It's Me or the Video: can videos substitute for lectures in the flipped classroom?

Dr Chris Evans
UCL Interaction Centre
University College London (UCL)
66-72 Gower Street, London WC1E 6EA, United Kingdom
+44 (0) 20 3108 7176
c.evans@ucl.ac.uk

ABSTRACT
This paper presents the results of two studies involving "flipping the classroom" using a form of video to deliver material. The videos consisted of interactive "e-lectures", replacing traditional face-to-face lectures. The e-lectures were designed to be studied prior to face-to-face workshops. The workshops were intended to assist learners with getting to grips with the material from the e-lectures. The effectiveness of the flipped model using e-lectures as videos was then evaluated using online surveys. The results suggest that students prefer the flipped model offered by e-lectures compared to traditional lectures. Further studies are planned to compare the use of interactive e-lecture videos with their alternatives.

CCS Concepts
Applied Computing – *education*; **Human-Centered Computing** – *Human-computer interaction, interaction design.*

Keywords
HCI; Education; Flipped classroom; E-lectures; videos; interactivity.

1. INTRODUCTION
In the last 30 years or so, there have been two significant changes that have formed the foundation to the flipped classroom model: changes in technology that might be used to deliver content; and changes in our understanding of how people learn.

2. TECHNOLOGY
The information technology revolution [7] has meant that learners have unprecedented access to information. Whilst in the past information was primarily delivered through the mechanisms of the classroom or the printed word, today's learners have resources that include the Web, Wikipedia, online journals and YouTube. This means the local subject expert is no longer necessarily the primary source of learning material. Moreover, it may also mean that from an educational point of view, the local expert may no longer be the best. Why listen to your lecturer explain the method of heuristic evaluation when you can listen to the inventor Jacob Nielsen explain it himself on YouTube? This means that the task of delivering information in the classroom is no longer regarded as logically necessary.

3. LEARNING THEORY
The dominant method of teaching in higher education remains the traditional lecture and has remained so for approaching one thousand years. In a traditional lecture, the lecturer delivers content through live speech perhaps supplemented by audiovisual aids. This method is predicated on the information transfer model of learning [9]. Under this model, the process of learning involves the transfer of knowledge from the lecturer into the heads of students. However, our theory of how people learn has changed radically. Most theorists now view learning as an active and constructive process in which new information is selectively assimilated with existing knowledge. Learners are no longer regarded as empty vessels to be filled with subject knowledge by an expert. This means that the task of delivering information is no longer regarded as logically sufficient. Learners need guidance in selecting, organizing and integrating information with what they already know. Taken together, the information technology revolution coupled with the change in our understanding of how people learn, suggest that we might need to rethink the traditional lecture and with it how best to use the time teachers have with students in the classroom.

4. FLIPPING THE CLASSROOM
The flipped classroom model [1] is becoming widely adopted in higher education. The idea behind the flipped classroom is to deliver content outside the classroom and then use classroom time to make sense of it. Under the traditional (non-flipped) model, most of the class time is spent by a subject expert delivering material. Learners then leave the classroom and work on getting to grips with it (homework), perhaps working on an assignment. The flipped model reverses this relationship both logically and chronologically. Class time is used to get to grips with the material and time outside the classroom is used to deliver it. Homework is performed at some time prior to the class. The role of the teacher becomes one of being a *facilitator* rather than an expert. The "sage on the stage" is replaced with the "guide on the side" [8]. In its purest form, no new content would be introduced in the class. Instead, learners might spend their time discussing the material, solving problems or putting theory into practice. In reality, many educators adopt a more mixed approach: providing some content outside the class and then discussing it in class

adding new content where relevant; they might also set additional homework tasks to complete after the class.

5. VIDEOS AS A TEACHING MEDIUM

One of the most popular technologies for delivering content outside the classroom is video. Videos combine the visual and audio elements familiar to learners from a traditional lecture. They allow learners to listen to an expert or educator as well as benefit from being able to see visual components including, for example, the screen of a lecture theatre or the visual cues associated with seeing the person who is talking. Videos have the advantages of flexible learning including being able to study at a time, place, pace, and method chosen by the learner rather than the teacher or institution. The main drawback of videos is that there is no opportunity for learners to ask questions. There are two common approaches to adopting videos as a means to deliver content. Teachers either use existing videos created by others and made available on free sites such as YouTube or Vimeo or commercial sites such as Lynda.com; or they record videos of themselves giving some form of lecture.

Educational videos typically fall under one of five categories:
1. Recordings of live presentations
2. Purpose-built screen recordings
3. Narrated whiteboard/blackboard presentations
4. E-Lectures
5. Interactive videos

Recordings of live presentations ("lecture capture") may involve recording the spoken audio from a real lecture in the presence of an audience along with recording the presentation screen, or filming the board or the lecturer (or some combination of all three). See Figure 1 below.
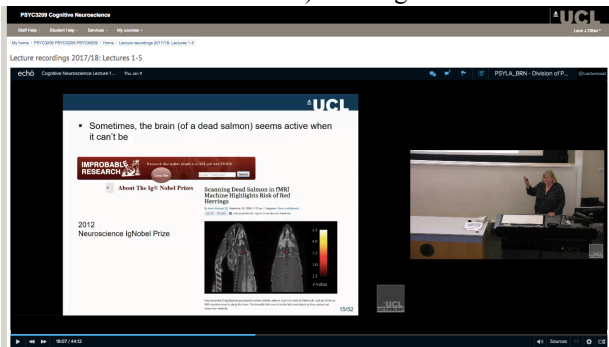

Figure 1. A screenshot from a lecture capture showing the screenrecording and video of the lecturer

Purpose-built screen recordings usually involve recording the spoken audio and capturing the screen when using presentation software (e.g. PowerPoint™) in the absence of an audience. See Figure 2 below.

Why is it so successful?

- Simple
- Colourful
- Physical
- Playful
- Approachable
- Pleasurable

Figure 2. A screenshot from purpose-built narrated screen recording in PowerPoint™.

Narrated whiteboard presentations usually involve using a tablet to capture writing on screen in real-time whilst also recording the spoken audio, again in the absence of an audience. This type of video was popularized by the Khan Academy [11]. See Figure 3 below.
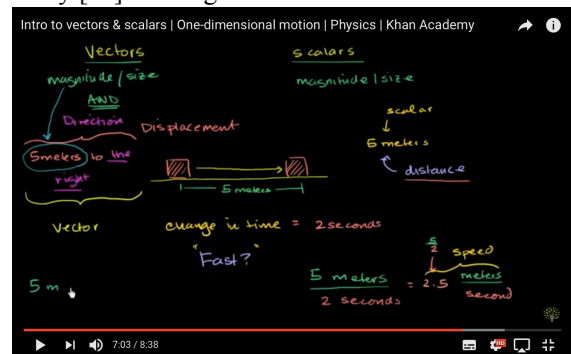

Figure 3. A screenshot from a narrated blackboard presentation at Khan Academy [11].

E-lectures are like purpose-built screen recordings in that they contain spoken audio recordings and visual presentation in the absence of an audience. They differ in that they are interactive, requiring the user to indicate when to proceed to the next screen, which content to display next or to answer occasional questions. See Figure 4 below. The full version is also available online [3].
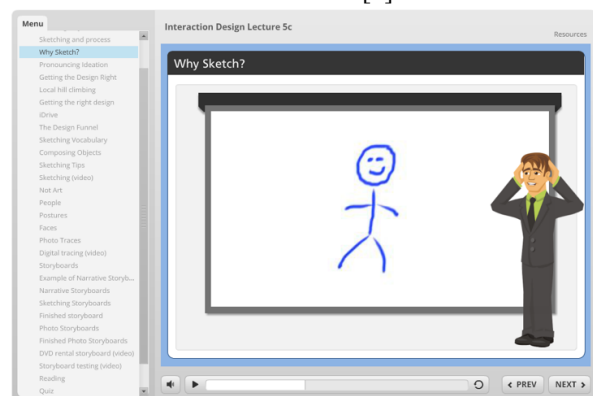

Figure 4. A screenshot from an interactive E-lecture on interaction design.

Interactive videos are videos that require learners to answer questions at various points before the video playback continues. Popular online platforms for embedded videos include PlayPosit™ [10] and Edpuzzle™ [2]. See figure 5 below.
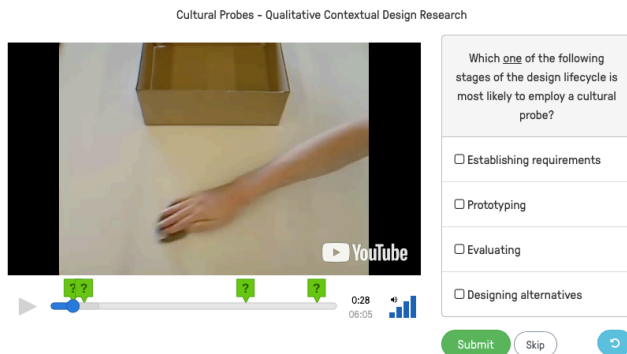

Figure 5. Screenshot from interactive video in Edpuzzle [2].

E-lectures and interactive videos can both be distinguished from the others by the fact that they incorporate interactive features. The constructivist model of learning suggests that interactivity should increase learning as it assists learners in selecting, organizing and integrating material. Previous research has indicated that interactive e-lectures increase performance in deep-learning tests [4,5,6] compared to the non-interactive alternatives.

6. STUDY 1
6.1 Aim
The aim of this study was to determine whether interactive e-lectures can enhance the learning process through use of the flipped classroom model.

6.2 Participants
In this study the participants were 40 students studying an MSc (postgraduate) course in Persuasive Games at a well-known university in the United Kingdom. The course lasted one term (10 weeks).

6.3 Method and Results
The students were given a series of ten e-lectures to study in their own time and ten weekly two-hour workshops in a classroom. The e-lectures included embedded videos and multiple-choice self-assessment questions. In the middle of the term the students completed an open-ended survey consisting of three questions: "Name ONE thing that you would like your tutors to STOP doing which would enhance the teaching", "Name ONE thing that you would like your tutors to START doing which would enhance the teaching", "Name ONE thing that you would like your tutors to CONTINUE doing which is valuable". The feedback was analyzed and seven themes emerged of which the e-lectures were one. Individual comments that were not shared by more than one person were discarded unless they raised issues of particular significance. Summaries of the comments relating to the e-lectures are given below.

Quotations have been selected to represent the general feedback.

"[Continue] the e-lectures"
"The use of external videos in e-lectures is amazing!"
"remote learning is good"
"the e-lectures are kind of boring".

Figure 6. Selected quotations about e-lectures from the mid-term survey.

At the end of the course students were asked to complete an online survey in class consisting of 10 Likert-style questions. The scale for the Likert questions was strongly disagree, disagree, neutral, agree, strongly agree. Key results are illustrated in Figures 7 and 8. In the figures the statistics for strongly disagree and disagree have been combined into a single "disagree" category. Similarly, strongly agree and agree have been combined into a single "agree" category. The completion rate was 80% (n=32).
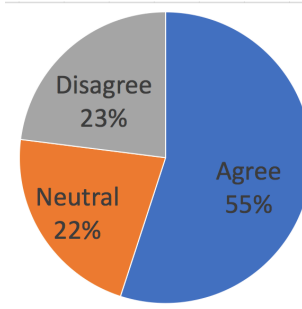

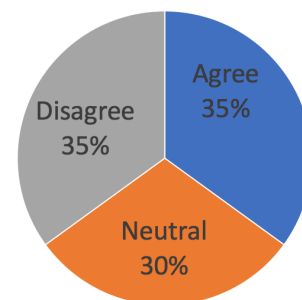**Figure 7. Agreement levels for whether e-lectures made a useful contribution.**

Figure 8. Agreement levels for whether practical activities were useful.

7. STUDY 2
7.1 Aim
Study 1 considered the effectiveness of videos in the form of e-lectures in a flipped classroom course. Study 2 was conducted to attempt to replicate the findings of Study 1, but also provide a comparison with traditional lectures.

The reliability of the results of Study 1 was assessed by attempting replication with students in a different department, studying a different subject at a different level. Comparison with traditional lectures was made by including a series of lectures not subject to the flipped

model and also inviting students to reflect on the two different models.
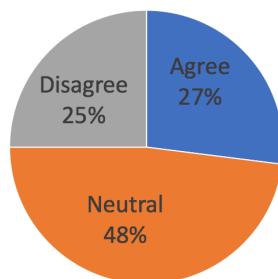
7.2 Participants
In this study the participants were 182 students studying a Level Three (undergraduate) course in Interaction Design at a well-known university in the United Kingdom. 25 students attended the class in which the survey was conducted. The course lasted one term (10 weeks).

7.3 Method and Results
The students were given a series of ten e-lectures to study in their own time, ten one-hour practical workshops and eight face-to-face (traditional) guest lectures. At the end of the course students were asked to complete an online survey in class. Key results are illustrated in Figures 9,10 and 11. The completion rate for the survey was 83% (n=29) of those present.
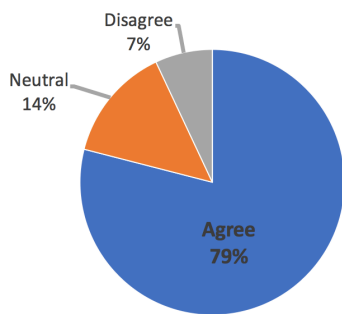
Figure 9. Agreement levels for whether e-lectures made a valuable contribution.

Figure 10. Agreement levels for whether workshops made a valuable contribution.
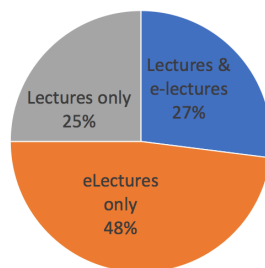
Figure 11. Preferences for media types in addition to workshops

Qualitative feedback reinforced the quantitative results with many participants commenting that the e-lectures were the main thing they liked about the module.

8. DISCUSSION AND CONCLUSIONS
The aim of this investigation was to determine whether videos can enhance the learning process through use of the flipped classroom model. Five different types of videos were identified and interactive e-lecture videos were considered in two separate flipped classroom studies. The results suggest that e-lecture videos are highly valued and learners prefer the flipped model over conventional lectures. It is interesting, however, that whilst learners valued the flipped model, they did not value the face-to-face workshops as highly as the e-lecture videos. Further research is necessary to determine why this is the case. Future studies are planned to compare the use of interactive e-lecture videos with the four alternatives identified earlier.

9. REFERENCES

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