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Creating Question-embedded Videos to Increase Engagement and Retention

Brian Pitts, M.D., M.S.

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Is this how medical students learn?
How do doctors get their continuing medical education?
Can technology save us?
We’ve grafted familiar experiences onto new technologies.
The problem is . . .

There’s too much information to learn!
How Much Is Too Much Reading for Medical Students? Assigned Reading and Reading Rates at One Medical School

Edward C. Staff, MD, and Canary A. Staff, MD

Abstract

Purpose To determine how medical students' reading time affects their ability to complete assigned reading.

Method The authors calculated the total amount of reading assigned during the first 11 weeks of the pre-clinical year at a major university. They found that the students spent an average of 35 hours per week reading, or 7% of their total work week. The authors then determined the amount of the assigned reading they had completed. The data showed that on average, students read approximately 5% of the assigned reading in the first week, 15% in the second week, and so on, with the majority of the assigned reading completed in the last week of the course.

Results The authors found that students read approximately 50% of the assigned reading during the first week, 75% in the second week, and so on, with the majority of the assigned reading completed in the last week of the course.

Conclusions Medical students need to prioritize their time to complete assigned reading in order to be successful. The authors recommend that medical schools provide resources to help students manage their reading load and ensure that they have enough time to study for exams.

Pre-clinical years

30K pages

100 words per min

500 pages per week

40 hours per week of reading just to keep up

Academic Medicine, Vol. 86, No. 9 / September 2011
New Paradigms

TRADITIONAL LEARNING
New Paradigms

TRADITIONAL LEARNING

BLENDED LEARNING
(flipped classroom)
New Paradigms
With video you can...

☑️ say more in less time
☑️ put the learner in control
☑️ re-purpose lessons
TECHNOLOGY
DRIVE
PEDAGOGY
DOES TECHNOLOGY DRIVE PEDAGOGY
Something must be done to engage learners.
Question

In the last 5 minutes, how many times has your mind wondered?
Mind Wandering Is the Enemy of Learning
Attention During Lecture

1 attention metrics: heart rate, clickers, or observation

Increasing Attention During Lecture

ATTENTION

(activity)

(break)

(start of lecture)

(end of lecture)

TIME (MIN)

ATTENTION metrics: heart rate, clickers, or observation

Why Do We Forget?

Sender  \[\rightarrow\text{transmission of content}\rightarrow\text{Receiver}\]

\[\text{working memory (active state, short-term)}\]

\[\downarrow\]

long-term memory

\{ATTENTION, MOTIVATION, RELEVANCE\}
Why Do We Forget?

Sender → transmission of content → Receiver

working memory (active state, short-term)

ATTENTION
MOTIVATION
RELEVANCE

long-term memory
Evidence-Based Education
Evidence-Based Education

Visible learning: A synthesis of over 800 meta-analyses in education (Hattie, 2009)
So, how might we use the best evidence in our instruction?
Test-Enhanced Learning

Practice tests during study increase the likelihood that information is remembered later.

(aka testing effect, retrieval practice effect, retrieval-enhanced learning, low stakes quizzes, practice tests)

Henry Roediger
Evidence for Retrieval Practice

From Roediger & Karpicke (2006, Psychological Science, volume 17, issue 3)
Percent Recall of Information

Retention Interval

<table>
<thead>
<tr>
<th>Interval</th>
<th>SSSS</th>
<th>SSST</th>
<th>STTT</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 minutes</td>
<td>83</td>
<td>78</td>
<td>71</td>
</tr>
<tr>
<td>1 Week</td>
<td>41</td>
<td>58</td>
<td>62</td>
</tr>
</tbody>
</table>

From Roediger & Karpicke (2006, Psychological Science, volume 17, issue 3)
For Learning To Last, It Must Be . . .

1. Meaningful
2. Require effort
In pairs, take two minutes to talk about the testing effect. Does it surprise you? If retention is better with retrieval practice, why are people so adverse to tests?
What About Video?

What kinds of video lead to the best student engagement (interacting, watching)?

- Shorter Videos (<6min)
- Talking head interspersed
- Faster speaking pace
- Lectures for novice, tutorials for practice
Video Analytics - Digging Deeper
Video Analytics - Engagement
In-class Lectures

On-line Lectures
In-class Lectures

YOUR ON-LINE AUDIENCE WILL LEAVE (QUICKLY)
Evidence-Based Education
Evidence-Based Education
An Experiment

What effect do quiz questions embedded into a video have on long-term retention?

Does it matter where the quiz questions are placed (interspersed or at the end)?
An Experiment
An Experiment

1. Question-embedded Video
2. Questions-at-end of Video
3. No questions Video

quiz scores, survey, video analytics, IMMS (attention, relevance, confidence, satisfaction)

Test

quiz scores, survey
The Learner Experience
1 week later...
The Developer/Researcher Experience
Technical Workflow

1. <image> to WISTIA
2. WISTIA to hapyak
3. hapyak to Amazon Mechanical Turk
4. Amazon Mechanical Turk to Qualtrics
5. Qualtrics to SPSS
STUDY_RANDOMIZED_AMT_V6 - RELEASED (12633)

You have unlocked your survey. When you have finished editing, please lock your survey again.

Consent to Participate in an Online Research Study

Title of Study
Retrieval Practice and Learner Motivation in Online Video Instruction (IRB 705192-1)

What the study is about
We are asking you to participate in an academic, not-for-profit research study, aimed at improving online learning. This form is designed to give you information about this study. The purpose of this study is to learn how people respond to a video-based medical lecture.

What we will ask you to do
This study involves watching two short videos (2-3 minutes each), taking a short quiz (2 minutes), and filling out a brief survey (5 minutes). This study should take about 10 minutes to complete.

Risks and Discomfort
We will make every reasonable effort to keep your information private. We will not collect or share any identifying information about you including your name, phone number, email, or any other information that will make it possible to identify you. However, no guarantees can be made regarding the interception of data sent via the Internet by any third parties. Taking part in this study is completely voluntary. If you choose not to watch the videos and/or complete the survey, you will not get compensated.

What you get in return
You will receive $0.60 for watching 2 videos and answering all questions. You may stop the survey at any time, but you will not get paid.

If you have questions
You may contact the principal investigator for questions. This research has been received “exempt status” but is nevertheless monitored by the Institutional Review Board (IRB) at the University of California, Davis. By selecting yes below, you acknowledge that you have read the above statements and consent to take part in this study.
LESSON 1 of 2

Press play to begin. The "Next" button will appear after 2 minutes. Do not refresh browser.

&nbs

<iframe allowfullscreen="" frameborder="" width="" height="" src="" width="" height=""></iframe>

Instructions: $e://Field/instructions"
Q7
This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Q8
Part 1 of 4
You’re almost done! You will now be asked to complete a brief survey (5 minutes) that is not timed. After that, you'll receive the payment code for Amazon Mechanical Turk.

Q9
What is your age?
- younger than 18
- 18 - 25
- 25 - 35
- 36-45
- older than 45
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Creating Question-Embedded Videos
Success over the last 7 days...

![Graph showing success metrics: 200% activity, 3 video plays, 15 annotation views.]

- **Activity:** 200%
- **Video Plays:** 3
- **Annotation Views:** 15

**Projects Tab**

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<th>Type</th>
<th>Tags</th>
<th>#</th>
<th>Modified</th>
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</tbody>
</table>
In general, which of the following oral airways (OPAs) is more likely to be appropriate for females?

- Purple
- Yellow
- Red
- No difference; they are all the same size.
In general, which of the following oral airways (OPAs) is more likely...

- Purple
- Yellow
- Red
- No difference; they are all the same size.
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the color of the general w?</td>
<td>False 5 Yellow</td>
</tr>
<tr>
<td>What is the color of the general w?</td>
<td>True 4 Purple</td>
</tr>
<tr>
<td>Prior to placing the syringe, what is its function?</td>
<td>False The syringe serves as a secondary way to ventilate the patient</td>
</tr>
<tr>
<td>Prior to placing the syringe, what is its function?</td>
<td>True Inflating the &quot;cuff&quot; verifies that the balloon is intact</td>
</tr>
<tr>
<td>What is the function of the general w?</td>
<td>True It creates a &quot;Hockey Stick&quot; shape that improves the chances of successful intubation</td>
</tr>
<tr>
<td>You've reached...</td>
<td>True Somewhat confident</td>
</tr>
<tr>
<td>What is the color of the general w?</td>
<td>False 5 Purple</td>
</tr>
<tr>
<td>Prior to placing the syringe, what is its function?</td>
<td>False Syringes often get misplaced during this important period</td>
</tr>
<tr>
<td>Prior to placing the syringe, what is its function?</td>
<td>True Inflating the &quot;cuff&quot; verifies that the balloon is intact</td>
</tr>
<tr>
<td>What is the function of the general w?</td>
<td>True It ensures that the endotracheal tube is functioning properly</td>
</tr>
<tr>
<td>Shorter handles are easier to maneuver</td>
<td>True 4</td>
</tr>
<tr>
<td>Shorter handles generally are easier to grasp</td>
<td>False</td>
</tr>
<tr>
<td>Shorter handles have batteries that last longer</td>
<td>False</td>
</tr>
<tr>
<td>Shorter handles generally are easier to grasp</td>
<td>True 4</td>
</tr>
<tr>
<td>It serves as a &quot;pull handle&quot; to better control the endotracheal tube</td>
<td>False</td>
</tr>
<tr>
<td>Shorter handles are easier to maneuver</td>
<td>True 4</td>
</tr>
<tr>
<td>You've reached...</td>
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</tr>
<tr>
<td>Shorter handles generally are easier to grasp</td>
<td>False</td>
</tr>
</tbody>
</table>
There are many more features and several options to create interactive video.
There are many more features and several options to create interactive video.

HTML5 Layer

Analytics (xAPI)

video layer (video host)
Back To Our Experiment

1. Question-embedded Video
2. Questions-at-end of Video
3. No questions Video

quiz scores, survey, video analytics, IMMS (attention, relevance, confidence, satisfaction)

AMT

Test

quiz scores, survey
Application

In pairs, predict what you think the results will be. Does question placement make a difference? Do we even need video annotations?
The Results

Retention Interval

90  -  80  -  70  -  60  -  50  -  40  -

POST
NONE

QEV
PRE POST (1 week)

90
82

68
63
39

percent correct

no significant difference

*low attention
*lower relevance
*more forgetting
Summary

**Pedagogy First!**

- Shorter Videos (<6min)
- Talking head interspersed
- Faster speaking pace
- Lectures for novice, tutorials for practice

- Working Memory

- Attention
- Motivation
- Relevance
KEEP VIDEOS SHORT!

EXPERIMENT & LEARN!

DESIREABLE DIFFICULTIES ARE GOOD!
EMBED QUESTIONS INTO VIDEOS!

- Y Questions embedded in Video
- Y Questions-at-end of Video
- N No questions Video (boring)
Reflection

In pairs, take two minutes to reflect on a concept or idea you learned in this session and how you might use the information to improve your own use or creation of interactive videos.
thank you

contact information
For more info, please contact me at

Work: brian.pitts@ucdmc.ucdavis.edu
LinkedIn: linkedin.com/mededsocial
Twitter: @brian_pitts