

Drag and Drop Streaming: the Next Revolution in E-Learning

Laura Guerra
University of Houston
College of Natural Sciences and Mathematics
011.832.836.9892
laura@vnetwork.com

Ovgu Dogangun
University of Houston
College of Natural Sciences and Mathematics
011.713.743.1618
odogangun@uh.edu

ABSTRACT

The Virtual Technology Center at the University of Houston has developed a web application, called VClass, that completely automates the process of capturing and publishing in-class lectures on the web using nothing more than a standard computer.

The captured lectures are distributed to students as streaming video that includes audio, notes, and any projected media.

Beyond classroom capture technology, VNet also features numerous course management features such as assignment posting, discussion forums, and announcements.

After just 2 years more than 200 courses are using VNet at the University of Houston to publish more than 11,000 resources. VNet receives over 1,200 unique users daily from all over the world – including Venezuela, Brazil, China, South Africa, France, Mexico and Iraq.

This presentation will cover how VClass functions and how VClass has impacted teaching and learning at the University of Houston.

Categories and Subject Descriptors

H.5.1 [Multimedia Information Systems]:
Evaluation/methodology, Video, Audio input/output.

General Terms

Management, Design, Human Factors, Standardization.

Keywords

University of Houston, VClass, streaming, distance education.

1. INTRODUCTION

When students miss a lecture, they typically beg a classmate to borrow the notes or hope that there is no quiz the next day. At institutions like the University of Houston (UH), students simply log onto the web. In VClass, digitally captured lectures from over 100 courses are streamed within moments of a class meeting.

The University of Houston is using a web-based, content

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management system, developed in-house that completely automates the process of publishing lectures in a streaming format. In just three simple steps professors are able to capture and publish lectures on-line using only a standard computer. The result is a streaming version of their lecture displaying not only what was said in class, but also what was displayed on the overhead and what was written on the board. Students can access the streaming version of the lecture through dial up or broadband and watch it on-line or download it to their computers or iPods.

After 2 years of offering VClass to faculty, more than 200 courses at UH are using VClass to publish streaming versions of lectures, PowerPoint presentations, assignments (in Word, Acrobat, Excel formats), and many other types of information. Because VClass does not require a camera in the room and the professor can do the recording on their own, the staff cost for running this project has been extremely low. This technology is being used at UH for class supplementation in order to improve student outcomes and course flexibility. It is also being used in many instances for blended and fully on-line courses with great success.

Our objectives for this presentation are: present a new approach to deliver recorded streaming lectures that does not require extensive technical support personnel or expensive equipment which are usually required for traditional streaming methods; show how Drag and Drop streaming has been key in getting professors to use emerging technologies like tablet PCs to record and publish their lectures daily for their students; demonstrate how daily lecture's recording improved the educational environment at numerous US universities using VClass; and discuss how daily recording of real classes can be an instrumental tool to help increase not only the number of long distance education courses but the quality and effectiveness of these courses [2].

2. VCLASS: A NEW APPROACH FOR DELIVERING STREAMING LECTURES

When this project first started, the Virtual Technology Center staff sought a way to record lectures and publish them online in an efficient and sophisticated manner. We knew we needed to minimize human intervention and effort in this process due to traditionally slow adoption rates by educators for new technology.

2.1 Using VClass for Audio/Video Capture:

2.1.1 Considerations

We realized that solutions that require a video camera for each recording greatly limited the use of this technology. For instance, if we wished to capture on video the professor, and any presentation media that might be used (slides, black board) intelligently, we would need a person to operate the camera. Thus, for universities, schools and colleges with several courses being

taught simultaneously this would require high quality recording equipment and at least one person for each class. There would also be other things needed, such a mount for the camera and a studio for the recording and editing. This solution is quite costly and non-practical and should give the reader some idea of the issues faced in capturing a class lecture.

Additionally, after interviewing students, we learned that from their viewpoint the most important parts of the lecture include: what the professor said, showed, and wrote. Surprisingly, for most classes, actually seeing the professor's face did not add significant value to the learning process and often reduced the visual clarity of the material being presented on the board or overhead.

2.1.2 VClass Solution

The solution that VClass offers to facilitate the recording of the lectures includes the usage of tablet PC's for recording. "Tablet PC's are computers that are equipped with a sensitive screen designed to interact with a complementary pen. Tablet PCs are fully-functional laptop PCs and more. You can use the pen directly on the screen just as you would a mouse to do things like select, drag, and open files; or in place of a keyboard to handwrite notes and communication. Unlike a touch screen, the Tablet PC screen only receives information from a special pen. It will not take information from your finger or your shirt sleeve—so you can rest your wrist on the screen and write naturally [3]."

Instead of using a camera, we decided to use desktop capturing software along with a wireless microphone. Desktop capturing software such as CamStudio (PC) or iShowU (Mac) records everything being shown on the desktop thus, everything the professor shows. This can include power point presentations, web browsing, and other subject specific applications. The wireless microphone allows professors to move freely around the classroom. By using a Tablet PC or adding a Wacom tablet to their existing computer, professors are able to capture all their handwriting, essentially replacing the whiteboard with a computer.

2.2 Recording Hardware and Manpower

2.2.1 Considerations

Many automated streaming solutions require specialized hardware, which can be very expensive. When considering our plans for a large scale implementation, we found these solutions to be unaffordable. Our review of options currently on the market range from \$5,000 – \$35,000 per classroom. To equip 200 courses with these capabilities, costs range from \$500,000 to \$3 million.

2.2.2 VClass Solution

UH uses a variety of solutions depending on the needs of each professor. For courses that do not require the instructor to write on the board, there is no specialized hardware needed. They can use their standard computer. For professors that require the ability to write in the classroom there are a number of options. One is to purchase a Tablet PC for each professor or for each department, which can be shared by numerous professors. The second option is purchasing a Wacom tablet to be used with a faculty member's existing laptop, which can cost as low as \$100. Wacom tablets convert any computer to a tablet PC, providing professors the ability to write on their computer.

2.3 Video Editing and Publishing

2.3.1 Considerations

Manual processing and hinting can take up to several hours for just one class. Publishing resources on the web has traditionally entailed hiring a web-site developer to link the appropriate files to a web page.

2.3.2 VClass Solution

VClass, using scripting technology, automates the entire process of compression, hinting, and publishing. The hour long process requiring a skilled technician can now be done by a non-IT technology-savvy individual in a matter of minutes. The professor simply opens a web page and drags and drops the avi or mov file onto a folder on the web. Once uploaded, the videos are immediately processed into as many as 4 versions – streaming for dial-up, streaming for broadband, computer downloading, and iPod downloading.

The professors decide which formats they would like to make available. One major advantage of streaming versus downloading is that streaming files can be seen even on very slow connections. Downloading a file can take a long time depending on a person's Internet connection.

3. OTHER CONSIDERATIONS

3.1 Bandwidth Issues

Campuses may have high-speed Internet access. However, off campus locations still suffer from lack of bandwidth. VClass caters to people with all kinds of Internet connection speeds as low as dialup.

3.2 Architecture

Professors manage their files in a course management system. On their course page they can post assignments, announcements, calendar events, and upload any type of file (including pdf, word, excel, mov, avi). VClass was designed to work like a familiar desktop environment, allowing professors to create, delete, rename, and update files.

3.3 User-Friendly Web Interface

The key goal in our web interface was to keep it simple, so that it can be used instantly without any prior training. Every function provided is made obvious in the interface.

4. FUTURE AIMS AND GOALS

4.1 Providing Subtitles

A new goal for VClass is to implant subtitles in different languages for recorded lectures using sophisticated speech recognition technology. In essence, lectures recorded in one language would be made available in several different languages using captioning. The key is speech recognition technology and overlapping the captions with the corresponding video frames.

4.2 Advanced Search

Captioning will also allow users to search on the audible content of the video.

5. VCLASS' IMPACT ON THE EDUCATIONAL ENVIRONMENT

5.1 Faculty Experience

Ease of use is an important factor when attempting to incorporate technology into any system. VClass digital streaming has evolved

and improved over the semesters that it has been used at the University of Houston. At this point there is minimal contact with IT personnel as the system is very user-friendly. Using tablet PCs and the associated electronic pen have allowed the instructors to teach facing the class with the benefits of maintaining eye contact with students [3]. In addition, having access to recorded lectures allows instructors the opportunity to review and improve their presentation techniques. In courses taught thus far, there does not appear to be any obvious erosion of attendance. Faculty, who initially expressed skepticism when first asked to use the system, have largely embraced VClass despite the initial problems experienced during the early semesters of system development. At this point, operational problems are minimal, and faculty who are open to trying new teaching experiences will quickly adapt to this teaching innovation. [10].

5.2 Student Experience

Discussions with students have revealed that they like the availability of the lectures in the digitally streamed VClass format and they use this resource in three basic ways.

1. Students spot-check certain segments of the class when they have a specific query or problem understanding the material.
2. Students view the entire lecture. This typically occurs when students miss a class. In one case a student who traveled to China for a family matter was able to keep up with her class. In a second example, a junior college student using VClass was able to continue and complete classes after his unit was posted to Iraq.
3. A few students have indicated that they viewed up to as many as 14 lectures prior to a major exam. Students commonly performed screen captures to generate a hard copy of slides used in the classroom presentation and incorporated these documents into their class notes.

Outside UH a number of other institutions are using or plan to start using VClass in the near future. These include Texas A&M University Chemical Engineering department, Wharton County Junior College, University of Puerto Rico, Texas Southern University, Vanguard College Preparatory School, and half a dozen others.

Aside from the well-received increased flexibility VClass affords, participating professors have noticed improved grades on exams testing certain challenging concepts. This observation coincides with finding at other institutions. In the study of classroom capture supplementation at Georgia Institute of Technology, almost 70% of students stated that the technology made the class more interesting and helped them pay better attention during the lecture [13]. Case study results from Tegrity and Apreso, two of the largest classroom capture technology providers, support these conclusions [11, 12].

6. IMPLICATIONS FOR LONG-DISTANCE LEARNING

Distance learning via the web is quickly expanding at many academic institutions. In the United States, online student enrollments increased from 2.4 million in 2005 to 3.2 million in 2006, an increase of 33% [5].

According to the 2006 Sloan Consortium study of higher education [5]:

- Over 58% of institutions surveyed viewed online education as critical to their long-term strategy
- 67% expressed a desire to increase the number of fully online classes and 61% hybrid offerings
- 90% offer distance education or plan to in the next three years and intend to use on demand computer-based instruction as the primary mode of delivery

One of the largest drivers for attaining class capture technology as both an in-class supplement and a tool for long distance education is the vast presence of non-traditional students. The National Center for Education Statistics states that that 73% of undergraduates are now considered nontraditional in one way or another [6]. These students may have families and work substantially more during the school year than their traditional cohorts. They make up the majority of attendees at community colleges and account for large student bodies at high enrollment universities. Use of distance education is also high for teaching Advanced Placement or college-level courses or courses otherwise not available at school especially in rural districts.

The two main barriers for delaying the creation of on-line courses at most institutions are the prohibitive costs of technology and time-limitations [8,1]. VClass has allowed us to overcome these barriers and keep up with the growing trend toward on-line learning. Currently VClass is being used at UH to offer courses to residents of countries such as Mexico, Venezuela, Brazil, and South Africa. VClass has allowed professors to offer these courses without requiring additional resources since they are simply capturing the class they do every day for their in-class students. Many professors are also using VClass for the creation of hybrid and blended learning courses with great success [9].

7. CONCLUSION

The new opportunities that VClass brings to faculty to deliver recorded live lectures via Web has proven to be an extremely useful and affordable means for improving the quantity and the quality of course materials used for E-learning. Despite its powerful capabilities, VClass greatly reduces the cost and complexity of bringing advanced, Internet-based services to students, faculty, and staff. VClass helps overcome the spatial and time limitations of the classroom environment, adding a new channel of communication between student and teacher, and greatly enhancing the learning experience. This ease of use has converted many faculty skeptics who initially resisted the implementation of this system [4].

8. ACKNOWLEDGMENTS

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