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Teaching Tools: Student Perception of Economics Videos

Over many semesters, our student evaluations indicate a desire for additional materials that enable the student to practice completing questions similar in style to questions on an exam. To address this desire, we create videos that move students step-by-step through problems using the application ExplainEverything. This paper describes the creation of these videos and how they can serve as powerful teaching tools. In addition, the paper provides a summary of how students perceive the videos and an interpretation of these results.

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1. Introduction

William E. Becker and Michael Watts (1995) describe many of the teaching innovations available in the instruction of economics. Over the years, the authors follow up with economics instructors and find that most U.S. economists are not implementing the innovations (both technological and delivery/learning styles) in teaching (Becker & Watts, 1996). In the Spring of 2000, Becker and Watts conducted another national survey and found that the "dominant picture of the U.S. undergraduate economics teacher continues to be a male…who lectures to a class of students as he writes text, equations, or graphs on the chalkboard, and who assigns students reading from a standard textbook" (Becker & Watts, 2001). Many instructors might be slow to adopt new teaching techniques if there are considerable start-up costs. Even though research states the benefits of "flipping" an economics classroom (Vazquez & Chiang, 2015), the high startup costs limit the adoptability. This paper describes a teaching technique using videos with low start-up costs, demonstrates how the videos serve as powerful teaching tools and reports students' perceptions of the technique.

2. Review of the Literature

Most of the literature on the use of videos for classrooms is found in the pedagogy of the "flipped" classroom. Vazquez and Chiang (2016) stress the theory and data from the neuroscience and cognitive science literature (e.g., Endestad, Magnussen, & Helstrup, 2003; McBride and Dosher 2002; Paivio, 2006; Pelli & Moore, 2003; Standing, Conezio, & Haber, 1970; Stenberg 2006) supporting the value of video presentations. The authors (Vazquez & Chiang, 2016) find pre-lecture videos increase the understanding and retention of economics material by allowing the brain to make visual connections between concepts and images.

Outside of economics, Pai (2014) describes four main methods of using videos for case studies. The first is as the only supplement to a written case study. The second is one of several supplements including social media. The third is as a collection of already existing videos to create a new case. Finally, the fourth is scripting your video to create a case. The author highlights the use of videos and the ability of the videos to help students visualize the case study.

Finally, Moreno and Ortegano-Layne (2008) examine the use of videos to help educate students who are learning to teach principles of economics. The authors compare teaching principles to students using videos of classroom scenarios and to students who are not given videos. The students who are given the videos reported increased motivation and learning when compared to those who were not shown videos. This paper links the existing knowledge of the use of videos to the four main powerful teaching tools from Agarwal and Bain (2019): retrieval practice, spaced practice, interleaving, and feedback.

The literature surrounding the use of videos in economics is focused on learning outcomes and their use in "flipping" classrooms. This paper extends the literature by providing the reader with a low-cost option, ExplainEverything, to create videos that unleash powerful teaching tools and reports the students' perceptions of the videos in economics courses.

3. Video Application

ExplainEverything is a digital whiteboard application that is described on their website as "the most versatile interactive whiteboard available for your device – use it for sharing knowledge, building understanding, personal productivity, and much more."[1] This application drastically decreases the start-up costs of creating videos that instructors can personalize for

[1] https://explaineverything.com/

their courses. A professor can insert prepared slides and videos or can create all the material as the video is created. The instructor can choose to be present in the video, or simply allow the video to capture the writing and the voice. One feature that we appreciate is the ability to make mistakes while recording and easily correct them by rewinding the recording and re-recording. This allows the user to begin recording without a lot of practice because the penalty for errors is relatively small.

The application is available as a free[2] download and comes with an instructional tutorial that allows for an extremely low-cost use. Instructors can create videos that are content specific to a course and choose topics with a history of being "more difficult" concepts for students. Once a video is created, it is saved as an mp4 file that is easily loaded onto a website, placed in a learning management system, or e-mailed to students. It is important to note that this paper does not provide tips for video creation as there are already many great resources surrounding this topic, in particular the website by Cynthia Brame (2015) and the book by Karen Costa (2020) titled *99 Tips for Creating Simple and Sustainable Educational Videos*. Instead, this paper describes the methods of implementing instructional videos, feedback from students, and how to use the videos to reinforce the literature from the science of learning.

4. Procedure

The authors created videos for four undergraduate courses (Principles of Microeconomics, Principles of Macroeconomics, Labor Economics, and Intermediate Microeconomics) at a small liberal arts college. These videos are made available before each in-class test. The number of tests and students varied in each class and is detailed in the appendix. The professors chose topics that have presented difficulties for students over the years. The selection process is entirely professor-dependent and based on years of teaching these classes. The professors post the videos on the school's course management system (Moodle, called Inquire, at the institution). Students are informed of the videos and the potential educational value of watching the videos but are explicitly told that watching the videos is voluntary.

After each test, the students are given a survey with the following questions (note that the language regarding video content and the exam number would change with each test and be different across classes).

[2]No additional explicit cost

General Questions

1. I am currently a (Circle One): Freshman, Sophomore, Junior, Senior

2. Prior to this course, I have completed _____ economics courses.

3. I watched the video (Circle One): Yes No

(If you answered "no" then you should not answer the rest of the questions)

Video X

4. On a scale of 1 (Strongly Disagree), 2 (Disagree), 3 (Neither Agree Nor Disagree), 4 (Agree), to 5 (Strongly Agree), please list your response for each of the following:

a.	Watching the video helped me learn the concept.	1 2 3 4 5
b.	I think I did better on the exam because I watched the video.	1 2 3 4 5
c.	The professor should create more videos for other topics on Exam X.	1 2 3 4 5
d.	I think watching the video was worth my time.	1 2 3 4 5

When handing out the survey, students are reminded to give an honest assessment and that their responses do not impact their course grade. The survey intends to receive an honest assessment of how the students perceived the videos.

5. How the Videos Create Powerful Teaching Tools

In the book *Powerful Teaching: Unleash the Science of Learning*, Pooja Agarwal and Patrice Bain (2019) describe how to use the science of learning to engage diverse students, parents, and professional development programs. They focus on four powerful teaching tools listed as retrieval practice, spaced practice, interleaving, and feedback. An instructor can use easily created videos from ExplainEverything to leverage these powerful teaching tools.

Once our students have acquired information from reading a textbook, listening to a lecture, or even watching a YouTube video, they need to practice retrieving the information. By creating these short content videos starting with a question, you can allow your students to practice retrieving information. We offered our students advice to help them practice by asking

them to play the video up to the point where the question is posed, then pause the video and attempt to answer the question on their own. Many students might think that they understand a particular concept, but without being asked to retrieve information related to the concept, they are not able to practice this process. As Roediger and Karpicke (2006) show in a study of college students who asked to retrieve information can retain more information a week later compared to students who are asked to simply reread information. Many readers probably already spend a lot of time asking their students to practice retrieval and the videos provide another opportunity to practice and the practice can be done on the students' time, not just in the classroom.

If you choose to assign or post videos at different times during a course, you can encourage the practice of spacing to your students. Rohrer and Taylor (2006) compare students who are asked to practice 10 math problems all at once to students who are asked to practice five problems once and then five more problems two weeks later. The students who spaced their practice out retained more information after four weeks, providing support to the assertion that spaced practice can increase long-term learning. If you create a few videos for one topic, you can release them at different times to have your students space their retrieval practice over time.

The third tool is interleaving. Agarwal and Bain (2019) illustrate the concept using a visual tool of two separate problem sets.

Problem Set 1: AAAA BBBB CCCC DDDD
Problem Set 2: ABCD ABCD ABCD ABCD

The first problem set represents blocked practice. A student is given a specific topic (A) and is asked to practice that topic four times in a row before moving on to the next topic. Then the student practices the next topic (B) four times and so on. The second problem set is an example of interleaved practice. Note that the student is practicing each topic four times, but in the second problem set, the student practices each one of the topics one time before being asked to practice a topic again. In Brown, Roediger, and McDaniel's (2014) book, *Make it Stick: The Science of Successful Learning*, there is a sports example of the two approaches. This example has the reader imagine someone practicing hitting a baseball. The equivalent of a blocked practice is throwing a batter 10 fastballs, 10 changeups, and then 10 curveballs. The equivalent of the interleaved practice is to have a pitcher throw the same amount of pitches but in no particular order. In the blocked practice, the batter is doing the equivalent of simply plugging and chugging through a set of similar problems. In the interleaved practice, the batter must recognize the pitch before coming up with a response. If you have several content videos, you can interleave them by posting them in an order that mixes up the topic order. Taylor and Rohrer (2010) show that fourth-grade students who interleaved their practice achieved higher performance on questions 24 hours after an initial exam than those who prepared using blocked practice. If your students can practice using your videos in an interleaved manner, they are more likely to retain the information throughout the semester.

Many of our students attempt to practice retrieval at times when we are not physically present and possibly not even awake. With videos, you can ask students to pause the video once the question has been posed, then attempt to answer the question before playing the answer. If we construct our video problems with step-by-step explanations of the problem,

then our students can receive feedback on their performance (recall they are being asked to attempt the problem on their own once it is introduced) without us being present. If you have taught a particular concept for several years, you know student errors that are more common than others. While explaining the problem, you can comment on those common errors and explain why they are wrong. Finally, you can provide feedback on why the correct answer is correct. This can eliminate the chance that a student has simply guessed an answer that is correct and then overestimate the learning that is occurring. Finn, Thomas, and Rawson (2018) find that presentation of examples during feedback increases student performance. With a video, you can elaborate much more on the feedback as opposed to an incorrect quiz or test answer.

This section provided the reader with an examination of how content videos can unleash the powerful teaching tools that are summarized by Agarwal and Bain (2019). As an instructor, you can choose to create your videos to leverage one, two, three, or all four of these tools. Each tool has empirical evidence that supports greater long-term learning, and your videos can enhance your students' learning. The next session discusses the students' perceptions of the videos.

6. Results

In combining the four classes, a total of 188 surveys were collected across 79 unique students. Of those, 163 responses indicate that the video was viewed before the test. In this sample of viewed videos, the averages for the four questions were 4.1178 for Question A, 3.7791 for Question B, 4.5521 for Question C, and 4.4540 for Question D on a 5-point scale. This means that on average, students rate their responses to Questions A, C, and D between agree and strongly agree. Students rate their responses to Question B between neither agree nor disagree and agree. This is true for all the different groupings in the table except when comparing the grouping of Freshmen/Sophomores to Juniors/Seniors. In that case, the Freshmen/Sophomore group is a 4.0247, which is essentially equivalent to agree, while the Junior/Senior group is approximately halfway between neither agree nor disagree and agree at 3.5366.

Sample	Question A	Question B	Question C	Question D
All Classes	4.1778	3.7791	4.5521	4.4540
Principles	4.1321	3.7736	4.5094	4.4151
Non-Principles	4.2456	3.7895	4.6316	4.5263
No Economics Courses	4.2456	3.8246	4.5263	4.4912
At Least One Economics Course	4.1321	3.7547	4.5660	4.4340
Fresh/Soph Status	4.2222	4.0247	4.5185	4.4815
Junior/Senior Status	4.1220	3.5366	4.5854	4.4268

Given the overall sample size (less than 70 total students) and an inability to track students across surveys, any attempt to statistically analyze the data beyond basic averages and the number of responses would not provide robust results. By simply observing the average responses, student perception of the videos is overall positive. Although there is insufficient data for robust analysis, several narratives can be gleaned. They are as follows:

7. Students Think Their Professors Should Make Videos

In each of the cases, the question with the highest level of agreement is Question C, the professor should make more videos for the exam. One possible explanation for this number is that students found the videos helpful and wish that more videos were available for the exam. Since the number is consistently higher than the learning question and the exam performance, students could think that this particular video did not have the most impact on their learning/ performance, but another video could. Finally, since the Question C average is consistently higher than the Question D average, students could view professors' time as less valuable than their time.

8. Upper Division Students Have a Greater Perception of the Videos

For each question, students from Labor Economics (a 200-level course) and Intermediate Microeconomics gave higher average agreement levels than that of the Principles of Microeconomics and Principles of Macroeconomics courses. One possible explanation for this result is that the material covered in the upper-division courses required more complex analysis, thus provided a greater benefit to the students. One difficulty of comparing these two groups is that there were only 24 students in the non-principles courses and 43 students in the principles courses, greatly limiting the number of observations in the non-principles courses.

9. Students With No Experience in Economics Perceive a Higher Level of Learning

The students with no previous economics courses reported an average of 4.2456 for Question A, "watching the video helped me learn the concept" while students with at least one previous economics course reported 4.1321. The upper-division economics courses have at least one perquisite economics course. Thus, the students reporting no previous economics courses are in the Principles of Microeconomics or Principles of Macroeconomics courses. Since the students with no experience with economics courses presumably have less base knowledge of economics, this result is unsurprising.

10. First and Second Year Students Report More Learning

Freshmen/Sophomore students reported an average of 4.2222 for Question A regarding learning the concept compared to Juniors/Seniors, who reported 4.122. Freshmen/Sophomores reported an average of 4.0247 for Question B regarding exam performance compared to Juniors/ Seniors who reported 3.5366. Once again, the younger students are expected to have a lower level of economic knowledge, so a higher perception of the level of learning and contribution to exam performance is unsurprising.

11. Conclusion

The ExplainEverything application provides economics professors with the ability to construct videos at an extremely low cost. These videos can be content specific to a given course and can allow students to work through a problem that covers a historically difficult concept for students in the given course. The videos are easily placed on a website, inserted into a learning management system, or e-mailed to students. The videos can also help unleash the powerful learning tools of retrieval practice, spaced retrieval, interleaved practice, and feedback. Two professors at Roanoke College created videos for four of their courses (Principles of Microeconomics, Principles of Macroeconomics, Labor Economics, and Intermediate Microeconomics). On average, students reported between agree and strongly agree that the videos helped them learn the concept, that the professor should create more videos for the

exam, and that the videos were worth the students' time. Students also reported an average between neither agree nor disagree and agree for the question of whether the video helped the students' performances on the exam. The students' perceptions of the videos provide support for instructors to implement this low-cost teaching innovation.

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