# INDEXED, CAPTIONED, SEARCHABLE VIDEOS: ASSESSMENT REPORT[1]

Lecia Barker

School of Information

The University of Texas at Austin

Austin, TX, 78701, USA

http://www.ischool.utexas.edu

Jaspal Subhlok

Computer Science Department

University of Houston

Houston, TX, 77204, USA

http://www.cs.uh.edu

## Abstract

At the University of Houston, faculty in the sciences and mathematics use tablet PCs to record, annotate, and project their lectures. Students have access to the videos produced for studying. This report describes a multi-semester assessment of student use of video lectures, focused on perceived value, influence on learning outcomes, devices used, and the videos' indexing and search functions. Online surveys were administered to 2,394 biology, chemistry, computer science, geology, and mathematics students from spring 2009 to spring 2011. Students reported using the videos to review before a test or quiz, to make up for a missed class, and to review difficult concepts. Course enrollment, class attendance, and longer commute times were positively associated with video use. A strong majority of students perceived the videos as very valuable for clarifying material, reviewing and studying, and getting the grade they hoped for. To enhance the videos, indexing with logical index points and search for video segments by keyword were added. Students overwhelmingly felt that the index was helpful, intuitive, easy to use, and that index points were appropriate. Likewise, most students who used the search function found it easy to use and felt that it helped them find the part of the video they were looking for. The value that students place on video lectures exceeds

expectations.

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**Abstract**

At the University of Houston, faculty in the sciences and mathematics use tablet PCs to record, annotate, and project their lectures. Students have access to the videos produced for studying. This report describes a multi-semester assessment of student use of video lectures, focused on perceived value, influence on learning outcomes, devices used, and the videos' indexing and search functions. Online surveys were administered to 2,394 biology, chemistry, computer science, geology, and mathematics students from spring 2009 to spring 2011. Students reported using the videos to review before a test or quiz, to make up for a missed class, and to review difficult concepts. Course enrollment, class attendance, and longer commute times were positively associated with video use. A strong majority of students perceived the videos as very valuable for clarifying material, reviewing and studying, and getting the grade they hoped for. To enhance the videos, indexing with logical index points and search for video segments by keyword were added. Students overwhelmingly felt that the index was helpful, intuitive, easy to use, and that index points were appropriate. Likewise, most students who used the search function found it easy to use and felt that it helped them find the part of the video they were looking for. The value that students place on video lectures exceeds expectations.

**Index Terms**

video lectures, assessment, student factors, index, search

## I.     INTRODUCTION, ASSESSMENT GOALS

At the University of Houston, video lectures have been used in the sciences and mathematics for more than a decade. Faculty use tAablet PCs to record, annotate, and project their lectures. The resulting videos are not videos of the instructor, but rather of the instructor's voice on audio and whatever was projected on video. In 2008, Professor Jaspal Subhlok and colleagues received funding from the National Science Foundation to add indexing, captioning, and search capability to the videos: "ICS Videos." Dr. Lecia Barker, University of Texas at Austin, conducted assessment from the viewpoint of students.

We assessed the lecture videos to understand:

1)   Student perceptions of the value added by making videos available, how students use the videos, perceived influence on student learning outcomes, which devices students used, their format preferences, and their access to high-speed Internet at home.

2)   Student perceptions and use, specifically about the newly implemented index and

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[2] Lecia Barker is associated with the University of Texas at Austin.

search functions.

This report describes assessment of student use and perceived value of ICS Videos, including value added by the index and search. The assessment method is presented, followed by the sample profile. Student usage and motivations for use are presented, followed by perceived value. The assessment of the index and search functionality follow, with recommendations presented in conclusion.

## II. ASSESSMENT METHOD

### A. *Student Survey*

A baseline survey of student use of lecture videos was developed and administered for the video framework that did not include indexing, captioning, or searching while they were under development. The goal was to provide understanding of student perceptions of value, differential use by students, relationship between video use and grade expectations and outcomes, and differences in the results of these variables across several comparison variables (individual difference variables). Comparison groups include class, class size, level of class, student grade expectations, hours students work to earn income, course load, and several other demographic variables (race/ethnicity, sex, number of dependents, marital status). The measurement of the impact of the videos on student learning was operationalized through several variables, including the student's level of preparation for the class, the nature and frequency of the use of the videos, and the perceived value of the video lectures. The development of survey items was participatory; the community of classroom video users, the development team, and the evaluation team from the pilot project were asked to contribute survey items. The pilot evaluation included several open-ended items which were of sufficient interest that they were asked of all students in this baseline survey to understand their generalizability.

The student survey items included variables categorized as: nature and frequency of usage, strength of need (how important it was to the student to do well in the class and how important video lectures were in attaining that goal), perceived value of the videos, perceived preparation for the class, expected grade, and several individual difference variables (e.g., the number of hours students work to earn income, number of credit hours, hours of studying per week, commute time, family status [e.g., single parent, number of dependents], and demographic information [sex, race/ethnicity, citizenship status, etc.]. The 2010/2011 surveys are shown in Table V. The Spring 2011 survey also asked students about their use of the index feature and search tool and how well they worked. This survey can be found in Table VI.

### B. *Faculty Survey*

Course policies and communication about the lecture videos may predict student use and perceptions. A faculty questionnaire (shown in Table VII) requested information about course enrollment; whether attendance was required; how many videos were posted, how and how often the availability of videos, the index feature, and the search tool were communicated; and the percent of quiz and exam items derived primarily from lectures.

### C. *Administration*

Surveys were administered in six terms. The initial pilot survey was developed and administered in Fall 2008; based on this pilot, an improved baseline was administered in Spring 2009. A slightly modified version of this survey was also administered in Fall 2009 and Spring 2010. The Spring 2011 survey was modified to ask a few additional questions and because responses did not vary on certain items from the first three samples, questions were removed. A total of 2,384 usable surveys were returned for the 2009, 2010, and 2011 terms, as shown in Table I below.

To increase the response rate and avoid the selection bias resulting from only capturing students who are in class on particular days (especially in the end of semester or on review days), surveys were administered online using Survey Monkey online software. Links were provided to professors with prefabricated/adaptable email scripts and professors were asked to send out the link multiple times. There is great variation in response rate by class, reflecting in part the willingness or ability of instructors to send multiple reminders to students. The overall response rate for courses for which there is enrollment data is 29%.

TABLE I.
COURSES SURVEYED AND RESPONSE

| Term | Course | Enrolled | Responded | Response Rate |
|---|---|---|---|---|
| Spring 2009 | BIOL1334 | N/A | 110 | N/A |
| | BIOL1362 | N/A | 280 | N/A |
| | BIOL3324 | N/A | 89 | N/A |
| | COSC4377 | N/A | 5 | N/A |
| | COSC6373 | N/A | 15 | N/A |
| | COSC6374 | N/A | 31 | N/A |
| | GEOL1330 | N/A | 6 | N/A |
| | GEOL1330 | N/A | 24 | N/A |
| | GEOL6376 | N/A | 7 | N/A |
| | GEOL1376 | N/A | 11 | N/A |
| | GEOL3331 | N/A | 22 | N/A |
| Fall 2009 | BIOL1334 | 475 | 106 | 22% |
| | BIOL1361 | 850 | 191 | 22% |
| | BIOL3324 | 275 | 94 | 34% |
| | BIOL4315 | 33 | 8 | 24% |
| | CHEM3331 | 170 | 37 | 22% |
| | COSC2410 | 55 | 44 | 80% |
| | COSC4393 | 5 | 1 | 20% |
| | COSC6380 | 35 | 8 | 23% |
| | GEOL1330 | 170 | 21 | 12% |
| | GEOL3330 | 68 | 10 | 15% |
| | GEOL6358 | 12 | 5 | 42% |
| | MATH1330 | 360 | 54 | 15% |
| | PHYS1321 | 41 | 11 | 27% |
| Spring 2010 | CS2402* | 43 | 16 | 37% |
| | BIOL1362 | 1000 | 136 | 14% |
| | BIOL1344 | 470 | 181 | 39% |
| | COSC1410 | 120 | 107 | 89% |
| | BIOL3324 | 220 | 102 | 46% |
| | COSC2410 | 67 | 55 | 82% |
| | COSC6385 | 48 | 17 | 35% |
| Summer 2010 | COSC1410 | 25 | 25 | 100% |
| Spring 2011 | BIOL1344 | 500 | 190 | 38% |
| | BIOL1362 | 300 | 112 | 37% |
| | BIOL2333 | 300 | 59 | 20% |
| | BIOL3324 | N/A | 81 | N/A |
| | CHEM3311 | 250 | 51 | 20% |
| | CHEM4397 | 8 | 5 | 63% |
| | COSC4377 | 15 | 5 | 33% |
| | COSC6373 | 14 | 3 | 21% |
| | GEOL1330 | 165 | 13 | 8% |
| | GEOL6376 | 25 | 19 | 76% |
| | MATH1330 | 140 | 17 | 12% |

| Term | Course | Enrolled | Responded | Response Rate |
|------|--------|----------|-----------|---------------|
| Total | | 6,259 | 2,384 | 29%** |

Response rates for classes in which students responded to the survey. Course names differ at the University of Houston-Downtown. Data from Spring 2009 not included.

III.     SAMPLE PROFILE

*A. Number, Level, Courses*

Altogether, 2394 usable surveys in 2009, 2010, and 2011 (Spring 2009 N=600, Fall 2009 N=627, Spring 2010 N=612, Spring 2011 N=555) provided insight into student use and perceptions. The majority of students in the sample were in freshman biology courses (55%), reflecting the substantial enrollment in biology majors in the U.S. The remaining students were enrolled in chemistry, computer science, geology, and mathematics (shown in Table II). The majority of students were undergraduates (95%). Although the sample is dominated by freshman courses, students in the freshman courses were not necessarily freshmen, as shown in Fig. 1. The mean age of undergraduate students was 22.27, slightly older than the national average age of undergraduates as shown in the most recent national data published in Fig. 2.

TABLE II.
COURSES AND NUMBER OF STUDENTS SURVEYED

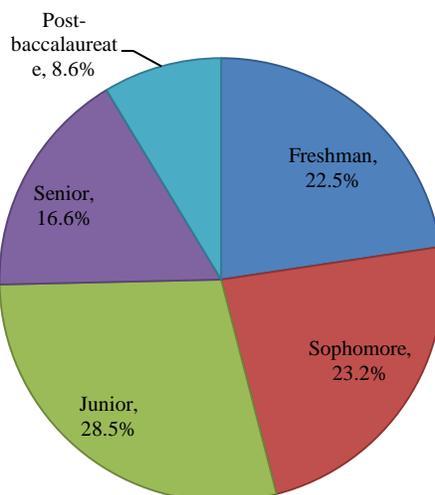| Course | N | % | Course | N | % |
|---|---|---|---|---|---|
| BIOL1334 | 222 | 9.3 | COSC6373 | 18 | 0.8 |
| BIOL1344 | 370 | 15.4 | COSC6374 | 31 | 1.3 |
| BIOL1361 | 201 | 8.4 | COSC6380 | 14 | 0.6 |
| BIOL1362 | 527 | 22 | COSC6385 | 17 | 0.7 |
| BIOL2333 | 59 | 2.5 | GEOL1330 | 34 | 1.4 |
| BIOL3324 | 368 | 15.4 | GEOL1330 C | 6 | 0.3 |
| BIOL4315 | 14 | 0.6 | GEOL1330 D | 24 | 1.0 |
| CHEM3311 | 51 | 2.1 | GEOL1376 | 11 | 0.5 |
| CHEM3331 | 37 | 1.5 | GEOL3330 | 10 | 0.4 |
| CHEM4397 | 5 | 0.2 | GEOL3331 | 22 | 0.9 |
| COSC1410 | 107 | 4.5 | GEOL6358 | 5 | 0.2 |
| COSC2402 | 16 | 0.7 | GEOL6376 | 26 | 1.1 |
| COSC2410 | 97 | 4.1 | MATH1330 | 80 | 3.3 |
| COSC4377 | 10 | 0.4 | PHYS1321 | 11 | 0.5 |
| COSC4393 | 1 | 0.04% | Total: 2394 | | |



Fig. 1.  Undergraduate Respondent Class Level. While the majority of students surveyed were in freshman courses, many of them were not actually freshmen.
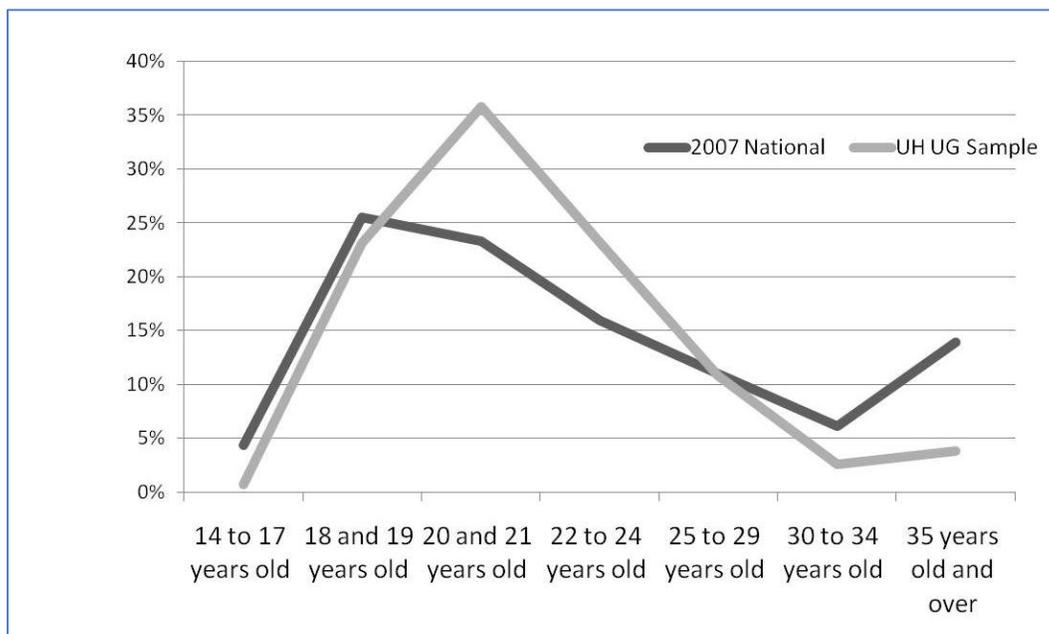
Fig. 2.   UH Sample Average Age Compared to 2007 National Undergraduate Population. The average age of students surveyed in the UT sample is slightly older than the national average age of undergraduates.

### B. Sex, Citizenship, English

Also reflecting a national trend in biology, 61% of the undergraduates sampled were female, this mean pulled up by the number of women in the biology courses (68%). Only 42% of students in the other courses combined were female. In addition, although the majority of students surveyed are American citizens or permanent residents (94%), about 33% of the undergraduates speak English as a second language. Most of these rate their competence with English as good.

### B1. Urban Commuters: Extracurricular Demands on Time

Time is at a more of premium for University of Houston (UH) students than for students attending university at residential or traditional campuses. Most UH students commute rather than living on campus. The average one-way commute time to campus is 30-45 minutes. 58% of students surveyed work to earn income, with about 7% working 36 or more hours per week. 54% of full-time and 73% of part-time students were employed. A substantial portion of the sample is made up of students returning for further credentials after having received a bachelor's degree. About 70% of these students work to earn income.

Many students at UH care for dependents (children, parents, others). As shown in the chart in Figure 1, many UH students are post-baccalaureate students, returning to college to earn credentials of some sort. Post-baccalaureate students students are much more likely to be married than their other undergraduate peers; 30% reported they were married, as opposed to 11% of other undergraduate students. About 3% of undergraduates were single parents, and about 11% of all students surveyed care for one or more dependents (including parents or other relatives).

*B2. Commitment to Education*

Most UH students have relatively long commute times, take full course loads, and are likely to work half time. Nevertheless, the majority of students responding to the survey in both terms felt that going to class was important and were quite concerned about their grade in the particular class and their grade point average in general. 88% of students agreed that it was important for them to go to class, whether or not the video lectures were available. About 17% of students claimed to have attended every class session and an additional 54% reported attending between 75-99% of classes. 99.7% of students agreed that their class grade was important to them and 99.4% agreed that maintaining a high grade point average was important.

## IV.    VIDEO USAGE, MOTIVATIONS, AND DEVICES

Professors posted anywhere between 7 and 50 videos for use by students. The analysis below is based on different data sets, which explains the difference in number of responses for various items.

*A. Use, Motivation for Use, and Devices Used*

*Use of videos.* 77% of the surveyed students reported using the video lectures at least once during the semester. The mean number of uses for undergraduates was 3; the mean number of uses for graduate students was 2.6. Both categories of students reported viewing only a segment of the video that they needed rather than the whole lecture, indicating the potential value of an indexing feature.

*Non-Use of Videos.* 16% of students reported that they did not view any of the videos. As in previous years, reasons given for not using the videos usually were having attended all the classes, that the professor was a very good teacher, or in a few cases, difficulty with the interface.

*Motivation for use.* In 2009 and 2010, students were asked to identify reasons for using lecture videos. The most frequently reported reasons for using the lecture videos were to make up for a missed class (73% of S09, 57% of F09, and 61% of S10 students), to review before a test or quiz (70% of S09, 67% of F09, and 72% of S10 students), and to review concepts that were particularly difficult (64% of F09 students and 56% of S10 students). Other top reasons were to review concepts not understood or not heard. Reasons are shown in Table III.

TABLE III.
REASONS FOR USING VIDEOS

| Reason | Spring 09 | | Fall 09 | | Spring 10 | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| To hear a lecture that I had missed because I had not gone to class. | 435 | 73% | 359 | 57% | 292 | 61% |
| To review before a test or quiz. | 422 | 70% | 420 | 67% | 342 | 72% |
| To review concepts that were particularly difficult for me. | NA | NA | 398 | 64% | 269 | 56% |
| To review concepts I didn't understand in the class-based lecture. | 193 | 32% | 354 | 57% | 277 | 58% |
| To review concepts I could not hear in the class-based lecture. | 382 | 64% | 208 | 33% | 157 | 33% |
| To preview a lecture before going to class. | 40 | 7% | 56 | 9% | 45 | 9% |
| To review a lecture later on the same day that the lecture was presented in class. | 101 | 17% | 86 | 14% | 76 | 16% |
| To review a lecture later in the same week that the lecture was presented in class. | 190 | 32% | 187 | 30% | 165 | 35% |

Reasons students reported for accessing video lectures.

*B. Course and Student Factors Related to Use*

*More Students in the Course, More Use.* On average, 84% of surveyed students in a class reported viewing at least one video during the semester they were surveyed, while 34% claimed to have viewed all of the videos their professor had posted. Data indicates that a significant positive relationship is present between the total enrollment in a course and the use of lecture videos ($r$(1167) = .185, $p$ = .000). In other words, the larger the class, the more students watch lecture videos.

*More Class Attendance, More Video Use.* One might expect that students who attended class more would view fewer videos. In fact, the opposite was the case with the combined Spring 2010 and 2011 sample: ($r$(1167) = .218, $p$ < .000). The more often students attended class, the more videos they viewed. It is possible that students who attend more classes are more serious students and study harder. On the other hand, given the number of students in the sample who stated that they work to earn income, it is also possible that students who have less time for class also have less time to study.

*Longer Commute, More Video Use*. One might also expect that students who work more or whose commute time was greater would use videos more. This hypothesis is supported for usage of videos and commute time ($r$(1064) = .087, $p$ = .005): statistically significant, but a relatively weak correlation. There was no statistically significant relationship between use of videos and working to earn income, number of semester hours a student was taking, being a single parent, or number of dependents.

*Demographic Groups Accessed Videos at Different Rates.* Eastern/Southeastern Asian students used more videos than did White/Caucasian students ($p$ < .05). Similarly, Asian Indian students used more videos than did White/Caucasian, Black/African American, or Hispanic American students (a.. at $p$ < .05). This may be due in part to English competency differences. Native speakers of English accessed fewer videos than did their non-native peers ($p$ = .005). However, native and non-native speakers did not rate the videos differently in terms of importance for their grade of value for clarifying material. Female students used significantly more lectures than did their male peers ($p$ = .002).

*C. Devices Used for Access and Preferences*

With mobile devices becoming increasingly common, it is important to understand whether any modifications need to be made to enable use on these devices. 3% of students surveyed used the videos on a mobile device (7% of students surveyed in Spring 2011), but most students are still accessing the videos from a computer on campus or at home. 39% of students would like to be able to download the videos, however, which may suggest that greater use would be made of mobile devices if download were available (and if Flash were possible on the iPad). 98% of students had high-speed Internet at home, which could account for the ambivalence of the 39% who would like to download videos.

V.     VALUE OF ICS VIDEOS TO STUDENTS

*A. Highly Valuable for Studying*

A series of survey items asked students to agree or disagree or to rate the importance of aspects of the videos. The survey items and their mean responses were rated on a six-point Likert scale ranging from disagree strongly (1) to agree strongly (6) ("don't know" was a separate choice). Responses tended to indicate strikingly high value for the videos. Table IV shows evaluation by the students who viewed at least one video.

A majority of students felt that the lectures helped them to clarify material that was not clear in class, found the video lectures useful for reviewing and studying, and believed that having access

to video lectures for this class was important to them.

| Survey Item | N | Mean (6-pt scale) | Std. Dev. |
|---|---|---|---|
| Lecture videos help me to clarify material that was not clear in class. | 1945 | 5.45 | .811 |
| Lecture videos are useful for reviewing. | 1982 | 5.64 | .709 |
| Having access to lecture videos for this class is important to me. | 1960 | 5.60 | .781 |
| The lecture videos helped me to study for quizzes or tests. | 1932 | 5.54 | .821 |
| It is important to me that lecture videos be posted soon after the class. | 1910 | 5.29 | 0.976 |

Reasons for importance of videos to students, rated on a six-point scale.

Students were also asked about the importance of the video lectures for getting the grade they hoped for. 65% of students rated the videos very important, 25% felt they were somewhat important, and 8% and 3% respectively felt that the videos were a little important or not at all important for getting their desired grade.

### B. Rating of Learning Resources

Students were also asked to rate the importance of several content sources in their learning. Fig. 3 shows that 87% of students rated "professor's lecture notes" as very important. The second most important resource rated was the lecture videos (66% of students rated them as very important), followed by notes students themselves take. Last in importance were the textbook and other reading sources. In open-ended comments, students for whom English was a second language noted that the videos were essential for helping them overcome any language difficulties they had had during live lecture.
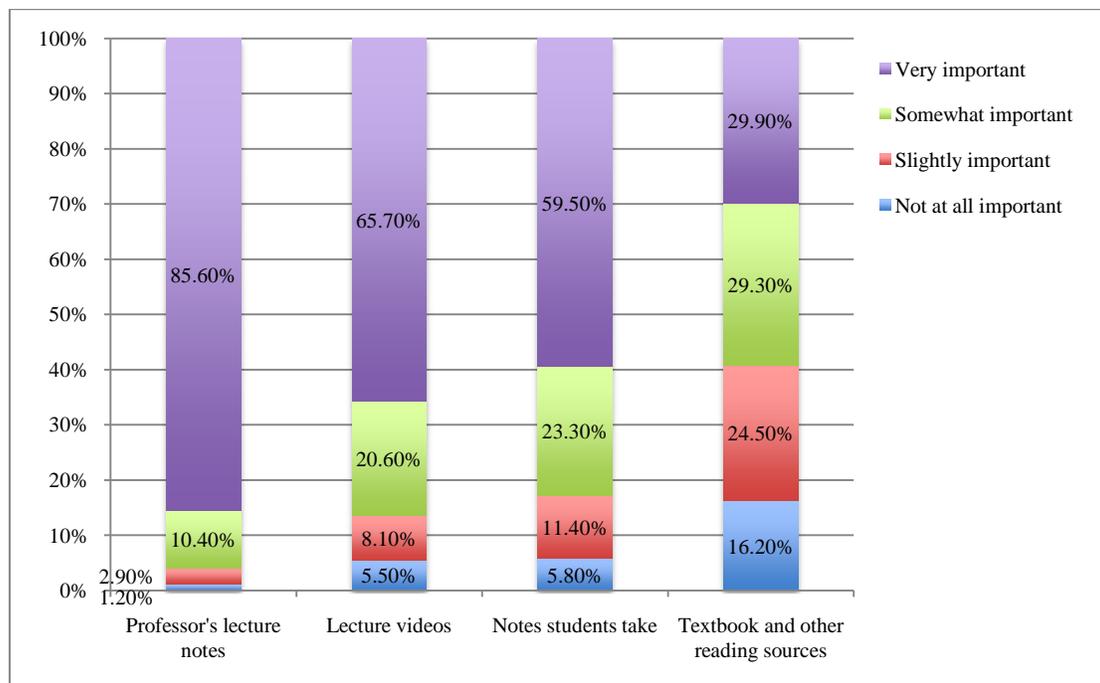


Fig. 3. Student Ratings of Important Learning Resources. Students rated the professor's lecture notes most highly and video lectures second most highly. The textbook and other reading sources was ranked the last important for learning.

*C. Women Valued Videos More*

Female students were significantly more likely to agree that having access to lecture videos was important ($p = .02$) and that it was important for lecture videos to be posted soon after class ($p = 0.022$). A likely explanation for these differences is females' attitudes toward grades; they were more likely to agree that getting a good grade in the class was important to them, though statistically, the difference is borderline ($p = .057$). Females expressed greater concern for their grade point averages than did males ($p = .011$). Nevertheless, males were expecting slightly higher grades than their female counterparts (males expected an average of B and females expected grades closer to B- ($p = .000$). This is probably consistent with a great deal of research that shows females express underconfidence and males express overconfidence.

## VI. ICS VIDEO FUNCTIONALITIES: AUTOMATIC INDEXING AND SEARCH

*A. Indexing*

The functionality of indexing the videos by 5-minute intervals was piloted in Fall 2009 and Summer 2010. After some improvements, the tool was evaluated on the Spring 2011 survey. Students were asked if they had used the indexing feature. The 447 who had used the index were branched to a set of forced-response items and asked for open-ended feedback. The perceived value of the index was overwhelming:

- 97% felt that the index was helpful
- 93% said they knew immediately what to do with the index (this was a way of getting at the construct "intuitive")
- 96% felt the placement of information and images made the index easy to use
- 91% thought the time intervals were appropriate for the lecture

No significant differences were found in use or appreciation of the indexing features across groups. In open-ended comments, students stated that using the index saved them time (e.g., "I didn't have to wade through the rest of lecture just to answer one question") and helped them to get back to studying after interruptions (e.g., "sometimes I would have to pause the lecture to take care of other responsibilities that I had to attend too, and when I was ready to come back to the lecture I'd pick up exactly where I was at, it was great!").

*B. Search Tool*

The search tool was implemented during the 2010-2011 academic year and evaluated on the Spring 2011 survey. Perhaps because it was visibly much less obvious, the search tool received much less use than the indexing feature. 51 students used the search feature and the majority found the tool easy to use (94%), found the search results easy to use (98%), and felt that the search tool helped them find the part of the video they were looking for most of the time (78.5%). Students usually knew which words to enter into the search box to find the segment of video they were looking for (76.5%). Although these results are strong, they are still preliminary given the small sample size.

## VII. RECOMMENDATIONS

Large lecture courses are a response to a very real problem of scale: they are an affordable way to manage large enrollments. Unfortunately, however, having 200 to 1000 students makes it extremely difficult for an instructor to interact personally with students. Research shows that student-faculty interaction is an important predictor of student engagement and retention. While

lecture videos cannot replace dialogic communication with one's professor, it does allow a student to re-hear a professor's explanations and viewpoints on what they are learning. Therefore, it is recommended that faculty be encouraged to continue capturing their lectures and making them available to students. A large majority of students use the video lectures and also perceive great value in having access to video lectures. There is a significant correlation between size of course enrollment and use of videos. Despite the availability of lectures, surveyed students still believe that it is important to go to class. There is a positive association between students' class attendance and use of videos. Lecture videos are not taking the place of attendance for many students, but instead giving students more "time on task" with the actual words of their professors.

Students who use the indexing capability believe it is very helpful for allowing them to access just the part of the video they want. Professors should be encouraged to announce the availability of indexing and to point out the availability of the search tool to students.

The value that students place on access to video lectures far exceeds expectations. It is recommended that capacity be built for other institutions to provide video lectures for students. Students who used video lectures, a majority of students sampled, believed that the video lectures were useful for reviewing, for clarifying material, and most importantly, for getting the grade that they hoped for.

# VIII.    APPENDIX: DATA COLLECTION INSTRUMENTS

TABLE V.

SURVEY MAP: VIDEO USE FOR LEARNING, INDIVIDUAL DIFFERENCE INFORMATION

| Variable Category | Survey Item | Response categories |
|---|---|---|
| Usefulness, frequency of usage, technical problems | Your professor posted XX "video lectures" of his/her class lectures this semester. Please estimate how many of these individual lectures you viewed one or more times this semester. | None, broken down into 20% increments by count, all |
| | Preferred viewing option | Download, streaming, either (open-ended comment) |
| | Video lectures help me to clarify material that was not clear in class. Video lectures are useful for reviewing. It is important to me that videos be posted soon after the class. In videos for this class, sometimes I could not hear everything I needed to hear. In videos for this class, sometimes I could not see everything I needed to see. I could not view one or more videos for this class because of technical problems in making, posting, or downloading/viewing the video. | Disagree/agree (6-point Likert with don't know as $7^{th}$ choice) |
| Study materials, commitment to education | Rate the importance of each of the following for your learning? The lecture videos, Notes you take during lecture and reading, The textbook and other reading sources, Professor's lecture notes, Other (please explain) | Not at all important, slightly important, somewhat important, very important |
| | Getting a high grade in this class is important to me. Maintaining a high grade point average is important to me. It is important to me to go to class, whether or not the video lectures are available. Having access to videos of lectures for this class is important to me. Viewing/listening to the videos helped me to study for quizzes or tests. | Disagree/agree (6-point Likert with don't know as $7^{th}$ choice) |
| Strength of need | What grade do you expect to receive in this class? At the beginning of semester, what grade did you hope to receive? | A, A-, B+, B, B-, C+, C, C-, D+, D, D-, F |
| | How important was use of the video lectures for this class for getting the grade you wanted? | Not at all important, slightly important, somewhat important, very important |
| | About what percent of classes did you attend for this course over the whole semester? | 100%, 75-99%, 50-74%, 25-49%, 0-24% |
| Perceived preparation for the class | I already knew a lot of the material for this class before the semester began. The subject matter of this class has been difficult for me. | Disagree/agree (6-point Likert with don't know as $7^{th}$ choice) |
| Individual Difference Variables: Please share some information with us, so that we can contextualize the survey information according to the varied life situations of UH students. | | |
| Hours spent on education, income | About what percent of THIS COURSE'S class sessions did you attend over the whole semester? | 20% increments from 0 to 100% |
| | About how many hours per week do you study outside of class? (Please type a whole number) | (write in) |
| | On average, how many hours per week do you work to earn income? | None, 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40 |
| | How many semester hours are you taking this semester? | (write in) |
| Level of student | (Level) Are you | Undergraduate student (levels given) Graduate student (levels given) |
| Family status, dependent care Demogra-phic variables | Please indicate your marital status | Single, married or in a similarly committed relationship, separated |
| | Please choose the best estimate for how long it takes you to get to campus on a typical day | 5, 15, 30, 45, 60, more than 60 minutes |
| | Are you a single parent? | Yes/No |

| Variable Category | Survey Item | Response categories |
|---|---|---|
| | How many dependents do you presently provide for? (include children, parents, or others who depend on you for financial support) | 0, 1, 2, 3, 4, 5 or more |
| | Please indicate your race/ethnicity (check all that apply) | Caucasian/European/White<br>African American/Black<br>Mexican American, Puerto Rican, Other Hispanic American<br>American Indian or Alaskan Native<br>Native Hawaiian or Pacific Islander<br>Asian Indian<br>Other Asian (Chinese, Korean, Filipino, Vietnamese, Japanese, other)<br>Middle Eastern<br>Some other race or ethnicity |
| | How would you describe your command of the English language? | Native speaker<br>Non-native: Good<br>Non-native: Fair<br>Non-native: Poor |
| | (Sex) Are you | Male/female |

TABLE VI.

SURVEY MAP: INDEX AND SEARCH TOOL

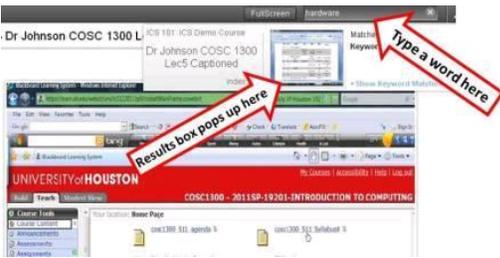| Variable Category | Survey Item | Response categories |
|---|---|---|
| Index use, value | The video player included an index (if you selected "advanced player"). An example is shown in the image to the right. Clicking on any of the frames to the left of the screen allowed you to go directly to different segments of video. Did you use the index?<br> | No, yes, don't remember |
| | The index was helpful.<br>I immediately understood what to do with the index.<br>The placement of index information and images on the screen made the index easy to use.<br>The time intervals of the index were appropriately placed for the lecture. | Disagree/agree (6-point Likert with don't know as $7^{th}$ choice) |
| | The index provided enough information to allow me to identify the video segment I needed.<br>The index made it easy to move from one video segment to another.<br>The index functioned well. | Never, hardly ever/seldom, sometimes, most of the time, always |
| | What should be done to improve the value of the index? | Open-ended |
| Search tool use, value | The video player includes a way to search for individual words shown in the video (e.g., words on a slide). The image to the right shows the search box and where the results show up. You type a word in the search box and if the word is found, one or more results boxes pops up and you can click on that. Clicking on the results box takes you directly to the video segment where the word was found. Did you use the search box to search for keywords in any of the lecture videos you viewed? | No, yes, don't remember |

| Variable Category | Survey Item | Response categories |
|---|---|---|
| |  | |
| | I found the search tool easy to use.<br>The purpose of the search box for finding video segments was clear.<br>The search results were easy to use.<br>The search tool made it easy to move from one video segment to another. | Disagree/agree (6-point Likert with don't know as 7th choice) |
| | The search tool helped me find the part of the video I was looking for.<br>I knew which words to enter in the search box to find sections of videos.<br>The results of the search were relevant to what I was looking for.<br>The search tool was helpful. | Never, hardly ever/seldom, sometimes, most of the time, always |
| | How can the search tool be improved? | Open-ended |

TABLE VII.

FACULTY QUESTIONNAIRE

| Variable Category | Survey Item | Response categories |
|---|---|---|
| Enrollment, attendance | About how many students are enrolled in this class? | (write in) |
| | Do you require attendance for this course? | Yes, no, other (please explain) |
| # videos | About how many ICS video lectures did you make available to the students in this course? | (write in) |
| Communication about videos and features | By which media were students informed that ICS video lectures were available? (Select all that apply.) | Stated on syllabus, Link on course website, Clickable icon next to topic of the day on website, Announced in class, Link on VNet or other courseware page, Other (please explain) |
| | About how often did you or your TA(s) announce the availability of video lectures in class?<br>About how often did you or your TA(s) announce the availability of the search feature for ICS video lectures in class?<br>About how often did you or your TA(s) announce the availability of the index feature for ICS video lectures in class? | Never, Once, A couple times during the semester, Several times, Don't remember, Other (please explain) |
| Relevance of lectures for exams | About what percent of your quiz and exam items for this course are derived primarily from your lectures, as opposed to the textbook or other sources? | 0-100% in 20% increments |