Panopto™

Gartner's Complete Guide to the Higher Education LMS Market

Plus 15 Recommendations for Supporting Video in Your LMS

Issue 1

Gartner®

Introduction

In the last ten years, two technologies have become nearly ubiquitous in higher education: the learning management system (LMS) and video.

The LMS is now a central part of course management, serving as a digital hub for instructors and students to share information and ask questions, assign and return projects, and schedule classroom activities.

Video, in turn, has become a central part of classroom instruction, underpinning pedagogical evolutions including lecture capture, the flipped classroom, and recording student presentations.

In the last two years, both markets have undergone significant change. In the LMS market, new vendors and new capabilities have prompted many institutions to put older solutions up for review. And in the video sector, a surge in demand within higher education has prompted new market entrants, including some of the most prominent LMS vendors.

In the following pages, you'll find Gartner's latest analysis of the higher education LMS market. You'll see how increasing product differentiation has led to a split between general-purpose LMSs and more specialized systems. And you'll read Gartner's recommendations for how institutions should review and prioritize their options in order to choose a solution that works best for their students, faculty, and administrators.

Following the market analysis, we'll take a closer look at the unique challenges of supporting video within the LMS. We'll discuss the latest statistics on the importance of video in the classroom, and compare the built-in video capabilities of Blackboard, Canvas, Brightspace, and Moodle with those of dedicated video platforms.

Finally, we'll review 15 capabilities every institution needs to effectively support video within their LMS.

Source: Panopto

Research from Gartner

Market Guide for Higher Education Learning Management Systems

Increased competition and changing institutional needs are driving changes in the higher education learning management system market. This Market Guide will help CIOs navigate an increasingly differentiated market that is becoming firmly established in the cloud.

Key Findings

- Increasing activity by institutions looking to replace their learning management systems (LMSs) is driving a lot of activity in the market, which is becoming progressively more differentiated and with a number of new vendors increasing competition even further.
- The major distinction in the market is between general-purpose LMSs and specialized systems supporting initiatives such as competency-based education (CBE), although the market for the latter is still small and largely limited to pilot projects.
- Although there is a strong emphasis on the LMS as a platform into which other tools and services are integrated using standards, many LMS vendors are developing additional services and tools, such as analytics, assessment management and video.

Recommendations

Higher education CIOs:

- Start the process of looking at the increasingly competitive marketplace earlier, rather than later, and include key stakeholders, such as students and faculty, in the process to evaluate new capabilities and their fit with your institutional learning vision and strategy.
- Review vendor roadmaps for delivery of additional functionality and services, such as analytics, and video capabilities, and assess the importance of these features being provided as embedded parts of the LMS or as third-party extensions in light of your own learning technology needs and capabilities.
- If you have not already done so, review your plans for moving your LMS to the cloud, because this becomes the predominant modality in higher education.
- Review the cost of licensing and supporting your LMS, and look for savings in the more competitive market.

Market Definition

In higher education, the LMS is typically organized around the various roles involved in teaching and learning, such as instructor, student or teaching assistant. The LMS usually contains a majority of the following components behind a secure login, often tied to an institution's core identity and access management system:

- A means of making course announcements
- A course or study calendar
- Communication tools, such as email, chat and a discussion board
- Online assessment or quiz engine (including an item bank)
- A gradebook, grading tools and rubrics
- A syllabus tool and a means of posting content
- An assignment tool or drop box
- Embedded analytics tools
- A mobile application allowing courses to be accessed via smartphone or tablet
- Tools to support the specification and achievement of learning outcomes and competencies
- Tools to support adaptive learning
- Tools to support badging and microcredentials

- Support for interoperability standards, such as Learning Tools Interoperability (LTI), and APIs to integrate third-party tools and services

At an enterprise level, the LMS is typically integrated with the student information system (SIS) and, in some cases, institutional CRM to enable the passing back and forth of roster information and grades between the SIS and LMS.

Market Direction

Over the past two to five years, changes in end-user expectations, the development and maturing of technical standards, and new entrants into the market have brought about a significant change in the higher education LMS market. These changes have created a higher education LMS market with a lot more choice and movement, without any one vendor dominating. But the underlying dynamics of the market point to this situation changing over the midterm to long term.

For a number of years, the higher education LMS market was very static and dominated by Blackboard, which enjoyed a majority of market share. New entrants into the market found it difficult to establish a firm presence in the market, given the long sales cycles in higher education and the difficulty and unwillingness of higher education institutions to move from one LMS to another. Over time, there was some movement of institutions to open-source and community source solutions, such as Moodle and Sakai. This movement was driven in part by a philosophical attraction to open-source and community source and in part as a response to rising costs. The movement to Moodle was especially driven by smaller institutions of fewer than 5,000 students, concerned about LMS costs and pricing structures that meant they paid considerably more per student than larger institutions.

The entry into the market by Instructure disrupted this status quo. The new vendor quickly began capturing new customers and market share due to the attractiveness of its cloud-only offering and clean student-centric interface. The fact of Instructure's success in the market made it clear that newcomers could establish themselves. Since that time, we have seen the entry of a number of new players, whether entering the higher education market from an established base in K-12 (for example, Schoology), from a geographical base outside of the North American vendors that have tended to dominate the higher education LMS market (for example, Teamie and itslearning) or as a totally new development (for example, NoteBowl and Motivis Learning Systems). These vendors, as well as the established vendors, have increasingly moved toward offering a cloud version of their product, as well as clean and student-centric interfaces.

There is now much more choice in the market, and a much-higher-than-normal number of higher education institutions are looking at the market and actively pursuing an RFP for a new system. The greater competition in the market has also made itself felt in costs, which are lower overall compared with even two years ago.

However, examining the actual choices made by institutions exploring new solutions shows that a majority are choosing to move to Instructure with only a few vendors being able to chalk up noticeable contract wins (for example ,Schoology). This is a consequence of the early mover advantage of Instructure, as well as its aggressive marketing and expansion strategy. But it is also a consequence of the conservative nature of many higher education institutions and the bandwagon effect, where colleges and universities tend to make decisions based on those made by a majority of their peers.

In addition, many of the capabilities of some of the niche solutions, such as support for competency-based education, are beginning to be emulated by more mainstream providers, such as D2L, Blackboard and Moodle. Most of the adoptions of the niche systems are still pilot implementations, and it remains to be seen how and to what extent they will become established in the market. We are, thus, likely to see a reduction of choices in the market over time, as the already-established players consolidate their positions.

Market Analysis

The more dynamic market for higher education LMSs consists of three major segments: broad-application commercial traditional LMSs, broad application open-source or community source LMSs, and specialized or niche LMSs.

Commercial Educational LMSs

This sector of the market is by far the largest and has been the most dynamic over the past two to three years. A number of new products have entered the market during this time period, most of which offer a cloud solution and a clean,

elegant, student-centered user interface and approach. The predominant approach within these LMSs is away from a "walled garden" approach that typified the LMS market for a long time. Here, tools were built into the LMS, often contributing significantly to feature bloat. Instead, there is much more emphasis now on LMSs functioning as central parts of a larger ecosystem, with the relatively easy integration of third-party standard-conformant applications added, often from an app store or interface associated with the LMS vendor. Despite this, however, most vendors have begun to add features, tools or services to their LMSs, in part to obviate the need for sometimes still tricky integration, to provide additional revenue streams or to assist in the processes around the use of the LMS.

Sample vendors in the segment include Blackboard, D2L, Instructure, itslearning, Schoology and Teamie.

Open-Source or Community Source LMSs

This sector of the market saw considerable growth in 1995 through 2010, as many universities and colleges sought to move away from commercial offerings for the philosophical or budgetary reasons described above.

The community source segment of the market, largely represented by the Sakai LMS, has shrunk over the past three years, but retains some strength, especially internationally. The reduction in the number of high-profile clients in the U.S. was largely set in motion by the decisions on the part of Indiana University and the University of Michigan to leave the Sakai community and move to a commercial offering of an LMS. The departure of a number of additional institutions from Sakai has raised some questions about the long-term viability of community source, especially given the role that member institutions play in developing the system.

Open-source LMS solutions, such as Moodle, have fallen behind commercially available LMSs, especially in terms of availability of cloud solutions, user interface and availability of specialized features. The Moodle headquarters undertook a major reorganization last year and changed the way that users were able to bring forward and prioritize new developments and features. This has resulted in some improvements and new features, but whether these will rise to the level of most commercial LMSs remains to be seen. Moodle also began to offer a cloud offering, although only to small installations of users.

Sample vendors in the open and community source sector are Sakai and Moodle.

Specialized or Niche Solutions

Gartner is seeing an increasing number of specialized or niche LMS platforms, often associated with a particular pedagogy or approach. CBE learning platforms make up the largest part of this segment. These offer tools to assist in the building and measuring of competencies, as well as more flexible ways of managing progress through a course of study, unlike the more traditional time-bound courses managed by conventional LMSs.

There is widespread interest in CBE, with many institutions in the U.S. having declared an intention to pursue CBE at some level, and some limited interest from European and Australian universities. Most of these LMSs are being used in pilots at higher educational institutions or in a few of the more advanced programs.

It is unclear how much this market segment will grow or even remain as a distinct part of a market segment. Many higher education institutions may balk at the concept of buying two separate LMSs for separate parts of their program offerings, and it may be difficult for some of the smaller vendors in this segment to remain viable unless they attract sufficient customers. Additionally, more and more conventional commercial LMSs are building competency tools and capabilities into their systems, which may pull significant numbers of customers away from the specialized platforms.

Another part of this segment are LMS platforms that build in social and relationship-based tools as a core part of the platform. These tools include links to advisors, peer groups, coaches and mentors as additional roles within an LMS out of a philosophy that these roles and relationships are a core part of teaching and learning in higher education. Some of these vendors refer to their platforms as "learner relationship management systems" (LRMSs).

A final segment of this market are specialized massive open online course (MOOC) platforms that allow higher educational institutions to run their own MOOCs in a white-label type environment (that is, an environment where they can use their own branding). MOOC platforms typically offer a stripped down feature set compared to most LMSs and especially competency-based or LRMSs. But they allow higher educational institutions to offer their own branded courses, including student sign-up, posting of content, quizzing and discussion forums.

Sample vendors in this market segment include Ellucian, Motivis, D2L and Instructure.

Representative Vendors

The vendors listed in this Market Guide do not imply an exhaustive list. This section is intended to provide more understanding of the market and its offerings.

Blackboard

Blackboard offers suites of products organized around a core learning system. As one of the most well-established products on the market, Blackboard has lost market share, but is still one of the largest vendors and has a strong international presence.[1] In mid-2014, Blackboard announced the development of a new user interface (now called the "Ultra Experience") as a SaaS-only offering and officially released it in July of this year. It continues to offer its legacy "original experience" (which also now has a SaaS option). Blackboard has continued to make acquisitions, with recent purchases including the analytics products Blue Canary and X-Ray Analytics, which reflects more of a focus on its learning analytics strategy. Over the years, Blackboard has been aggressive in its acquisitions of Moodle hosting companies, including Moodlerooms, Remote-Learner UK, Nivel Siete and NetSpot.[2] Through these services, it offers hosted and SaaS versions of Moodle, often with some additional features, such as the X-Ray Analytics service through Moodlerooms.[3]

D2L

Waterloo, Ontario-based D2L continues to push the development of new features and services in its Brightspace LMS. In addition to its core Brightspace platform, its comprehensive learning analytics tools, adaptive learning engine, a competency-based learning solution and a gamification platform, D2L has added a lecture capture and enterprise video tool. D2L has also made significant improvements to the user interface and mobile experience with the development of its Daylight release, and has sought to accelerate user adoption and benefit from learning analytics through its Blueprint service and optional strategic consulting. D2L retains an impressive record with customer retention, keeping 98% to 99% of its customers from year to year.

Ellucian

The student administrative systems vendor Ellucian entered the LMS market in April 2015 with the purchase of a CBE-focused LMS from Helix Education. Renamed Brainstorm, the new solution is currently in limited release and is available as a cloud-only offering. Thus far, most of the course installations are small (<50 students), but the solution has been stress-tested for larger installations. Obviously, given the challenge of integrating the SIS and LMS for a CBE program, Ellucian is hoping that its core strength in providing and supporting SISs offers a key advantage.

Instructure

Canvas was released onto the market in 2011 and has continued to attract a lot of customers in the U.S. and increasingly internationally. Close to 80% of new contracts in the LMS space result in a move to Canvas.[4] It has continued its geographical expansion beyond Australia, Asia and Europe into Southeast Asia, Central America and Latin America. The core of its offering is an LMS that maximizes usability for both students and teachers, and is a SaaS-only offering. Instructure is currently improving its CBE capabilities through a number of foundational enhancements, including Mastery Paths. Additionally, it has an enterprise video service in beta testing.

itslearning

Norwegian-based itslearning was born of a college computer engineering project in 1998, and the company was formed in 1999. It evolved into a significant presence globally, largely in Europe, although it does have some higher education clients in Latin America. It has approximately 250 higher education clients currently in production, as well as 100 noneducation clients. It is available exclusively as a SaaS offering. In addition to the core LMS tools, it offers access to a transactional data store for learning analytics as well as embedded learning analytics, a competency-based learning tool, an adaptive learning platform, a content or learning repository, and an embedded plagiarism detection tool.

Moodle

Moodle is one of the principal open-source LMSs in education. Developed in Australia in 2002, Moodle enjoys a strong following in many markets globally, but especially in smaller higher education institutions (fewer than 5,000 full-time equivalent students), among for-profits and with other very large distance education institutions. Moodle also enjoys a strong following among users philosophically attracted to the concept

of a true open-source offering, as well as the constructivist educational theory around which it is built. The organizational structure supporting the core part of Moodle was recently reorganized,[5] with the promise of better support and innovation for the product, and a bigger role for users who pay to be members of the association for setting product direction. Moodle came out with a major release at the end of 2015, and the developments coming out of and building on that release have emphasized an improved user interface, mobile capabilities and analytics.

Motivis Learning

Motivis Learning is the product spun out of Southern New Hampshire's College for America program. The product was designed specifically to support competency-based learning and is referred to as an LRMS, because of the extensive connections students can make to advisors, educators and other staff through the LMS. Motivis Learning was founded in 2014, but is launching its first full product offering this year (2016) as a cloud-only solution. The company remains small, with under 50 employees and three clients in production, although it has a number of other institutions exploring the product through pilots. In addition to support for personalized and flexible learning paths, the system also collects actionable data to help with assessments.

Sakai

Sakai was launched in 2004 as a fully open-source or community sourced LMS. It has been implemented in over 250 institutions in many parts of the world besides North America, including Africa, Asia, Australia, Central America, Latin America and Europe. However, given that Sakai is open-source and freely downloadable, it is difficult to track the exact number of institutions deploying the product. The governance of the project is provided by the Apereo Foundation, which is made up of more than 80 institutions. The Foundation oversees a number of other projects, including OpenCast and the Apereo Learning Analytics Initiative. Fifty to 100 developers contributed code to the latest version, Sakai 11, which features a new responsive design, a gradebook update and a more-user-friendly lesson creation tool.

Schoology

Founded in 2009 and based in New York, Schoology started with a focus on K-12, but has increasingly started to market to higher education and is winning contracts in this space — for example, at Wheaton College, Colorado State University Global Campus, Hebrew College and Mohave Community College. Perhaps even more so than some of the newer systems, the native cloud LMS is built very much around the student, with a very social and familiar interface. Schoology offers several areas of functionality beyond the core LMS, including course and curriculum management and mastery learning modules to support activities such as CBE, a learning object repository and a professional learning community space. Schoology is currently working on expanded reporting and analytics, such as system-level proficiency reporting, and a variety of enhancements focused on improved user experience across mobile and the core platform. The vendor recently announced support for assessment management and reporting, which should prove to be an attractive option for many higher education institutions.

Teamie

This SaaS LMS was founded in 2011, and based in Singapore, Teamie has begun to attract a growing amount of attention, including from outside the Asia/Pacific region. The company is still relatively small (with fewer than 50 employees), but has 50 institutions in production (20 of these being in higher education, with the balance being made up of K-12 and corporate organizations). It has supported installations of greater than 350,000 students. Beyond the core LMS functions, which feature strong social capabilities, the product also offers a gamification platform, a learning object repository and a competency-based education platform. Its product roadmap includes a content recommendation engine and a mobile grading application.

Market Recommendations

- Review your institution's strategic plan and IT strategic plan to help you identify the teaching and learning needs of your college or university over the next two to five years. These needs, such as a focus on student retention and completion, a focus on competency-based learning or an expansion of online learning, will help you identify what some of your core needs are in an LMS and will shape how you approach the market.

- Start the process of looking at the increasingly competitive marketplace earlier, rather than later, and include key stakeholders, such as students and faculty, in the process to

evaluate new capabilities and their fit with your institutional learning vision and strategy.

- Review vendor roadmaps for delivery of additional functionality and services, such as analytics, and video capabilities, and assess the importance of these features being provided as embedded parts of the LMS in light of your own learning technology needs and capabilities.
- If you have not already done so, review your plans for moving your LMS to the cloud as this becomes the predominant modality in higher education.
- Expect to see shorter contract lengths, much closer to three years than the more traditional five-or even 10-year contracts.
- Review the cost of licensing and supporting your LMS, and look for savings in the more competitive market.

Evidence

[1] See "LMS Data — Spring 2016 Updates," Edutechnica, 20 March 2016.

[2] See "Blackboard Is Now An Official Moodle Partner," Moodle News, 14 March 2016.

[3] See "X-Ray Learning Analytics: Moodlerooms introduces X-Ray Analytics, helping you to identify at-risk learners, streamline course facilitation, and understand Moodle use across your institution," Moodlerooms, 2015.

[4] See the chart in P. Hill, "MarketsandMarkets: Getting the LMS market wrong," e-Literate, 31 July 2016.

[5] See "Some additional details on the Moodle Association," Moodle News, 29 May 2015.

[6] See "Leading the way to next generation digital learning environments: Use-cases and new product categories," IMS Global Learning Consortium.

Acronym Key and Glossary Terms

CBE	Competency-based education is a way of organizing instruction based on the acquisition or possession of specified competencies by the learner. Traditional instruction is based on the credit hour and completion of a course by a set of students. CBE platforms are niche tools to support the new mode of instruction with more flexible systems that enable students to advance through courses at their own pace and with enhanced assessment functions to test the competencies.
IMS Global Learning Consortium	The IMS Global Learning Consortium is a nonprofit collaborative body developing interoperability standards for learning technologies in education.
LTI	The Learning Tools Interoperability specification was developed by IMS Global to establish a standard way of integrating external and third-party learning with LMSs and to facilitate the exchange of data between the two. IMS Global has also been working with the member community to create the next generation of the LTI standard in LTI 2, which deepens the level of integration available between the LMS and third-party tools.[6]

Source: Gartner Research, G00292659, Glenda Morgan, 19 September 2016

Recommendations for Supporting Video Inside Your LMS

The rise of video in the classroom

Only a short time ago, video was a novelty in the classroom. An instructor may have opted to present an occasional recording with the help of a TV wheeled in from the AV department, but at best, the technology was an infrequent part of students' daily learning experiences.

Today, video has become so common in the classroom that Gartner has entirely removed the technology from both its Hype Cycle and Market Clock reports for Higher Education. In doing so, the firm has made clear that, thanks to wide-scale adoption, video is now just as expected in the classroom as projectors and whiteboards.

How did we get here?

For starters, it's the results. In an independent survey by Wainhouse Research, a majority of respondents reported that implementing lecture capture yielded a variety of benefits. Students found that on-demand videos helped them study more effectively and provided a more personalized learning experience. Faculty gained new opportunities to more effectively use existing materials and available class time. Respondents even reported that recorded lectures helped improve grades, and made their schools more competitive.

That enthusiasm has led to widespread adoption. According to the same study, lecture capture has already been adopted either campus-wide or at the departmental level in 80% of universities.

As instructors have come to embrace video, students have come to expect it. When available, data collected from numerous institutions indicates that 3 in 4 students on average will watch lecture recordings. Of those who do, more than 95% will report the videos were a valuable part of their learning experience and 80% will factor the availability of lecture capture into their future course selections.

Beyond lecture capture: The expanding use of video for traditional and online learning

Beyond traditional lecture capture, the uses for video in higher education continues to expand. Just a few of today's applications for the technology include:

Creating a "campus YouTube", enabling departments and libraries to curate in-house and licensed video for classroom learning and research.

Flipping the classroom, where instructors record and share details from an upcoming lecture in advance, thereby freeing up class time for discussion and interactive learning.

Student assignments, where students record themselves either in class or at home, with the resulting video used by teachers, peers, and the student themselves to review and critique a presentation or role-play performance.

Streaming campus events, allowing institutions to share commencement, guest lectures, and other high profile occasions with parents, families, alumni, and their communities live via the web.

Staff and faculty training, enabling instructors and staff to view training on-demand, to better fit into the varied work schedules common to academia.

Internal and external communications, shared either securely or publicly, delivering news, announcements, and more to those on and around campus.

Recruiting and alumni relations, promoting the institution, its fundraising initiatives, and all the great work being done on campus.

Athletics and coaching, including capturing practices for player review and improvement, as well as streaming matches not available elsewhere for alumni and fans to follow along.

Just like lecture capture, these once-novel applications for video are quickly becoming common on campus.

Most notable among these is the flipped classroom. Only eight years after its introduction, the NMC Horizon Report named the flipped classroom one of the most important developments in educational technology. Already in place in 30% of classrooms and anticipated in another 27% this year, the Horizon report recommends institutions plan for a "one year or less" adoption horizon for the requisite flipped classroom tools, including video.

And classroom flipping is hardly an outlier. Analysis of the more than 2 million videos stored in the Panopto Cloud finds:

- 38% of academic videos recorded in 2016 — more than 1 in every 3 videos — are less than 15 minutes long, offering further evidence of the popularity of non-lecture recordings like flipped classrooms and student presentations.
- 41% of academic videos created in 2016 now include 2 or more simultaneous video streams (multiple views of a lab experiment or field exhibit, for example, or video of the instructor teaching synced alongside video from their laptop screen as they work out a problem). This trend suggests faculty have become comfortable with video, and are now increasingly leveraging video to capture and share more complex demonstrations and activities.
- And 76% of schools have experimented with live streaming classrooms and events at least once, and many have now made live online broadcasts a regular activity.

Video has become an expected part of today's higher education learning experience, and schools should consider the full breadth of use cases for the technology as they make their investments.

Institutions that fail to plan appropriately run the risk of providing substandard support for video, thereby undermining their student learning experiences and putting the institution at a competitive disadvantage. Those schools may also find themselves pressed to support a disparate set of point solutions sourced at the departmental level, creating a support burden on campus technology teams and delivering a disjointed experience for faculty and students.

In either situation, the institution will likely need to conduct a second RFP in order to find another solution that will more fully meet their needs.

In modern Learning Management Systems, however, support for video remains incomplete

Recognizing the growing demand for video, a few LMS providers have begun developing select video capabilities in order to expand their core feature sets and create new revenue streams. Among these are the four dominant LMS vendors: Blackboard, Moodle, Canvas, and Brightspace. Together, these vendors now comprise nearly 80% of the total LMS market, and more than 85% of the new learning management systems installed in the last year.

Below, we've charted how these four systems support video, and how the video add-ons they offer compare with Panopto, a purpose-built platform for video designed to be integrated with learning management systems. Beneath these charts, you'll find a detailed summary of each LMS vendor's available video capabilities.

As you'll see, there is substantial variance in how these systems support video, and even as an add-on, support for video in today's modern LMS options is still incomplete. Given the importance of video to the student learning experience and the broad set of video-specific product requirements, institutions should plan to either conduct a separate video platform RFP, or dedicate a section of their LMS RFP to video and include video platform vendors in that process.

Charting the video capabilities offered as add-ons to the four largest LMS solutions

There is a long list of required features for supporting classroom video at scale. In this report, we've grouped them into nine overarching categories, defining each as follows:

Recording. The features in a video solution intended for capturing video and audio. Considered in this group are questions of flexibility (how many video sources may be recorded simultaneously), ease-of-use (device setup, recording workflow, the ability to schedule recordings in advance), and quality (technical considerations that improve the viewing experience, like maximum framerate and bitrate).

Webcasting. Features designed for broadcasting a video live online. Considerations include technical concerns around quality and reliability, as well as the availability of interactive features including the ability of viewers to ask questions or take notes.

Mobile Apps. The availability and extent of features offered in native apps for iOS and Android. Considerations include viewing capabilities (whether playback is tailored for the mobile device, and whether interactive features like search, notes, and questions are available for mobile viewers), as well as video production and management features (whether video can be recorded and/or uploaded directly from the device, and the extent to which other video management features are available on the app).

Editing. Features designed for editing the videos produced and/or uploaded to the system. Considerations include basic functionality like trimming segments and splicing in other recordings, advanced functionality like export for editing with professional software, and ease-of-use given the often complex nature of traditional video editing.

Analytics. Features designed to monitor and report on the activity of the system. Considerations include features for reporting on individual video and individual user activities, monitoring full-library usage, and connection and/or export of data to third party analytics solutions.

Transcoding. Features designed to convert video files into formats universally playable on any device. Considerations include the breadth of file types a system supports and whether the workflows required to make each conversion are manual or automated.

Reliable Playback. Features designed to ensure video files will be played efficiently, live or on-demand, with minimal buffering and/or lag time. Considerations include support for adaptive bitrate streaming and integration with bandwidth management systems like WAN optimization solutions and content delivery networks (CDNs).

Secure Storage. Features designed to provide a centralized library for video storage. Considerations include the library's ability to scale as the number of videos stored there grows, the availability of hosting options, integrations with LMS or other single sign-on (SSO) technologies for secure access, and ease-of-use in file management and sharing.

Search. Features intended to allow viewers to find specific content in specific recordings. Considerations include the extent to which videos are indexed for words both spoken and shown on-screen, whether search results indicate exactly when in each recording the keyword(s) appear, and the extent to which viewers can search across all videos in the library.

Further examining the video capabilities offered as add-ons to the four largest LMS solutions

Blackboard Collaborate

An early leader in the industry, Blackboard remains the most popular learning management system when measured by market share.

Blackboard's video offering, Blackboard Collaborate, is an interactive web conferencing system. Akin to Skype or WebEx, the system is built on the WebRTC standard and is meant to allow instructors to stream classes online as they happen.

As a web conferencing tool, Blackboard Collaborate is comparable to the other such tools in the market, capable of streaming webcam video from up to five presenters, and allowing live on-screen annotation of PowerPoint and PDFs files.

While it is possible to record a Collaborate session, Blackboard offers no support for managing the resulting video, or making its contents searchable and shareable. Even embedding a Blackboard Collaborate video in course materials requires first uploading the file to an outside platform like Panopto or YouTube, then using that service's embed code to add the file to a Blackboard class.

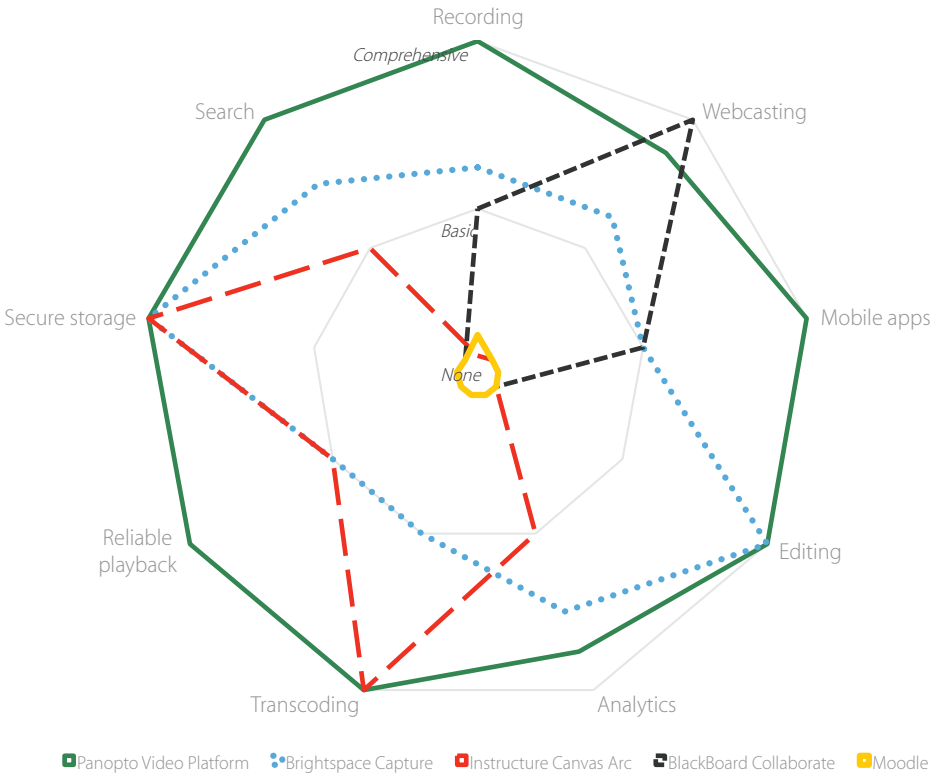
Schools interested in Collaborate should compare it with other web conferencing tools, such as Citrix's GoToMeeting, Cisco's WebEx, Microsoft's Skype, Google's Hangouts, or BlueJeans Video.

Schools should also take time to understand the differences in how web conferencing tools and video platforms support video, especially for live broadcasting. In prioritizing the real-time, "synchronous" video needed for back-and-forth conversation, web conferencing tools often limit other elements to maintain low latency. Depending on the tool, that may mean capping attendance, limiting the size or resolution of the video or screen that can be captured, requiring dedicated software and apps to view the broadcast, or a combination of all three.

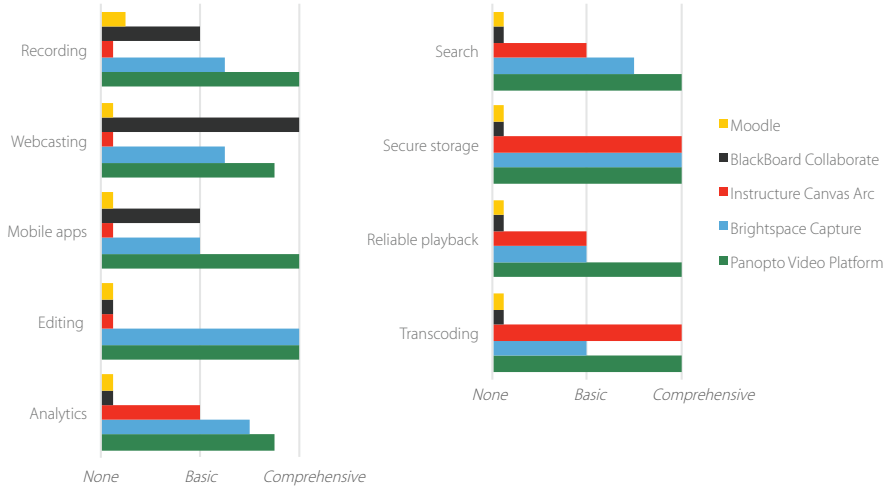
By contrast, video platforms typically stream "asynchronous" video, utilizing a slight lag to enable the video to stream live in HD to an unlimited audience over the internet via any web browser. This short delay is not unlike the few-second broadcast delay standard in television transmission. A more detailed review of the differences and similarities of video conferencing and video platforms can be found here.

Given that most applications for video on campus rely on on-demand access to recorded content, Blackboard's focus on synchronous web conferencing will offer a small subset of the capabilities required for most institutions.

FIGURE 1 Support for Video Capabilities in the LMS: Complete Feature Comparison



Support for video capabilities in the LMS: Individual feature breakdown



Source: Panopto

For addressing the broader set of video needs, including storage, management, content search, editing, and analytics, institutions should evaluate a dedicated education video platform that offers integration with Blackboard.

Arc for Instructure Canvas

Taking a different approach entirely is Instructure, today's fastest growing LMS vendor, and the catalyst behind much of the change in the market. Instructure has announced its own add-on for video in Canvas LMS, called Arc.

Akin to YouTube, Arc enables schools to upload and manage video content in a central library. Instructors are able to embed videos in their Canvas courses, and students can comment on videos and leave feedback directly in the timeline.

Arc, however, does not include the majority of expected video capabilities, offering no support for recording, live streaming, video content search, or editing.

Without these features, Arc will require help from one or more point solutions in order to support most of the common use cases for video in the classroom. Institutions that opt for Arc will need to identify which additional tools will need to be implemented in classrooms for recording and broadcasting lectures and events, which will be installed on faculty laptops to support flipped classrooms and screen recordings, and which will be made available to students for capturing presentations and assignments.

Instructure has just released Arc publicly after 10 months in beta testing. It remains to be seen whether the service will evolve in the years ahead to more holistically support the range of uses for video in the classroom.

Brightspace Capture

Although the smallest of the four big LMS vendors in terms of market adoption, Desire2Learn offers the most extensive support for video in its Brightspace Capture option.

Built on the technology Desire2Learn acquired when it bought Captual in 2011, Brightspace Capture allows for webcam and screen recording, scheduled recording and webcasting, video upload, file storage, editing, and embedding.

While Capture may be a more well-rounded solution than Collaborate or Arc, institutions may still find its features do not support a number of important classroom video applications. Most notably, Capture recordings and webcasts are limited to capturing only a single camera and computer screen. Common scenarios like lab demonstrations, large events, and student role-play activities that benefit from multiple camera angles will be limited to one.

Further, the breadth of Capture's recording capabilities comes in part by adding complexity. Costs and installation requirements depend on whether schools opt to purchase dedicated recording appliances (which are called Capture Stations and are permanently installed in a classroom and thus not available for other uses), SaaS recorders (called Capture Encoders, which Brightspace notes may not be able to capture the highest quality video), or some combination of both. And since instructors interact differently with the Stations than they do with the Encoders, the potential for confusion and increased tech support requests exists.

Capture also relies on a manual publishing process, leaving much of the work to the instructor. After recording, the video must be manually saved, uploaded, and embedded into a class, and instructors must be connected to their network throughout the process or the upload will fail. Should an instructor miss any step, or should an instructor's local or VPN network connection falter, students won't be able to access the video.

File storage limits may present additional challenges for institutions that adopt Capture. For example, a 16-minute recording will result in a file approximately 1GB in size. Given that Brightspace contracts typically limit maximum file sizes to between 500MB/FTE and 1GB/FTE, institutions may find that recording 60- and 90-minute lectures will quickly lead to exceeding storage capacity. Schools interested in Capture should discuss the costs of adding storage capacity, and factor the projected growth of their video libraries into their total cost of ownership calculations.

Similarly, schools considering Capture should review the ability of their existing network infrastructures to support any growth in video streaming. While Capture does offer high-definition and standard-definition playback options to help

save bandwidth, those options are selected by the viewer and not the network. Furthermore, playing videos on Capture is done entirely with single bit-rate streaming and progressive download. This means that videos won't automatically adapt to network speed, and instead will buffer as the video attempts to download over slow connections. Progressive download is also often impractical for video playback on mobile devices, as it requires the entire video (which can be several gigabytes in size) to download to a phone or tablet with limited storage.

Capture's video delivery was the default process for video in the mid-2000s, but today that is no longer the case. Adaptive bitrate streaming processes multiple versions of a video simultaneously and intelligently switches between them to optimize bandwidth and visual quality. And a network of technical infrastructure including content delivery networks, WAN optimization systems, and edge caching servers now exist to speed along the process of delivering complex files like video. Given that video viewership by students spikes around midterms and finals, relying on Capture's single-bitrate, progressive download may result in increased pressure on the campus network.

While its recording capabilities rise above that of its peers, the complexity and technical limitations of Brightspace Capture will remain challenges for any campus AV or IT team seeking to make video easier at scale. As most video platforms for higher education already have ready-made integrations for Brightspace, many institutions will find that dedicated video platforms will offer a better solution without adding complexity to the LMS.

And finally, Moodle

Moodle has chosen to forgo video almost entirely. Officially, Moodle supports embedding or linking to videos from other video platforms, and the solution has no native features to enable institutions to record, stream, manage, or share video.

As an open source product, Moodle does have an unofficial video solution in PoodLL. This add-on, however, is limited, offering only the ability to record a single video stream with no secondary window for slides or computer screens. Further, as of this writing, all multimedia content produced with PoodLL is hosted on a server in Tokyo, which may slow video access and load times for students located in other geographies.

Why is video not a standard LMS feature by now?

Given the importance of video to the student learning experience, and the need for video to be tightly integrated into the LMS, it may be surprising that end-to-end support for video isn't already built into all of the major learning management systems.

The unique challenge of video engineering is carried in the promise of video itself: we expect that by pressing record, we'll create a carbon-copy of the activities that follow, including every intricacy of the way we move, the words we speak, and the images we show.

For a video solution, that translates into technical requirements an order of magnitude more complex than those needed for processing text-based content and images. And whereas formatting irregularities or color issues are something the human eye can adapt to and still interpret in a static document or image, when a video system incorrectly processes inputs, the result is often incomprehensible or simply unplayable.

As with any other content, video engineering at its highest level can be reduced to three demands: creating the content, processing the files, and delivering the output. The challenge for a video system is executing on all three with enough precision to convince the human eye and ear — and doing so without the benefit of any widely adopted technical standards or languages.

Recording offers the easiest illustration. Literally tens of thousands of cameras are available for recording, from expensive and complex specialty tools to the cheap webcams now given away at tradeshow booths. Depending on their make, model, age, and operating systems, they all encode content differently even under optimal circumstances, and all respond differently to system overloads or CPU event spikes. The video system must be engineered to understand and manage each, as well as to proactively check for errors in sample time reports to ensure audio and video remain synced. Should a video system allow for even a 1 millisecond loss per minute, that loss will become noticeable to viewers within a few minutes and will make the recording unwatchable over a period of 60-90 minutes.

The engineering challenge, however, isn't limited to syncing recording sources. Much the way every camera presents a possible stumbling block for recording accuracy, every video file format and compression algorithm ("codec") create their own hurdles for performance and management. There are today several hundred video and audio standards, codecs, and implementations, each governed independently, updated irregularly, and like any code, none perfectly free of bugs and errors. Further complicating matters is the need for supporting historical codecs in order to allow for previously-captured videos to be uploaded and shared.

This means that for any video system, the framework used for processing video and reviewing performance is essential. If a system will only support a single video stream (the way YouTube works, for example), this framework may be relatively straightforward. But the engineering becomes much more complex when solutions are tasked with managing files with multiple simultaneous video streams, and/or composite recordings with one or more videos as well as slides, interactive features, and other elements commonly expected in the classroom video playback experience.

And beyond the intricacies of developing a video solution, just assuring the quality of ongoing performance offers its own set of challenges. The organizations that create new cameras and new codecs rarely if ever notify video systems of updates to their outputs and standards. Instead, it falls to the video solution to test and retest to ensure recordings display correctly. Given the number of inputs to check, this is a labor-heavy requirement even when things work as they should.

When errors in playback do inevitably arise, they can come from anywhere. Recent examples include systemic changes in Microsoft's Windows 2016 Anniversary Update that inadvertently rendered Logitech webcams incompatible with the operating system, or Apple's decision to change the order in which the headers in video file metadata were processed, resulting in minor corruption across every segment of video streamed to iOS devices. Identifying the root cause and solution to any error can demand many days' worth of time from every subject matter expert on the video platform provider's team until the issue can be isolated.

From a business perspective, getting video right requires both technically specialized knowledge and a team large and experienced enough to address the myriad of engineering challenges individually. Historically, vendors making this leap have done so in one of three ways:

- Staffing up a team of 20 or more engineers with expertise in video, then starting a multi-year process of building the capabilities from scratch.
- Acquiring another video vendor or platform and integrating it into an existing product offering (itself often a costly and time-intensive process).
- Foregoing native features and instead supporting integration with existing video vendors and platforms.

Even with adequate time and funding available, there is no guarantee that any new video solution will be well received by the market. Which is why, while LMS vendors have begun to explore first-party video capabilities, every learning management system still maintains tight integrations with today's video platforms.

Keep these points in mind when you review built-in LMS video capabilities

Going with a native solution for video may be tempting at first, but just as they would for any other major technology investment, institutions must do their homework. Keep the following points in mind as you consider any video solution:

- The broad and growing list of uses for video on campus requires a comprehensive set of video capabilities.
- Video engineering is not a core competency for even the most forward-looking LMS vendors. This means that capabilities already available in most video platforms will either take years for the LMS vendor to develop, or will simply be omitted. This may put schools at greater risk of falling behind the technology curve, forcing them to spend more to bridge future gaps.
- Integrating a video platform with an LMS is easy. The Panopto support team generally expects the process of working through integration with any modern LMS to take less than one hour.

What to look for in a complete video solution for your institution

Regardless of how an institution is using video today, the amount of video it creates and the number of use cases for video it embraces will only grow. Leaving support for video to a web of point solutions or an incomplete set of LMS features will lead to faculty and student frustration — not to mention increase the workload on campus IT and academic technology teams.

It's important to invest in a video platform that can grow with your institution. With that goal in mind, here are 15 considerations to plan for in order to support video in your LMS:

Out of the Box Integration. Your LMS is still the hub for your classroom, and any additional classroom technology should be able to connect to that portal with ease. Modern video platforms typically offer ready-made integrations for most LMS solutions, with quick initial setup processes and the ability to provision new courses, schedule recordings, automate publishing, and establish a rolling sync with your LMS single sign-on rosters.

Flexible Recording Capabilities. With so many different ways to apply video in the classroom, institutions should seek out platforms that support a wide variety of recording possibilities. Video platforms should be able to record with any device that can capture video, from inexpensive webcams to high-end camcorders and other specialty equipment like document cameras, video-enabled medical equipment, smart whiteboards, and other tools. Along with basic audio+screen capture, a video platform should accommodate more complex scenarios requiring multiple cameras or recording simultaneously from multiple locations.

Ability to Schedule Recordings in Advance. Automating recording makes video easier for instructors to use and for IT staff to support. Look for systems that enable administrators to upload class schedules in batch at the start of each quarter, making it even easier to plan ahead and to scale up across campus.

Support for Both On-Demand and Live Video Streaming. In most modern video platforms, live streaming a classroom or event typically requires only one extra click. And just like any other recording, those live streams can be scheduled in advance and enable viewers to take notes and ask questions directly in the video player. For institutions where budgeting for technology is a regular concern, meeting this need will make it possible to avoid paying for two solutions and instead purchase just one.

Reliable Video Playback on Any Device. There are almost countless devices available for viewing video, and your institution needs to be able to support them all (or risk being overrun with student complaints of "file type unsupported" errors). A strong video solution should be able to process video files recorded in any format, then automatically reformat them ("transcode" is the industry jargon) to be playable on any device.

Comprehensive Video Content Search. Lectures are long, and filled with important details from start to finish. Search based on titles and tags may work for the short clips on YouTube, but for 60- and 90-minute classes, they don't offer students enough help. Modern video platforms can offer much more. Panopto's Smart Search, regularly cited as the industry's best, indexes a combination of automatic speech recognition, optical character recognition, traditional metadata, and uploaded slide and transcript details to enable viewers to find and instantly fast-forward to any word spoken or shown in any video.

Detailed Video Analytics. For faculty, analytics offers insights into which students are watching which videos, and which recordings are watched most. Instructors can use that information to revisit concepts students seek out more often, and to inform future lesson plans. Administrators, meanwhile, will rely on analytics to monitor the activity, health, and size of the video library, watching real-time reports on videos, users, playlists, servers, and other details important to the performance of your overall campus IT ecosystem.

Simple Video Editing. Most video editing tools fall victim to one of two extremes: they're either overly complex and impossible for faculty to learn, or their functionality is limited. Most video platforms offer a middle ground, making it easy to trim unwanted moments and splice in other videos, and providing the option to export the video for more detailed scrubbing with professional editing software like PowerDirector or Adobe Premier.

Robust Mobile Applications. Today's students are "mobile-first," often resorting to a laptop only when their smartphone fails. Providing a rich mobile viewing experience is table stakes for any video solution. Many of today's video platforms go

much further, offering recording, uploading, and management features in their mobile applications. Panopto's native iOS and Android applications also include Remote Control, a unique feature that allows administrators to manage scheduled recordings and even control the recording equipment in provisioned classrooms remotely from a smartphone.

Network-Friendly Streaming. Without sufficient planning, spikes in video viewership (which are common enough to be predictable at exam times) can overwhelm networks. To date, no LMS has developed the infrastructure required to ensure a high volume of requests for video won't overload your servers. Modern video platforms, however, can provide an option to fit any network. Panopto, in particular, utilizes modern, HLS-based streaming that leverages the architecture of the internet and partners with existing WAN optimization and content delivery networks (CDNs) to make streaming video both more efficient and more reliable.

Ability to Scale. As of this writing, the University of Arizona captures 23,000 hours of video every month (case study). The UK's University of Essex records 80,000 hours per school year (case study). Given that recording a single minute of video creates a 120MB file, storage capacity and the associated costs are important concerns when it comes to supporting video. Most LMS vendors still set file size limitations based on the needs of smaller files like documents and images — and even when hosting in the cloud, still charge for extra storage space. Video platforms, however, are purpose-built for larger files, and can make solving the challenges of scaling significantly easier. And along with file storage concerns, institutions should consider the ease of provisioning classrooms for recording — software-based solutions in particular offer the ability to implement video in a virtually unlimited number of locations overnight, as the UK's University of Southampton has described.

Cloud and On-Premises Deployment Options. You should be able to host your videos in whatever way makes the most sense for your institution. Having options for deployment will make it easier to support scaling your video solution and managing a growing library of video over time, as well as enable you to manage service level agreements, security, and any other internal or external regulatory requirements that affect your IT ecosystem.

Reliable Architecture. No IT environment is 100% stable. Not long ago, Thomas Jefferson University saw a key server malfunction only days before midterms. Panopto's failsafe recording, however, ensured every scheduled lecture was still captured, then uploaded everything when the server finally recovered three days later (case study). Institutions should seek out video technology that works even when other machines don't. Key capabilities include failsafe recording, automatic upload (ensuring files aren't orphaned if the presenter's computer is switched off too early), and redundant hosting ("mirrored" backups of your video library hosted in separate physical locations, ensuring that if one server falters another will be instantly available).

Accessibility Made Easy. As lecture capture in particular has gone mainstream in higher education, accessibility has become a key concern in the management and delivery of classroom video. This point has been underscored by recent lawsuits against Harvard and MIT, finding that classroom recordings must be ADA Section 508 compliant. At a minimum, schools should seek out video systems that make video captions easy to request, add, and view. For improved support and flexibility, institutions should look for solutions that provide multiple options for generating and uploading captions, and enable administrators to request captions automatically. Schools should also bear in mind that accessibility does not begin and end with captions — usability-oriented features including keyboard accessibility, screen reader support, variable speed playback, interface adherence to user-configured settings, and overall adherence to Web Content Accessibility Guidelines, all play important roles in ensuring an accessible classroom video experience.

An Integrated Feature Set with Predictable Pricing. As for any investment, institutions should insist on calculating total costs of ownership for any video solution. Essential features that are sold as add-ons should be factored in, as should be any incremental fees that appear likely to be incurred for storage, streaming, or support. Some vendors do provide transparency — Panopto, for example, provides one product at one price. Institutions get the tools needed to fully support video, and costs are set according to full time enrollment (instead of storage capacity) in order to encourage widespread use without adding to costs.

Video systems should be selected with the same attention to detail as are learning management systems

Video is no longer a "nice-to-have" in higher education. It's a necessity, increasingly expected by both students and faculty.

It may be tempting to assume that, as video has become a normal part of the learning experience, its requirements can be sufficiently supported with functionality provided by the LMS vendor. But video technology has a broad and unique set of requirements that go beyond the course management, document sharing, and student management capabilities traditionally served by the LMS.

A handful of LMS providers have recognized the rising importance of video in higher education and have sought to add to their revenue streams by rolling out a small set of video features. But these add-ons support at most a fraction of the capabilities now expected of video in today's classrooms.

As video use continues to proliferate in the classroom, institutions need to look instead for a flexible and comprehensive video platform that will integrate with their chosen LMS. With integrations between most modern video platforms and learning management systems already developed and readily available, opting simply to connect these two systems two will make video easier use, easier to support, and easier to afford.

More importantly, by opting to integrate a video platform with a learning management system, institutions are able to implement two best of breed systems, rather than being forced to search for a single option with the fewest tradeoffs.

Source: Panopto

About Panopto

Panopto was founded in 2007 by technology entrepreneurs and software design veterans at Carnegie Mellon University's School of Computer Science, with the goal of making video easier and more affordable for higher education by embracing commodity video recording tools and cloud-based storage.

Now the fastest-growing academic video platform worldwide, Panopto is used by leading institutions to capture lectures, record flipped classroom videos, train faculty, capture student presentations, and manage all of their video content.

Panopto is designed to provide an end-to-end platform for all your video use cases.

Our video capture tools enable the recording of one or multiple video feeds from nearly any recording device. Live streaming is enabled with a single extra click. Recordings and live streams can be scheduled in advance. And existing videos in virtually any format can be uploaded to Panopto's video content management system (VCMS).

The VCMS makes video management easy, in the cloud or on premises. Panopto handles the technical work of transcoding and optimizing videos for playback automatically. The platform includes rich analytics and editing capabilities. And no video platform is more network-friendly than Panopto, with modern video streaming built on HLS and compatible with a range of network optimization technologies.

And Panopto makes video more useful for teaching and sharing information. Our unique Smart Search technology enables viewers to instantly find and fast forward to any word spoken or shown in any video. Our interactive video players enable students to take notes and ask questions. And our native mobile iOS and Android apps enable faculty and students to take your video library with them – not just for viewing, but for recording and managing video too.

Panopto includes integrations for all of today's leading LMS solutions, as well as LTI tools for simple connections, and an open, documented, fully supported API for custom development.

Gartner Research has now recognized Panopto as a "Leader" three years in a row in its Magic Quadrant for Video Content Management. We've also been named a University Business Readers' Choice Top Product, and a Campus Technology Readers' Choice Winner.

If you'd like to see Panopto for yourself, you can try it before you invest. Contact our team for a free 30 day trial – no contracts and no commitments.