Deploying Online Streaming of videos via the internet for the delivery of classroom lectures (Real time/On-demand streaming) in ODL schooling.

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Abstract

This paper, investigates the model of online streaming which provides a free-of-charge access to streaming educational lectures, via the internet. Streaming video can be used for live instructional broadcasts or accursed instructional activities that can grab learner's attention and present information that is easy to absorb.

Essentially, streaming video is a term applied to the compassion and buffering technologies that allow one to transmit and view video in real time through the internet. The study shows that streaming video is relatively of high quality/low band width format suitable for asynchronous web-casting, the production system, video editing system, streaming server for post production in streaming video format.

In line with global economic changes and the growth of social network media worldwide, education is undergoing a paradigm as the wall in classrooms are opening up to rich media contend. This shift has been influenced largely by technological and pedagogical trends, video streaming is poised to act as a powerful agent that adds value and enhances the quality of learning experience.

Key words- Broadcasting, Streaming video, On-demand/real-time, lecture capture etc

Introduction

The Internet and technological inventions of the 21st century served as fuel and catalyst that can contribute massively to the radical changes in traditional approaches to the fields of research in science and education. I strongly believe that high-quality education and technology have the power to change the world by developing the human talent required to seize the opportunities that arise from global change. The development of the higher-order capabilities required in 21st century learners requires Video (**On-demand/real-time**), as a fundamental agent in the process of education **development**, **empowerment and transformation**, its facilitates collaboration, accommodates different learning styles, increases engagement and excitement among students, helps maximize school and university resources, and improves learning outcomes.

In an effort to collect existing research and document the benefits of video in improving teaching and learning and the overall quality of the classroom experience, I am happy to introduce this paper and share it with the wider global community of teachers, school officials, administrators, decision makers, and education stakeholders. The act of helping education institutions implement video technologies encourages readers to see video technologies as an enabler and a complementary tool for high-quality 21st century education. In order to maximize the gains of video, it is imperative to have a forward-looking pedagogy, a solid professional development program for teachers, and true integration of video technology with curricula. As the world

continues its journey into the second decade of the century, the propagation of video technologies in education is poised to accelerate because of the proliferation of portable devices and the explosion of Internet and mobile phone users. Also driving adoption are the increased understanding and appreciation for these types of technologies by young people, as well as their constant desire to interact and collaborate at any time beyond the classroom and campus' walls.

The opportunity is clear, the technology is here, and the timing is right. It is now up to us to responsibly adopt video technologies in the classroom, guiding our students on how to best profit from them and contributing to the development of the appropriate skill sets that will help them fulfill their role as global citizens of the 21st century.

Background History

Video as a change agent in the classroom has undergone a unique cycle of adoption over time Broadcast television and film were first used sparingly, primarily as out-of-the classroom forms of enrichment (assignments to supplement class work).

Beginning in the 1980s several new forms of video came along: Laserdiscs and the VHS videotape were popular methods of enriching the classroom with content, whatever the subject matter. Additionally, satellite delivery-which had already been available -became a more common method of delivering instruction in distance education networks.

Camcorders made it possible for educators and students to begin to create their own analog content, although the means for broadly distributing that content did not yet exist. In the first decade of the 21st century, classrooms became connected to the Internet sufficiently that digital content could more easily be distributed globally. Within a few short years, YouTube came to dominate the notion of how to bring video into the classroom for enrichment—and how to empower learners to create their own content. Devices like webcams and Smartphone's also came of age around the same time. Podcasts have brought the ability to create discrete audio files that could be delivered for educational purposes—and enhanced podcasts added video to the equation. DVDs brought the ability to build upon use of VHS resources, enabling greater depth of material because of the ability to add content digitally.

Key words Definitions

Broadcasting is the distribution of audio and video content to dispersed audiences via any audiovisual medium.

Streaming video (also known as webcasting when conducted over the Internet) is the equivalent of broadcasting to large audiences and of making content accessible to learners in either synchronous or asynchronous fashion.

A streaming broadcast might be live or recorded, with the core content flowing one way and having somewhat limited interaction capabilities. However, in recent years some streaming solutions have incorporated features that allow users to conduct live chats, post messages, edit, and tag, and share content, thus facilitating and promoting interaction.

Lecture capture systems are a subset of streaming products specifically designed for capturing and managing classroom content for learner access later on. Lecture capture systems help make content searchable and automatically blend not just audio and video, but also other productivity tools like PowerPoint, PDF files, flash animations, video clips, polls, surveys and other types of rich media content.

Low Cost Narrow Bandwidth Classroom-based Streaming Video

Experiment: To identify levels of preparation and support (equipment, software, staffing, facilities, infrastructure, etc.) necessary to produce and distribute live classroom-based Internet streaming video at low cost to students at home or in their offices Remote students would offer their comments and questions through a simultaneous live chat session

Internet Streaming: An Internet data transfer technique that allows the user to see and hear audio and video files without lengthy download times ,in which its content as can be access as it is been received.

Software's

We used apps from RealNetworks .com to encode and serve our classroom-based streaming video RealProducer (now Helix Producer) to capture and encode video RealServer (now Helix Universal Server) to distribute the video RealPlayer and RealOne Player to view streaming video

Streaming

Video Process Capture with RealProducer Encode with RealProducer Distribute with RealServer, view with RealPlayer/ RealOne

Production System

Mixer Splitter Videotape backup Video monitor Encoding PC Audio capture Video capture Audio monitor

Distribution System

ITS Streaming Server RealPlayer/RealOne Clients Chat session

Video Was Delivered Directly to the Student's Desktop We did not broadcast to studios or computer labs where students would have to gather to participate—delivery was directly to the student's desktop

Video Encoding Rates

- RealProducer can encode video files for streaming to any combination of the following clients: 28.8Kbps or 56Kbps for dial-up modems 64Kbps for single or 128Kbps for dual ISDN lines 150Kbps for local area networks 256Kbps, 384Kbps, or 512Kbps for faster LANs, cable connections, and digital subscriber lines (DSL)
- Encoding Rates and File Size Triple stream video files encoded at 56Kbps, 150Kbps, and 256Kbps use 3.9 megabytes of storage per minute Stream to the viewer at the highest reliable connection, typically 34, 150, or 225Kbps This multistream provides a good balance of sound and picture quality and targets dial-up, LANs, and broadband In the future we may encode at 56, 150, and 384Kbps for playback at 34, 150, and 350Kbps

Connections Rates:

- LAN/Broadband Local Area Network (LAN) and broadband connections (cable, DSL) are clearly better Video encoded at 256Kbps is received at 225Kbps Video encoded at 384Kbps is received at 350Kbps Video encoded at 512Kbps is received at 450Kbps Sound and video are both good Acceptable for motion, detail, and close-up work
- Connections: 56K Dial-up 1 Streaming video encoded for 56Kbps dial-up modems is received at 34Kbps Sound is good Picture is not nearly as good as 150, 225, or 350Kbps streams Video is choppy and there may be frequent rebuffering if there is network congestion More like a slide show than a motion picture
- Connections: 56K Dial-up 2 May not be acceptable for classes or demos involving motion, detail, or close-up work May be acceptable for discussion-based classes with little movement May be acceptable for large image PowerPoint presentations with little or no animation
- Connections: 28.8K Dial-up 28.8K modem connection is problematic Should be used as a streaming video transmission speed in limited circumstances Little motion in presentation No need for detail or close-up work No need for synchronization of sound and video

Results:

- It’s possible to create and distribute good quality narrow bandwidth (512Kbps) Internet streaming video with limited staff at low cost when using software from RealNetworks.com and off the shelf (Radio Shack) hardware
- Results: A Instructor’s teaching style and course content must be amenable to this delivery method if it is to be successful Instructors don’t need to change their classroom methods very much to succeed with Internet streaming video broadcasting; long periods of training appear to be unnecessary
- Results: B Preparation, rehearsal, and timely distribution of supporting material are critical to successful streaming video presentations Instructors found reviewing archived streaming video files to be a valuable tool for improving class content and teaching methods
- Results: C Faculty workload increases in this environment, but not nearly as much as in an asynchronous text or multimedia-based online teaching environment Time spent on

preparation and production is less with streaming video, though post-production work may be more, depending on the faculty member's decisions on how much to do after class

- Results: D Student response to viewing classroom presentations (both live and archived) was generally favorable; the faster the Internet connection, the better the student experience Student response to live classes was generally good, even from those with relatively slow 56Kbps dial-up connections
- Results: E Students want more classes offered via streaming video if they have access to fast connections like Oceanic Cable's RoadRunner service
- Results: F Students thought viewing archived streaming video class files on demand (asynchronously) was as effective from an instructional viewpoint as participating in the live class (synchronously), provided they could then interact with the instructor via e-mail, chat, or videoconferencing Asynchronous delivery with a scheduled online class meeting component could increase access
- Results: G Archived files could be viewed when network traffic was low, or, archived files could be distributed on CDs which would eliminate delivery problems associated with slow network connections or network congestion—this could be a boon to less developed areas with weak infrastructures
- Results: H It's possible to broadcast streaming video to or from any classroom or conference room Network improvements made in Spring 2002 dramatically increased network bandwidth into and out of the campus with concomitant improvements in streaming video delivery quality and viewer satisfaction
- Results: I Bandwidth is Critical Network bandwidth is the critical variable in streaming video viewer satisfaction Faster connections support notably better viewer experiences No amount of preparation can overcome problems associated with a slow connection or network congestion Viewers will blame you or the technology if their picture is bad or blur

Examples of content that can be delivered via broadcast and streaming of videos

•YouTube clips, enhanced podcasting, and video-on-demand (VoD casting) delivered via streaming capabilities.

• Lecture capture, including archived lectures made available on demand via streaming capabilities

• Video games, which can be delivered on demand or in real time

• Broadcast content, including educational programming

• Streaming video, including live class or public events

• Lecture capture, a form of streaming video that in some instances is delivered as live streaming as well as archived for on-demand viewing

• Satellite delivery, which includes live instruction

• Satellite delivery, which in some instances includes two-way or multi-way live instruction

• Interactive videoconferencing and telepresence technology, which consists of two or more

Locations connecting with live instruction, presentations, and collaboration

3 primary ways to deliver Streaming Videos in education.

• On-demand video, which may be locally based or delivered on demand via the Internet.

• One-way video, which may be time-ruled, packaged, broadcast TV, on-demand streaming video, or real-time, instructor-based satellite TV.

• Two-way interactive video, which includes interactive videoconferencing, compressed interactive video.

Some of the applications of broadcast and streaming video discussed in the white paper include:

Classroom enrichment

Video gives students the opportunity to travel to remote places outside the classroom walls without leaving school.

Accelerated learning

One-way streaming blended with other online methods of communicating is one of several ways of ensuring that learners can take the college-level courses they need.

Distance education

To make courses, lectures, and faculty accessible to populations in remote areas and also to students with disabilities or with physical impairments.

Global student collaboration

Video technologies can help students connect with peers located in different campuses and in different countries so that they can interact with different cultures, exchanging information and learning from each other.

Communications

Video can also be used to stream instructional/informational or entertainment related content at campus public areas such as cafeterias, auditoriums, and stadiums.

How to learn with Video technology in Education

Although learning with video and multimedia technologies in educational outcomes is a field of ongoing research, the pedagogical of learning with video can be summarized by three key concepts:

1) **Interactivity with content** (the learner relates to visual content, whether verbally,by note taking or thinking, or by applying concepts)

2) **Engagement** (the learner connects to the visual content, becoming drawn in by video, whether on-demand or real-time)

3) **Knowledge transfer and memory** (the learner may remember and retain concepts better than with other instructional media)

Because video combines many kinds of data (images, motion, sounds, text) in a complementary fashion, learning can be adjusted more easily than with other tools to the diverse learning styles and individual learning pace of students. With video, the learner has more control over the information he receives and an additional opportunity for deeper learning by being able to stop, rewind, fast-forward, and replay content as many times as needed.

Adopting Streaming Video Technologies in Transforming Education

The studies analyzed in this paper show how online streaming of videos can transform students in the following areas:

Grades and performance: On-demand video has been shown to impact grades and test performance through a large number of studies conducted by colleges and universities. Some studies have led to the conclusion that students who engage in [viewing streaming video] outperform peers who are in a traditional face-to-face classroom. School readiness: Educational television has been shown to have a positive impact on school readiness, including letter and number recognition. Positive relationships have been found between childhood viewing of educational television and cognitive performance at both preschooler and college levels.

Student's collaborative abilities: Access to video apparently encourages students to develop their problem-solving abilities via collaboration with others, which has important implications for future workers in a world more driven by teamwork, collaboration, and multicultural awareness

Overall academic development: Educational TV can have positive effects on the intellectual and academic development of children. Similarly, many studies are beginning to confirm that blended learning—the combination of face-to-face and online instruction—can be equal to or superior to either face-to-face or online-only programs. Many blended learning programs include on-demand or real-time video as program components. Workforce preparation: *Video content* and *video literacy*—both the understanding of how to take full advantage of video as a communications tool and knowing how to use technology itself—are considered a core

competency when students leave university. Video can better prepare students for the workforce because it develops skills such as creativity, sociability, exposure to the spotlight, and civic responsibility, as well as qualities like self-esteem and cultural understanding

Student Motivation: When students are given the opportunity to create digital material for classroom use, the feeling of empowerment, ownership, and sense of purpose is much higher. This in turns enhances the students' motivation toward a particular subject and also contributes to the development of additional skills such as innovation, creativity, leadership, social interaction, and project management.

Learner Engagement: An essential finding across multiple studies reviewed in this paper shows that on-demand streaming content increases student engagement. Individual control over the pace of learning enables students to review segments repeatedly of a lesson and feel that they are learning more effectively.

Learner conceptuality: Cross-cultural understanding can also be enhanced through video because of the "reality" or "conceptuality" provided by it. This can often decrease isolation, increase cultural awareness, and even help minimize xenophobia.

Social skills: Several studies point at a clear positive impact on the enhancement of children's social and affective skills. Also, when students are allowed to create their own videos and share them with their peers as part of their classroom experience an effective part of learning (teaching to others) is developed.

Digital and multimedia literacy: Multimedia helps foster other 21st century skills such as critical thinking, problem solving, communication, and collaboration. In parallel, increasing use of video by students is bringing them closer to media and IT technologies, demystifying and placing them in the hands of learners as tools for content creation.

Drivers, Barriers and Success Factors of implementing Video in Education

The use of video is only beginning to meet the needs of today's and tomorrow's learners. Video can help educators address the challenge of different learning styles and enhance the way in which today's children and youth access, absorb, interpret, process and use information. While not a panacea for good teaching, video is clearly an essential tool that can have a powerful impact on student retention of information as well as on student engagement. As 21st century learners need to learn to be global citizens and to collaborate with others, learner-generated video will be a powerful tool in the hands of students. A common element of the 21st century skills movement is the practice of students creating multimedia content and delivering presentations to authentic (community stakeholders) audiences, and doing so throughout their education. Learners must be taught to be wise consumers of multimedia and must also be given the skills necessary for creating it. he rapid availability of video tools supports the changing role of the

educator. Teachers will increasingly perform the mentoring role both in person and over distance, across geographies and time and across different media.

This will turn the world into a universal multimodal classroom, giving learners, educators, and their institutions access to vast amounts of content worldwide. Broadcast and streaming video will be essential elements of that multimodal learning model.

Building a foundation for video learners

- Provide learners with skills to interpret multimedia
- Understand how to use video effectively
- Frame learning with previewing discussions
- Extend learning with post-viewing discussions
- Adapt viewing to student's individual needs

Invest in professional development

- Use video technologies for teachers training programs in schools.
- Empower educators to incorporate video technologies into their teaching curriculum

Technological

- Technology access (bandwidth in rural areas)
- Fidelity of implementation
- Equipment failures and reliability

Legislative

- Requirements for special-need learners
- Weak science and technology policies
- Deficits in government funding

Behavioral

- Attitudes, expertise and pre-conceived ideas
- Teachers' poor proficiency with technology
- Extra time needed for class preparation

- Faculty resistance (IP and digital rights issues)

Resource-Based

- Low quality of high-educational TV programs
- Poor professional development/technical support

Pedagogical

- Greater Understanding that students learn differently
- Need for greater emphasis on globalization/

competitive workers skills

- Need for critical problem solving skills Technology
- Changes in access, devices, and behaviors
- Increased access to the Internet
- Greater consumption of online videos
- Greater numbers of mobile devices

Social

- New generations of technology savvy teachers for video
- Learners' proficiency with technology and affinity

• Educators wishing to gather more information about the advantages of broadcast and streaming video solutions in comparison to other tools for learning.

• Superintendents, administrators, deans, and information and communications technology (ICT)

Specialists seeking to find out more about available video technologies and their usability.

Media for storing broadcast and streaming Videos

Two-way Videoconferencing

Camcorders

Video CDs

Lecture capture

iPADs & tablets computing

User-generated video

Videogames

Real-time 3D immersive worlds

DVDs

Podcasts

Streaming video

You Tube/Teacher Tube

Webcams

Camera-enabled Smartphone's

Videotapes

Satellite

Laserdiscs

Instructional Video Media Types

- On Demand Video,
- One-way Real-Time Video,
- Two-way Real-Time Video

How broadcast and streaming video can EMPOWERS teaching and learning.

Flood in 1995 found that video has the potential to enhance the learning of foreign languages because its portrayal of "dramatized cultural context" with materials that illustrate the interconnection of language and culture, essential when learning a foreign language. Other examples include use of video in history and geography lessons where students can bring a subject to life, stimulate their ability to recall facts and events, and experience places they wouldn't otherwise experience.

• ACPB (1997) teacher survey reported that video was used more in science than in any Other subject area.The use of video for instruction of science subjects like physics, mathematics, astronomy and biology allows students to expand their understanding of complex concepts by strengthening the links between abstract ideas and practical applications. It also helps demystify these disciplines, which are often perceived as difficult, and increases student's interest,

engagement, and in-class participation. Videos are uniquely suited for taking students on "impossible" field trips, such as a trip inside the human body, and that can illustrate complex, abstract concepts through animated 3D images and show experiments that cannot be done in class.

Digital technologies have brought about the seamless convergence of broadcast video and streaming video, as we speak "silos" of networks and devices are no longer a factor and where video can now be delivered over multiple networks and to multiples types of devices. These technological improvements are critical; they mean that educators can spend more time focusing on their pedagogical goals, on individual student performance, as well as on content quality. The convergence of broadcast video and streaming video also gives students additional tools to better control their individual learning process, allowing them to pause, rewind, replay, and download content for later review either in the classroom or in the comfort of their own homes. It also has opened up access to user-generated video and the "back and forth" of instructor-to-learner and learner-to-learner interaction, which stands in contrast to the old instructional video model.

Video streaming can be seen from these perspectives below

• **Classroom enrichment:** Video gives students the opportunity to travel to remote places outside the classroom walls without leaving school.

• **Accelerated learning:** Many rural and even urban secondary schools lack instructors in certain areas. One-way streaming blended with other online methods of communicating is one of several ways of ensuring that learners can take the college-level courses they need.

• **Distance education:** Thanks to the use of video, distance-learning programs have made courses and lectures accessible to populations in remote areas and also to students with disabilities or with physical impairments.

Using video technologies for distance education programs is also of particular value to higher education institutions to for example expand their campus presence into other areas of a city, other states, and even to other countries. Research shows that distance learning through video technologies can be as effective as traditional instruction, provided enough room is left for interaction between students and lecturers and between students themselves.

• **Global student collaboration:** Research shows that it is through interaction with other peers that deeper and more sophisticated learning can occur. Video technologies can help students connect with peers located in different campuses and in different countries so that they can interact with different cultures, exchanging information and learning from each other.

• **Communications:** Video can also be used to stream content at campus public areas such as cafeterias, auditoriums, and stadiums. That content may be purely instructional or a blend of entertainment and information.

Video Streaming for learner's Development

The paper encourages educators, superintendents, administrators, deans, and information and communications technology specialists to see video technologies as tools that enable and support the learning process and that need to be complemented with forward-looking pedagogies, solid professional development programs for teachers, and a true integration with curricula.

Primary and secondary school educators have strict requirements for professional development. Often they can meet these requirements through online tutorials with video components, where they can see either live instructors or review recorded sessions at their own pace recorded lessons also help "pre-service" teachers to become familiar with classroom settings before starting their field placements. Increasingly, busy educators are also taking advantage of recorded seminars and online virtual communities when they miss the "live" version. Using video technologies has proven helpful when sharing *resources, exchanging ideas, recording and evaluating themselves, and taking full advantage of professional development opportunities they might otherwise miss.*

The part of a continuum in which interactivity with content becomes the key principle and a means for *cognitive development:* the learner *interacts* with visual content, whether *verbally*, by *note taking or thinking, or by applying concepts. Engagement* occurs when the learner connects to the visual content, becoming drawn in by video, whether on-demand or real-time. *Interactivity* and engagement begin in the affective realm, the feeling side of learning. In order for interactivity to take place, the quality of the video experience should be high. Once *engagement* occurs, the continuum then flows into knowledge transfer and memory: the learner, according to some studies, may remember better. The net result in theory is a combination of affective and cognitive development, and *retention of content*.

Video is not all in all about learning Tools

Just as one method of transmitting knowledge has never been enough, any individual grouping of media may never be sufficient. That is why video should be seen as a *complementary tool for learning rather than a substitute.* Educational television, films, newspapers, textbooks, podcasts, radio, the web. This is why texts, oral presentation, recorded audio, slides, and other forms of media invite enhancement by video. Video does not just add emphasis, however. It is becoming central to learning, a need felt not only by students who are growing up with rich digital technologies, but also increasingly by educators.

Affective Domain Cognitive Domain

Some debate exists on memory enhancement. Most studies believe visual content helps learners remember concepts and ideas and practices, video not only consolidates visual and auditory stimuli into a single package, but also helps "bridge the gap between schools' artificial environment and the outside world, bringing reality into the classroom". Video as a learning tool is its outreach power, as large numbers of people, including those in remote areas, can learn

directly from experts without having to travel. Because video combines many kinds of data (images, motion, sounds, text) in a complementary fashion, learning can be adjusted more easily than with other tools to the diverse learning styles of students. With video, the learner has more control over the information he receives by being able to stop, rewind, fast-forward, and replay content as many times as needed .However, teaching methods that include the use of video and audio will, in effect, "reach more students and provide more opportunities for neural development and learning" (Marshall).

About Video Technologies Research findings

The impact of video and multimedia technologies in educational outcomes is a field of ongoing research. To date, most of the research on the use of ICT in schools has focused on small samples, lacked rigorous controls, and has not been generalized to address large student populations. Although open questions still exist about the real impact of video and other multimedia materials in education, numerous studies show how video and multimedia tools support and enhance learning, offering a bigger advantage when contrasted with traditional unimodal methods. A 2008 study commissioned by Cisco found that adding visuals to verbal (text or auditory) learning can result in significant gains in basic and higher order learning. Another study of 2500 sixth-graders and eighth-graders in Los Angeles showed a statistically significant increase in math achievement scores when students used streaming digital video on demand (Boster, 2004). In another example, Bryant, Alexander, and Braun (1983) found that viewers of early childhood educational programs demonstrated improved reading skills, mathematics skills, increased Peabody

Some of the specific academic benefits of video include its impact on:

Grades and performance: On-demand video has been shown to impact grades and test performance through Access to video can help to motivate students, engage them, and create a distinctive context for their learning experience.

Student Motivation: Numerous studies reveal that learners are more motivated to interact with educational content when the content uses narrative storytelling, uses some degree of personalization, or offers some degree of control over how the content is accessed. Moreover, when students are given the opportunity to create digital material for classroom use, the feeling of empowerment, ownership, and sense of purpose is much higher. This in turns enhances the students' motivation toward a particular subject and also contributes to the development of additional skills such as *innovation, creativity, leadership, social interaction, and project management.*

Drivers

Pedagogical, technological, and social drivers are helping to foster adoption of video technologies in education. Pedagogical factors include those items mentioned earlier in this

paper: greater understanding that students learn differently; the need for greater emphasis on globalization and competitive worker skills; and recognition of the need for critical problem solving skills. Technological factors include changes in access, devices, and behaviors; increased access to the Internet; greater consumption of online video; greater numbers of mobile devices like Smartphone's and touchpad's. Social drivers are twofold: a new generation of teachers has entered the workforce having grown up with technology, resulting in greater willingness to incorporate it in and outside of the classroom. In some countries, teachers' attitudes towards video also seem to be changing at a faster pace. The more teachers get familiar with the technology, the more they feel prompted to use it and to find optimal ways to incorporate it in their methodologies. According to the American Public Broadcasting System's (PBS) annual teacher survey on media and technology, the percentages of teachers finding value in multimedia and video content has increased each year since 2007.Another factor driving adoption today is the learners 'proficiency with technology and their affinity for video. Where teachers and learners alike may have been camera-shy in the past, today many of them are more willing than ever to be in front of, or behind, the camera as they incorporate video into teaching and learning. This makes video in the classroom somewhat "viral," as learners see their peers using video and adopt video themselves for learning.

Barriers

Challenges do exist for wider adoption of video in the classroom. These challenges can be categorized as

Technological, legislative, Behavioral, and Resource-based.

Technological barriers: Some institutions find on—demand streaming video to be a challenge due to access to the technology, especially when bandwidth is lacking—an issue frequently found in rural areas. Others cannot afford the bandwidth from their service providers necessary to deliver the quality of service (QoS) expected by their teachers and learners. The way students and teachers use the technology and the fidelity of the implementation might also hinder success. The fidelity of technology implementation in a school is determined by leadership, teacher proficiency, professional development, fit with curriculum, school culture, and pedagogical approaches, and to some degree by levels and Equipment failures and reliability also represent significant barriers to adopting video or any other type of technology in the classroom. Technical glitches might stem from the hardware as well as the software, and teachers do not typically have the background to troubleshoot quickly when problems arise. Continuous technical problems with the equipment might jeopardize the flow of information and the flow of the class, creating frustration and reducing the teacher's motivation to use the technology.

Legislative barriers: Some challenges are legislative in nature. Technologies in some countries must meet requirements of special-needs learners; in other cases, there might be an absence of a science and technology policy or even a deficit in government funding directed towards the

implementation of new technologies in the classroom. Legislatures might fail to grasp the benefits of bringing technology to education, thus neglecting essential investments.

Behavioral barriers: Behaviors, attitudes, expertise, and preconceived ideas can become important barriers when adopting any new technologies or teaching methods. According to Polin (1992), there are four stages in the adoption and integration of multimedia technology into the classroom:

1) The Comfort Zone, when the instructor gets acquainted with the equipment and its operation.

2) Disjointed Instructional Use, when the instructor is able to work with the technology, but is still unable to integrate it with his or her instructional goals.

3) Integrated Instructional Use, when the teacher is able to integrate the technology into the instructional plans, but the technology still drives the plan.

4) Transparent Integration, when the focus moves from the technology to the content and instructional strategies. At this stage, the technology is no more than one of many tools used by the teacher to accomplish the educational goals. Educators typically go through these phases when incorporating new technologies into their teaching methods. Some educators are reluctant to "teach" to a camera and feel at a disadvantage vis-a-vis their students regarding proficiency in technology. They have to work within the own school's culture, vision, resources, and guidelines for teaching or often have to adjust their own behaviors to improve interactivity. When teachers use new technologies in the classroom, they often need to dedicate more time to class preparation, research, and coordination than when they give traditional lectures. The instructor may need additional time not only to get trained in the technology and familiarize himself with the equipment, but also to identify the appropriate place of the session(s) within the curriculum, research the appropriate content to use, plan for the recording of the lesson, and develop supporting materials such as handouts, slides, and further reading notes. For certain subjects (for example, mathematics, physics, and chemistry among others), teachers need to allot additional time for subsequent demonstrations and exercises that facilitate and consolidate the information transmitted through video. In the case of distance learning, instructors also need to take into account additional factors such as accessibility of supporting materials and extra time and interaction mechanisms for addressing follow-up questions, as well as engagement strategies that keep students motivated once the session has finished. Another attitudinal challenge that is worth mentioning is faculty resistance. This is especially the case among some post-secondary educators who lack appreciation of on-demand technologies, particularly if they believe that intellectual property and digital rights issues may be at play. However, as several high-profile institutions have begun to post classes for public consumption online in recent years, more educators are accepting streaming lecture capture (as an example) as a net positive for professors, departments, and institutions.

Resource-based barriers: Some studies find the percentage of high-quality educational TV programs to be low. This, of course, depends on the subject matter and educational level being discussed. For example, textbook publishers have become more media savvy in recent years tying together textbooks (digital or print), rich educational media, video, and Web 2.0 capabilities. This will improve over time. Often resource challenges have to do with lack of professional development or technical support more than with the technology itself. Sometimes problems associated with the adoption of video gets confused with weak application of the technology (something that can easily be rectified through focus, training, enhanced content, or additional infrastructure).

Negative aspect of videos. Videos can evoke or induce anger, excitement, terror, activity, Motivation, love, laughter, whimsy, tears, dreams, calmness, relaxation, sleep, and a coma. Videos can have powerful emotional effects. Instructors need to decide the effect they want to produce in a given learning situation. Applied inappropriately, the video clip can distract and decrease learning, even incite students to riot. Unless rioting is a specific learning outcome, instructor's administrators should be very discerning in their choices.

Conclusions

Successful adoption of video technologies in the classroom is a process that requires time, a clear vision of education transformation, proper integration with curricula and alternative methodologies, as well as the continuous engagement and support of teachers, learners, administrators and parents. Some of the drivers, barriers, funding of the Technology project, and government education policy on adopting Online Video (On-demand/real time) Technologies in education should be adequately addressed by education stake holders in every countries.

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