

How Video Production Affects Student Engagement: An Empirical Study of MOOC Videos

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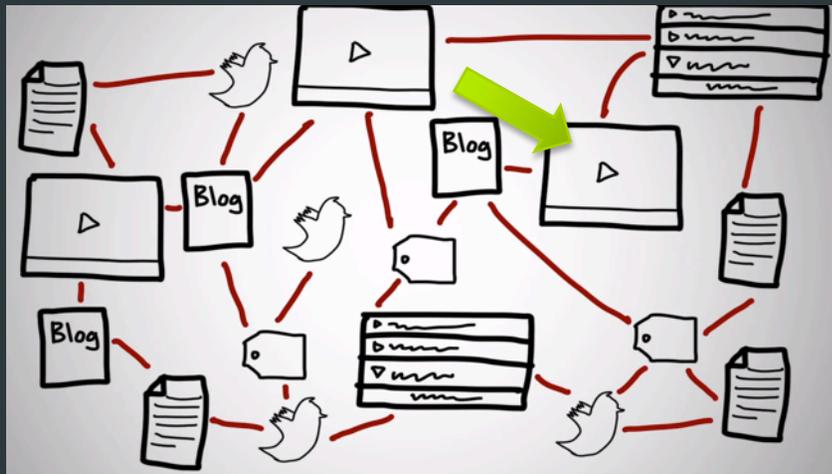
Rob Rubin

MIT CSAIL -> University of Rochester

MIT CSAIL

edX

cMOOC



Cormier, Downes, Siemens. 2008 –

xMOOC

A screenshot of an xMOOC (extended MOOC) interface. The browser address bar shows the URL: https://courses.edx.org/courses/MITx/6.00x/2012_Fall/courseware/Week_3/Lecture_5/. The page title is "MITx: 6.00x Introduction to Computer Science and Programming". The interface includes a navigation menu on the left with options like "Overview", "Week 1", "Week 2", "Week 3", "Recursion", "Objects", "Problem Set 3", "Week 4", "Week 5", "Midterm Exam 1", and "Week 6". The main content area displays a video player with a play button and a video player interface. The video content shows Python code for a factorial function:

```
def fact(n):  
    """assumes that n is an int > 0  
    returns n!"""  
    res = 1  
    while n > 1:  
        res = res * n  
        n -= 1  
    return res
```

 A green arrow points from the "Recursion" menu item to the video player. Another green arrow points from the video player to the video player interface.

Coursera, edX, Udacity. 2012 –

A man with glasses is visible in the background, looking towards the camera. He is in a video production studio. There are several computer monitors. One monitor in the foreground shows a line graph with data points. Another monitor in the background shows a document with Japanese text. The desk is cluttered with various items, including cables, a laptop, and a tablet. The overall scene is a professional video production environment.

*Which kinds of videos lead to the best **learning outcomes** in a MOOC?*

*Which kinds of videos lead to the most **engagement** at a **reasonable cost**?*

edX video producer

OUR STUDY

How does video production
affect engagement?

(largest-scale study to date)

METHODOLOGY

Video data

4 edX courses, Fall 2012: CSI, A.I., Stat, Chem
862 videos, 128k students, 6.9 million sessions

Engagement metric

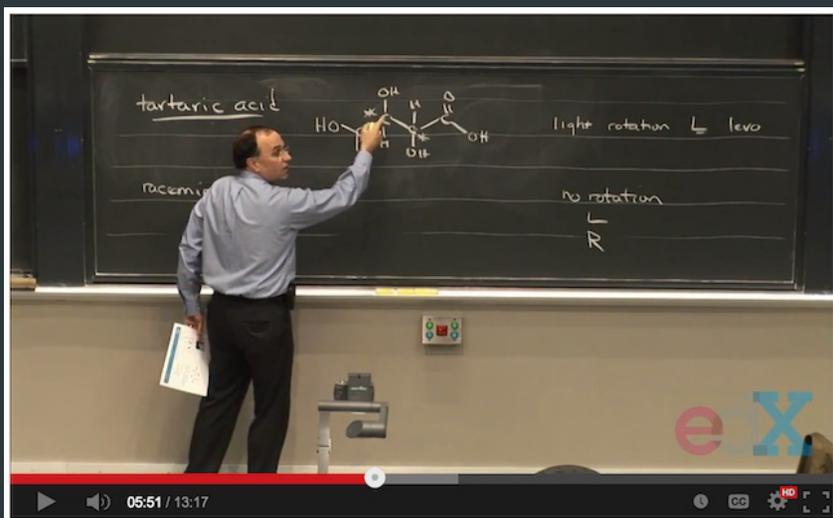
video watching session length

Interviews

with edX video producers & program managers

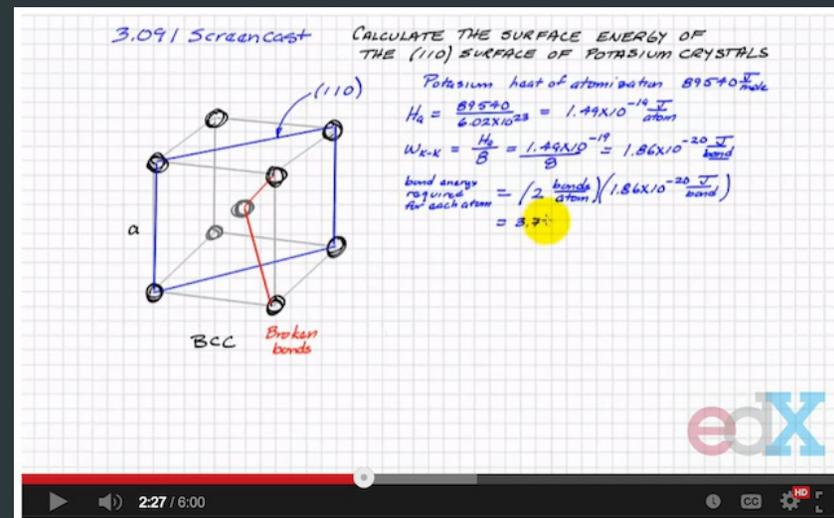
VIDEO TYPE

Lectures



A lecturer in a light blue shirt and dark trousers stands in front of a chalkboard. He is pointing at a chemical structure of tartaric acid drawn on the board. The structure shows two chiral centers with hydroxyl groups and hydrogens. The board also has the text "tartaric acid", "racemic", "light rotation L = levo", and "no rotation" written on it. The video player interface at the bottom shows a timestamp of 05:51 / 13:17.

Tutorials



A tutorial screen on a grid background. On the left is a diagram of a Body-Centered Cubic (BCC) unit cell with atoms at the corners and center. A (110) surface is indicated by a blue line. Red lines represent broken bonds. The text "BCC Broken bonds" is written below the diagram. On the right, the following calculations are shown:

3.091 Screencast CALCULATE THE SURFACE ENERGY OF THE (110) SURFACE OF POTASSIUM CRYSTALS

Potassium heat of atomization $89540 \frac{\text{J}}{\text{mole}}$

$$H_a = \frac{89540}{6.02 \times 10^{23}} = 1.49 \times 10^{-19} \frac{\text{J}}{\text{atom}}$$
$$W_{K-K} = \frac{H_a}{8} = \frac{1.49 \times 10^{-19}}{8} = 1.86 \times 10^{-20} \frac{\text{J}}{\text{bond}}$$
$$\text{bond energy required for each atom} = (2 \frac{\text{bonds}}{\text{atom}}) (1.86 \times 10^{-20} \frac{\text{J}}{\text{bond}}) = 3.7 \times 10^{-20} \frac{\text{J}}{\text{atom}}$$

The video player interface at the bottom shows a timestamp of 2:27 / 6:00.

RECORDING STYLE

a.)

tartaric acid

light rotation L levo

no rotation

racemic

edX

05:51 / 13:17

b.)

edX

1:13 / 6:16

c.)

3.091 Screencast

CALCULATE THE SURFACE ENERGY OF THE (110) SURFACE OF POTASSIUM CRYSTALS

Potassium heat of atomization $89540 \frac{\text{J}}{\text{mole}}$

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bond energy required for each atom = $(2 \text{ bonds} / \text{atom}) \times (1.86 \times 10^{-20} \frac{\text{J}}{\text{bond}}) = 3.7 \times 10^{-20} \frac{\text{J}}{\text{atom}}$

BCC

Broken bonds

edX

2:27 / 6:00

d.)

Matched Analysis

Basic principle: Perform analysis within each matched group and then pool to obtain a summary average

Typical format for results from a case control study involving 1-1 matching on a single factor.

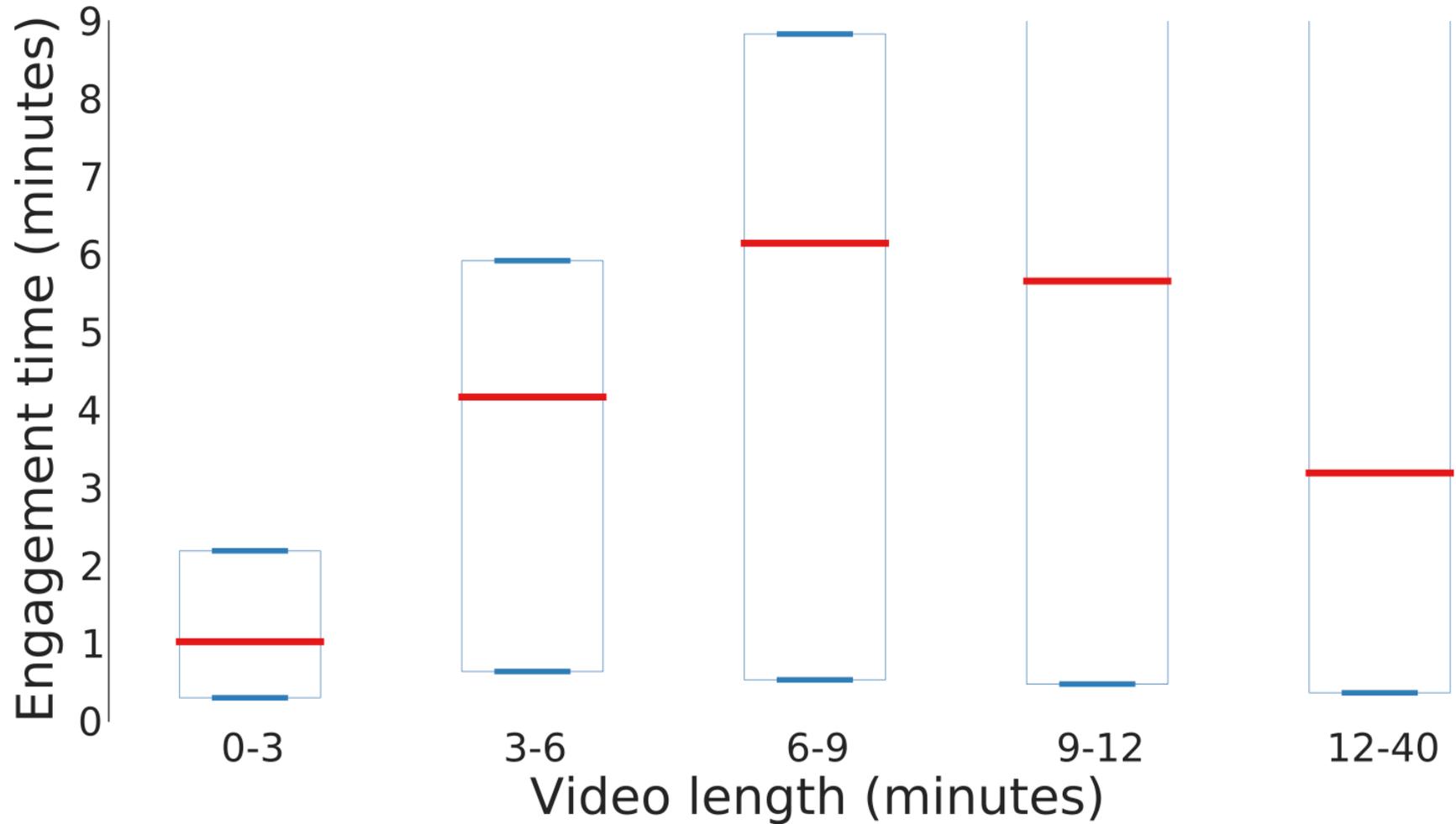
	Exposure Status of Control	
	+	-
Exposure Status of Case	+ A	B
	- C	D

edX

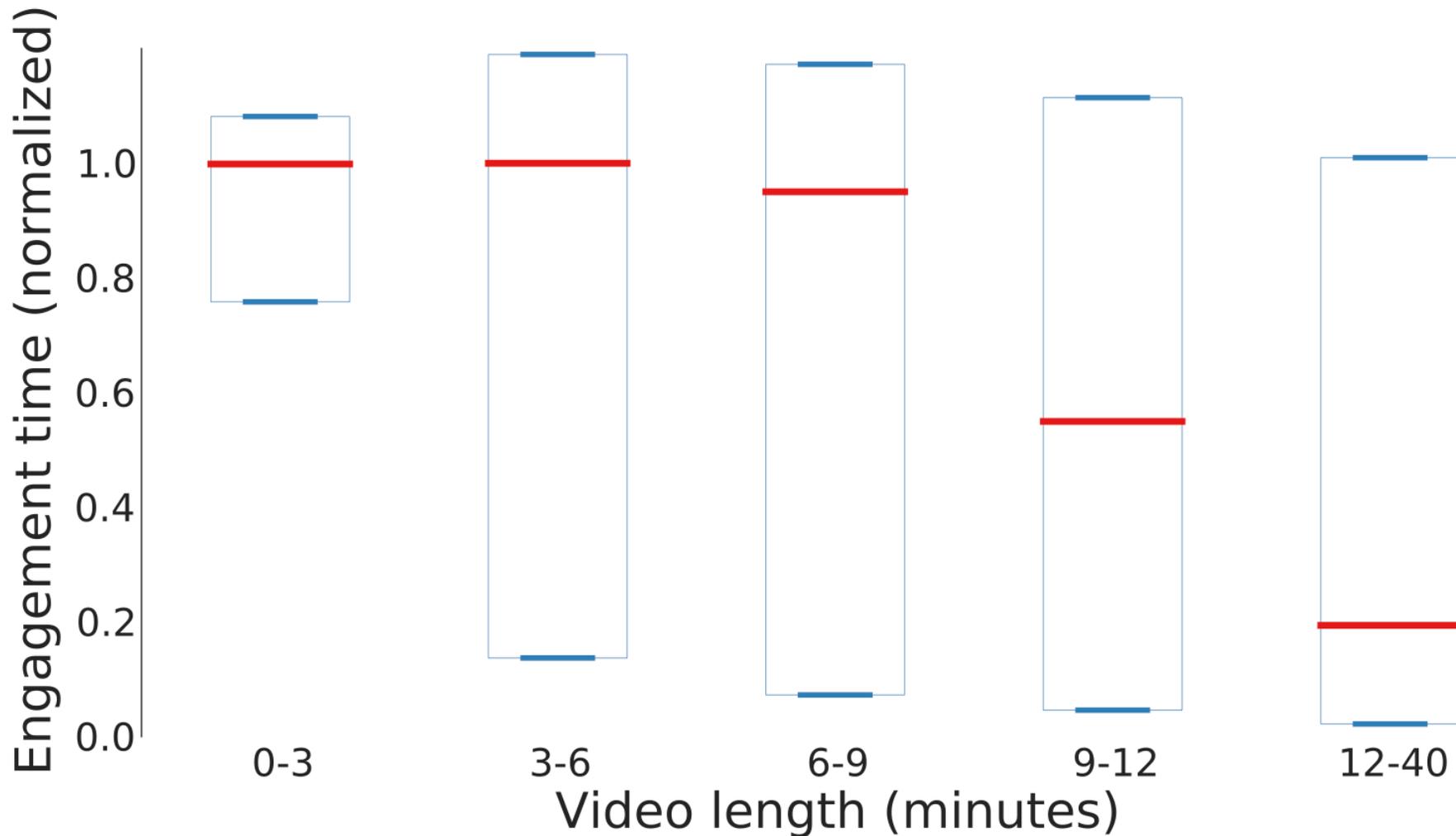
02:32 / 11:04

Five Findings and Recommendations

I. Shorter videos much more engaging



I. Shorter videos much more engaging



RECOMMENDATION

Invest in pre-production to
plan for < 6-min segments

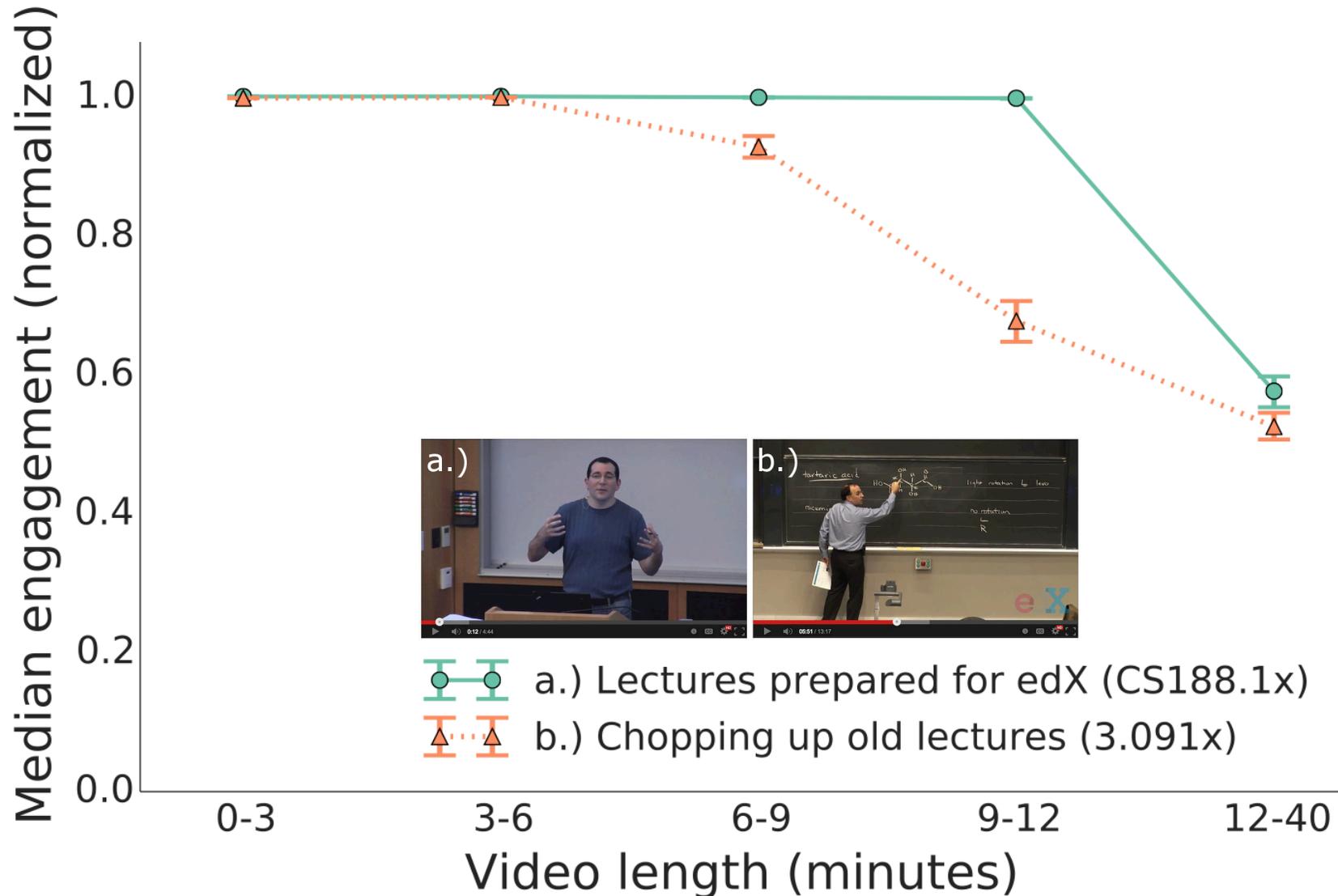
2. Pre-production improves engagement



Both courses recorded as live classroom lectures with highly-rated lecturers.

a.) with pre-production, b.) only post-production

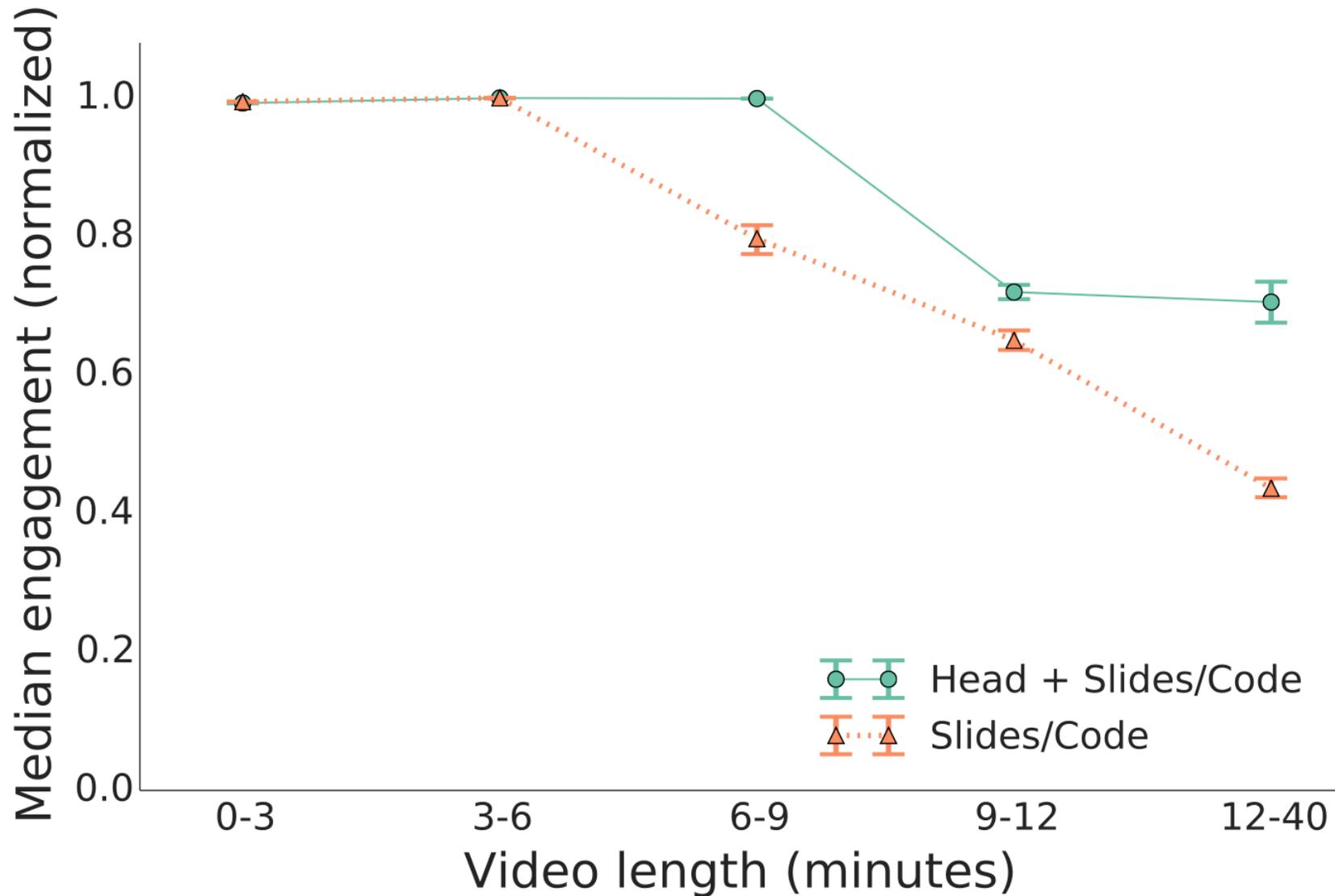
2. Pre-production improves engagement



RECOMMENDATION

Always plan for MOOC
format, even for live lectures

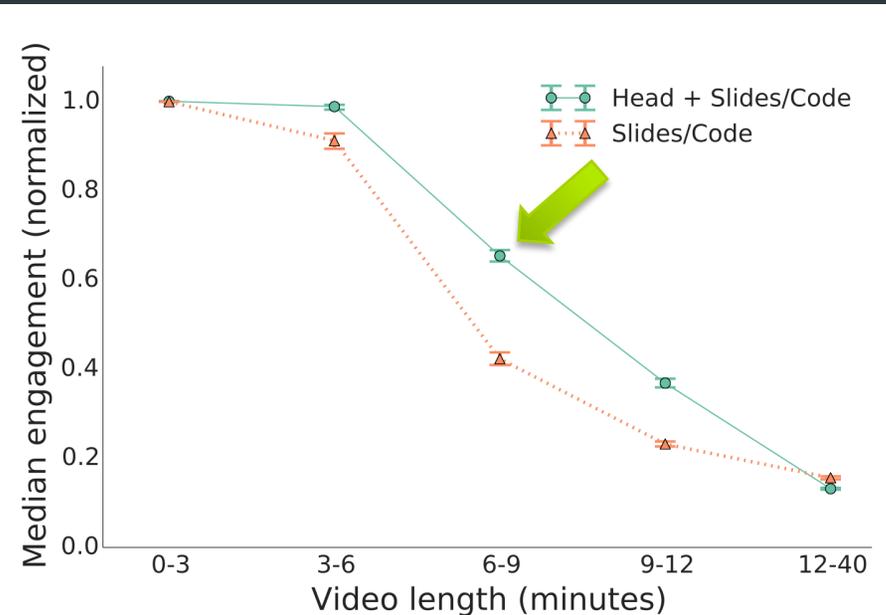
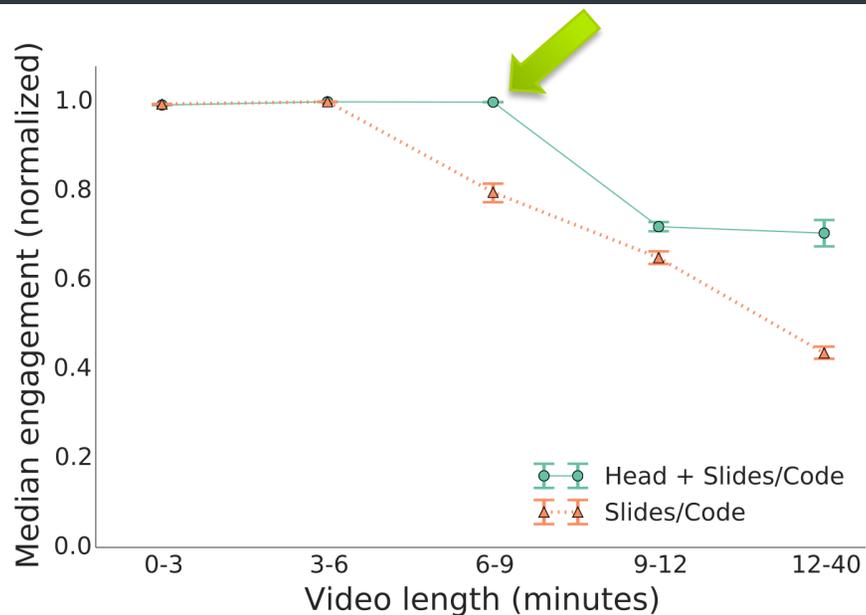
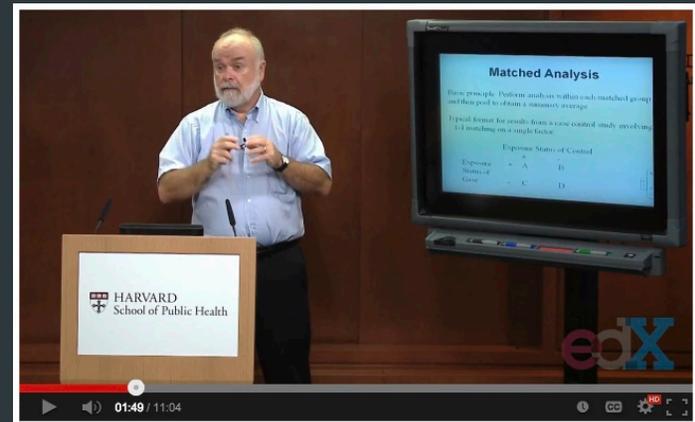
3. Talking head more engaging



RECOMMENDATION

Record and insert talking head
at opportune times

4. Informal shots can beat expensive studios

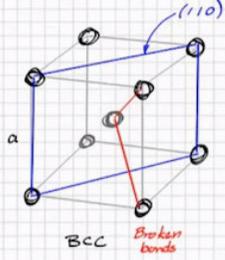


RECOMMENDATION

Strive for one-on-one,
personal feel instead of
high-end studio production

5. Khan-style tutorials beat slides/code

a.) 3.091 ScreenCast CALCULATE THE SURFACE ENERGY OF THE (110) SURFACE OF POTASSIUM CRYSTALS



Potassium heat of atomization $89540 \frac{\text{J}}{\text{mole}}$

$$H_a = \frac{89540}{6.02 \times 10^{23}} = 1.49 \times 10^{-19} \frac{\text{J}}{\text{atom}}$$
$$W_{110} = \frac{H_a}{8} = \frac{1.49 \times 10^{-19}}{8} = 1.86 \times 10^{-20} \frac{\text{J}}{\text{bond}}$$

bond energy required for each atom = $(2 \frac{\text{bonds}}{\text{atom}}) (1.86 \times 10^{-20} \frac{\text{J}}{\text{bond}})$

$= 3.7 \times 10^{-20} \frac{\text{J}}{\text{atom}}$

BCC Broken bonds

edX

2:27 / 6:00

b.)

```
def findPayment(loan, r, m):
    """Assumes loan and r are floats, m an int
    Returns the monthly payment for a mortgage of size
    loan at monthly rate of r for m months"""
    return loan*((r*(1+r)**m)/((1+r)**m - 1))

class Mortgage(object):
    """Abstract class for building different kinds of mortgages"""
    def __init__(self, loan, annRate, months):
        """Create a new mortgage"""
        self.loan = loan
        self.rate = annRate/12.0
        self.months = months
        self.paid = [0.0]
        self.owed = [loan]
        self.payment = findPayment(loan, self.rate, months)
        self.legend = None #description of mortgage

    def makePayment(self):
        """Make a payment"""
        self.paid.append(self.payment)
        reduction = self.payment - self.owed[-1]*self.rate
        self.owed.append(self.owed[-1] - reduction)

    def getTotalPaid(self):
        """Return the total amount paid so far"""
        return sum(self.paid)

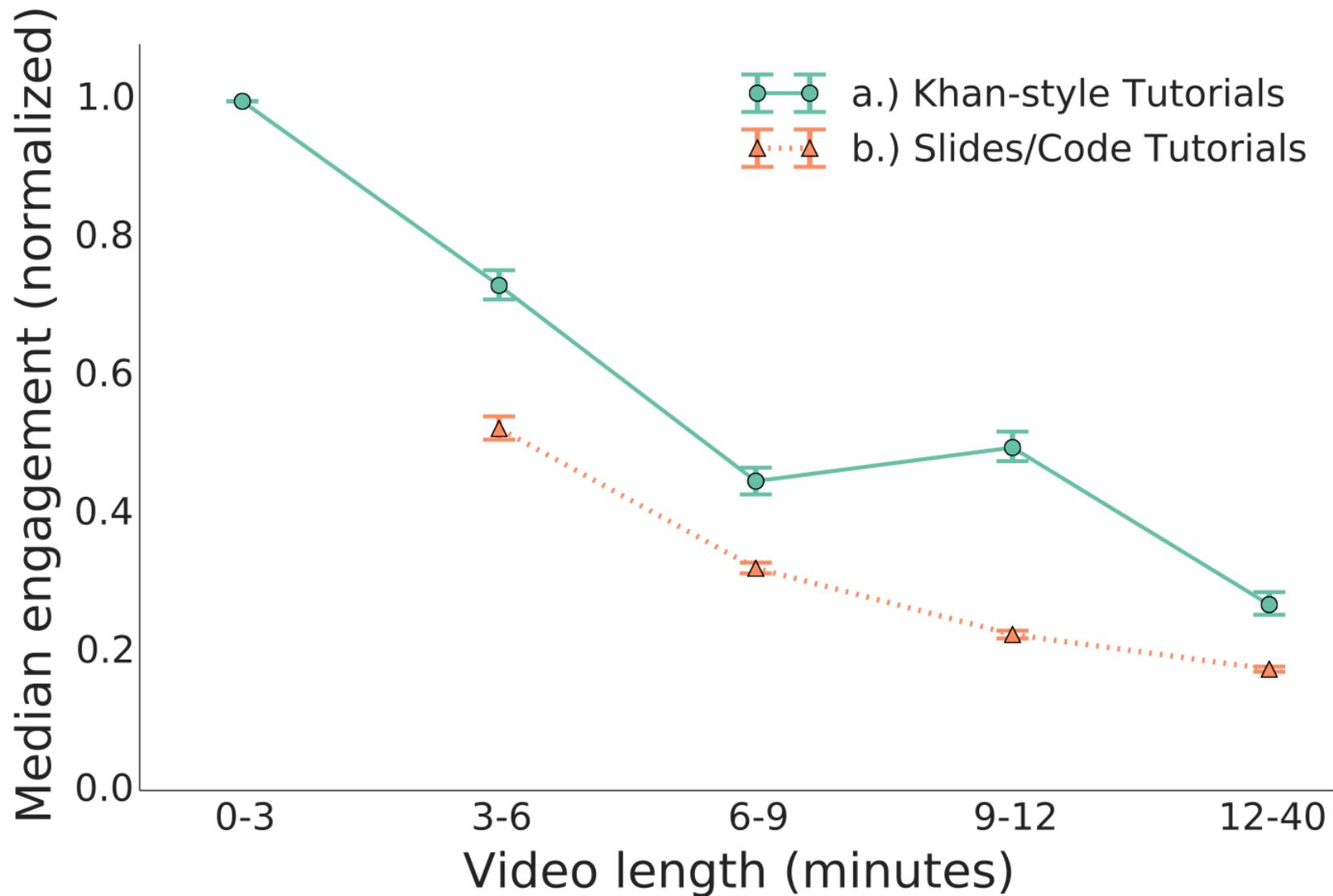
    def __str__(self):
        return self.legend
```

Python 2.7.3 [EPD 7.3-2 (32-bit)] (default, Apr 12 2012, 11:28:34)
[GCC 4.0.1 (Apple Inc. build 5493)] on darwin
Type "copyright", "credits" or "license()" for more info.
>>> ===== RESTART =====>>>
>>>

edX

2:27 / 8:40

5. Khan-style tutorials beat slides/code



RECOMMENDATION

Use hand-drawn motion and
extemporaneous speaking



*Which kinds of videos lead to the most **engagement** at a **reasonable cost**?*

1. *Short*
2. *Pre-planned*
3. *Talking head*
4. *Personal*
5. *Khan-style*

Question: Future of educational videos?

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