of the people and events described in the pages of history books.

In addition to providing a glimpse into the past, motion picture technologies enable dynamic representational attributes such as the depiction of motion sequences or adjustment to the speed of recorded events. The ability to depict real-world phenomena faster or slower than they normally occur was discussed with great excitement in the early days of film as an important advantage of educational film (Brunstetter, 1937; Ellis & Thornborough, 1923; Greene, 1926). Nelson L. Greene, editor of *The Educational Screen* and past president of the Association for Educational Communications and Technology (AECT), wrote, "The film is unique for revealing for the first time in the history of human learning things which are too slow or fast to be seen by the human eye" (1926, p. 128). Greene proposed several examples that illustrate how stop motion film can be used to represent natural events faster than they normally occur including, "...germination of a seed, the opening of a flower, the development of fruit from the blossom" (p. 128). With respect to the use of film to represent natural events in slow speed, Greene noted that, "By the more complicated device of the speed camera we can know, by actually seeing it, how a water drop splashes, how an insect moves its wings, what really happens at the bursting of a shell, what a swinging golf club does when it meets the ball, and a host of other phenomena hitherto totally invisible" (p. 128). The new visual medium had provided an unprecedented mechanism through which natural phenomena could be revealed and studied in remarkable detail.

Silent film brought the capacity to preserve real-world events, depict motion, and change the speed of recorded phenomena. By the late 1920s, a new capability was introduced with the arrival of the sound film. The first theatrical feature film with talking sequences was released in 1927 (Dixon & Foster, 2008) and the educational sound film followed shortly thereafter in 1929 (Saetter, 2004). At this time a shift from visual to audiovisual media began to occur (Reiser, 2001). Brunstetter's (1937) book, *How to use the*

Educational Sound Film, explored the potential of sound film in the classroom. One of the example films described in this book, called *Sound Waves and their Sources* (Encyclopedia Britannica Films, Inc., 1933), illustrates how sound adds a valuable representational counterpart to the visual information. In this film the topics of loudness and pitch are introduced using a combination of animations and demonstrations using tuning forks, musical instruments, and an oscilloscope. The addition of sound makes it possible to hear differences in loudness or pitch depicted in the visual information within the film.

The intrinsic representational advantages of film were infused within instructional methodology from the start. Several instructional strategies for classroom film that were recommended to teachers between 1920 and 1940 are listed in Table 1 (Brunstetter, 1937; Ellis & Thornborough, 1923; Greene, 1926). The list in Table 1 illustrates a few examples of the perceived value of educational film. Note that these strategies are still applicable for use with current video technologies including video clips from online sources.

Table 1
Early Strategies for Teaching with Educational Film

Instructional Use	Examples
Process Overview	Show manufacturing process or food producion from farm to table.
Initiate Lesson	Introduce a new topic to provide background information or spark interest.
Topic Survey	Illustrate a historical sequence or events in the life of a famous person.
Demonstration	Observe a medical or scientific procedure.
Speed Time Up	Show seed germination or a flower opening.
Slow Time Down	See how a golf club swings to hit a ball.
Visit Dangerous or Remote Locations	Explore life in the arctic and Antarctic regions. See volcanoes and forest fires.
Motion Animation	Animated diagrams of electric circuits or blood flowing through the human body.
Expert Lecture	Archeologists excavate a historic grave site.
Micro Cinema	View microscopic pond life.
Performance	Watch musicians in a symphony orchestra.
Dramatization	Enactment of historical event or literature.

The instructional strategies described in Table 1 have a timeless quality insofar as they are applicable regardless of the currently available motion picture technology. Prior to the 1960s the educational motion picture was recorded on film that came in sizes including 8mm, 16mm, 28mm, and 35mm (Saettler, 2004). In the 1960s videotape technology became available for consumer and school use; this period also saw a shift from film to videotape. Film reels and projectors began to disappear as videotape popularity grew. Winslow (1970) described the transition when reporting that, "The purchase by education of television videotape and associated origination and display equipment increased 13% in 1967 over 1966 while in the same period the purchase of film projection and associated equipment decreased" (p. 7).

Video recording devices extended the capacity of earlier film technologies by providing a way to easily videotape television programs. It became possible to escape the constraints of broadcast schedules that did not correspond to classroom schedules. In addition to this, the process of recording videotape footage of sporting events, science experiments, or local history could easily be accomplished with portable video cameras. New possibilities for assessment and self analysis were also supported. For example, videotaped recordings of students giving speeches could be replayed so that they could review and critique their own performance (Kay & Kay, 1983).

As the technical evolution continued forward, additional capabilities were created for teaching and learning. The emergence of commercial videodisc players beginning in the late 1970s and early 1980s introduced more advanced levels of access and control plus the capacity to store text, charts, graphs, and audio in addition to video (Barron, Breit, Boulware, & Bullock, 1994). With videodisc it was possible to jump directly to video segments without having to rewind, search, and play as was required with videotape. At least three levels of interactive control were available depending on the hardware setup. Level I interactivity controlled the videodisc through the buttons on the player, a remote control device, or a barcode reader. In level II interactivity a software program was embedded in the videodisc to support enhanced control options without the need to connect the player to a computer. Level III interactivity incorporated an external computer to increase flexibility and support integration of computer databases with visual media stored on the videodisc. Two monitors were suggested for level III "…because the video monitor cannot display the computer information and the computer monitor cannot display the video information" (Barron, et al., 1994, p. 16).

Currently, there is abundant support for video on computers and a single monitor is sufficient. Media players that enable video playback on computers have existed since the early 1990s. Though various forms of video were widely

supported, compatibility was somewhat of an issue depending on browser, coding and decoding software, etc. This problem was addressed with the video technologies used on YouTube. Now when videos are uploaded to websites like YouTube, they are converted to Flash® video, which is viewed by a player that is easy to install and typically available on most computers. Video streams from the online services allow users to view media as it is transmitted through the Internet rather than waiting for a lengthy download. Streaming video is both convenient and advantageous in online courses to provide learners with visual and auditory modalities during instruction (Hartsell & Yuen, 2006). For example, students in an online biology course be directed to DNATube, located at http://www.dnatube.com, to watch streaming video visualizations of HIV (Human Immunodeficiency Virus) infection, replication, or life cycle complete with instructional narration.

Online video from streaming video services support instructional activities that can work well in either traditional or online classrooms. News and current events stories are commonly available online and can be used for discussion, debate, or to provide background information (Snelson, 2008; Tamim, Shaikh, & Bethel, 2007). The HTML "embed" code, provided with YouTube™ and other services, can be pasted into online discussion board posts for student analysis and response in the virtual classroom. Students may record video responses with webcams and upload them to online video-sharing services for easy distribution to teachers and peers around the globe. This adds a new dimension to discussion boards whereby students can see and hear each other rather than simply read text responses.

Another intriguing new capability that has become available in recent years is that of mobile video. This type of technology enables video-enhanced field-based instruction. Many mobile phones now come equipped with camcorders, Internet browsers, and media players. YouTube™ contains a collection of videos that have been formatted for mobile devices, which allows for video-enhanced, field-based instruction. For example, a group of elementary school children visiting the zoo could look at the animal in the cage and immediately watch videos of those same animals in their natural habitat. Alternatively, if a mobile phone has a digital video camera and Internet access, it can be used to record video in the field and upload it directly to YouTube. One possible application of this might be distance collaboration as students from different cities, states, or countries create short video documentaries of local history and share them with each other through YouTube. The portability of the mobile phone, combined with relatively low cost and widespread access, may promote mobile phones to a high level of importance among the learning technologies.

Some of the intrinsic advantages of educational motion pictures were

discussed in this section within a broad historical context spanning from silent film to YouTube. Certain advantages, such as historical preservation and representational attributes, persist throughout the history of the educational motion picture and remain present today within the vast repositories of online video. Additional advantages were introduced later in the history of film and video as newer technologies appeared bringing capabilities such as interactivity, online streaming, and mobile access to video content and video-sharing services. Although the intrinsic advantages of motion picture technologies appear beneficial for education, there has nevertheless been a long history of differing opinions regarding the benefits of film and video. The next section delves into this historical theme, again tracing back through time from silent film to YouTube.

Differing Opinions about the Benefits of Film and Video

Over the years there has been a succession of advocates for educational motion pictures. Despite the enthusiasm, universal agreement about how, when, why, or even if film and video should be used has remained elusive. Beginning in the silent film era, concerns about educational film were raised in opposition to those who campaigned for the widespread adoption of motion pictures in classroom teaching. Castro (1922) argued that the pedagogical benefits attributed to educational film were based on unproven and unscientific psychological principles. She warned that blind acceptance of these unconfirmed advantages "…will consign the whole movement to an early and irrevocable doom because of the swift disillusionment which is bound to follow eagerly accepted promises which prove incapable of fulfillment" (p. 7). Although educational film research had already begun there was little solid evidence available to allay these kinds of concerns.

Educational film research began near the end of World War I with the first reports of experimental studies appearing in 1918 (Saettler, 2004). Between 1918 and 1950 over two hundred experimental and survey studies were conducted to investigate the effectiveness of educational film (Hoban & van Ormer, 1951). The predominant technology of the time was the motion picture projector and screen, so research naturally revolved around projected film. Hoban and van Ormer showed that researchers had studied many aspects of educational film including the ability of film to impart knowledge, long-term retention of knowledge learned from films, effectiveness of perceptual-motor skill instruction through film, the influence on motivation and attitudes, audience characteristics, aspects of film production that might influence learning, and studies of film compared with other media or methods. Findings were mixed and depended largely on the specific use of educational film, the audience, and

the context. With respect to the learning of facts and concepts, Hoban and van Ormer (1951) explained that "…the effectiveness of films depends on how well their content is related to a specific instructional objective. There is nothing in a motion picture presentation, per se, that guarantees better learning" (p. 3-11). This quote goes to the crux of the entire debate over the value of the educational film. After the first three decades of educational film research, no conclusive evidence had been found for the effectiveness of educational film as an audiovisual medium. The debate over how, when, and under what circumstances educational film contributes to learning has continued.

Attempts to learn how educational film impacts learning were made through several large scale research studies beginning in 1919. At that time, Johns Hopkins University conducted a study of the impact of film for controlling venereal disease. The study used a public information film called *Fit to Win,* which was shown to approximately 5,000 people from varied backgrounds. Information about knowledge gain and emotional impact of the film was gathered through a combination of questionnaires, interviews, and pre- & post-tests. The results of this study suggested that the film was generally effective at disseminating information, but that it failed to bring about attitude changes that would effectively inhibit the spread of venereal disease. However, some long-term retention effects were found when the main facts of the film were remembered up to five months after viewing (Hoban & van Ormer, 1951; Saettler, 2004).

The University of Chicago Experiments, also known as the Freeman-Commonwealth study, was another large scale film research project described by Saettler (2004) and more briefly by Hoban and van Ormer (1951) who set the date of this research at 1924. This study was conducted in eight school systems and involved over 5,000 students during a three-year period. Findings from the final report of this study suggested that motion pictures are most valuable when used to represent motion or action, which is a fundamental representational attribute of motion picture technology. This finding relates back to the ongoing debate over what, exactly, motion pictures contribute to learning. Results of this study further suggested that motion picture films should be constrained to small units. Saettler explained that the results of this study were ignored and rediscovered two decades later during the development of the single-concept film. The idea of short, single-concept films relates well to the current video clip phenomenon. YouTube, for example, typically restricts the length of video to ten minutes, thus constraining the scope of what can be covered in a single video clip. Information must be organized into logical chunks for effective presentation within the time allowed.

The time constraints of online video could be used advantageously.

Online video clips are accessed through links to the Web pages where they are embedded along with controls used to play them. The ability to navigate directly to a short focused video segment enables the visual and auditory attributes of video to be exploited without losing student attention during a long-playing presentation. Instructors can collect several related video clips together in one distributable collection, called a playlist, to illustrate concepts or spark discussions (See Appendix A for examples of educational content available on YouTube). Another promising new feature in YouTube™ is the annotation tool, which allows video creators to add notes, captions, or hyperlinks from one video to another video, user channel, or search result page (YouTub 2009c). This adds a new level of interactivity hard to duplicate with analog iterations.

Interactive video has been associated with positive learning gains. During the videodisc era, a meta-analysis of research studies comparing videodisc to conventional instruction in military training, industrial training, and higher education was conducted through the Institute for Defense Analysis in response to Congressional direction (Fletcher, 1990). The report indicated that interactive videodisc instruction, across all settings in 47 separate studies, improved achievement when compared to traditional instructional methods. It was further stated that achievement increased when interactivity increased, although it was not clear why this occurred (Fletcher, 1990).

The instructional potential of interactive video has continued to be investigated in recent years. Zhang, Zhou, Briggs, and Nunamaker (2006) conducted an empirical study of interactive video in e-learning. A comparison among four different learning settings was made in this study. Three of these were e-learning environments: one with interactive video, one with non-interactive video, and one with no video. The fourth setting was a traditional classroom. Learning effectiveness, measured by test scores, and perceived learner satisfaction, measured by a survey instrument, were the dependent variables. The results showed that the interactive video group achieved both significantly higher learning gains and higher levels of satisfaction than the other three groups. This result has implications for all forms of online video. The interactive video group in the study worked with an e-learning system that provided random access to video content whereby they could select and jump to video clips of interest (Zhang, Zhou, Briggs, & Nunamaker, 2006). This has some similarities to the current array of online video services, which contain small video clips that are located through a search tool.

When considering the results of video research, however, those looking into the results need to be aware of the disagreement rising from media comparison studies. The *media effects debate* is typically traced back to an

article by Clark (1983) who wrote that "The best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in nutrition" (p. 445). Those who adhere to Clark's viewpoint eschew any studies that compare learning outcomes when the independent variable is media. Among other arguments, they hold that too many other variables confound outcomes, and one can never therefore fully isolate the effect to the media itself. But, as with any perspective among academics, not all scholars hold the same viewpoint. Kozma (1994) suggests that the role of media for learning is more complex than simple delivery, requiring consideration of the capabilities of media and the interaction between cognitive processes and characteristics of the learning environment. A plethora of "no significant difference" results that come from media comparison studies seem to suggest that isolating media effects is indeed very difficult, but questions about the impact of media and video continue to be asked. It is not likely that the debate will be resolved any time soon.

Misgivings about the merits of the educational motion picture were not limited to arguments about the reasons underlying mixed results in media research. Concerns about the general quality of the educational film initially surfaced during the silent film era. Duffey (1922) stated "It is with considerable satisfaction that we, who are constantly dealing with schools and communities, note a decided reaction on the part of school authorities and community leaders against the poorer class of non-theatrical films. Not so long ago, those in charge of schools and communities were prone to accept any sort of motion pictures that did not offend with vulgar situations or suggestive titles" (p. 10). Concerns about video quality easily extend to present-day online video, which originates from both amateur and professional sources. While many excellent video clips are available online, those obtained from public video-sharing services may be of dubious origin, contain questionable content, or provide little of educational value.

Although content accessed through YouTube™ can be used for educational purposes, it was not initially designed for an audience of educators. Rather, it was created for the general user to easily share videos. This is problematic because the shift from entertainment to education sometimes provokes a type of bias or disdain toward the use of a "fun" technology that might undermine serious education. However, the history of motion picture technologies is filled with entertainment technologies that are later adopted for school use. The primary reason for this is the expense of inventing new technology. For example, in the early days of film, it was the theatrical film industry that was responsible for developing the technology and absorbing the cost of

research and development (Greene, 1926). Similarly, videotape technologies were developed by the entertainment industry (Winslow, 1970). Now there is YouTube™ and similar services, which although used by many for entertainment, also serve the educator with both free access to content and an easy to use distribution system for instructional video. The advantages of YouTube™ have not gone unnoticed in higher education. The establishment of a YouTube™ presence can even lead to some interesting outcomes in terms of publicizing one's own work. An article in *The Chronicle of Higher Education* reported that professors who post videos on YouTube™ sometimes gain popularity and become Internet stars (Young, 2008). This further blurs the distinction between entertainment and education as educators begin to acquire an entertainer persona.

The practice of using motion pictures for entertainment purposes in the classroom has been criticized both in the early days of sound film and more recently with video. With respect to the sound film, Brunstetter (1937) stated that, "Many untrained teachers mistake the educational talking picture for an entertainment experience, a diversion to be scheduled as a pleasant interlude in the familiar routine. This attitude has probably carried over from film theater-going habits" (p. 12). More recently, Hobbs (2006) described several non-optimal uses of video observed in K-12 classrooms that included its use as a reward or to control student behavior. While the use of a video to have a fun break once in awhile may seem harmless to some, the loss of limited academic time to non-instructional pursuits remains a valid concern. However, it is conceivable for entertainment to sometimes be combined with education for legitimate instructional purposes. For example, Berumen (2008) used several popular entertainment movies including *Finding Nemo*, *Jurassic Park*, *Happy Feet*, and *A Bug's Life* to teach biology concepts while simultaneously engaging student interest to promote learning.

Given its perception as an entertainment venue, YouTube™ in particular is likely to be received with mixed reactions by educators and scholars engaged in serious academic pursuits. Evidence of this is seen in reactions to the *Learning from YouTube*™ course offered at Pitzer College in the fall of 2007. Responses to the course ranged from supportive to hostile. The course received attention from the media and sparked a debate over the appropriateness of a college course based on YouTube™ (Carvin, 2007). Videos recorded during live class sessions and commentary posted by instructor Alexandra Juhasz remain available at http://www.youtube.com/user/MediaPraxisme.

Other online video sites such as TeacherTube may be deemed more acceptable given the more overt emphasis on education rather than entertainment. One must note, though, that new forms of visual media

technology, including motion pictures, have a history of educator disagreement regarding their value in the classroom. For example, when silent films entered education, there were numerous objections including a belief that still pictures were better than moving pictures for instruction (Ellis & Thornborough, 1923). Still pictures had become an accepted visual medium, while silent film was not. By the time sound film became available, some educators had accepted the potential of silent film, but now had a new form of instructional technology to contend with. This led to a new round of disagreement among educators about the merits of film. With respect to this period of crisis for the educational film, Saettler (2004) writes:

> Just as educators were becoming convinced of the educational merits of the silent film, the advocates of the sound film realized they had to fight the battle all over. The first educational sound films brought mixed reactions. Some educators repudiated the old silent films; others rejected the new sound films; still others refrained from either open approval or disapproval until they became convinced that the addition of sound was not just another technical novelty. Many hesitated to accept the sound film because they feared their silent equipment would become useless. (p. 106)

Saettler's comment highlights some of the reluctance that has been associated with motion pictures in education. The presence of resistance to new motion picture technologies is not tremendously surprising since it is a well known fact that new innovations are not always immediately accepted and embraced (see Rogers, 2003). However, it does illustrate that the problem has deep historical roots that extend back to the earliest decades of the educational motion picture.

This section of the article has discussed some of the differing opinions about the benefits of film and video that have appeared over the past century. While space limitations restrict deep analysis of every possible area of disagreement, a few persistent issues were introduced. Among these disagreements are questions related to the specific contribution film and video make to support learning, misgivings about quality, disagreement about the appropriateness of entertainment media in education, and educator disagreement regarding the value of evolving motion picture technologies in the classroom. The next section explores a third historical theme by tracing the pragmatic problems of access and equipment issues that have repeatedly surfaced over the past century.

Access and Equipment Issues

Limited access to appropriate motion picture content and equipment problems are grave difficulties that have persisted in schools since the beginning

of classroom film. Greene (1926) described problems associated with cost of film and projection equipment, various standards for film that were not always compatible with school equipment, limited availability of good educational film titles, and an inadequate distribution system. Similar problems have appeared in one form or another throughout the history of film and video. The advancement of technology has opened new instructional possibilities, while simultaneously introducing new problems.

The history of motion picture technologies is replete with examples of obsolescence leading to loss of investment. Since the silent film era, the process of buying motion picture equipment has been a bit like waging a bet on which format would last the longest and prove to be the wisest investment. A succession of new media formats have appeared over the decades, leading to format wars and the ultimate demise of technologies that once were the latest and greatest thing. Videotape saw its own format battle with Betamax, eventually succumbing to VHS. Videodisc, once an exciting new technology, has now been superseded by DVD. And within the past few years, a new battle has ensued over which type of DVD – "BluRay" or "HD" – would dominate the marketplace. The need to continually invest in new players and new media is expensive and has led to some understandable cynicism. While writing about library acquisitions of media technologies, Dick (1999) noted that "In an age of increasingly rapid technological obsolescence, the anticipated shelf life of any new video format – rather than its inherent superiority – probably figures into its widespread adoption" (p. 51).

The cost of motion picture media and technology has long been a prohibitive factor for schools. Because of this, caution has been urged. McClusky (1947) advised that "… because of their expense, motion pictures should not be used to present concepts which are common, everyday experiences, or which could be taught with inexpensive materials such as models, objects, or wall charts" (p. 380). This sentiment was later echoed by Clark (1994) who argued that since no proven learning effects were known, the least expensive medium required to get the job done should be selected. This advice is sound when considering the purchase of expensive media. However, online video may provide a solution. Much of the video now available online in sites such as YouTube™ is free and uses common, browser-based technology that does not require a technician to install. Online video has the potential to alleviate the problems of cost and investment losses due to media obsolescence.

In addition to cost factors, the limited availability of classroom films has long been a problem. In 1948 a group of seven publishing companies collaborated to conduct a survey of school teachers and administrators. The purpose of the study was "…to evaluate the effectiveness of the visual aids now

available and to explore more fully the possibilities of correlation between film production and textbook publication" (Knowlton, 1948, p. v). Questionnaire responses were obtained from superintendents, assistant superintendents, visual-education directors, principals, elementary-school teachers, and high-school teachers in 424 of the 501 largest public school systems in the country at that time. The results of this survey indicated that one of the single largest hindrances to the use of film in the classroom was "the need for more and better films" (Knowlton, 1948, p. 71). Access to an adequate supply of high-quality films was lacking. This problem is often compounded by inaccessibility to equipment, an ongoing issue experienced in schools during the first four decades of educational film (Cuban, 1986).

Online access to video has the potential to alleviate the problem of availability. With millions of clips to choose from, and more appearing online every day, it makes sense to make use of this global resource. However, computers and Internet access are essential equipment for classroom access to the vast repository of free online video content. Internet access is currently available in nearly all U.S. schools (Wells, Lewis, & Greene, 2006). Unfortunately, computer access has not attained a sufficient level to support regular integration of Internet resources, including online video. A survey of teachers and support professionals indicates that the number of computers available for student use in individual classrooms was inadequate for effective instruction (National Education Association & American Federation of Teachers, 2008). Technical assistance and support in using equipment and software was also reported as inadequate. Without the basic essentials of adequate equipment and technical support the potential benefits gained with access to extensive online video resources will be rendered useless.

Even when computers with Internet access are available, broadband limitations can inhibit access to online video. A report from the Communication Workers of America (2008) indicates that high speed Internet access in the U.S. lags far behind other industrialized nations. School broadband access is also considered inadequate to fully support innovative educational technologies such as Web 2.0 tools (blogs, wikis, document sharing, etc.), which can include online video applications (SETDA, 2008). It is possible to optimize video for Internet delivery, but high usage imposes a burden on systems with limited capacity. If broadband access increases in the future this problem can be substantially reduced. In the meantime, this issue is problematic for educators struggling with sluggish systems and also for technical support staff charged with the management of limited resources.

The new problems of access are not limited to broadband. In an ideal classroom situation where there is adequate technology and broadband

connectivity, access to online video may be blocked by software or firewalls that schools install to block questionable material. In order to receive financial support for Internet service under the E-Rate program, for example, schools and libraries must demonstrate compliance with the Children's Internet Protection Act (CIPA) (Universal Service Administration Company, 2008). Compliance to the CIPA includes taking measures to block or filter Internet access to inappropriate or obscene content. This means that online video-sharing services, such as YouTube, will most likely be blocked at institutions supported under the E-Rate program. YouTube, like many other public video-sharing sites where anyone can upload video, will contain content deemed inappropriate. This could be due to factors such as questionable video content or user comments, which are not always suitable for children to read. Though a reporting mechanism exists in which the online community can flag inappropriate videos, any video can end up on the site for a short period of time until it is reported and removed. In a school where YouTube™ is banned, teachers have no access to the good content that is available, because the potentially inappropriate content forces the entire site to be blocked. Some teachers and users have resorted to using software tools, freely available online, to download and save Flash-based videos, and then bring them into the classroom. However, this practice appears to violate the terms of use (YouTube, 2009a), thus making it a questionable strategy for overcoming the problems of school inaccessibility. Access to YouTube™ content in the K-12 classroom is clearly problematic. As it stands now, YouTube™ is best saved for use with adult learners who have access to computers unconstrained by Web-filtering software or broadband limitations. Change occurs quickly with online video services, so it is possible that school-friendly sites will expand in the coming years.

This section focused on access and equipment issues that have arisen and evolved throughout the history of educational motion picture technologies. Problems of cost and obsolescence have imposed burdens on schools and libraries. Access issues have limited instructional use of film and video simply because teachers could not get them into the classroom to be used. Online video offers the promise of instant continual access to millions of hours of free video content, but Web-filtering practices block sites, thus introducing new access barriers.

Conclusion: The Potential Future of Online Video

Motion pictures have been used for educational purposes for approximately one century. Yet, the essential representational attributes of motion pictures have changed little over time. The ability to capture real-world events, depict

motion sequences, and change the speed of recorded natural phenomena endures. The history of motion pictures has now entered a new age, where interactive video-sharing and authoring tools work directly through everyday Web browsers. Students can create and distribute their own videos using common technology that is easy to use. By engaging in online video production, there is an opportunity for students to learn how to develop high quality instructional presentations that synthesize their own research and add to the pool of instructional video clips. Students also have the opportunity to search a vast online repository of existing video clips to augment papers, reports, and presentations. Given the long history of educational motion pictures in education and the growing quantity of educational online video (See Appendix A and Appendix B for examples.), it seems logical to conclude that the role of online video in the classroom will increase.

The growth of digital online video means that the days of continual equipment purchases to play the latest media format are becoming outdated. If computers are in adequate supply within classrooms, kept up to date, and connected to high speed data transmission lines, it will become easier to take advantage of online video technologies. To be sure, problems associated with Internet safety need to be addressed before a video site like YouTube™ can be used in a K-12 classroom. This may require specialized filtering software granting selective access, innovative school policy, changes in online video-sharing services to better support education, or all of these to occur. If online video has a future in the K-12 classroom these issues must be resolved.

The best educational value of online video, both now and in the future, can be informed by research that begins by closely examining previous studies. Media comparison studies have been conducted since the early 1900s and with mixed results suggesting the need for new directions in educational video research (Clark 1983, 1994). Recent work with interactive video shows promise as a compelling line of research inquiry (Zhang, Zhou, Briggs, & Nunamaker, 2006). Research on the educational merit of short, interactive, video clips will align with the current online video phenomenon. Additional research on the instructional value of student video production using Web 2.0 tools, or evaluation studies of existing video content would expand the knowledge base for educational motion pictures.

Online video may gain increased importance in the future as more and more education becomes digital. In addition to online courses, textbooks are becoming more widely available in digital form. Some schools have begun to experiment with laptops and digital content as a replacement for printed textbooks. A news story in the May, 23, 2008 issue of *The Arizona Republic* has the ominous title: *Textbooks Face Ban Under e-Learning Finance Bill* (Pitzl,

2008). In this article, the reporter describes legislation that could eliminate textbooks in favor of digital curricula accessed with a computer. Interestingly, Thomas Edison, one of the inventors of motion picture technology, predicted the demise of the textbook as early as 1913 (Saettler, 2004). Motion pictures will likely not replace textbooks, but the short digital video clip is likely to become a regular feature within digital learning materials.

The future of online video is likely to mirror the past in many ways. The intrinsic value of video will continue to serve educators by providing audiovisual representations of ideas, information, and events. The current manifestation of video technology brings the combination of a global online delivery system and an interactive interface that permits both viewing and authoring of video content, which extends previous video capabilities to include greater levels of engagement with the media.

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Appendix A

LIST OF SELECTED YOUTUBE™ CHANNELS CONTAINING CONTENT WITH POTENTIAL VALUE IN EDUCATION

Academic, Intellectual, and University Video

- Nobel Prize Channel: http://www.youtube.com/user/thenobelprize
- Pulitzer Center: ttp://www.youtube.com/user/PulitzerCenter
- Research Channel: http://www.youtube.com/user/ResearchChannel
- TED Talks: http://www.youtube.com/user/TEDtalksDirector
- UC Channel: http://www.youtube.com/user/uchannel
- YouTube™ EDU: http://www.youtube.com/edu

Art

- Eclectic Asylum Art: http://www.youtube.com/user/EclecticAsylumArt
- The Painting & Drawing Channel: http://www.youtube.com/user/paintinganddrawing

Documentary and Biography

- The Documentary Channel: http://www.youtube.com/user/docchannel
- YouTube™ Shows: Documentary and Biography: http://www.youtube.com/shows?p=None&s=None&b=17

Government and Politics

- Royal Channel: http://www.youtube.com/user/TheRoyalChannel
- United Nations: http://www.youtube.com/user/unitednations
- U.S. House of Representatives: http://www.youtube.com/user/househub
- U.S. Senate: http://www.youtube.com/user/senatehub
- Whitehouse: http://www.youtube.com/user/whitehouse

Library and Museum

- Brooklyn Museum: http://www.youtube.com/user/BrooklynMuseum
- Computer History Museum: http://www.youtube.com/user/ComputerHistory
- Library of Congress: http://www.youtube.com/user/LibraryOfCongress

Math

- Khan Academy: http://www.youtube.com/user/khanacademy
- MathTV: http://www.youtube.com/user/MathTV

Public Television

- PBS: ://www.youtube.com/user/PBS

Science

- NASA Goddard TV: http://www.youtube.com/user/NASAexplorer
- NOAA Visualizations: http://www.youtube.com/user/NOAAVisualizations
- Periodic Table of Videos: http://www.youtube.com/user/periodicvideos
- ScienCentral News: http://www.youtube.com/user/sciencentral
- Science Channel: http://www.youtube.com/user/ScienceChannel

Appendix B

LIST OF SELECTED ONLINE VIDEO SITES CONTAINING CONTENT WITH POTENTIAL VALUE IN EDUCATION

Academic, Intellectual, and University Video

- Academic Earth: http://academicearth.org/
- Big Think: http://bigthink.com/
- Fora.tv: http://fora.tv/
- iTunes U: http://www.apple.com/education/mobile-learning/
- MIT Tech TV: http://techtv.mit.edu/

Digital Storytelling

- Story Circles: http://www.storycircles.org/

Documentary, Biography, History, and Travel

- Biography Channel Videos: http://www.biography.com/video/index.jsp
- Discovery Channel Videos: http://dsc.discovery.com/
- History Channel Videos: http://www.history.com/video.do?action=home
- National Geographic Videos: http://channel.nationalgeographic.com/channel/videos/

Education

- After Ed: http://aftered.tv/
- Annenberg Media: http://www.learner.org/resources/browse.html
- Edublogs.tv: http://edublogs.tv/
- Edutopia Video Library: http://www.edutopia.org/video
- SchoolTube: http://www.schooltube.com/
- Teachers.tv: http://www.teachers.tv/
- TeacherTube: http://www.teachertube.com/

Foreign Language

- DotSub: http://dotsub.com/

Government and Politics

- CSPAN Video: http://www.c-spanvideo.org/

Math

- PBS Teachers Mathline: http://www.pbs.org/teachers/mathline/lessonplans/search_k-2.shtm

News and Current Events

- eSchool News.tv: http://www.eschoolnews.tv/
- CNN Student News: http://www.cnn.com/studentnews/
- Current: http://current.com/
- Fox News: http://www.foxnews.com/video2/video08.html
- iCue: http://www.icue.com/
- MSNBC: http://www.msnbc.msn.com/id/8004316/
- New York Times Video: http://video.on.nytimes.com/
- Reuters Video: http://www.reuters.com/news/video

Science, Health, and Medical

- DNATube: http://www.dnatube.com/
- ICYou Health: http://www.icyou.com/
- JoVE: http://www.jove.com/
- Lab Action: http://www.labaction.com/
- NASA Video: http://www.nasa.gov/multimedia/videogallery/index.html
- NOVA: http://www.pbs.org/wgbh/nova/programs/
- SciVee: http://www.scivee.tv/
- The Weather Channel: http://www.weather.com/multimedia/videoplayer.html
- Untamed Science: http://www.untamedscience.com/

Social Justice, Environmental, and Non-Profit

- DoGooderTV: http://www.dogooder.tv/default.aspx
- Engage Media: http://www.engagemedia.org/
- One World: http://tv.oneworld.net/

Sports and Physical Education

- Broadband Sports: http://broadbandsports.com/
- CBS Sports: http://www.cbssports.com/video/player
- ESPN Sports: http://espn.go.com/video/
- PEVideo.org: http://www.pevideo.org/

Technology Training

- Woopid: http://www.woopid.com/

Tutorials on Varied Topics

- Common Craft: http://www.commoncraft.com/
- Graspr Instructional Video Network: http://www.graspr.com/

- Kids Know It Network: http://www.kidsknowit.com/interactive-educational-movies/index.php
- 5Min Life Videopedia: http://www.5min.com/
- eHow: http://www.ehow.com/
- How Stuff Works: http://videos.howstuffworks.com/
- Howcast: http://www.howcast.com/
- Video Jug: http://www.videojug.com/
- WonderHowTo: http://www.wonderhowto.com/

Video Archives with Historical Content

- Internet Archive Moving Image Archive: http://www.archive.org/details/movies
- Library of Congress American Memory Project Motion Picture Collections: http://memory.loc.gov/ammem/browse/ListSome.php?format=Motion+Picture