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Investigating the Influence of Micro-Videos used as a Supplementary Course Material

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Investigating the Influence of Micro-Videos used as a Supplementary Course Material

Introduction

In the past few years, on-line educational video content has gained greater interest with many instructors attempting to make course material universally appealing to all students[1]. In some cases, universities have integrated this technology into their classrooms by uploading lectures for students to review or using video content as a way of constructing a flipped classroom[2]. Several studies have also shown the benefits that video lectures have on student education including decreased anxiety before tests and exams, increased student perception of content material, and the ability of repetitive and controlled review[2-5]. Due to their growing popularity, some instructors have advocated for more integration of video content into the classroom[1].

Universities that have not yet adopted this technology into their classrooms, leave students with the option to seek video content elsewhere and attempt to learn course material from outside resources. In some cases, students who attempt to relearn material from other universities, may find it extremely time consuming on top of already having a full class schedule. Additionally, learning from different instructors can also have many disadvantages to students since different instructors teach in many different styles and focus on many different areas of a single subject. When a student uses another faculty's lecture, in hopes of better understanding their current course material, they run the risk of focusing on areas that were important in one classroom, but maybe not in their own.

In order to address these issues, while also highlighting the benefits of online video content, weekly micro-videos were created and uploaded for enrolled students in an introductory fluid dynamics course. The goal of the videos was to act as supplemental material that provided brief discussions and examples to complement the lecture, homework and exam material. Although there has been work done focusing on the value of integrating technology resources into classrooms, there has been little work done concerning the way video content can be presented and influence students' performance and value[6-9]. This work also aims to establish key patterns concerning student use of supplementary online resources while also investigating individual feedback and attitudes.

Video Description and Data Collection

Videos were constructed using Microsoft Office Mix, a free extension to PowerPoint 2013 that allows the user to screen record any audio and video narration. The extension was provided for free for all faculty, staff, and students at Syracuse University. After compiling a PowerPoint Mix or "mix", videos could be uploaded to the Office Mix website for all Office users or a selected private group to see. For the purpose of this work, uploaded mixes were only made available to the students and faculty involved in the course. Office Mix also provided the capability of including quizzes and polls into mixes, which allowed the uploader to gain any feedback as to what the viewer was gaining from the videos. Since this was the first semester of using this resource, quizzes and polls were not included in any uploaded mixes.

Videos were also constructed weekly or near the conclusion of a chapter in lecture. Each time new content was uploaded at least two videos were made, the first being discussion based video that summarizing key topics from lecture and the second being an example videos that gave a step-by-step walk through of an example not found in the homework or on quizzes. All mixes were narrated by the courses teaching assistant (TA) and produced and edited by an external course aid (CA). The TA and CA also worked closely with the instructor to ensure the uploaded content was complimentary to lecture material. Students were then able to view content by clicking on the link provided on the course's blackboard page. Students were also able to download videos onto their personal electronic devices for on-the-go viewing.

In order to identify key patterns associated with each video, statistical data was collected and provided by the Office Mix website. When a video was uploaded to the Office Mix website, statics tracking was immediately enabled for each video. The data provided allowed the uploader to identify the number of individual visitors, who those individual visitors were, the number of views of each video, how much percentage each visitor watched, the total amount of time each visitor spent on each video, the total amount of time, visitors, and views for each slide, and the average percentage of completion of each video. Figure 1 displays an example of the statistical data provided from the Office Mix website. Another noteworthy tool was the ability to look at these statistics in any time frame specified by the user; Office mix allowed the user to look at the data from week to week as well as over then entire semester.

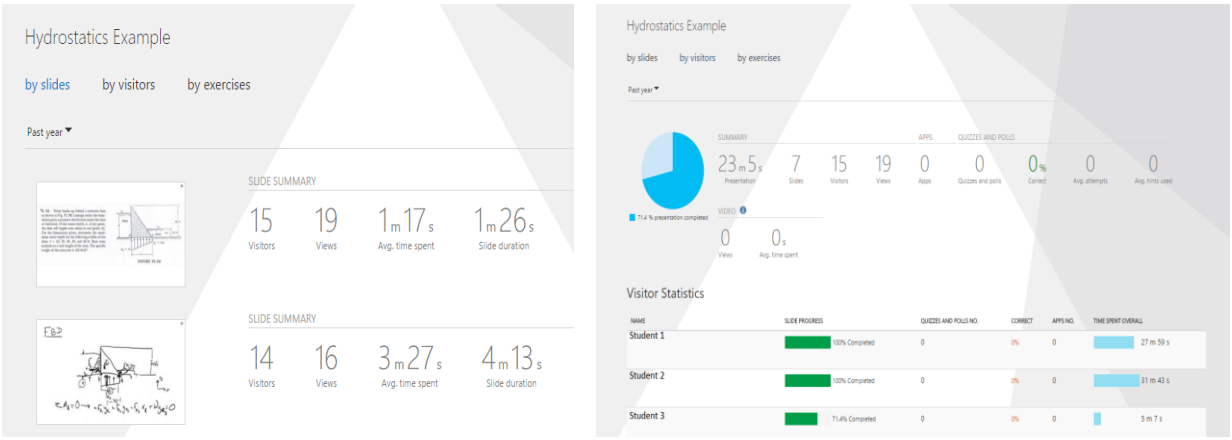

Figure 1: An example of an uploaded video's analytic data recorded and provided from Microsoft mix at https://mix.office.com/

Results and Discussion

At the end of the semester data was compiled and processed to provide a summary of student performance and content viewing patterns. The initial step was to determine if there was any association between the amount of content watched by each individual student and their performance. However, as depicted in figure 2, the data showed no relation between the amount of videos students watched and their overall grade performance.

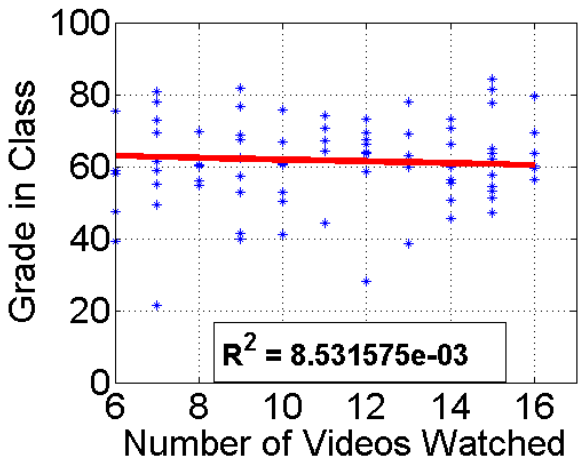

Figure 2: Data plot of number of student views corresponding to overall grade performance with added trend line and correlation.

Despite some students watching a majority of videos, or some students watching none, it appeared that there was no guarantee that it would influence their grade, as seen by the very low correlation coefficient value. This did not mean that the videos were ineffective in improving students understanding of the subject material. Many students, particularly at a tertiary level, have a variety of different learning habits that help them gain a better understanding of the material10, 11. While some students might have found the videos useful, from the ability to learn visually, others might have seen video content as unhelpful and decide to stick to their own study methods. This idea was further seen when examining personal student feedback in the end of the semester surveys.

At the end of the semester, 52 randomly selected students (out of 141 students) were asked to complete an anonymous survey regarding the uploaded video content. The survey provided a deeper understanding as to how students used the videos, whether or not they found the videos helpful, and what they would recommend when using videos in future courses. As seen in figure 3, 87% of the randomly selected students reported watching a large majority of uploaded video content. In addition, 76% of the students who watched the videos, also reported of finding the videos helpful in understanding course material.

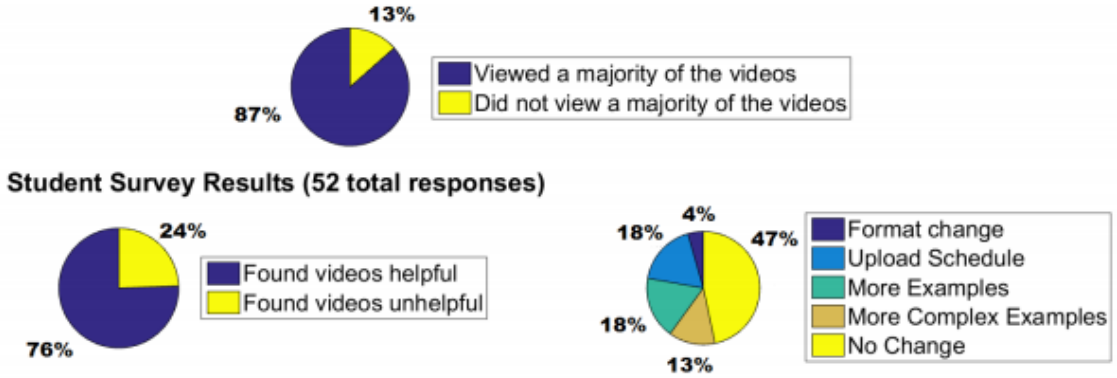

Figure 3: Anonymous Student Feedback Survey Response Breakdown

However, there were several suggestions as to how content could be improved. Despite content being uploaded weekly or at the end of a chapter, 17% of students who watched a majority of content suggested that videos should be uploaded earlier, with some suggesting prior to homework due dates. Another 17% of students claimed that more example videos would be beneficial, while an additional 13% desired harder example problems similar to exam questions. Although the suggestions are helpful in determining how to improve the quality of video content, some of them raise concerns as to how students are learning the material.

In an online class, most of the material is either provided to students with online notes or videos produced by the instructor. In that setting, online content is the major source where students learn the majority of information. In this case however, uploaded video content was a supplementary material that complemented in class material. If more examples were to be uploaded earlier and guide students through homework problems, how would that encourage them to utilize other resources (textbook, class notes, peer discussions) and develop critical thinking skills? In this instance, it was crucial to provide a resource that encouraged students to learn on their own while giving additional clarity to anything they didn't understand.

Another key component identified in the surveys, was how students used video content to learn the course material. Out of the 52 students who took the survey, 60% of students said they used it for studying before the exams. Some students even commented as to why they used it to study for exams, with one student claiming, "the videos helped me fill in the gaps of what I might have missed in lecture or in the text book [sic]. If I had forgotten something, the videos reminded me." Alternatively, when looking at students who didn't watch a majority of videos, despite being a small minority, some students claimed they couldn't find the time to use the video content in their studies. A deeper look at the viewership of uploaded content, provides a better understanding of how and when students learned from these videos.

Figure 4a and 4b show the amount of visitors (students who watched each video) and the number of views (how many times the visitors watched the video). Each line, represented by an individual video, begins to increase in viewership when the video is uploaded. It can also be seen that for the first few uploaded videos, viewership was high. Since this was the first time students were using video content and they were allowed to decide whether they would use them as a study tool. Figure 4a and 4b show that some students continued watching content as it was uploaded while others did not. This is indicated by the lower peak value of the number of visitors and views of the second set of videos just before the second exam as compared to the peak before the first exam. Still the total amount of viewership was approximately ~60 visitors per video (a little over a third of the students), and would continue around that value throughout the semester.

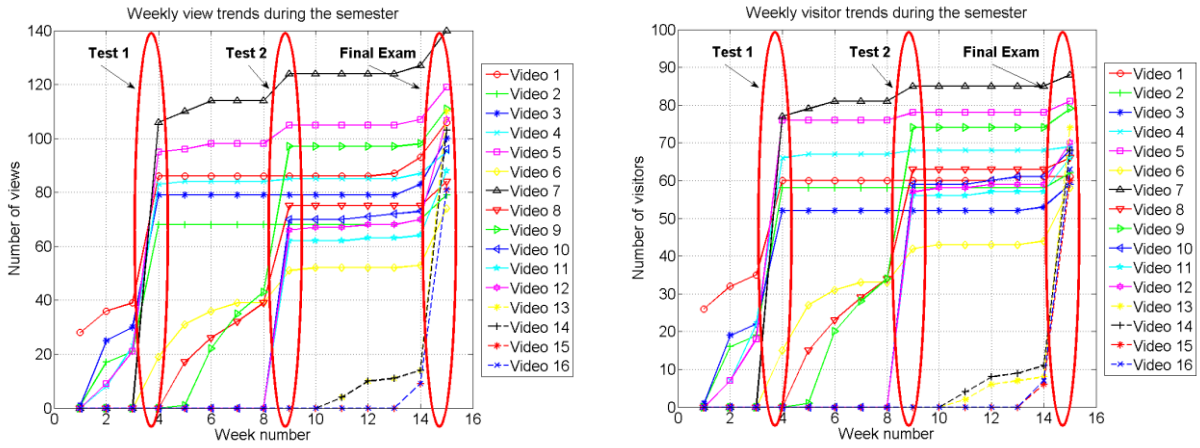

Figure 4a and 4b: Data plot of weekly total of views and visitors for each uploaded video.

As exam dates approached, there was a significant jump in visitors and viewers. The red ellipses are indicators of test 1, 2, and the final exam which were held at the conclusion of week 4, 9, and 15. During these periods, there was a spike in the amount of visitors and views, indicating that more students visited and viewed video content closer to exams dates. The number of views for previously uploaded videos leveled off significantly after exam 1 and received a steady climb in viewership for newly uploaded videos each following week. As exam 2 approached, there was a smaller amount of visitors than before exam 1, indicating that some students who had used video content to study for exam 1, had decided not to use newly uploaded videos to study for exam 2. Two weeks prior to the final exam (Week 13), there was a higher amount of viewers for some videos compared to exam 2, indicating more students either were reviewing earlier course material they may have forgotten or were looking back at small ideas they might have missed on previous assignments.

The depicted climbs in visitors and viewers provide an interesting component as to how students study for exams. For example, the number of visitors to each video increased as a new student viewed the uploaded content. The minor rise before the final, particularly for videos that had been uploaded for several months, showed that some students were trying to use video content to prepare for their final despite never viewing the content before. It remains unclear however, as to whether or not the students intended to use the content to learn the material completely or just review. Although it does suggest that more students began using this resource as a way to better understand the course material. In addition, the total amount of views for each video, particularly before the final, show a much steeper climb, then the number of visitors. The higher rate in viewership in a brief time span leading up to the final exam can suggest multiple views from previous visitors. This suggests that students who had watched video content before were now reviewing video content again to better prepare for their final exam.

In addition to viewing habits, it was also crucial to identify video demographics regarding who watched the majority of the videos and how they performed in the overall course. As seen in the figure 5, a majority of students watched less than half of the uploaded content throughout the entire semester. It can also be seen that for students who did watch a majority of the video

content had a higher percentage of A's compared to the percentage students who received an A and watched less than half the uploaded content. Alternatively, the percentage of students who received an F grade was smaller for those who watched a majority of content compared to those who watched less than half. This could indicate that students who watched a majority of the uploaded videos were more prepared and therefore more likely to receive a passing grade compared to students who watched less than half the video content.

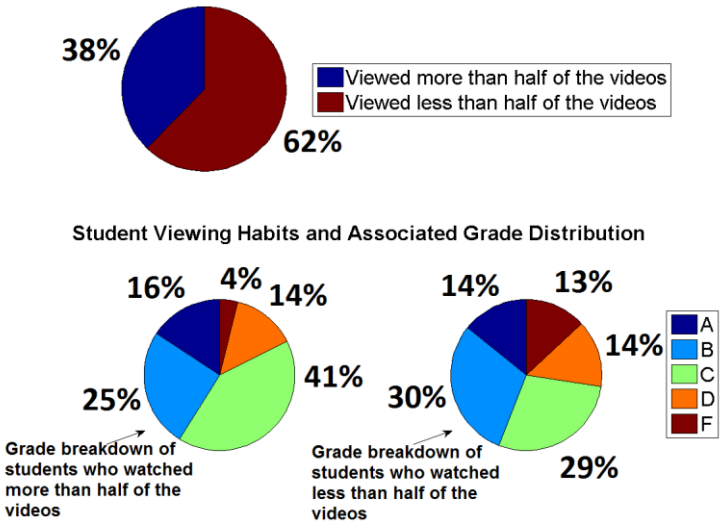

Figure 5: Performance breakdown of students who watched less or more than the half number of videos.

In some of the student surveys, one suggestion was to shorten the length of the video content, despite all uploaded videos being far less than the length of a lecture. In order to determine the relationship between viewer retention and length of video, the correlation coefficient was calculated. Figure 6 shows the weak association between the average percentage of the video content viewed over the course of the semester and corresponding length for each video. It appears that the longer a video is, there is a slightly less chance that students will watch the video in its entirety. Although, the correlation is weak, it could be stronger if the information in the video was vital to improving students understanding of the material. As seen in previous figures, many students used video content to prepare for exams. If a student lacks the knowledge in a subject matter that they know is going to be on an exam, they are most likely going to use a supplemental video in its entirety to learn the subject as best as they can.

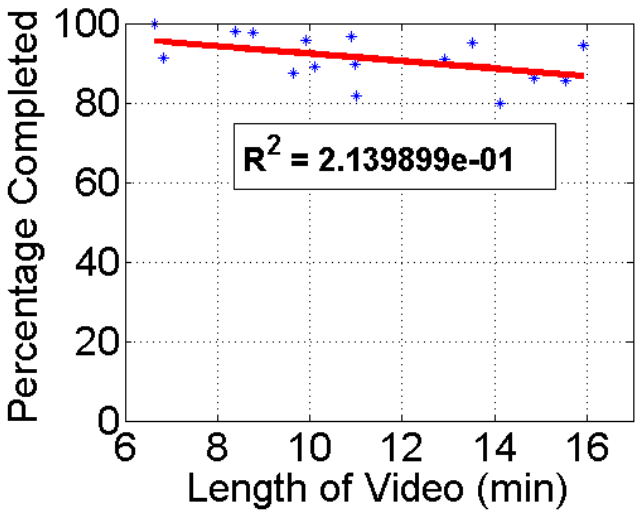

Figure 6: Data plot of the length of each video to the average percentage watched of each corresponding video with tread line and correlation.

Another suggestion for future videos was to incorporate more examples. As stated before, the videos were broken up into discussion and example videos that were uploaded simultaneously. During the end of the semester survey, many of the recommendations involved adding more example videos. The comparison between how many views the discussion videos and the example videos received expressed this demand for more examples. In figure 7, it is clearly shown that over the course of the semester there were more views of the example videos than discussion. One of the reasons for this could be due to the presentation of discussion and examples. In most courses, there are more resources that explain general concepts compared to examples that focused on a weekly topic.

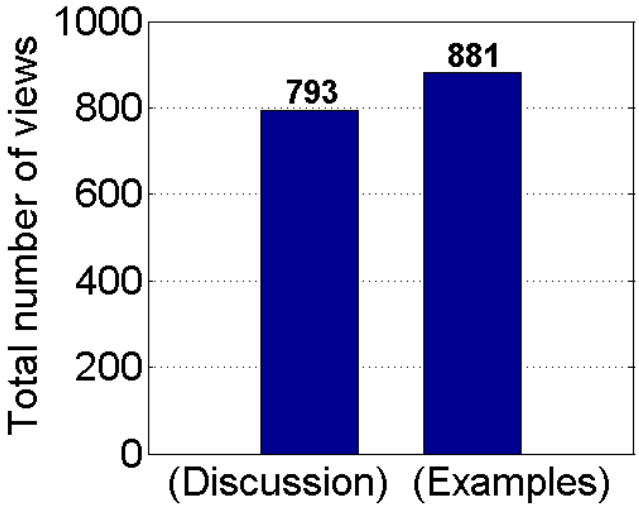

Figure 7: Comparison between the total number of views for discussion and example videos.

However, another suggestion was to incorporate harder examples similar to the exam. As discussed before, providing students with an extremely simplified walkthrough of problems

could limit their personal growth an independent learner. Furthermore, providing harder examples to those who are just learning material for the first time may discourage student growth as well by being too difficult to understand. Therefore, in order meet the need of all students, example videos should aim to engage the student intellectually by allowing them to identify key components to the process, establish their own thought, and encourage them to think on their own. By creating the video content in this manner, one can better prepare students for more complex problems that they can attempt to solve independently.

Conclusion and Future Work

The growing popularity of technology resources makes the work done in this study crucial to understanding how certain technologies engage students. This work aimed to provide supplemental material for a fluid mechanics course in the form of micro-videos that were uploaded weekly or at the conclusion of a course chapter. Although, there was no established correlation between student performance and amount of video content viewed, there was significant data that showed video content had positive influence on students retaining material as well as an indication of content viewing patterns with 76% of a sample of students who watched more than half the videos reporting they found the videos helpful. In addition, 60% of students reported to watch the videos leading up to the course's exams. Overall, students who viewed the majority of video content were shown to have a higher percentage of passing grades and lower percentage of failing grades compared to those who watched less than half. Lastly, there was a slight correlation between the length of videos and percentage of content viewed, indicating that longer video content was unable to fully retain all visitors.

Since example videos were found to have more views than discussion videos as well as a strong student request to include more videos, future integration of micro-videos into different courses will focus on providing example videos and their influence on student performance. Another issue discovered in the end of semester surveys was the conflicting request from students, some students felt the videos were too long while others found the video content adequate to their learning styles. It was difficult to accommodate these two conflicting views for such a large class. If micro-videos were to be implemented into a smaller course, reoccurring trends and patterns might be easier to identify and further establish the findings of this work. Once key patterns and trends are identified, instructors will be able to utilize technology resources more effectively, and hopefully ensure a better education for all of their students.

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