# Lecture Capture Overview

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## *Executive Summary*

Lecture capture technology has the potential to fundamentally alter the way instructors and students interact in the classroom. Recorded lectures can free up time that may be used for class discussions, group work, and other activities that engage students as active learners. The ability to access material at any time also allows students an opportunity to review difficult concepts, and supplement their learning experience with additional material provided by the instructor.

This is a rapidly growing and changing field and it can be difficult to make the right decisions when considering a large-scale deployment. It is vital that as many stakeholders as possible provide input and that feature sets be clearly defined. Properly implanting a lecture capture initiative can require significant resources, not only in software, but also in networking and storage infrastructure.

## *Introduction*

There is increasing interest in providing students with recorded class material. Millennial students expect to have 24/7 access to learning materials and see technology integration as very desirable in an educational environment. Not only does lecture capture technology allow this to happen, it may change the relationship that instructors and students have in the classroom; shifting more from the "sage on a stage" mode to one that incorporates more interaction.

Choosing an appropriate system is not easy. There are many stakeholders (instructors, students, support staff, instructional designers, network and storage staff, and others) who need to be heard in the course of making a choice.

Compounding that is the wide array of technology available, from simple podcasting software on a laptop, all the way to permanently installed capture stations with multiple cameras and dedicated computers. Even when a basic level of sophistication has been decided on, there are many offerings with very similar feature sets that make choosing one somewhat difficult.

The results of a well-chosen and implanted deployment, however, have great potential for students, instructors, and the institution.

### *The Role of "Lecture Capture"*

The term "lecture capture" covers a great deal of ground. So much so, that it is more appropriate to discuss it in terms of the end-use of the captured material. And although there have been studies that have reported detailed breakdowns (Harley et al., 2003), it is perhaps sufficient to assign three primary roles to this technology:

- Synchronous Delivery/Collaboration
- Review of Lecture Material
- Providing Supplemental Material

Of these three, it is possible (at least in this case) to dismiss the synchronous delivery role as being outside the area under discussion. It is a relatively specialized activity, largely directed at distance learning. It is also generally more complex than simple capture situations, primarily due to the expected level of interactivity on the part of the participants; it is not uncommon to have one or more support personnel in attendance to both monitor the technology and provide audience content moderation. This is not to say that this in an untenable technology; it simply is not very scalable without a significant investment in resources.

The other roles of lecture capture are significantly "lighter" in their needs. In fact, one primary goal of providing such a system is to utilize technology that can be directly administered by faculty, without the need of significant support services. Typically, this involves installation of software on either facility computers or on faculty laptops. Although dedicated hardware-based solutions are available (and preferable in some cases) they are typically too expensive for wide-scale deployment and are not further considered here.

The advantage of such a "personally hosted" system is that it give faculty the ability to record not only their scheduled lectures (often with very little effort), but also to create supplemental material at any time and in any place they feel is appropriate.

In a broad, pedagogical sense, lecture capture allows faculty to change the nature and environment in the classroom by using captured material in one of three ways:

*Preview:* When class material is pre-recorded and made available to students prior to class, instructors are free to spend more of their "face time" engaging students with discussions, activities and small-group dialogs. In other words, there is more of an opportunity for active learning strategies that can improve student learning.

*Review:* Students also find the ability to review material at their leisure and as often as they like valuable in understanding difficult concepts. In particular, students who may have English as a second language or those with under-developed note-taking abilities can benefit from this strategy. Most capture systems create an automatic table on contents that allows the view to jump directly to a specific point in a presentation that they may find confusing.

*How-to:* Supplemental material, such as demonstrations and step-by-step instructions are a valuable adjunct to the primary course material. Instructors may choose to make short, single-concept recordings that expand or clarify the main lecture topic. This may be done in response to student

questions, based on experience from pervious terms, or as a way to provide information that allows advanced students to gain additional insights into the course material.

Of course, any new technology used for education brings with it a host of questions, and lecture capture is no exception: "Will students stop coming to class if the material is available online?" "How is student achievement affected?" "Who owns the intellectual property rights to the recorded material?" While there are no definitive answers to any of those questions, that does not negate the importance of investigation and experimentation. There is enough evidence (Harley, 2003; Traphagan, 2010; etc.)to suggest that lecture capture can have broad positive impacts.

## *Required Infrastructure*

It goes, almost without saying, that any lecture capture system that is intended for large-scale distribution requires a robust connectivity, processing, and storage infrastructure. Virtually all software-based capture systems record material directly to a classroom computer (either permanently installed or brought in by the instructor) and then sends the raw files to a server for processing and distribution.

On a small scale, the requirements are not high, but when we begin to consider large-scale deployment that may include dozens of simultaneous classes, the need for powerful back-end systems becomes paramount.

*Connectivity:* In many cases, it is not necessary for a computer to be connected to a network to actually record material. However, to do scheduled recordings, some systems do require a connection to send a signal to actually begin the capture, even if the material is stored locally. Regardless, at some point the files must be transmitted back to a central server where they are processed. In most cases, the files will be relatively small (a few hundred megabytes) but some systems do allow for very high-quality archival recordings which may be up 13 Gigabytes per hour.

*Processing:* The files transmitted to the central server are "raw". That is, they need some further manipulation before they are available for viewing. This may include the automatic indexing (of both visuals and text) as well as transcoding the capture into, perhaps, several display formats: mp3 for audio, mp4 for video, or rich media experiences that incorporate all available streams. Some systems control their pricing structure by regulating the number of simultaneous captures that can be processed. At the most basic level, the system can only work on one file at a time; any others are queued to wait their turn. In large operations, this may be insufficient since the turn-around time becomes too long. In that case, such systems are scalable by expanding the simultaneous processing power, which involves extra licensing fees and, perhaps, extra hardware.

*Storage:* Over time, this is one of the most critical infrastructure needs for lecture capture. Although many people now tend to think of disk storage as extremely inexpensive, there is a significant difference between what you might use on a home computer and what is required for professional, reliable storage. Again, when we begin to talk of perhaps hundreds of classes being recorded and stored per semester, the need for very large amounts of storage becomes clear. Additionally, there will need to be some policy decisions made regarding length of retention, backup, and other storage-related issues.

## *Basic Functions*

In evaluating any emerging system where there are multiple vendors, choices must be made about what features to evaluate. Since each package will have some differentiating characteristics, this often comes down to a "Required vs. Desired" comparison. There will, of course, be some common ground for all systems, but it is the differences, rather than the similarities that will drive the decision.

Here are some basic functions that most (but not all) lecture capture systems will exhibit:

- Scheduled Recordings (take place without user intervention)
- Ad Hoc Recording (a schedule is not *required* to record)
- Multiple Output formats
- Course Management Integration
- Ease of Use (subjective)
- Cross-Platform Solutions

Once those functions are assumed, the presence and/or sophistication of other capabilities will come to the fore:

- Editing
- Synchronous Operation
- Video Capture (not just screen capture)
- Robust Playback Options
- Chaptering and Text Search

Clearly, this is just a small sampling of functions that might be available. Each institutional deployment will have different requirements and will need to develop a checklist to compare systems. And even when multiple systems have the same functionality, the extent to which it has been implemented may be the deciding factor. A system that offers simple heads-and-tails editing may not be sufficient for some applications, for example.

Similarly, the claim of "cross-platform" compatibility may require more investigation. Virtually all systems create final output streams that are viewable on PC's and Macs, but that does not mean that the capture solutions available to instructors are necessarily cross-platform as well. Some may offer software that only runs on one type of system, or that provides a significantly different recording experience depending on the operating system of the recording computer.

## *System Comparison*

There are literally dozens of lecture capture solutions available and it is beyond the scope of this document to discuss all of them. And changes are happening so rapidly that such a comparison would be out of date almost immediately. Instead, we have narrowed the field down to four representative systems that are already in widespread use within the educational arena.

The checklist presented as Appendix 1 was derived using input from the Community of Educational Technology Support (ComETS) at Iowa State University. The Online Media Affinity Group (OMAG)

comprised of both faculty and staff, was consulted about their perceived requirements for a lecture capture system and their comments were distilled into the accompanying chart.

As you can see, the systems are very close in features. There are a few differences, however, and individual packages may have strengths (such as being able to accept input from third-party solutions) that were not considered in this chart.

Even with some consensus on capabilities, it is unlikely that everyone involved in evaluating these systems would choose the same one as the "best".

One factor that is not listed on the chart, but is of primary importance, is price. Each vendor has a different business model and a different way of computing cost. Some charge a site license based on the number of expected users. Others use scalability as the cost-basis and charge more for increasing the number of concurrent streams that can be processed. At least one vendor does not charge for the software at all, per se, but instead bases pricing on the level of support required.

A factor that is on the chart, but one that is difficult to quantify, is "Ease of Use". This is clearly a subjective comparison, but it is, perhaps, above all others, fundamentally important. Even the most cost-effective, feature-rich system is pointless if instructors find it too difficult or onerous to use. Pilot programs, demonstrations, and a solid commitment to local technical support are vital if the chosen system is to be a success.

*Note: The indication of available features for each package may not be complete and is based, in most cases, on research and available datasheets. Some packages may support features that are not marked on this chart.*

## *Conclusion*

As is the case with virtually all technology decisions, there is no "one size fits all" solution to lecture capture. Even within the same institution there may be a need for fixed cameras and capture stations, installed computers to do scheduled recordings, and portable machines that can be configured for both scheduled and ad hoc operation.

For large-scale deployment, however, it is desirable to have a system that can leverage existing technology (such as instructor laptops) in order to reduce costs and support requirements. This improves scalability and allows for easier upgrades as improved software becomes available.

Regardless of the system chosen, it needs to address the needs of all stakeholders and be flexible, scalable, and robust, without taxing the technology infrastructure.

## *References and Resources*


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Traphagan, T., Kucsera, J. V., & Kishi, K. (2010). Impact of class lecture webcasting on attendance and learning. *Educational Technology Research and Development, 58*(1)


## *Capture System Vendors Referenced*

Camtasia Relay - http://www.techsmith.com/camtasia.asp

Echo 360 - http://www.echo360.com/

Panopto - http://panopto.com/

Qumu - http://www.qumu.com/

***Appendix 1: Comparison Spreadsheet***

| | Panopto Coursecast | Camtasia Relay | Echo 360 | Qumu Create |
|---|---|---|---|---|
| ***Required*** | | | | |
| Scheduled Recording | X (Windows Only) | | X | X |
| Ad Hoc Recording | X | X | X | X |
| Editing | X | X | X | X |
| CMS Integration | X | X | X | X |
| Scalability | X | X | X | X |
| Cross-Platform | X | X | X | X |
| Software Only Option | X | X | X | X |
| Ease of Use | Claimed | Claimed | Claimed | Claimed |
| Multiple Outputs | X | X | X | X |
| Viewer Usage Stats | X | X | X | X |
| FPS-Based Screen Capture | X | X | | X |
| Offline Recording | X | X | X | X |
| | | | | |
| ***Desired*** | | | | |
| Synchronous Option | X | | | |
| iTunes U Integration | X (RSS Feed) | X | X | X |
| Note Taking Ability | X | | | |
| Video (webcam,etc.) | X | | X | X |
| Text Search | X | | | |
| High-Speed Play | | | | |
| Tagging Capability | | | | |
| Attach Support Documents | X (PDF) | | | |