Captioning the podcasts in a UCI biology lecture for international and non-international students

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April 2014

Abstract:
A recent increase in the number of international students in the Francisco J. Ayala School of Biological Sciences at UCI has generated interest in improving their transition to American higher education and to biology coursework. This paper describes providing captions to lecture capture videos generated by a biology core course instructor, presenting them to her 834 students, and analyzing their use. We found that each lecture requires about 8 hours of work to caption, and that not all instructors are able to provide the videos. But when the captions are provided, they are used and appreciated by students. Users of lecture capture watch an average of 14/49 available videos, and international student users watch slightly but significantly more (~ 19/49 available videos). We provided both uncaptioned and (several days later) captioned videos for each lecture. Use of captioned videos represented 50% of all video use in all students. In a post-course survey, 42% of non-international and 66% of (the roughly 20) international students prefer the captioned videos, with the rest expressing no preference. They cite improved focus, help with vocabulary, and better notetaking as primary reasons. The difficulties and benefits of providing captioning in the future are discussed.

Rationale:
UC Irvine has seen a recent increase in the total number of international students enrolling in undergraduate programs, from less than 20 eight years ago to 290 in 2012 and 512 in 2013 (UCI OIR data). Most of these students do not choose Biological Sciences as a major, but there are an increasing number who do and are struggling to succeed in freshman-level courses. In Fall 2013, the number of “official” international students in Bio 93 was over 25 for the first time.

The Student Affairs office of the Francisco J. Ayala School of Biological Sciences has a staff counseling position to help these students transition to biology coursework. These students also have campus-wide peer-assisted learning available to them through LARC and the BioSci Peer Tutors program. But the School is seeking to maximize course-based learning tools that will be particularly helpful for students who need to learn both the concepts of biology and the English that is used to convey them.

Lecture capture has been utilized by some core faculty since 2009. The capture software on the instructor’s presentation computer (Camtasia Replay) captures both the audio and the slides of the presentation, and requires minimal effort to set up and use. Students access the video files via EEE and can watch all or part of the lecture over again. Students are strongly supportive of these videos, often referred to as podcasts, even though our research indicates they produce little improvement in exam performance. The videos contain a function to add closed captions, but the automated captioning is very poor at dealing with biological language and is useless unless manually corrected.
The purpose of this project in Winter 2014 was to examine the feasibility of captioning the lecture capture videos of a single required biology course, and measuring student use of the captions – particularly by international students.

Fall 2013 - Requirements and System Testing:
In order to provide captioning for students and track their use, we required the following:

1. Instructors willing to run the lecture capture software while they taught
2. Hiring of undergraduate biology majors able to do the manual captioning
3. Access to a podcast link site that would record student info for each viewing
4. Human subjects approval to measure student activity in the course

During Fall 2013 we discussed this project with faculty, Bio Sci administrators and staff, and OIT staff. By the end of fall quarter we had beta-tested several aspects of the project, including setting up a login for video editing for undergraduate captioners that maintained student privacy within the regular course and measurements of time required to caption each 50-minute video (roughly 8 hours!). The major difficulties in our university environment were:

- The main course management system, EEE, could not track student use of podcasts
- Faculty who were not already using lecture capture were not able to start using it successfully, limiting the sections that could provide captioning
- The process requires a manager who is able to work effectively with the captioning and hosting software, the course instructor, the OIT staff, and the undergraduate tutors.

We solved these issues with the support of UCI Distance Learning, which provided a Moodle hosting “class” to post the URLs of the captioned videos and track student login and use. Faculty member Dr. Catherine Loudon teaches two large sections of Bio 94. She was already captioning and was willing to work with us to have them posted on the Moodle site. The author (AW) was the project manager.

Winter 2014 – Final Methods:
A summary of the workflow used in Winter 2014 is below.

1. Student Affairs hired upper-division biology majors as Student Assistants to be captioners. Students were willing to work 10 hours per week and were comfortable with class material (at least a B in the course). They did not need to attend class. We found at least three captioners per class should be hired, four will provide a faster turnaround.
2. UCI Distance Learning set up a Moodle “course” and added all Bio 94 students and tutors and TAs as students. Added faculty, head TAs, captioners and the project manager as instructors.
3. OIT created a Camtasia Replay profile for captioners and described how to upload videos for captioning
4. After each lecture, the Bio 94 instructor (Dr. Loudon) emailed the link of the posted non-captioned video to the project manager and captioners. This non-captioned video was posted immediately on Moodle, usually before midnight the day of class.
5. The captioners downloaded an mp4 of the uncaptioned video and re-uploaded it to Camtasia for captioning (requires Camtasia Studio software, roughly $120).
6. The captioners started captioning video as their schedule permitted. Each video requires roughly 8 hours to caption, at about $12 per hour.
7. The captioners added the link to the captioned video next to the uncaptioned video link in Moodle.
8. At the end of the course, a survey was sent to all students on their use of captioned vs uncaptioned podcasts. The use files from Moodle were downloaded as an independent measure of student use.

Results:
General use of all podcasts: As usual, lecture capture videos are very popular with students. There are 830 students who accessed at least one video, and the number of students who finished the course was 832. Since podcast use was recorded by Moodle, not EEE, the video users likely include students who subsequently dropped. Nevertheless, use was still high. There were 22 international students in Bio 94 and one IUPP student via Extension. Of the 23 enrolled, 21 used the lecture capture videos.
By the end of the course, 49 videos were linked on the Moodle page: 26 uncaptioned videos and 23 captioned (the captioners fell behind in Week 5 and could not caption three of the 26 videos). The average number of videos watched by non-international student users was 14.2 videos; the average number by international student users was 19.0. This increase is significant (2-tailed Mann Whitney U, $p = 0.023$).

Use of captions: Captioned podcasts were usually posted several days after the uncaptioned podcasts; most students watched a mixture of both. I calculated the fraction of viewed podcasts that were captioned for each student. The non-international students video use was 50% captioned; the international student video use was 51% captioned. There was no significant difference between the groups. We initially had only two captioners, and hired a third after the two got behind during midterm season. It is possible that if the captioned videos were more readily available their use would be still higher.

Survey results: After the course was completed, all students were invited to respond to an EEE survey about their podcast use. Of the 834 students contacted, 425 responded (51%). The respondents were asked about which type of lecture capture podcast they used:

<table>
<thead>
<tr>
<th>Only captioned, even when they were late to arrive</th>
<th>Captioned as much as possible, but uncaptioned when necessary</th>
<th>Uncaptioned / Didn't care</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>40%</td>
<td>60%</td>
</tr>
</tbody>
</table>

A large number of students (42%) indicated a preference for captioned videos.

When students who preferred captions were asked in an open-response question how it helped, the students indicated that seeing the words as the professor spoke them:

- Allowed them to pause and take exact notes
- Improved their focus as they watched
- Helped them understand when Dr. Loudon spoke quickly
- Helped spell vocabulary words
- Helped overcome difficulties hearing when in lecture

Students who utilized captions were asked to pick the reason that best described why they benefitted from captions. The majority chose “improved focus” over other options like “English wasn’t spoken at home” or “my biology background was poor.”

The twenty-two normally-enrolled international students who used podcasts were specifically encouraged to respond to the survey, with 16 responding by the deadline. Five of the sixteen said they had no preference for the captioning. Of the ten that did prefer captioning, 6 said they valued it because English was not their native language. The remaining four chose between improved focus, improved processing of auditory info, and a weak biology background.

Summary:

We found that captioning was considered quite valuable by students who already find lecture capture to be a useful tool. This perception was even more true for international students, who perceived captioning to be beneficial at a higher rate (66%) than non-international students (42%), and indicated most often that this was because English is not their native language (60%).

Determining if captioning actually increases student learning or test scores is a more difficult experiment. The number of international students in biology courses is still too small to create a randomized control trial with and without captioning. Such an experiment could likely be performed if:

- An instructor team or single instructor teaches two sections of Bio 93 or Bio 94
- Good pre-class demographic data is available for international students (ideally, exam score in Bio 93 or a summer advising biology concept test)
- Students are randomly placed in the two sections, and captioning is only offered in one section.
We have looked at the effects of uncaptioned lecture capture podcasts on exam scores in non-international students and found that there was little difference in exam scores. We do not predict a strong effect of captioning on learning by international students, but there may be a small effect.

The generation of captions may provide benefits beyond a small increase in grades for international students. All students in the course perceive the Francisco J. Ayala School of Biological Sciences as providing important resources for their success, and this perception is important to the School and University. Captioning of lecture capture videos also increases the universal design (accessibility for disabled students) of the course. It even provides job opportunities for upper-division biology students that reinforces their understanding of core biology concepts.

The major constraints for continuing captioning are:

- A project manager is needed to oversee all captioning
- Course instructors need to be willing to spend an extra 5 hours during the quarter to help facilitate captioning (adding assistants to their EEE course, sending emails, using lecture capture software)
- Funding. I estimate roughly $2,000 for the project manager per quarter, and 26 lectures x 8 hours x $12/hr = roughly $2500 for the captioner salaries, per class.

It would also be beneficial to have a system that allows both faculty and captioners to post video links for multiple courses and tracked student use. EEE is not ideal for this. Continuing to use Moodle will require reimbursing Distance Learning; using UCI Sites will not provide student tracking.

Overall, if funding and personnel are available, I recommend continuing to integrate captioning with an eye towards good experimental design in the future.

Acknowledgements:
Funding for the project was provided by a donation by UCI alumnus Lester Ng to the Biological Sciences International Students Program. The Moodle framework was provided free of charge by Dr. Sarah Eichhorn, Associate Dean of UCI Distance Learning. Course Administrator Billy Ryoo spent an estimated 5 hours setting up the Moodle course, adding students and instructors, and problem-solving. Dr. Kate Loudon was gracious and accommodating throughout the quarter, regularly providing solutions, solving student problems, and allowing us to interact with her students.