

MIT, 하버드, 스탠포드  
학생 백만명 시대:  
학교가 필요 없어진다?

MIT CSAIL 김주호



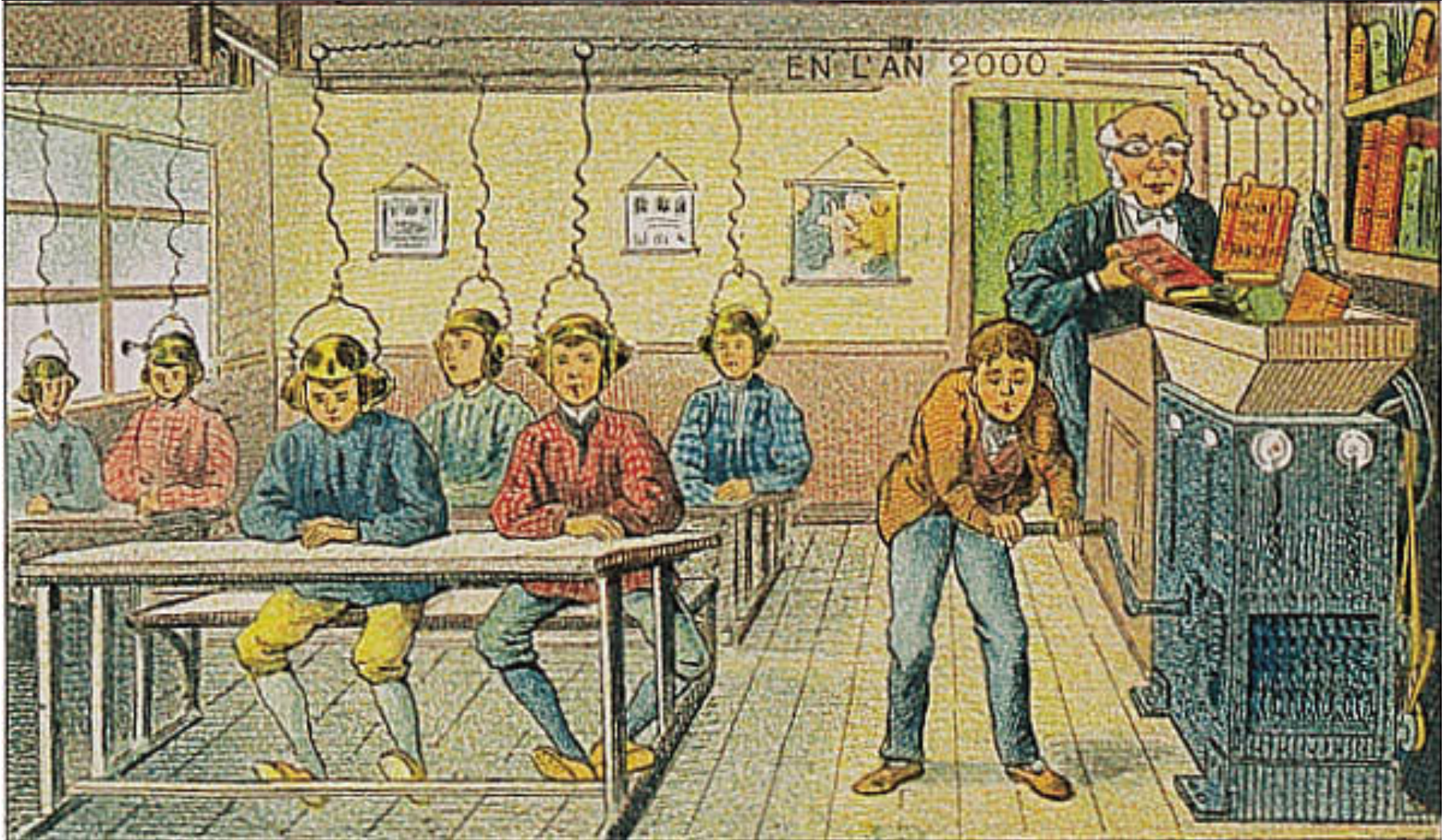






Český Krumlov, Unesco World Heritage. "Zlatá Koruna School." Germany.

# School in 2000, from 1910





서당, 단원풍속도첩. Wikipedia









<http://www.generationbubble.com/2010/04/28/class-struggle-corporatized-higher-education-and-symbolic-power/>

# 교육의 이슈들

# Reach

## Schools for Africa

아프리카에 학교를 지어주세요!



# Quality



# Money



AP Photo/Steve Yeater

AP

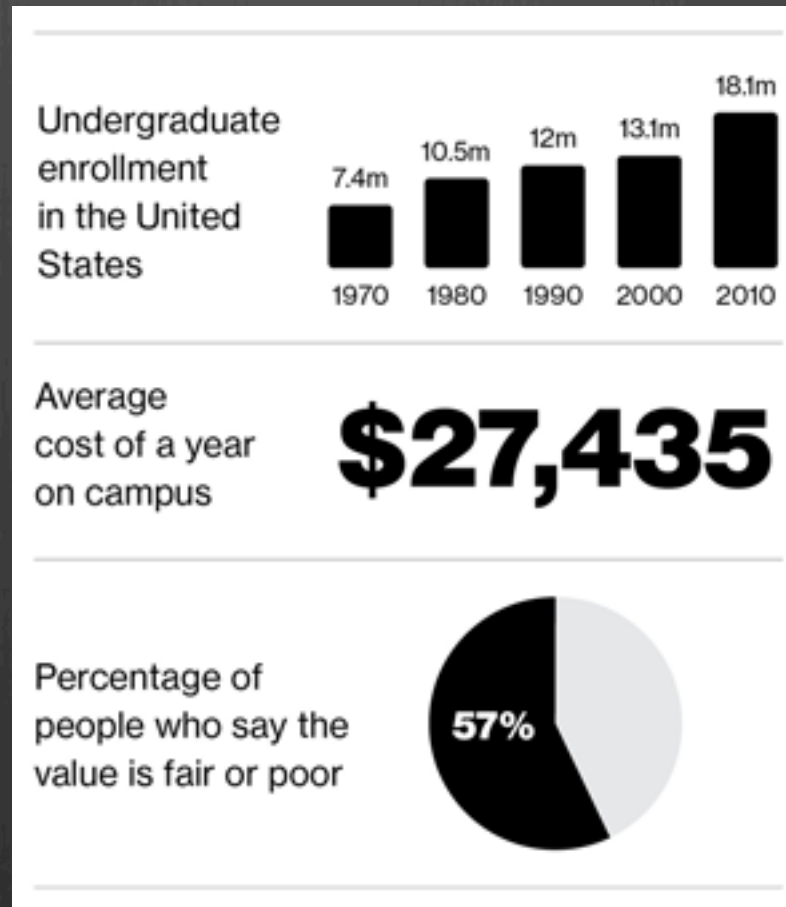


SBS

## 🎬 한국

🎬 사립대 평균 등록금: 연간 768만원 (세계 2위)

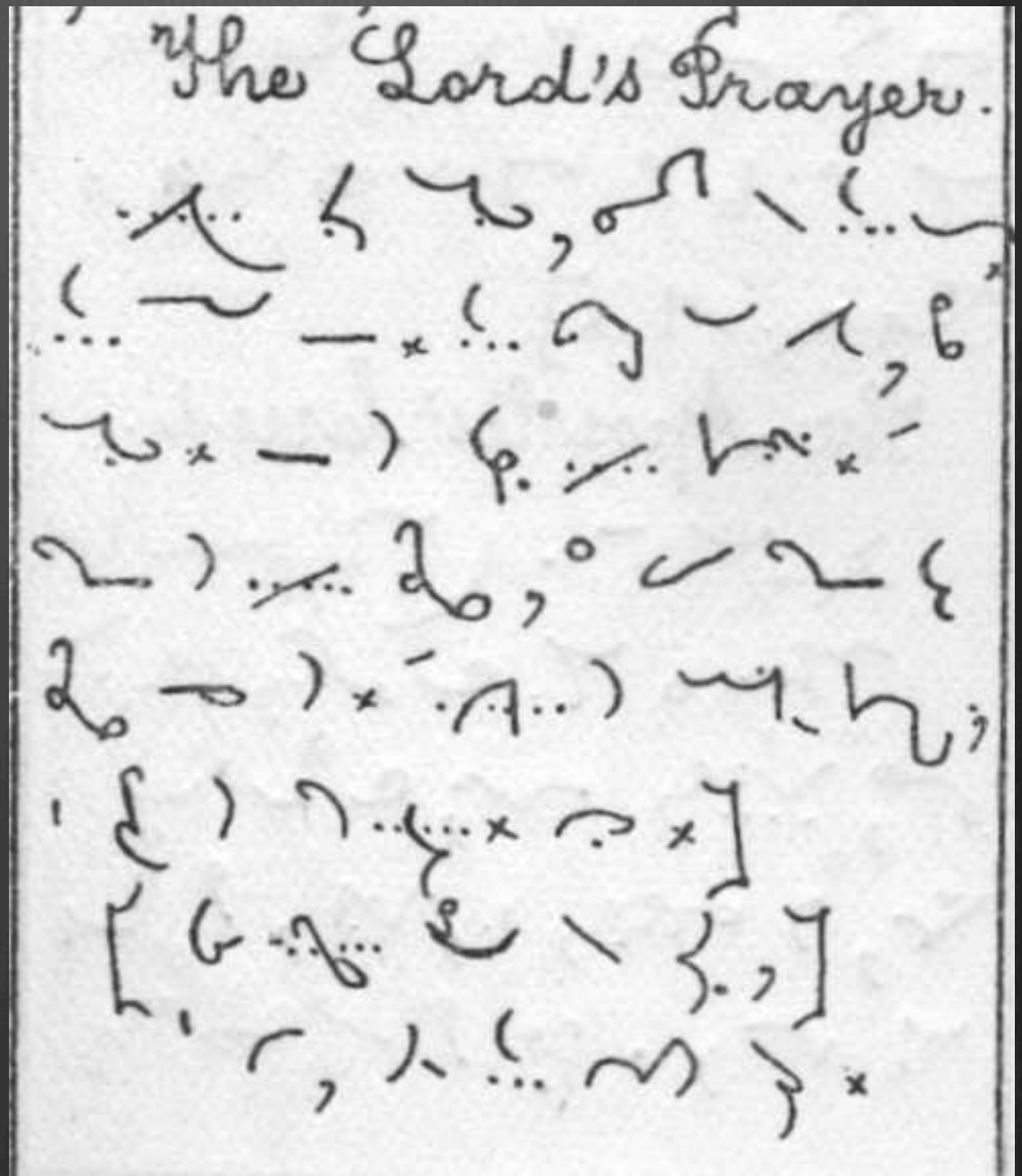
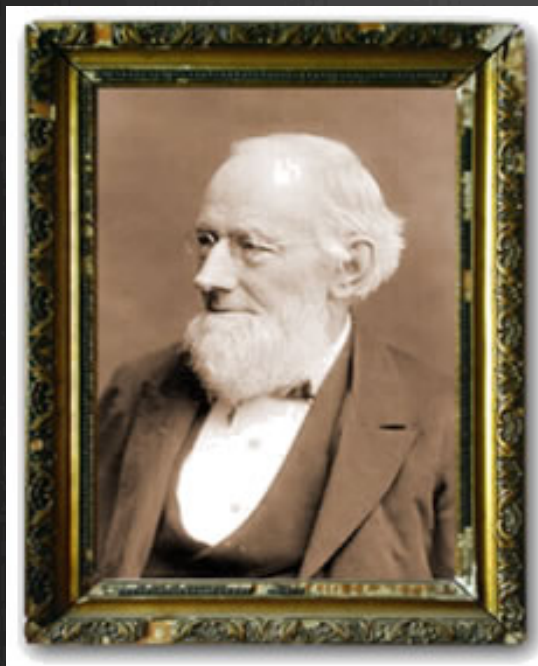
## 🎬 미국



# Distance Learning




# Sir Issac Pitman



# Landon School of Illustration and Cartooning

1894

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1899

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1900

1903

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 National Press Ass'n, 116 The Baldwin, Indianapolis




1907

**DO YOU LIKE TO DRAW? That's All We Want To Know.**  
 Now we will not give any GRAND PRIZE—a lot of FREE STUFF if you answer this ad. Nor do we claim to make you RICH in a week. But if you are serious to develop your talent with a successful cartoonist, you can MAKE MONEY, send a copy of this picture, with 5 cents in stamps for portfolio of CARTOONS and SAMPLE LESSON plate and let us explain. THE W. L. EVANS SCHOOL OF CARTOONING, 421 Garfield Bldg., Cleveland Ohio.



1908

**COPY THIS SKETCH**  
 and let me see what you can do with it. You can earn \$20.00 to \$25.00 or more per week as illustrator or cartoonist for newspapers or magazines. My practical system of personal individual lessons by mail will develop your talent. Fifteen years successful work for newspapers and magazines qualifies me to teach you. Send me your sketch of President Taft with 5c in stamps and I will send you a set lesson plate, also collection of drawings showing possibilities for YOU.  
**THE LANDON SCHOOL OF ILLUSTRATING AND CARTOONING**  
 1408 Schafeld Bldg., Cleveland, O.



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Successful cartoonists earn big salaries. Many of the most popular cartoonists of today learned to draw in their spare time, at home, through the Landon Course of Cartooning and now earn \$75 to \$200 or more per week.



The Landon Picture Chart Method of teaching ORIGINAL drawing makes cartooning easy to learn. Hundreds of sketches like the above explain every step in creating ORIGINAL heads, figures, animals, etc. Send 6c in stamps today for sample Landon Picture Chart and full explanation of this wonderful course, also long list of successful Landon students and information showing possibilities for you. *Please state your age.*

**The Landon School, 738 National Building, Cleveland, Ohio**

## Former Students Who Are Now Successful Comic Strip Artists

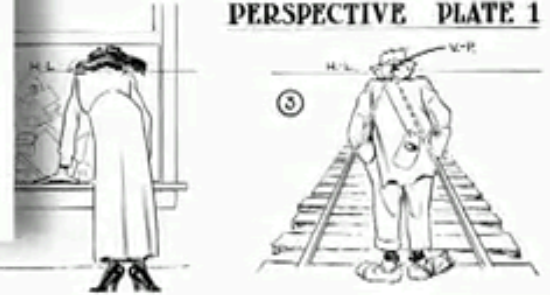
- BLOSSER**—Now drawing "Freckles and His Friends."
- BYRNES**—Now drawing "Reg'lar Fellers."
- BRANNER**—Now drawing "Winnie Winkle."
- LOCHER**—Now drawing "Cicero Sapp."
- TAYLOR**—Now drawing "Mom 'n Pop."
- EDWINA**—Now drawing "'Cap' Stubbs."
- CRANE**—Now drawing "Washington Tubbs II."
- ETHEL HAYS**—Now drawing "Flapper Fanny."
- PAUL FUNG**—Now drawing "Gus & Gussie."
- KNICKERBOCKER**—Now drawing "This and That."

KIDS  
PLATE 1



SHADOW  
PLATE 2.

PERSPECTIVE PLATE 1



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2학년 2학기

# 일일공부

2학년 2학기

오늘 하루

이름을 알려주세요. 그리고 모양 위에 이름 스티커를 붙여주세요.



이름을 알려주세요. 그리고 모양에서 '가'를 찾아주세요.



주말에는 '테스트북'으로 공부하세요.

2학년 2학기

# 일일공부

2학년 2학기

오늘 하루

그림을 보며 맞는 이름 스티커를 붙여주세요.

## 고구마



## 고추



이름을 알려주세요. 그리고 모양 위에 이름 스티커를 붙여주세요.

## 고무장갑

## 고양이



주말에는 '테스트북'으로 공부하세요.



수업 과제  
→ **학습 동기**  
(EBS 427)

문제 영역  
(수능, 모의고사)  
→ 학습 방법 (기초)  
(**학습 동기**)

- 이차!  
고등학교  
수학, 영어  
(100-100)

자신을 사랑하고 **학습동기**를 갖자.

**학습 동기는 학습의 가장 큰 원동력**

EBS+7  
수능특강



# 새로운 기술 → 새로운 교육형태

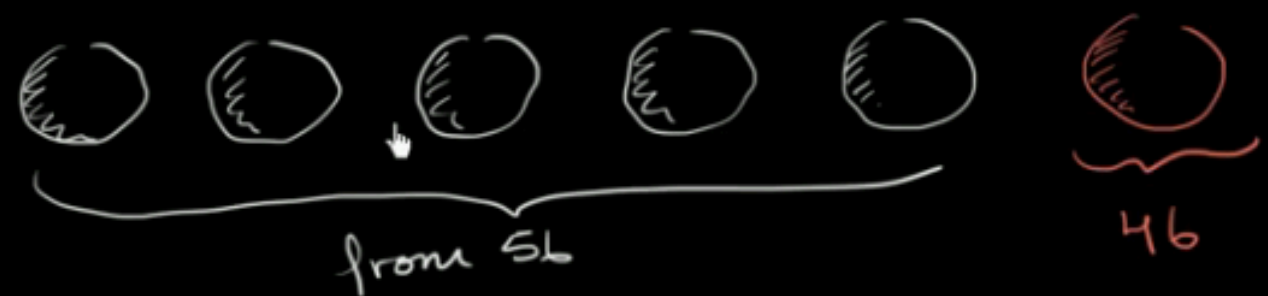
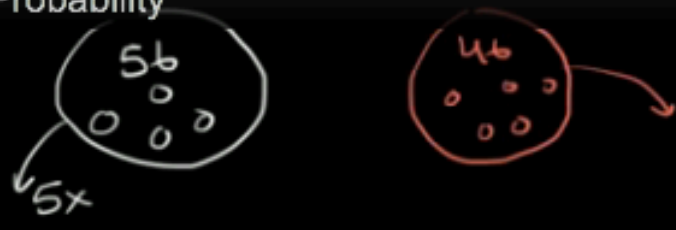
- 1840 우편제도
- 1920 라디오
- 1940 TV
- 1970 Personal Computer
- 1990 인터넷
- 2010 ??



# Mega Millions Jackpot Probability



Like Share More info



$${}_{56}C_5 = 56 \cdot 55 \cdot 54 \cdot 53 \cdot 52$$



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675

Juho Kim ▾

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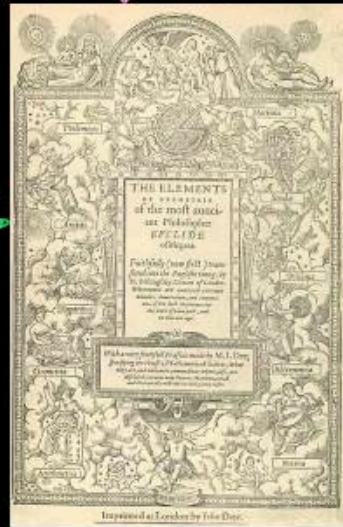
COACH

VOLUNTEER

ABOUT

### Euclid as the Father of Geometry

"The laws of nature are but the mathematical thoughts of God." - Euclid



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Mega Millions Jackpot Probability

$56$   
 $46$   
 from SL  
 $56 \cdot 55 \cdot 54 \cdot 53 \cdot 52$

DNA

Transcription

UACCGCAU ← mRNA

20 amino acids

Amino Acids

That's still not enough to code  
That's still not enough to code  
for for one of 20 amino acids

Earnings and EPS

Sales	200,000
Cost of Goods Sold	-300,000
<b>Operating Profit</b>	<b>1,000,000</b>
Interest	-500,000
Pre-tax income	500,000
Taxes (30%)	150,000
<b>Net Income</b>	<b>350,000</b>

ROE:  $\frac{350,000}{5,000,000} = 7\%$   
 earnings  
 videos, on accounts receivables

French Revolution (Part 1)

- \* France "poor"
- American Revolution
- Seven Years War
- \* People starving
- Nobility "Living it up"
- Enlightenment ← American Revolution

Convocation of the Estates General

1. Clergy
2. Nobility
- 3.



Photo by Joe Pugliese



# Massive Open Online Courses (MOOC)

⦿ Best of college:  
exceptional instruction

⦿ Best of technology:  
online interactive learning

UDACITY

edX

**Coursera**

**MITx**



Photo by Sam Come

# AI Class Experiment

- 160,000 signed up
- 23,000 finished
- 200 Stanford students (170 online)
- 411: the top Stanford student
- \$1 per student per class

## Python Expressions

Expression  $\rightarrow$  Expression Operator Expression

Expression  $\rightarrow$  Number

Operator  $\rightarrow$  +

Operator  $\rightarrow$  \*

Number  $\rightarrow$  0, 1, ...

Expression  $\rightarrow$  ( Expression )

Which of the following are valid Python expressions that can be produced starting from Expression?

3

(1 \* (2 \* (3 \* 4)))

((3))

+ 3 3

(((7)))

+1 1.1k Tweet 1 Like 2

## - Unit 1

- ✓ 1. Introduction
- 2. Web Crawler
- 3. First Quiz - [Question](#) - [Answer](#)
- 4. Programming
- 5. What Is A Programming Language - [Question](#) - [Answer](#)
- 6. First Programming Quiz - [Question](#) - [Answer](#)
- 7. Congratulations
- 8. Would You Rather - [Question](#) - [Answer](#)
- 9. Grammar
- 10. Backus Naur Form
- 11. Eat Quiz - [Question](#) - [Answer](#)
- 12. Python Expressions - [Question](#) - [Answer](#)
- 13. Speed Of Light - [Question](#) - [Answer](#)
- 14. Processors

< Previous

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Next >

Auto-Next: ON

## Juho Kim's Courses



### Computer Vision: The Fundamentals ▾

University of California, Berkeley 23 April 2012

Jitendra Malik

Go to Class



### Natural Language Processing ▾

Stanford University To be announced

Dan Jurafsky, Professor

Christopher Manning, Associate Professor

You are signed up



### Computer Vision: From 3D Reconstruction to Visual Recognition ▾

Stanford University, University of Michigan September 2012

Silvio Savarese, Assistant Professor

Fei-Fei Li, Assistant Professor

You are signed up



### Gamification ▾

University of Pennsylvania August 2012

Kevin Werbach

You are signed up

## Courseware Index

▶ Overview

▼ Week 1

**Administrivia and Circuit Elements**

Lecture Sequence

Circuit Analysis Toolchest  
Lecture Sequence

Resistor Divider  
Lab due March 18

Week 1 Tutorials  
Tutorial Index

▶ Week 2

▶ Week 3

▶ Week 4

▶ Week 5

▶ Week 6

▶ Week 7

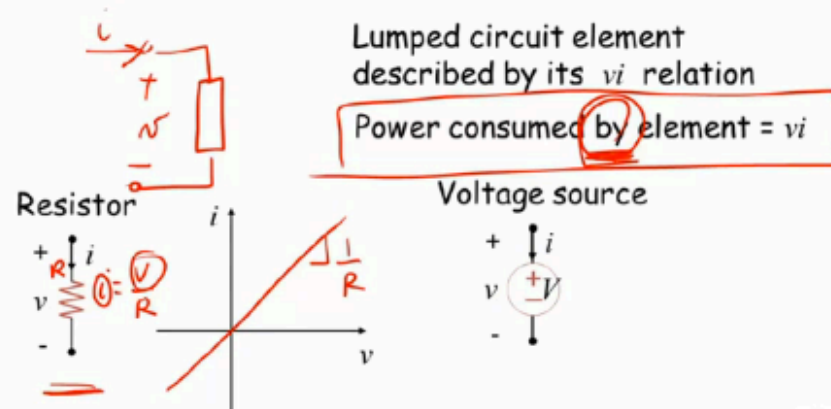
▶ Week 8

▶ Week 9

▶ Week 10

## S1V7: Lumped element abstraction

### Lumped Elements



And the slope of the straight line is given by 1 divided by

$R$ .

So the resistor is one element.

And we have enumerable elements in EECS.

And another element is a voltage source.

A voltage source is an idealistic model of a battery.

**Again, you can see that there's a voltage,  $V$ , and**

current,  $I$ , that I've defined for the element.

And the voltage,  $V$ , the capital  $V$  written inside the

element, that is the voltage supplied by the element itself

for a typical battery.

It might be, for example, 1.5 volts



# Outside of School

# Programming



Hey! Let's get to know each other. What's your name?

Type it with quotes around it like this "Ryan" and then press enter.

> █

## Learn to code

Codecademy is the easiest way to learn how to code. It's interactive, fun, and you can do it with your friends.

[Get Started](#) (it's free)

```
1 var codeMaster = false;
2
3 if ( codeMaster === false ) {
4   print( "Use Codecademy to start on \
5     the path to becoming a better \
6     programmer" );
7 }
8 else {
9   print( "Hone your skills or help teach \
10    the craft" );
11 }
12 }
13
14
```

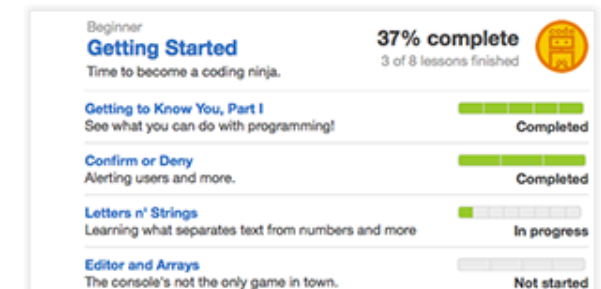
### Program Websites and More

Learning with Codecademy will put you on the path to building great websites, games, and apps.



### Learn with Friends

Keep tabs on your friends' progress and make sure you're learning more - faster!



### Track Your Progress

Start learning - and don't stop. See how fast you're learning and stay motivated.



# Why learn programming?

Written by [Leng Lee](#)

Section

Q&A Help (45)

Glossary

Scratch Pad

✓ 1. Editor and comments

✓ 2. What am I learning?

✓ 3. Interactive JavaScript

✓ 4. What is programming?

✓ 5. Data Types I & II: Numbers & Strings

✓ 6. Data Type III: Booleans

The third type of data is a **boolean** (pronounced "bool-ee-uns" and named after [George Boole](#)). A boolean can have only two values, `true` or `false`.

You can use them in your code by making statements that **evaluate** to `true` or `false`.

For example:

- `10 > 3` evaluates to `true`
- `5 < 4` is just crazy talk, so it evaluates to `false`

Booleans are extremely useful because later they will let us run certain parts of our code only if certain conditions are `true`. For example, ATMs evaluate `[the amount in your bank account] > 0` and will only give you cash if the answer is `true`.

Write code that will say `true` if `I'm coding like a champ!` has more than 10 characters.

Show hint

```

1 10 > 3;
2
3 5 < 4;
4
5 "I'm coding like a champ!".length > 10;

```

Run

Reset

Versions

5:42:11 am

Save

```

use the exact string "I'm coding like a champ!"
==> true

Good work completing this section! Start the next section.

>

```

Keyboard shortcuts: Run ⌘ + Enter Save ⌘ + S

Learn a New Language



## Enter a Spanish word that describes these images

⚠ Hint: It's the translation of *the boy*



**Woot, you are almost correct.**

Check

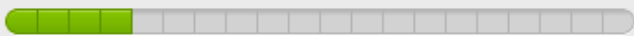
Continue

**Correct solution:**


- el niño

⚠ Pay attention to the ñ character.

Still think you're correct? [Let us know](#)



### Translate this text to English

 Yo soy una niña.



I am a girl


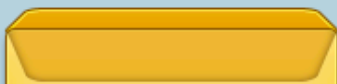
Feedback



**You are correct.**

Check

Continue



Cars  
**BMW Serie 3 número 100.000**  
View original →

Length: 4 Sentences

Contributors: 3020

Published: 12/01/2011

Do you like this document?



Feedback



BMW Serie 3 número 100.000

Difficulty: 1



Translate this sentence to English

Unidad número 100.000 del BMW Serie 3.

Áá



Submit translation

2676 People have translated this



Difficulty: 1



El coche del aniversario fue un BMW 330i Titan Silver.

Difficulty: 2



En Leipzig se fabrican 570 coches al día, con una plantilla de 4.100 trabajadores.

Difficulty: 3





Learn Graphical Design

help me with color correction

Current users

User
img_magic
mzpanic

File Share

Name	Size
004021.jpg	1.5B

Audio Settings

Chat

12:37 am [img\_magic] hi there  
12:37 am [mzpanic] hi thanks for joining

Everyone

Send

video, guest, and publication information updated

Live 1:1 Video reply Watch others

Displaying 1-6 of 6 result(s).

**select the cake at the back?**

0 answers / 0 views / 0 likes  
by **mzpanic** 58 seconds ago  
Tags: selection, food, photo

**make it black and white**

0 answers / 0 views / 0 likes  
by **img\_magic** 5 days ago  
Tags: color

**help me use the healing brush**

0 answers / 0 views / 0 likes  
by **psd-guru** 5 days ago  
Tags: las vegas, fun, photo, building

**please help me retouch this photo**

0 answers / 0 views / 0 likes  
by **mzpanic** 6 days ago  
Tags: eggs, colorful

**help me use the healing brush**

1 answers / 0 views / 0 likes  
by **psd-guru** 6 days ago  
Tags: healing brush

**how to apply content-aware fill here?**

1 answers / 0 views / 0 likes  
by **img\_magic** 2 weeks ago  
Tags: photo

# Ask & Answer



Start Playing!

This movie poster is in many of the 'worst movie poster ever' lists. There's gotta be more we can do to this Woody Allen movie!

3 players / 24 views / 0 likes  
by [mcaulic](#) 4 days ago  
Tags: movie, poster

what happened so far...

3



blur the background even more so that the man sticks out more, and the man needs something in his hands.

1 views / 0 likes  
by [mcaulic](#) 1 hour ago  
session length: 4 minutes

2



background needs to better merge with the man, and where's the title?

1 views / 0 likes  
by [mcaulic](#) 1 hour ago  
session length: 1 minutes

1



let's add some background to the image. This lonely man lives in NYC.

2 views / 0 likes  
by [mcaulic](#) 4 days ago  
session length: 2 minutes

# Play

## Answer Information



submitted  
**huge improvement!**  
0 views / 1 likes  
by [photoshaver](#) 2 weeks ago  
session length: 7 minutes

[Like](#) [Share](#) [link](#)  
[go back to session page](#)

## Playback

The screenshot shows a video player interface. The main content area displays a Photoshop workspace with a photograph of a tree-lined path in autumn. A 'Layer Properties' panel is open over the image, showing various settings. Below the video player, there is a progress bar with markers at 0, 27, 55, 82, and 110. A button labeled 'Pause/Stop the Recording' is positioned at the bottom center of the player.

# Learn

What does MOOC have?

Short Videos,  
Frequent Quizzes

Overview

Week 1

Week 2

**Simple Algorithms**  
Lecture Sequence



**Functions**  
Lecture Sequence



**Problem Set 2**  
Problem Set due October  
15, 22:00



### L3 PROBLEM 2 : 5.0 POINTS

Below are some short Python programs. For each program, answer the associated questions.

Try to answer the questions without running the code. Check your answers, then run the code for the ones you get wrong. You'll learn the most this way, by figuring things out, instead of just running the code and reading off the answers.

1.

```
myStr = '6.00x'  
  
for char in myStr:  
    print(char)  
  
print('done')
```

1. How many times does `6` print out?

2. How many times does `.` print out?

3. How many times does `0` print out?

4. How many times does `x` print out?

5. How many times does `done` print out?

# Peer Assessment

[view all code](#)

26 String[] features = new String[]{-

33 weeks ago by [\[redacted\]](#)

In java string arrays (and many other arrays involving primitives), the array can be declared and initialized with just the list between the braces. The 'new' keyword is not needed. EX: String[] oneDimArray = { "abc","def","xyz" };

👍 0 👎 0

29 - 34 "team meetings", "quizzes" }; -

Save Cancel

35 { if ( name.toLowerCase().equals...

automatically generated by checkstyle

'{' should be on the previous line.


👍 0 👎 0

```
17 /**
18  * Tests if the string is one of the items in the Course Elements section.
19  *
20  * @param name - the element to be tested
21  * @return true if <name> appears in bold in Course Elements section. Ignores case (capitalization).
22  * Example: "Lectures" and "lectures" will both return true.
23  */
24 public static boolean hasFeature(String name){
25     //List of features from site.
26     String[] features = new String[]{
27         "lectures","recitations","laptops required",
28         "text","problem sets","code review","projects",
29         "team meetings","quizzes"
30     };
31
32     //iterate through features and compare them to input
33     //return true if the feature and input match.
34     for ( String feature : features )
35     {
36         if ( name.toLowerCase().equals(feature) )
37             return true;
38     }
39
40     //if the input feature is not on the list, return false.
41     return false;
42 }
```



Social

Questions and answers about mega millions jackpot probability:

Most votes first 

Q.  5 

Since the winnings are much greater than \$176 million, doesn't this mean that it would be reasonable to buy 176 million tickets, guaranteeing that you make a profit of ~\$300 million?

Martin Kess asked 2 months ago 

A.  3 

In addition to the points made above, keep in mind that the cash value is "only" \$462 million, and taxes will reduce the winnings further.

dradcliffe answered 2 months ago 

A.  2 

yes but if two people both win the jackpot they SPLIT the jackpot. and with so many people playing the odds of two people winning are quite realistic.

emstrobel answered 2 months ago 

A.  2 

Well..first of all..you need a lot of time to print the 176 million tickets, might just not be possible....2nd..even if just another person wins, you have to share the winnings...as more and more people buy tickets (driven by the size of the jackpot, the possibility of some one actually winning increases)...also when you take a lumpsum it is not 700 million...and if you have 176 million...1. would you need more, 2. are you willing to risk that much in 1 investment/chance...

neeleshshah answered 2 months ago 

A.  2 

The people who run the lottery have mathematically worked out the odds of winning so that they will always, over time, make more money then they give out in prizes. Otherwise they would go broke very quickly.

PaulunderscoreKingtiger answered 2 months ago 


A.  1 

An Australian investment group tried this a few years ago. They paid a lot of people to buy up a lot of tickets for them. They didn't buy enough to guarantee the jackpot win, but still made millions in profit on lesser prizes.

Bob Ress answered 2 months ago 

Congratulations. You've earned 1 new badge



 Tweet 43.4K

 Like 61k

 Send



Interactive

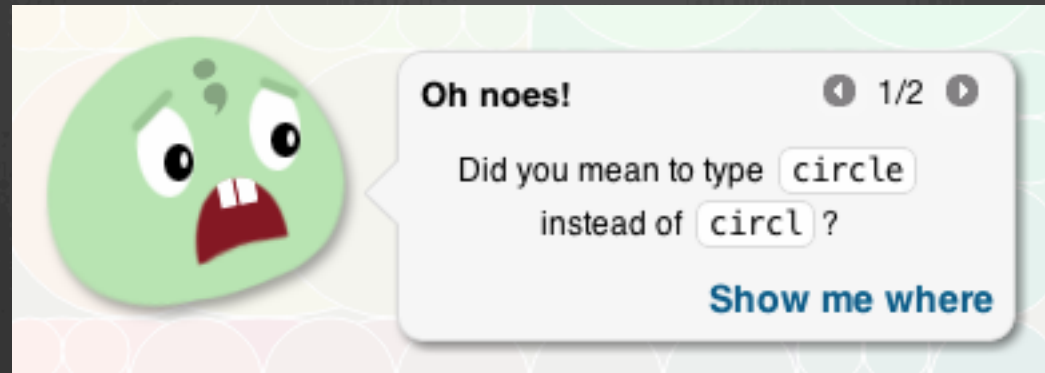
## 🎬 Online learning groups

- 🎬 Video chat, discussion forum

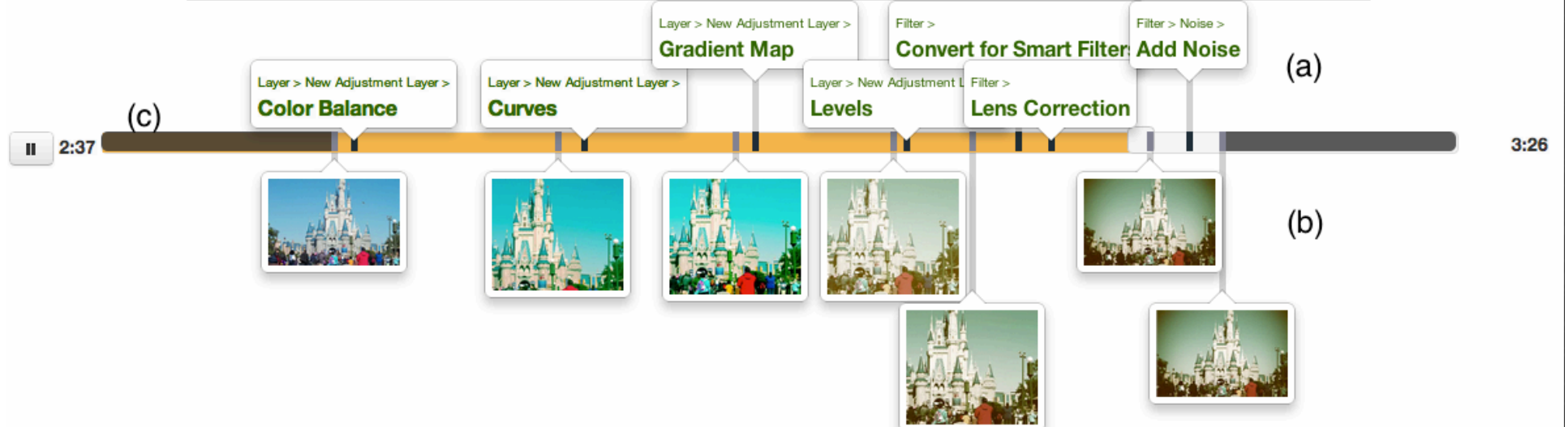
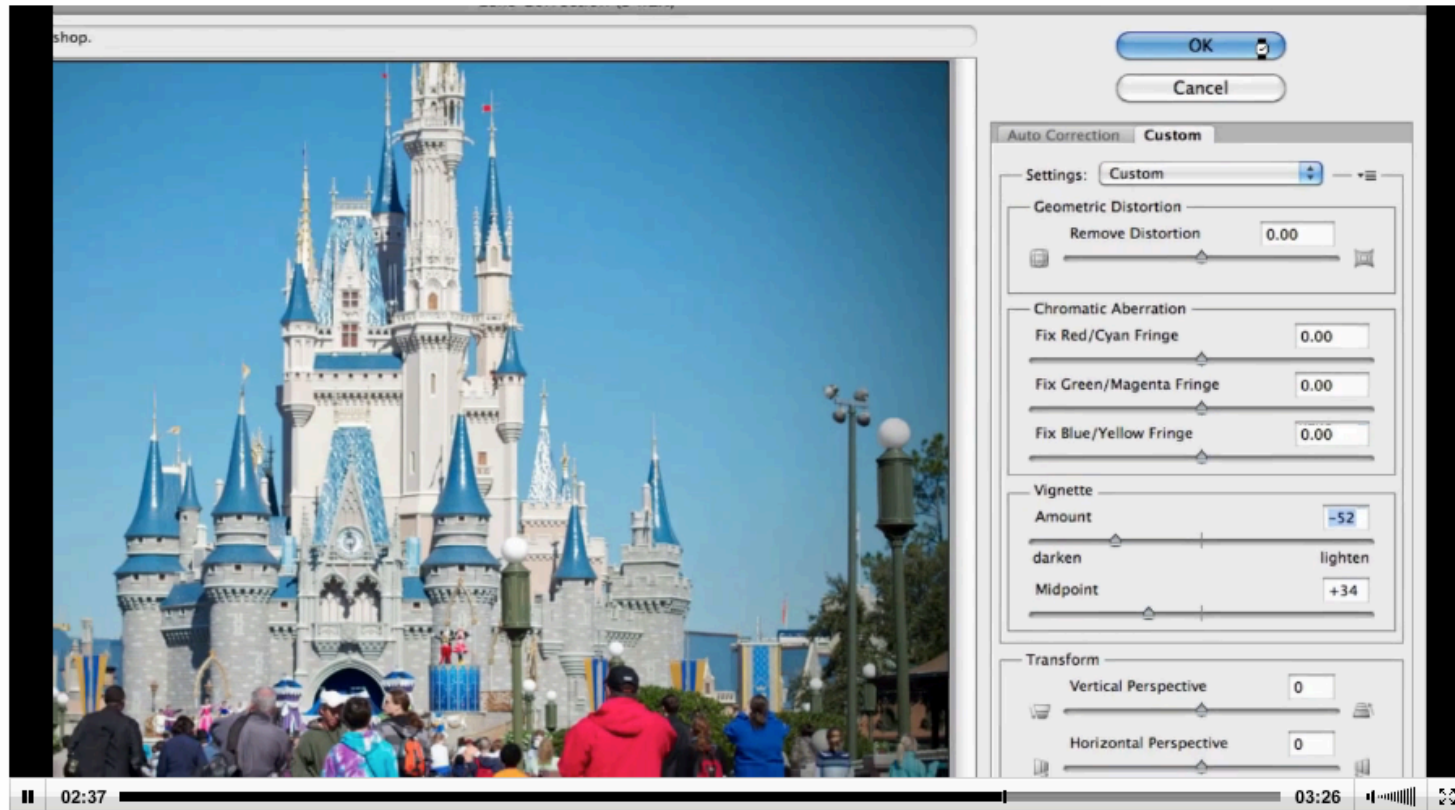
## 🎬 Offline learning groups

- 🎬 Face-to-face chat, collaboration

# Interactive Technologies

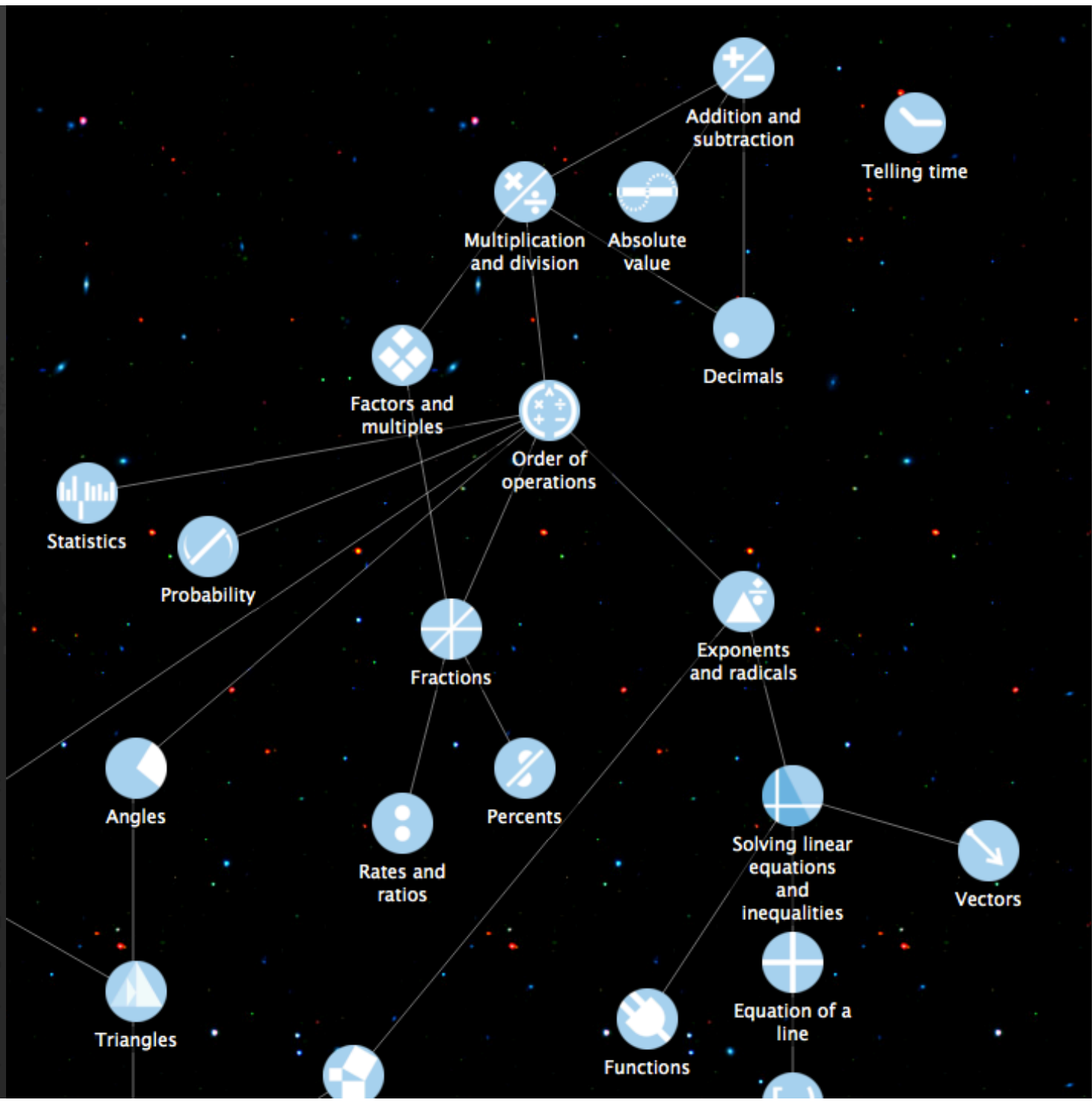


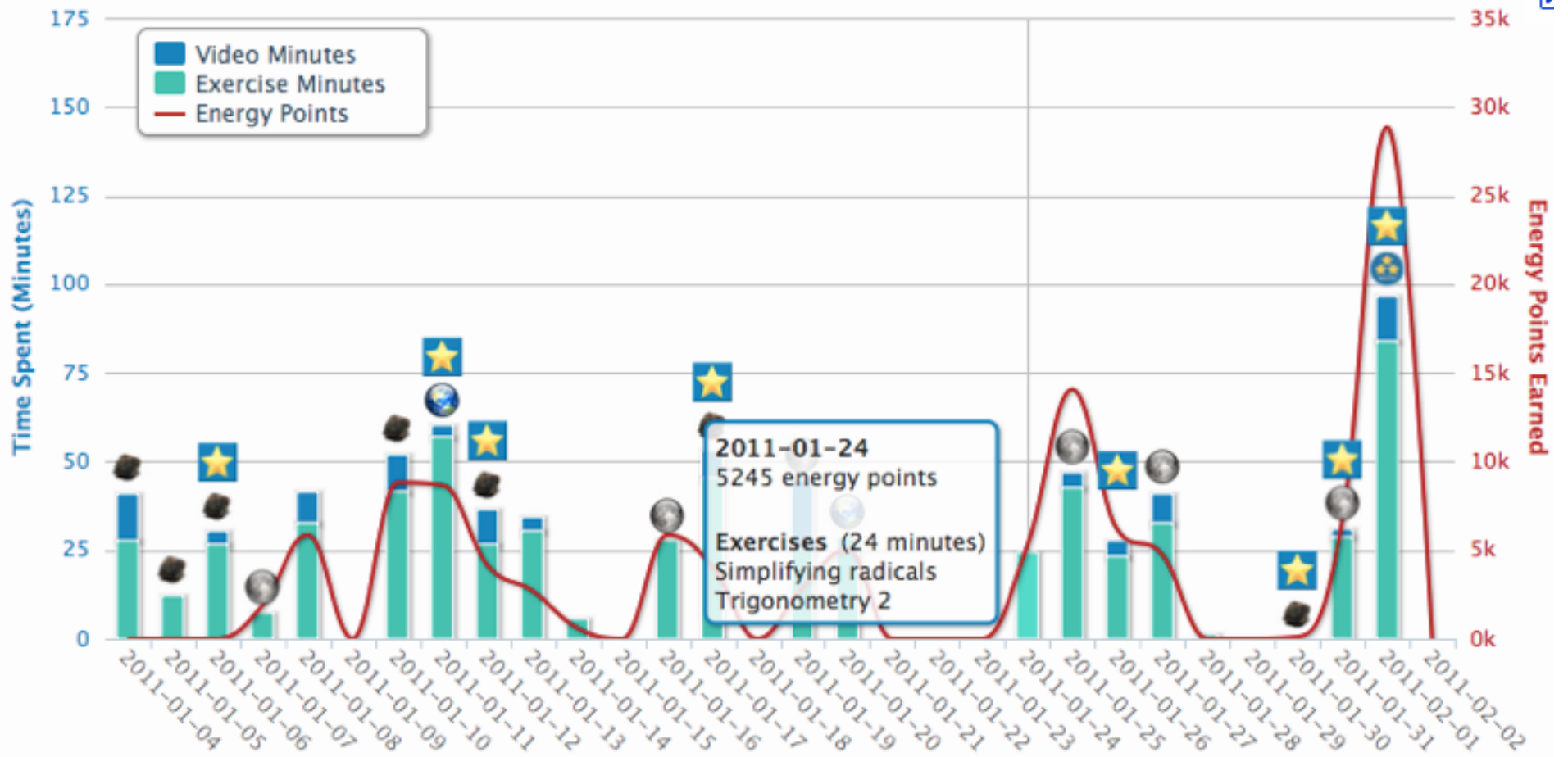
# Photoshop: Vintage Effect





# Personalization





# Implications

# Flipped Classroom

- 수업은 집에서 비디오로
- 숙제는 학교에서 교수님, 친구들과
- 학교의 의미는?



Photo by Joe Pugliese

# Open

- 세계 최고수준의 교육을
  - 모두에게
  - 무료로
- 오픈 플랫폼
  - “인디” 대학

# MOOC 경제학

## ● Infrastructure

- Cheaper computers

- Cheaper bandwidth

- 학위값 \$100 시대



# 교육의 민주화

● 부익부 빈익빈?

● 탑스쿨만 살아남는다?

● 농산물 직거래 vs 재벌 독과점

● 새로운 형태의 업자들이 등장?

# 한계점

● 참여도 저하

● 적용범위

