A TALE OF TWO LEARNERS

optimizing anesthesiology residency training for the new culture of digital natives

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AIM ANESTHESIA INFORMATICS AND MEDIA LAB

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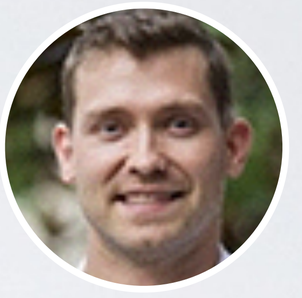

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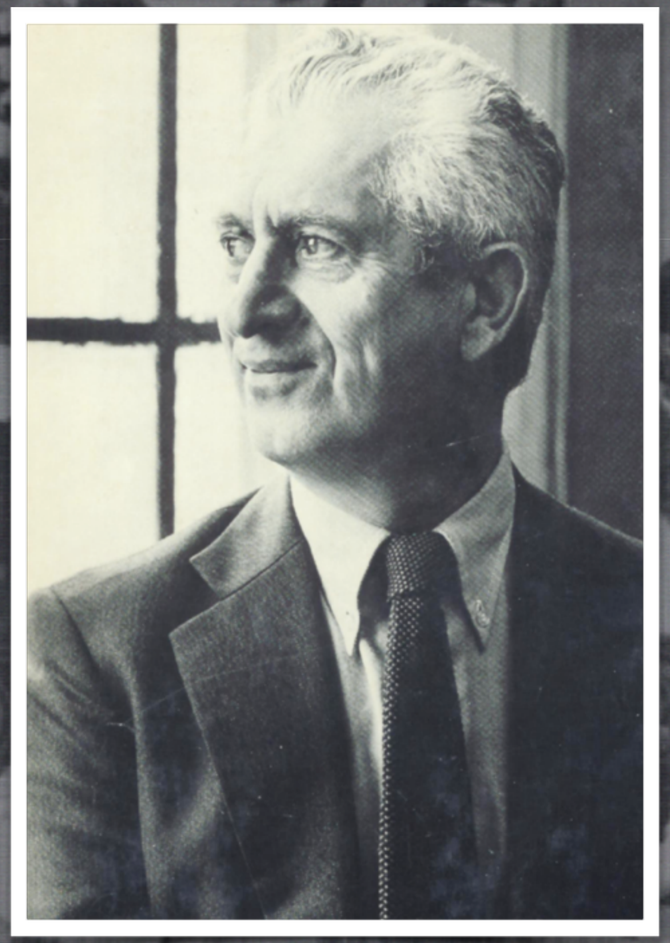
THE INTERSECTION OF MEDICINE AND EMERGING TECHNOLOGIES
APRIL 21 - 23, 2017
THE FUTURE OF MEDICAL EDUCATION
MEDICINE X | ED
#medx |
VOLUNCHEER
VOLUNCHEER

em • pa • thy
noun
The ability to step into the shoes of another person, aiming to understand their feelings and perspectives, and to use that understanding to guide our actions.
#medx | #meded

Challenges to IPCP
Institution
Lack of other institutional collaborators
Practical issues
Faculty development issues
Assessment issues
Lack of regulatory expectations

digital natives

digital immigrants



benjamin bloom

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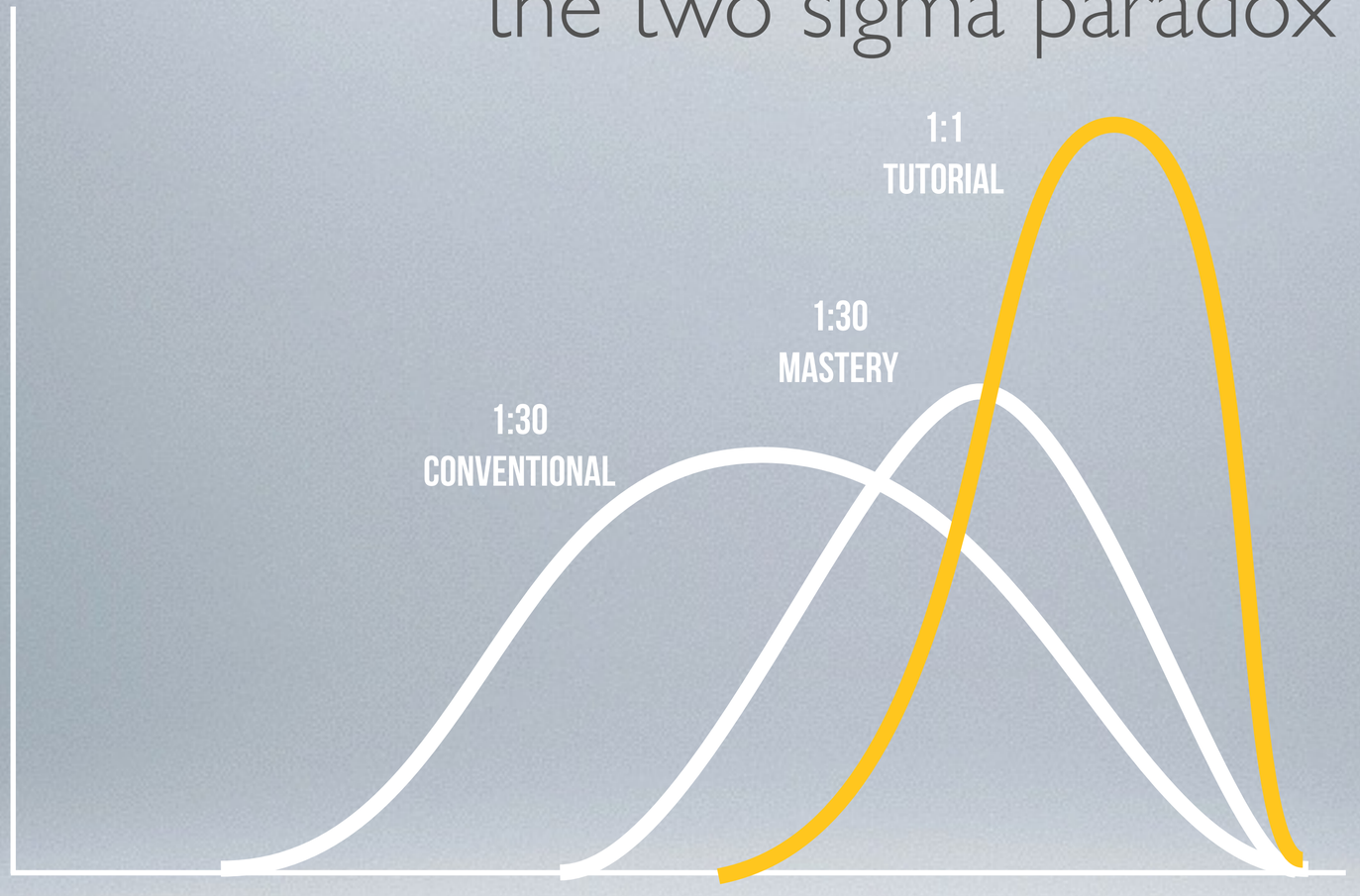
the two sigma paradox



AVERAGE STUDENT
IN TUTORIAL
>98% CONTROL
IN MASTERY
>84% CONTROL

THE 2-SIGMA PROBLEM: THE SEARCH FOR METHODS OF GROUP INSTRUCTION AS EFFECTIVE AS ONE-TO-ONE TUTORING. BLOOM, B.S. EDUCATIONAL RESEARCHER, VOL 13, NO 6 (JUN-JUL 1984) PP. 4-16

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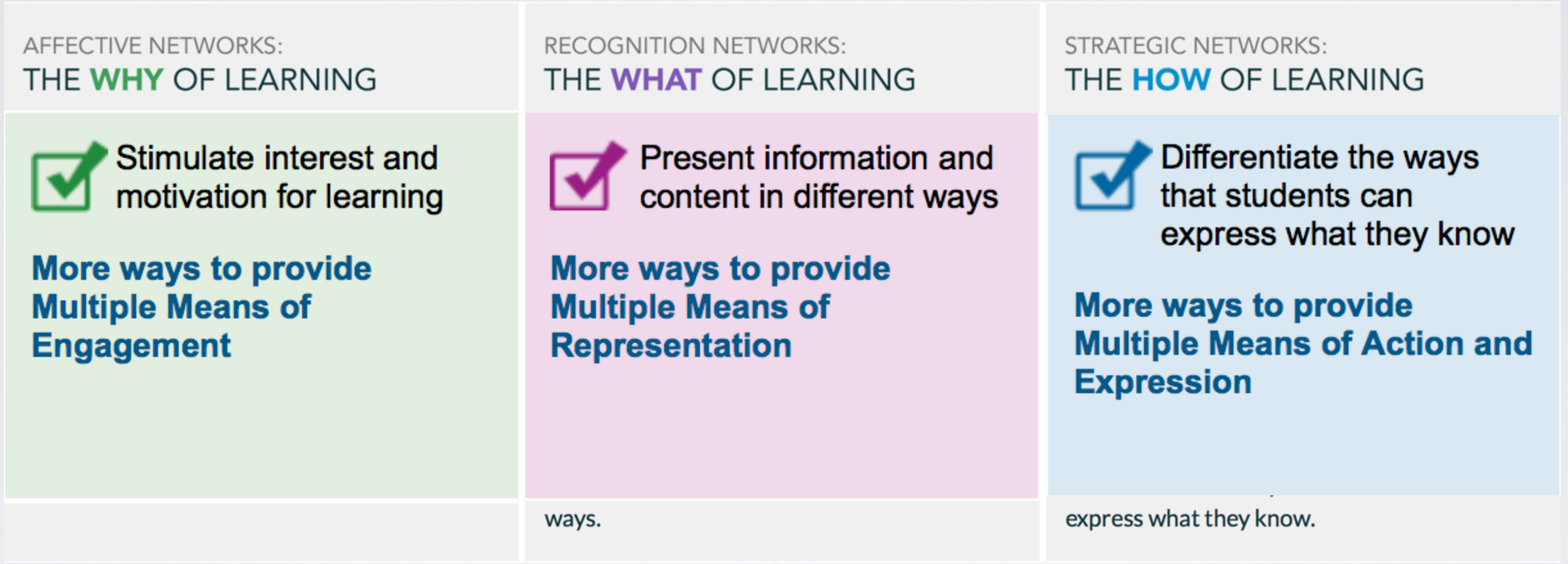
NEW TOOLS–SAME GOALS

EFFECTIVE LEARNING BY DESIGN

CHALLENGE FOR TEACHERS

UNDERSTAND NEW INSTRUCTIONAL TECHNOLOGIES

UDL - Universal Design for Learning



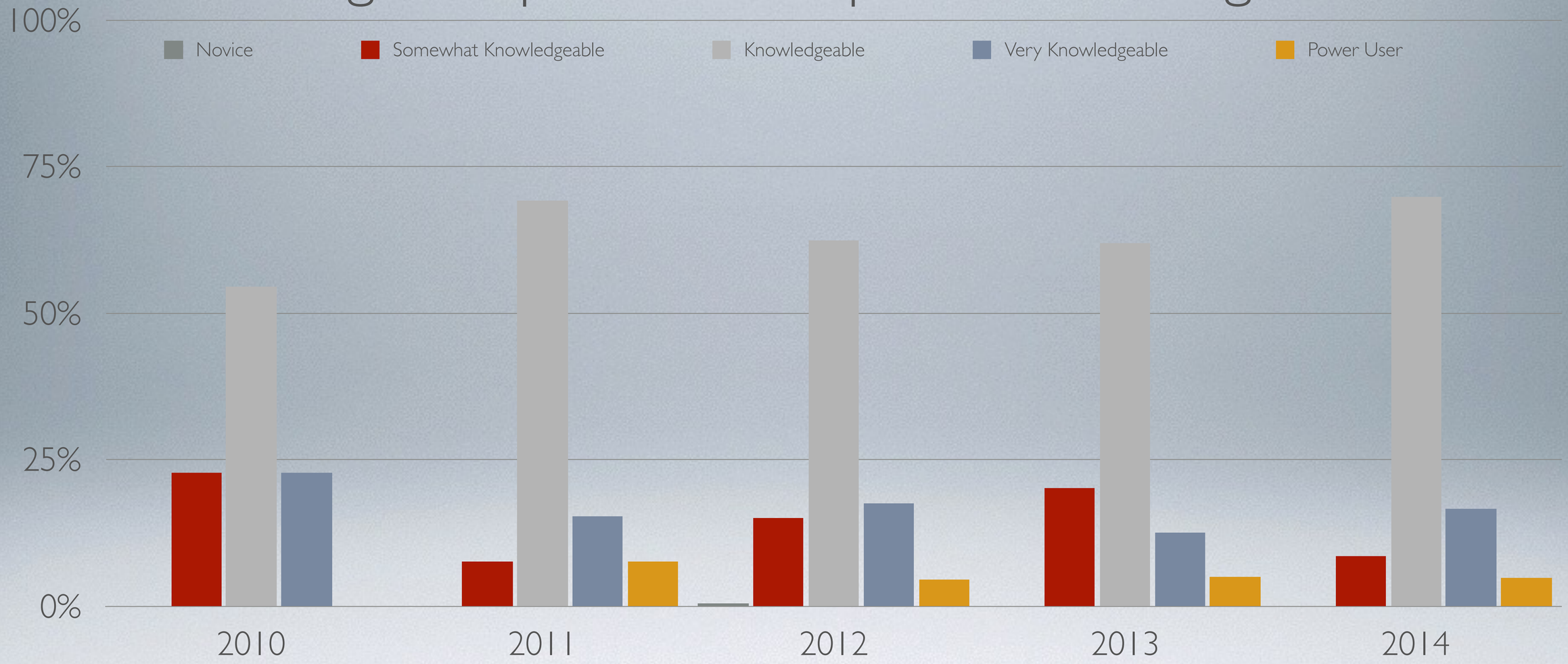
UDL provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone–not a single, one-size-fits-all solution but rather flexible approaches that can be customized and adjusted for individual needs.

http://www.cast.org/our-work/about-udl.html#.Vte894RGdMZ

EMPATHY FOR LEARNERS

WHO ARE TODAY'S ANESTHESIA LEARNERS?

high adoption of computer technologies



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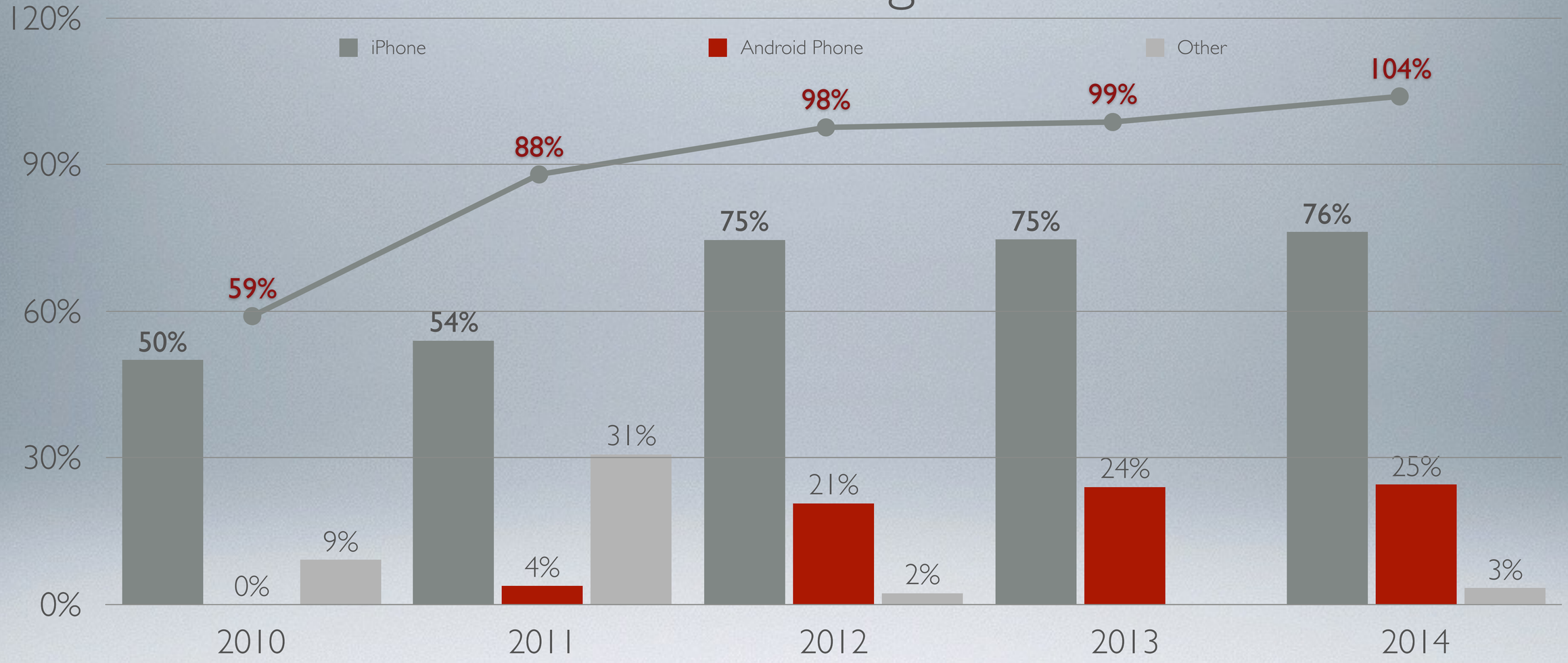
mobile and data-connected generation of learners



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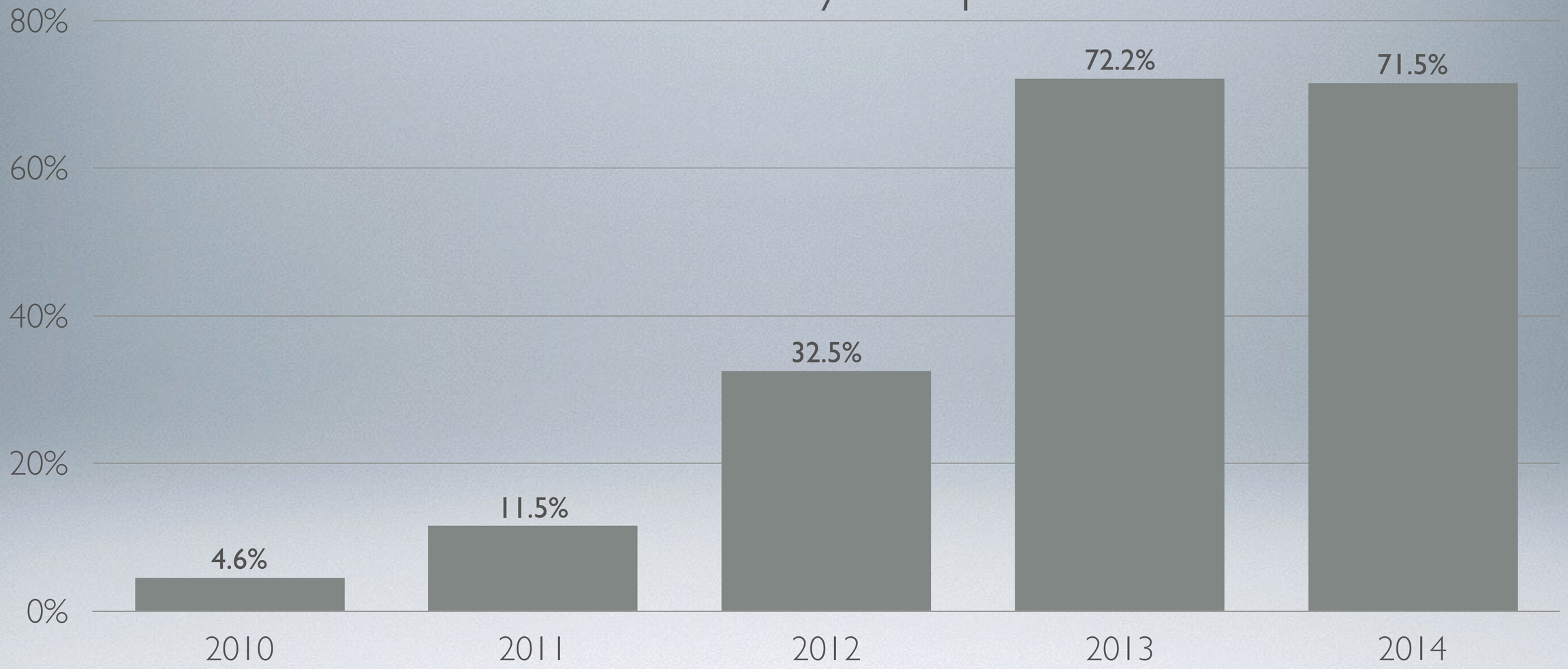
anesthesia residents are heavy adopters of tablet devices



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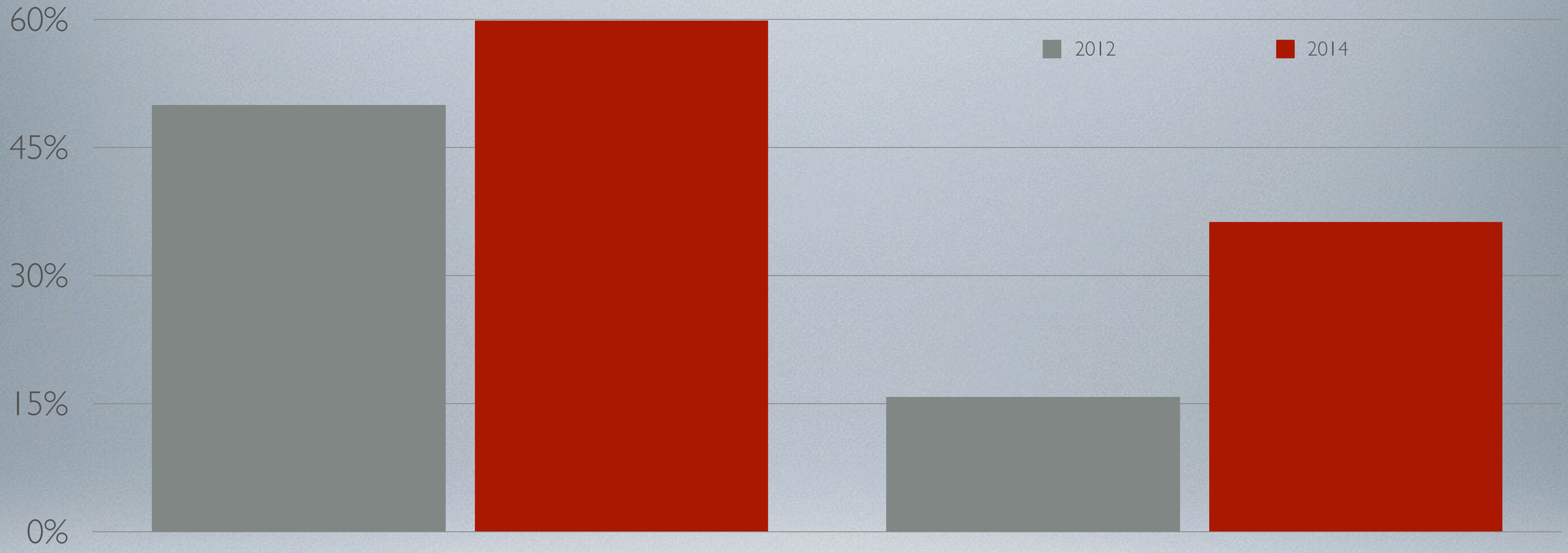
residents believe tablets under-utilized in their education



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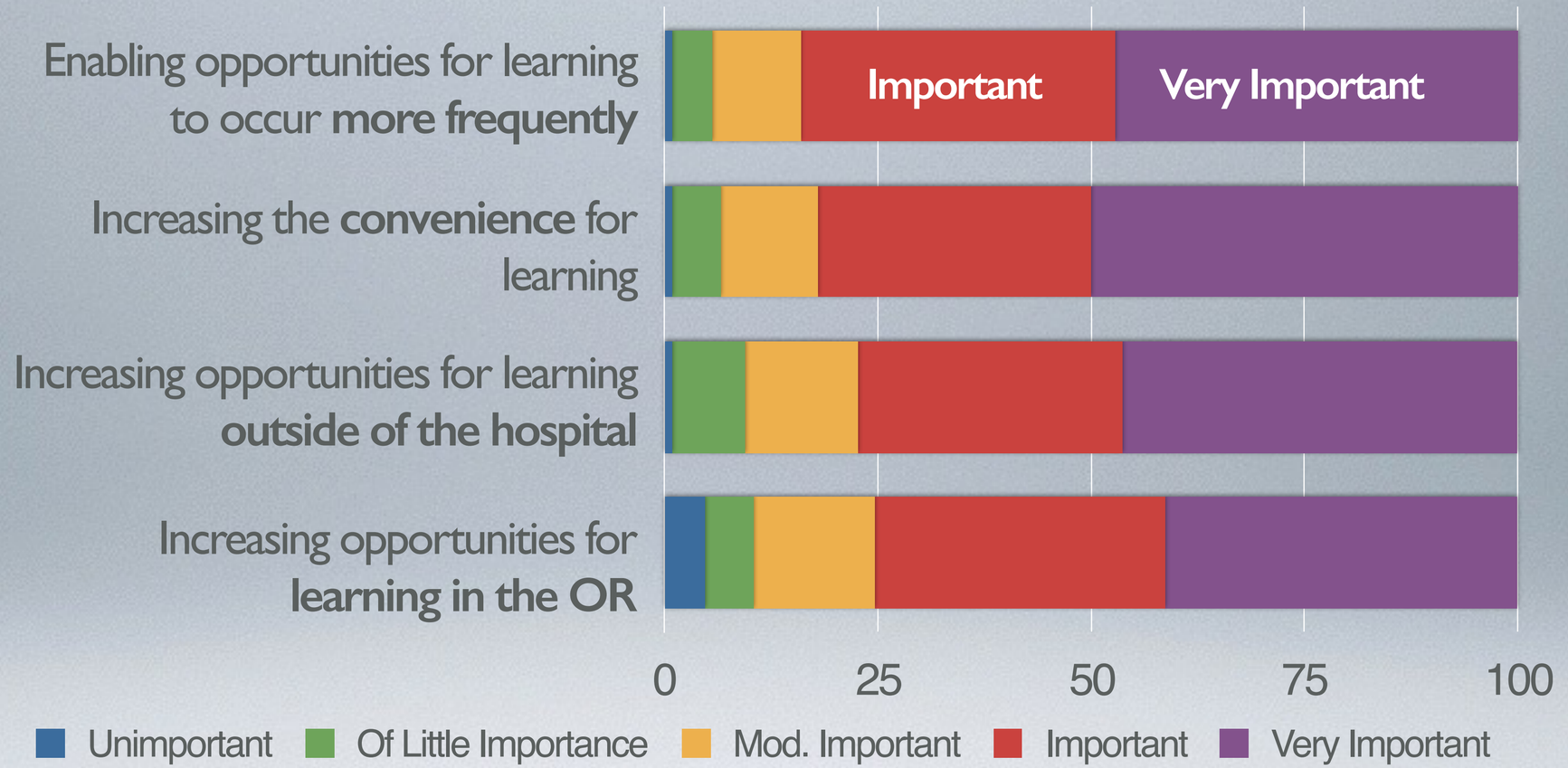
residents believe tablets enhance multiple educational uses



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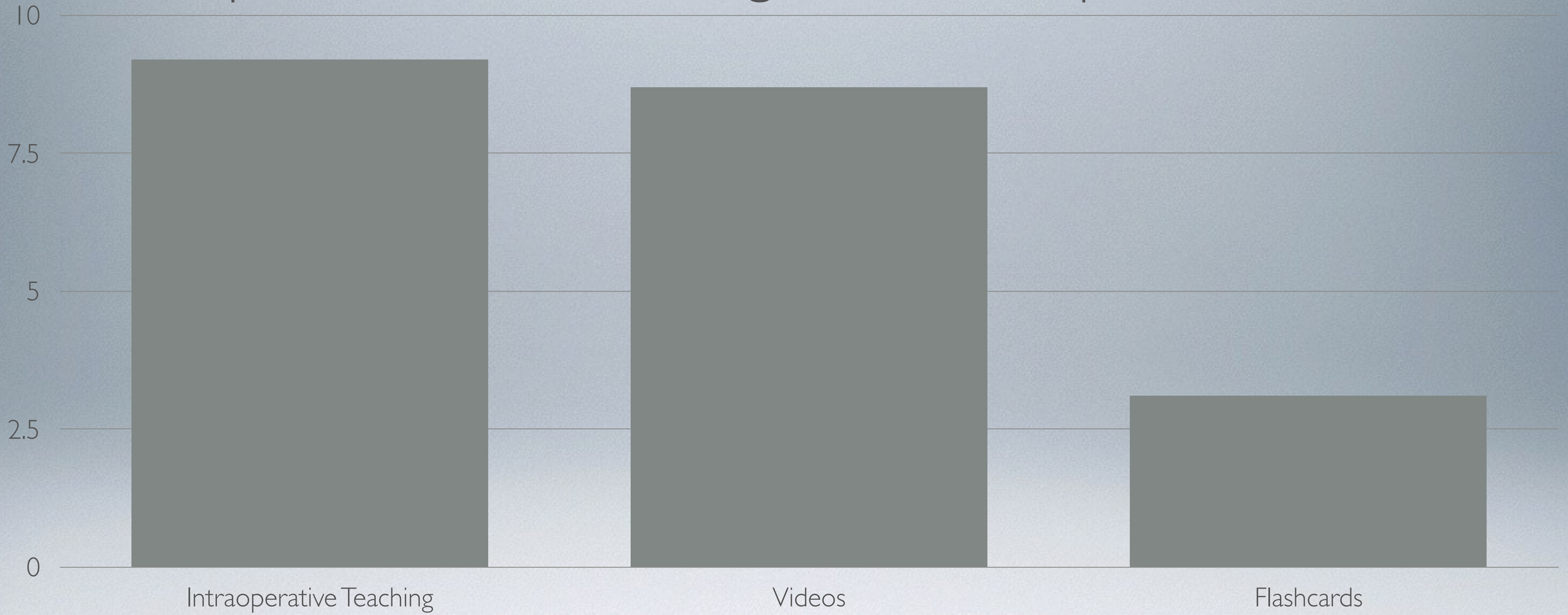
preference for learning new clinical procedure



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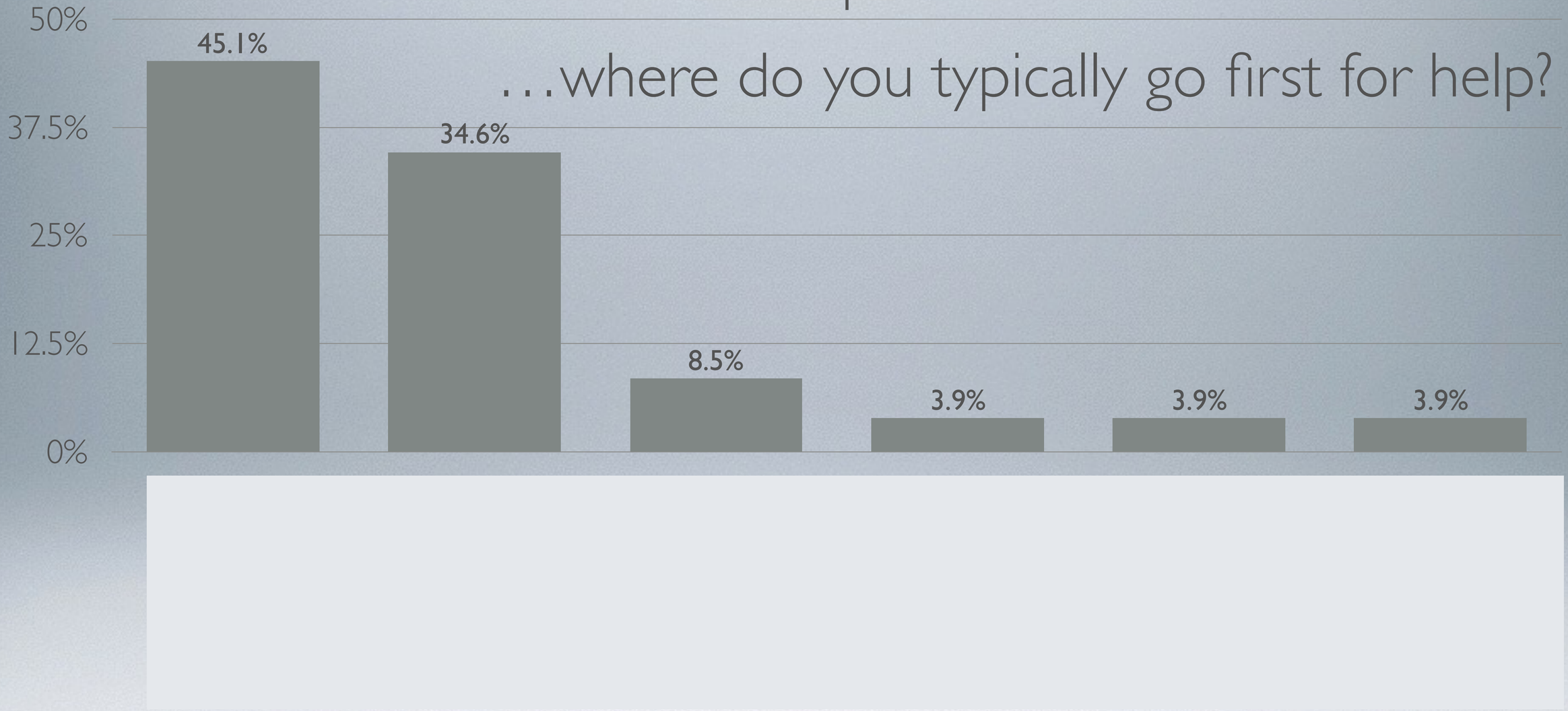
anesthesia residents seek help first from online sources

. . . where do you typically go first for help?



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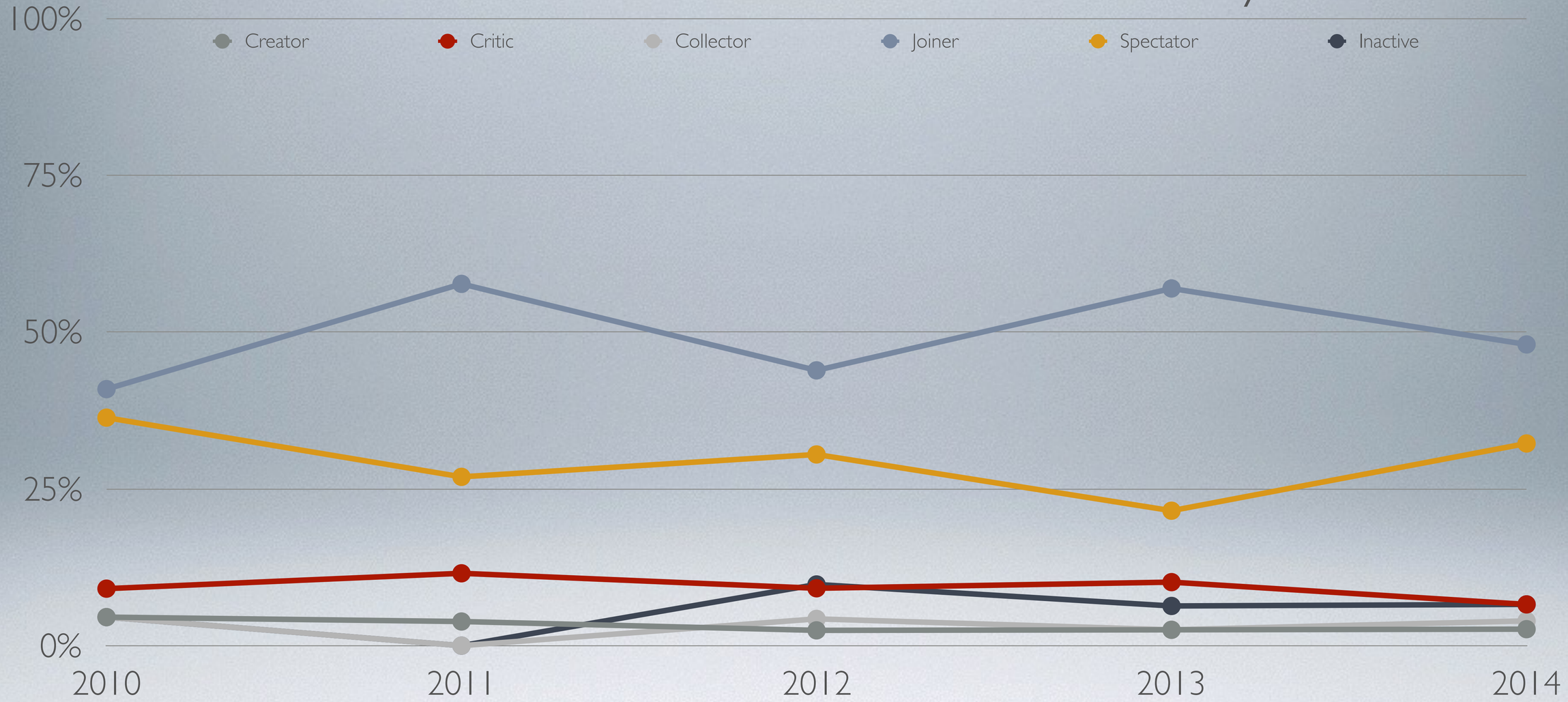
anesthesia resident are not content creators, they're consumers



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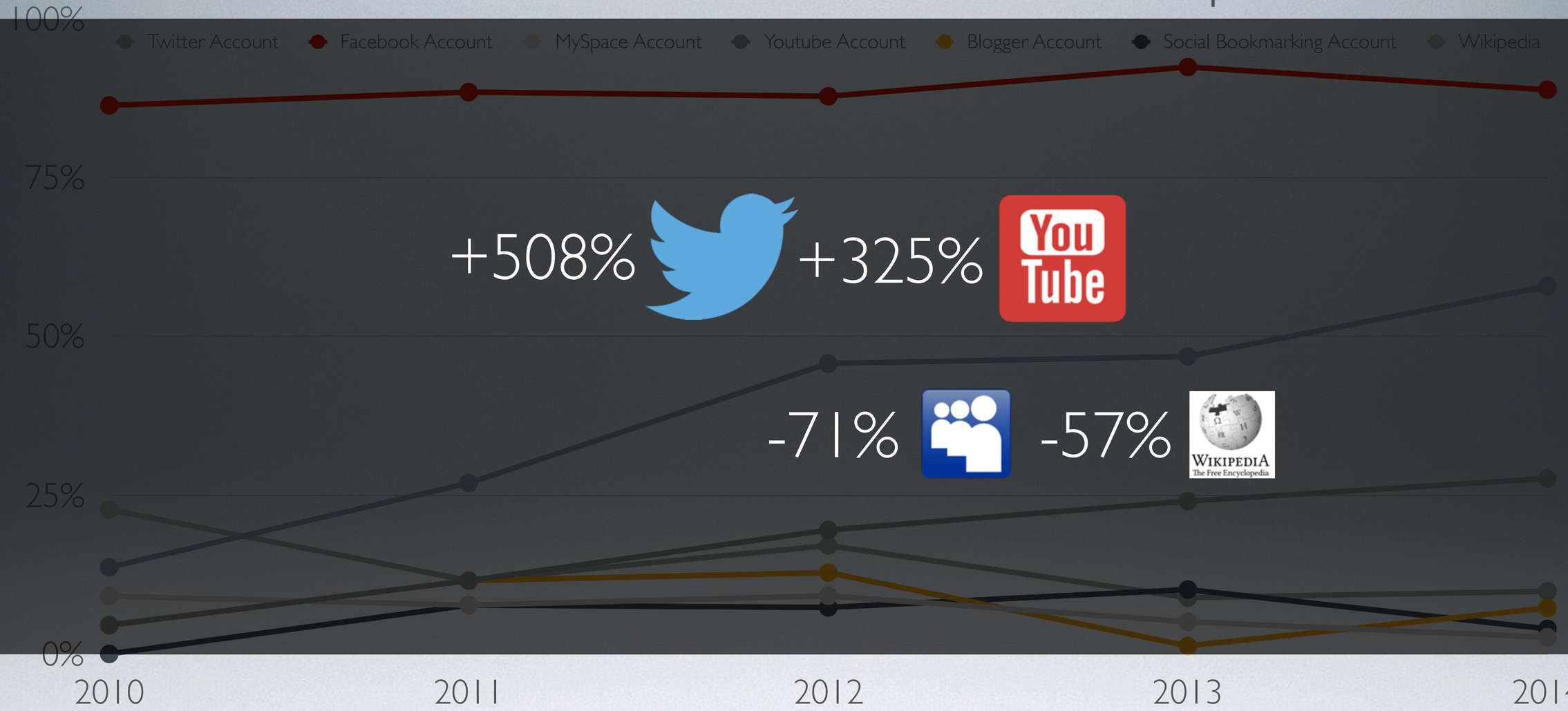
social media account ownership



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THOUGHTFUL USE OF EDTECH

WHAT ARE THE UNIQUE AFFORDANCES YOU SEEK?

REAL EXAMPLE

screen-based simulation increases feeling of preparedness

PROJECT

10 month online elearning curriculum designed to prepare anesthesia interns for residency training. Launched in 2009. Now deployed at 23 schools nationwide.

RESULTS

Post-curriculum quiz scores improved by an average of 24% each month ($p<0.0001$), self-assessed preparedness scores improved by 72.2% ($p=0.02$) after completing the online course. Mean AKT-1 scores were 14% higher in the START cohort (86.2%ile nationally) vs. historical control (75.8%ile national) ($p=0.03$).

Journal of Graduate Medical Education: March 2013, Vol. 5, No. 1, pp. 125-129.

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REAL EXAMPLE

how might we scale experiential learning?

"Net Gen learners are ***experiential***, prefer to ***learn by doing*** rather than being told what to do. This enables them to better retain information and use it in creative, meaningful ways."

Oblinger and Oblinger, Is it Age or IT, First Steps Toward Understanding the Net Generation, 2005

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REAL EXAMPLE

HOW CAN WE ENGAGE TODAY'S RESIDENTS THROUGH EXPERIENTIAL LEARNING USING VIDEO?

FRAMEWORK: FIRST-PERSON POV VIDEO GAMES.

AFFECTIVE NETWORKS:
THE **WHY** OF LEARNING

Engagement

For purposeful, motivated learners, stimulate interest and motivation for learning.

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ethercast

INDUCTION OF GENERAL ANESTHESIA

BRING LEARNING TO SCALE

ROLE OF CURATION AND PERSONALIZE LEARNING

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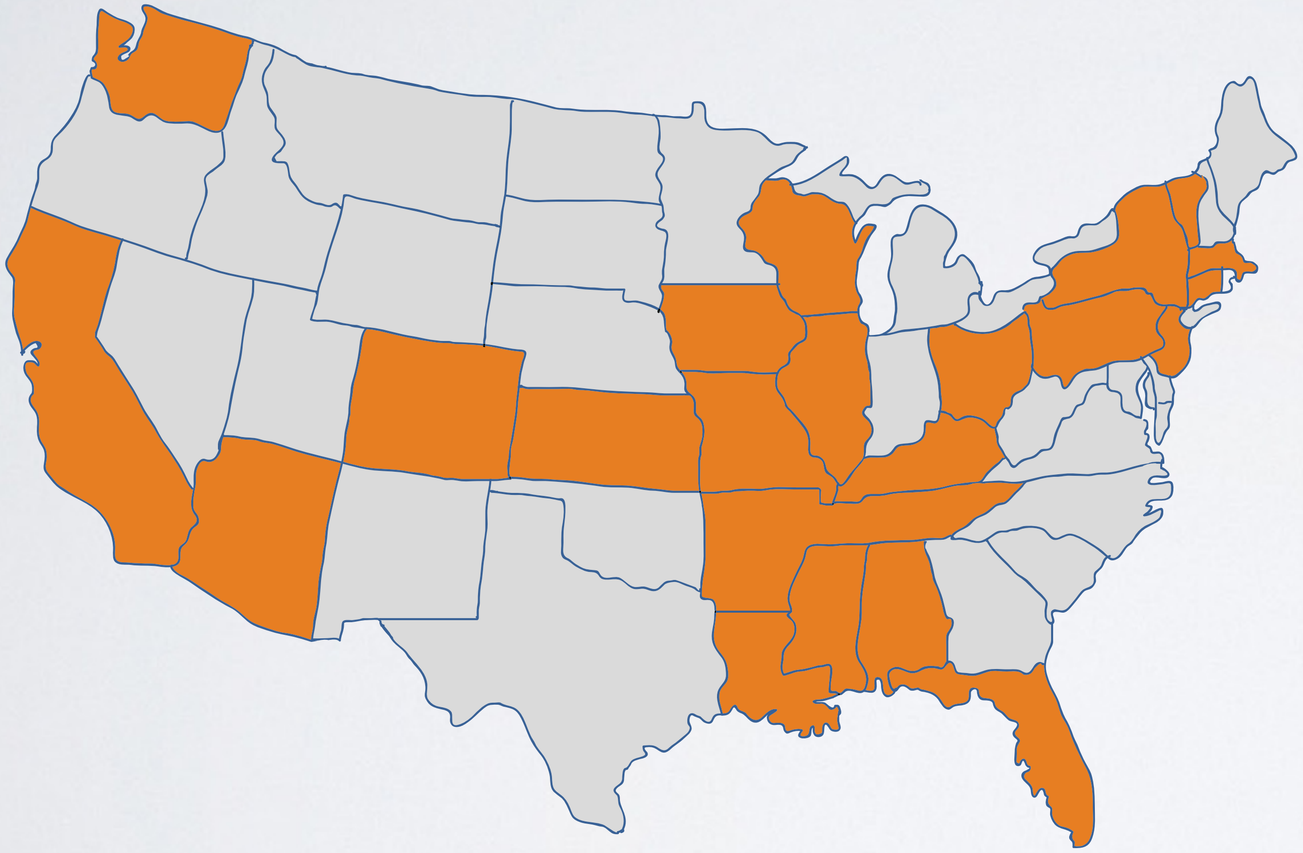
LEARNLY | FOUNDATIONS MOOC



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1400 Anesthesia Learners

48/133 Programs = 36% US

1 Australia

1 South Africa

2014: 1400/3517 = 40% US

2015: 1471

BACKGROUND

- **Majority of current residents are millennial learners,** incorporating new technologies and fast, mobile delivery of information.
- **Accustomed to mobile, online learning from grade school through medical school**, expecting similarly sophisticated teaching modalities in residency.
- **Learnly was created to meet this need for a time-shifted, place-shifted method of learning that strategically promotes an incremental model of studying** (vs. cramming) to prepare residents for high stakes educational milestones.

UNIQUE AFFORDANCES

340+ online learning modules, organized around anesthesia basic sciences. Learnly is not marketed as a board review course.

UNIQUE AFFORDANCES

Daily trigger email

Short online reading

Knowledge Assessment Questions

Introduction to Lesson

Monday, September 8, 2014

Ventilators: Classification: Flow Generation vs. Pressure Generation

James M. Hunter, Jr., MD
Assistant Professor of Anesthesiology and Surgery
University of Alabama at Birmingham

Support

Learning Objectives:

After completing this lesson the learner will be able to:

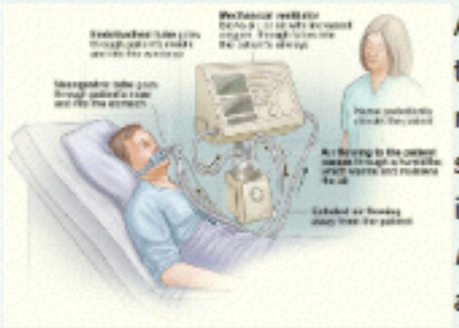
1. Describe the flow patterns in flow-targeted and pressure-targeted mechanical breaths.
2. Contrast how changes in lung compliance and chest wall compliance affect airway pressure a pressure-targeted breath.
3. Contrast how changes in airway resistance affect airway pressure and tidal volume in a flow-
4. Explain how pressure support differs from pressure control.

AFFECTIVE NETWORKS:
THE **WHY** OF LEARNING

Engagement

For purposeful, motivated learners, stimulate interest and motivation for learning.

What would you do?



A 52-year-old woman is slow to awaken after general anesth transported to the PACU and mechanical ventilation with volu nurse calls because the patient is "fighting the ventilator" an sounding. Evaluation reveals that the patient is attempting to inspiration. *How might the choice of mechanical breath type mechanical ventilation? How would changing to pressure-sup* answer after completing today's module!

Lesson with Writable Questions -->

Lesson With Reflection Questions -->

Mon 09/08/14 - Ventilators: Classifications: Flow Generation vs. Pressure Generation

Positive Pressure Breaths

The flow pattern of a mechanical breath is determined by parameters controlled by the ventilat and duration.

This chapter describes the common types of positive pressure breaths:

- volume-control
- pressure-control, and
- pressure support.

Each of these breath types is useful in the operating room. For example, pressure support can patient's inspiratory efforts.

Check your understanding!

- List the parameters that can be controlled by the ventilator in delivery of a positive pressure

Move on to the next section!

RECOGNITION NETWORKS:
THE **WHAT** OF LEARNING

Representation

For resourceful, knowledgeable learners, present information and content in different ways.

STRATEGIC NETWORKS:
THE **HOW** OF LEARNING

Action & Expression

For strategic, goal-directed learners, differentiate the ways that students can express what they know.

Question 1

Marked out of 1.00

Flag question

Write a personal note

save question note

Send feedback to teacher

send feedback

Edit question

Question # Q1L1D66W13

How is most blood carbon dioxide transported?

Select one:

- A. As carbaminohemoglobin
- B. As bicarbonate ion (HCO_3^-)
- C. As dissolved CO_2
- D. As carbonic acid (H_2CO_3)

STRATEGIC NETWORKS:
THE **HOW** OF LEARNING

Action & Expression

For strategic, goal-directed learners, differentiate the ways that students can express what they know.

Support

Question 2

Marked out of 1.00

Flag question

Write a personal note

save question note

Send feedback to teacher

send feedback

Edit question

n # Q2L1D66W13

Which of the following is **NOT** a determinant of mixed venous oxygen content?

Select one:

- A. Hemoglobin
- B. Arterial oxygen content
- C. Oxygen consumption
- D. Partial pressure carbon dioxide
- E. Cardiac output

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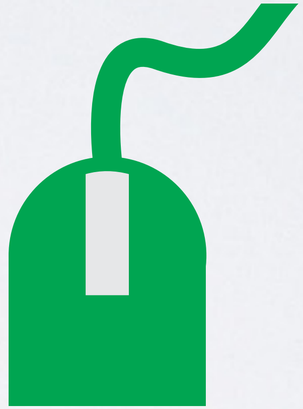
WHO'S USING LEARNLY?

99% used learning technologies in college

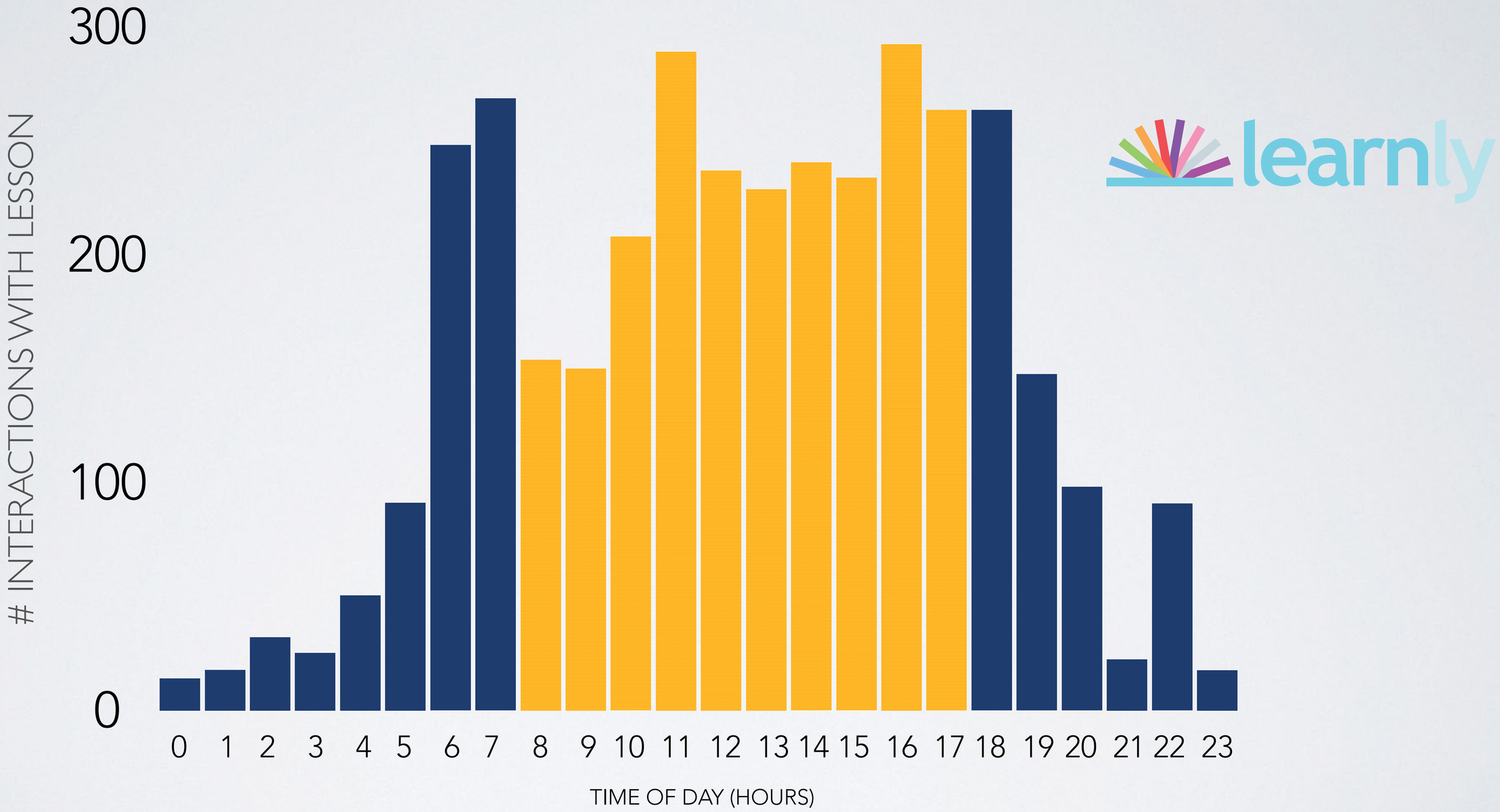


59% completed an online course before

LEARNLY MORE ENGAGING

- **81% of residents** who have been using the course for at least 3 months **say that Learnly is more engaging than traditional study methods**
- **86% of residents** say Learnly is more engaging than **traditional lectures**

LEVEL OF ENGAGEMENT OVER 24 HOURS



LEARNLY MORE USED, MORE PREPARED

37% of Learnly residents are regular users,
compared with 7% average completion rate for MOOCs

88% of Learnly residents say makes them feel more prepared for high stakes milestone exams

Time Shifting

98% of residents say they use STARTprep to learn and study at convenient times not possible with in person courses

Podcasts

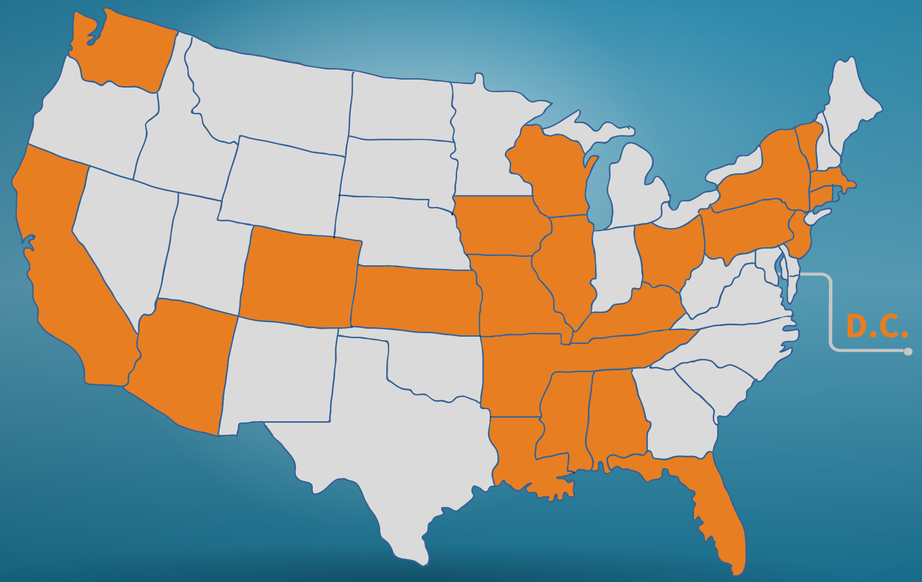
Podcast episodes have been downloaded 2,604 times across eight countries

Participation

1/3 or residents open daily course emails and 29% click through to the course

Demographics

42% female
62% ages 25-30
45% on facebook
22% 1° caregiver



Mobile Learners

58% of residents primarily access STARTprep from a mobile device such as an iPhone

990 Residents

Residents from 38 residency programs across US, 1 in Australia and 1 in South Africa

learnly

95% of residents rate STARTprep chapters as being good, very good or excellent.

95%

86% of residents say STARTprep is more engaging than traditional lectures.

86%

88% of residents say that STARTprep makes them feel more prepared for high stakes educational milestones.

88%

CLINICAL APPLICABILITY

- **92% of respondents** say that Learnly helps them **make better clinical decisions**
- **94% say** Learnly helps them **feel more prepared for daily cases**

SUMMARY

Initial results show the program helps learners:

- **Feel more prepared for high stakes educational milestones**
- **Engages learners more** than traditional lectures and study methods
- Allows residents to **learn at times that are convenient** to their needs and lifestyles
- **Reveals strengths and gaps in residents' knowledge** of the anesthesia basic sciences

STUDENT FEEDBACK

“**Slow and steady wins the race!** The key of [Learnly] is it cuts out the wasted time in figuring out what to study. Each day there is a set topic for review.”

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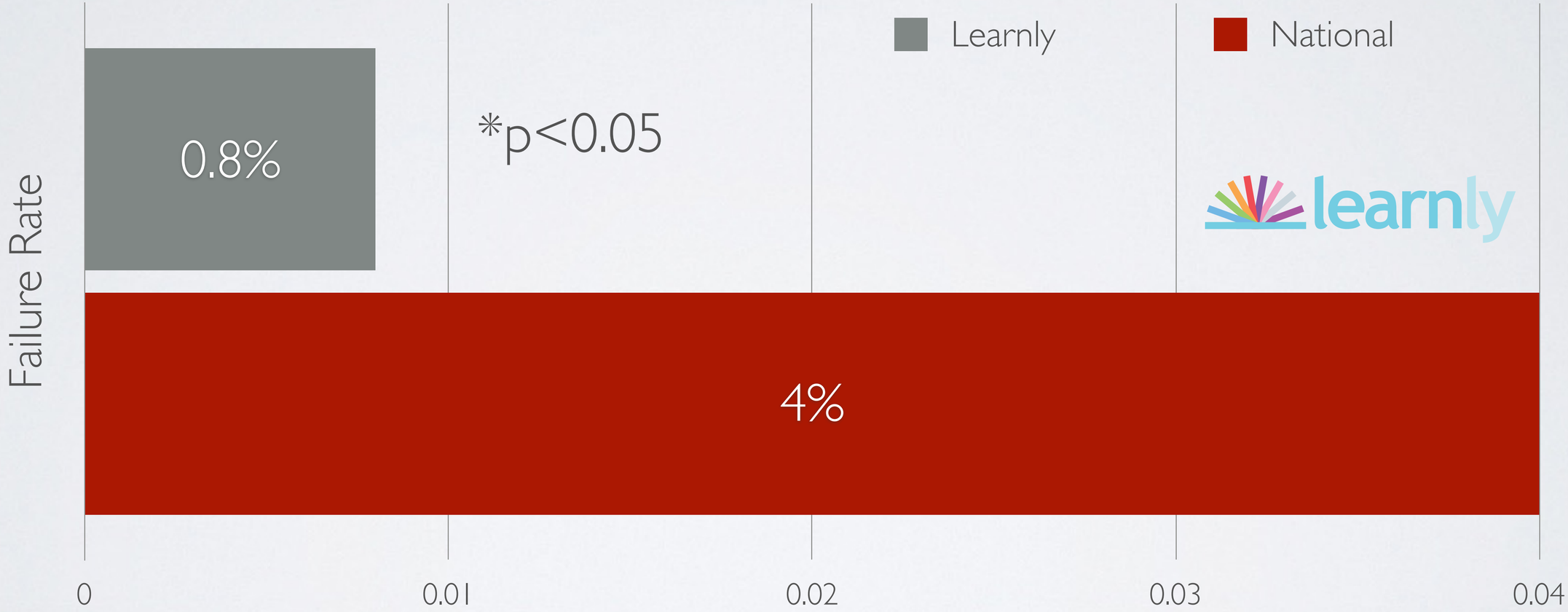
OUTCOMES (2013 COHORT)



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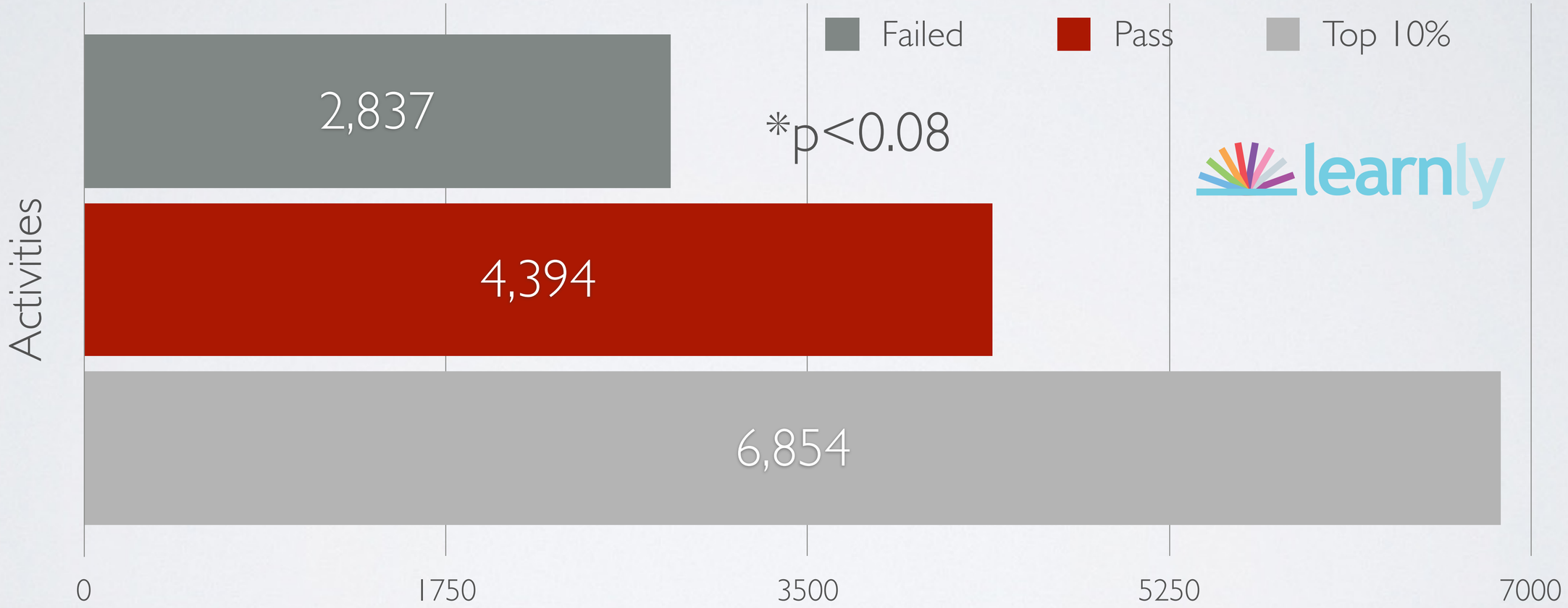

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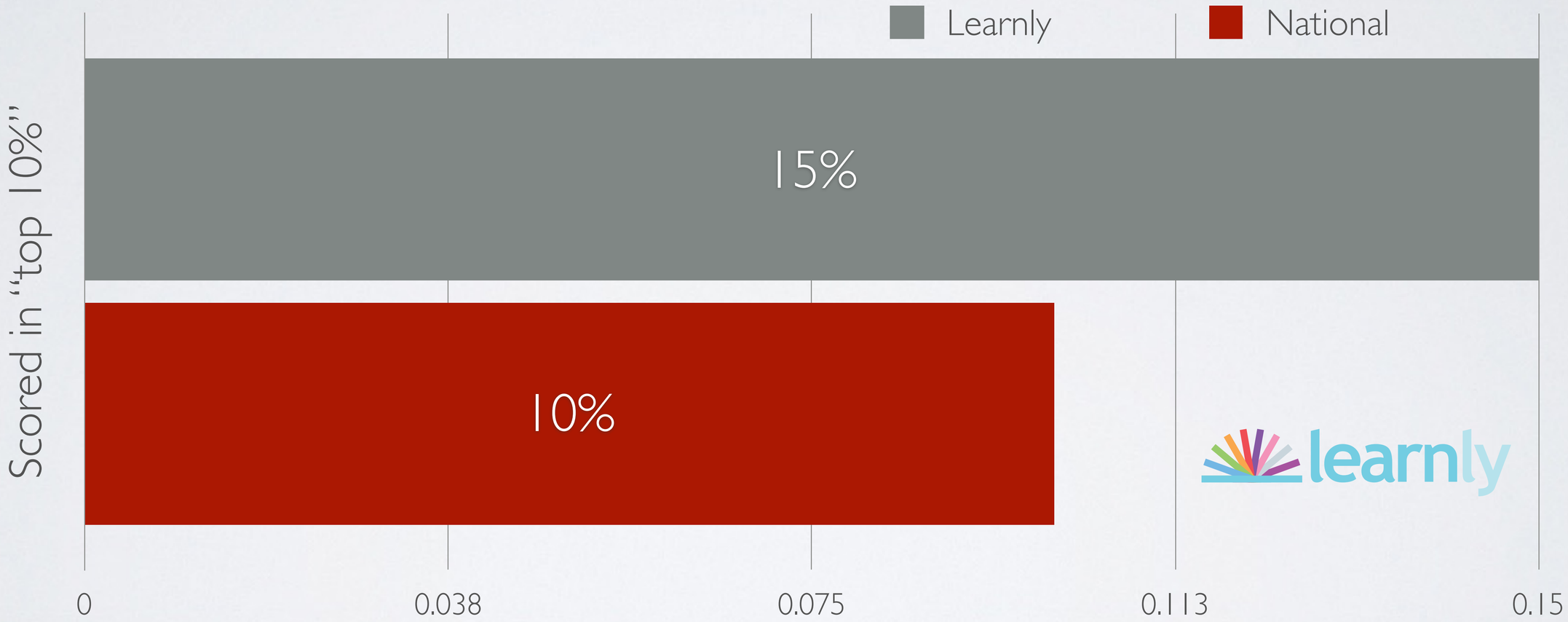

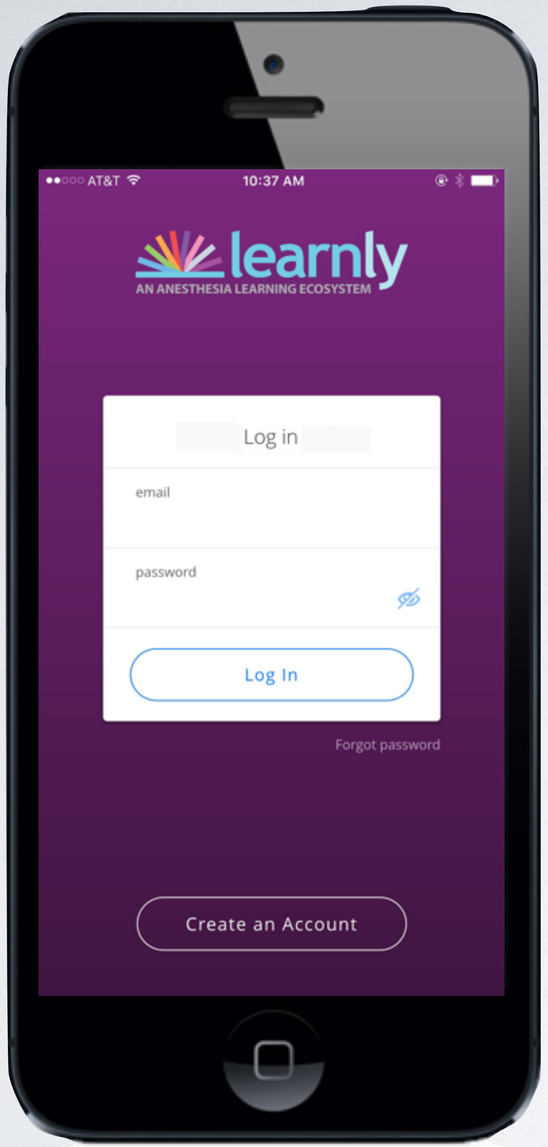

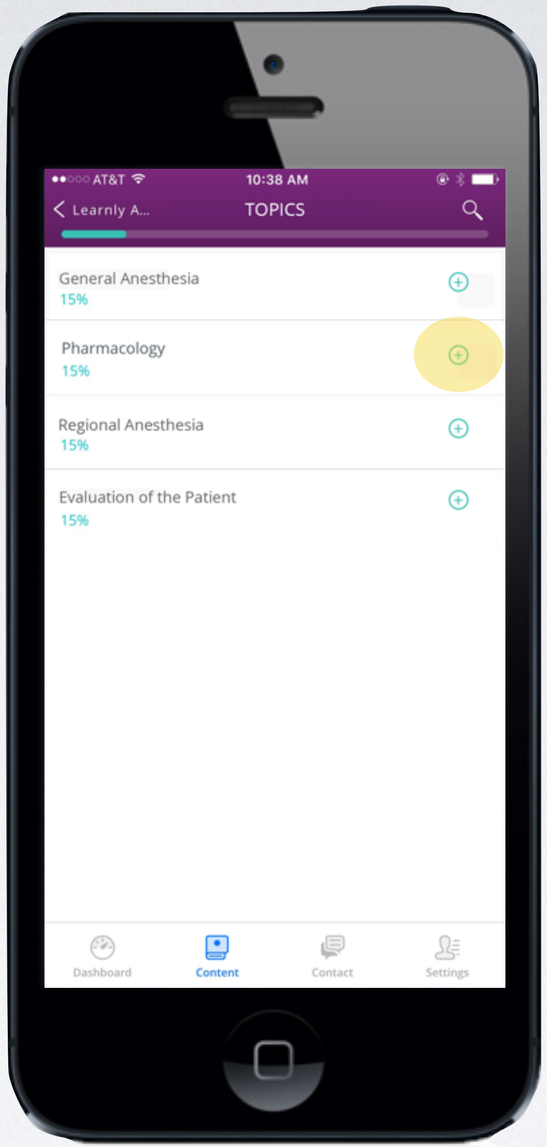

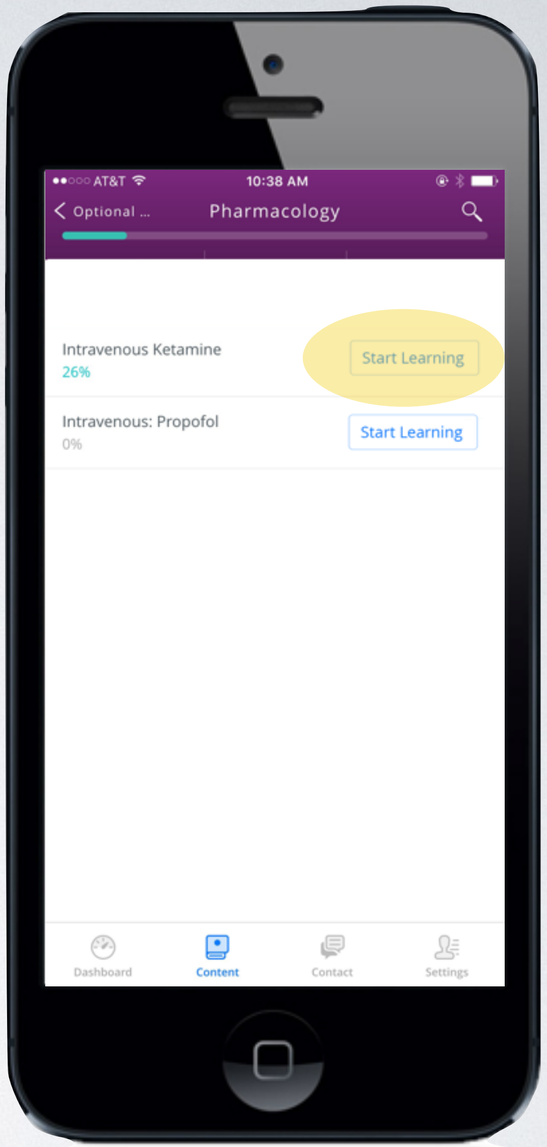

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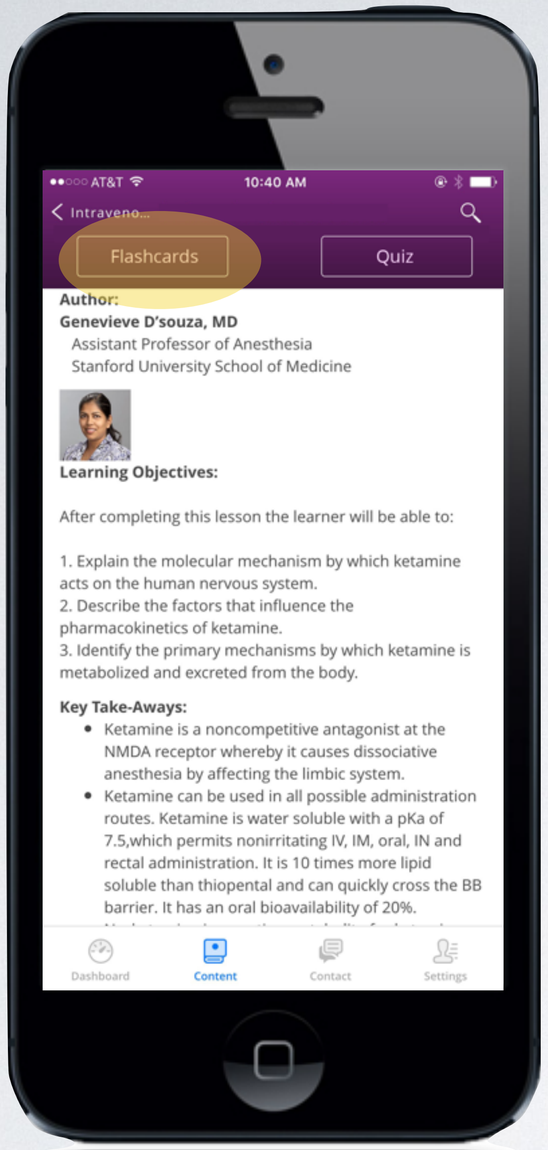

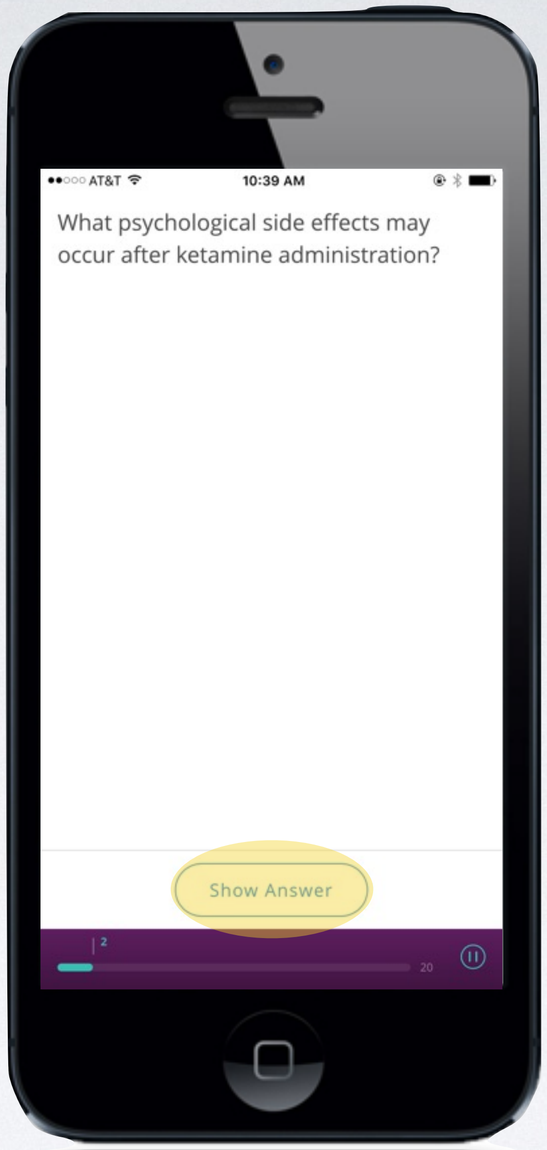

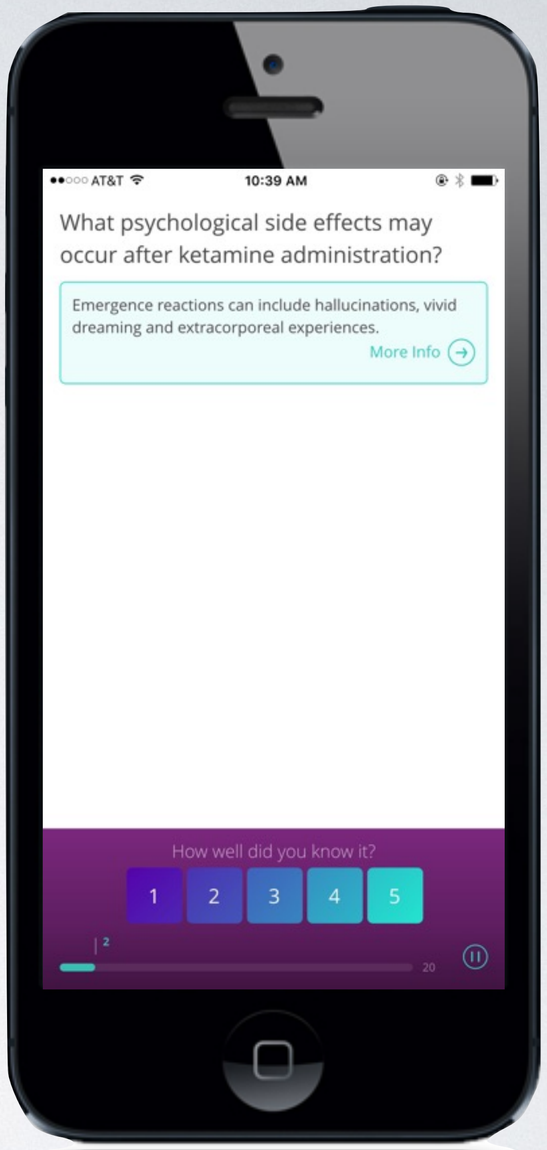

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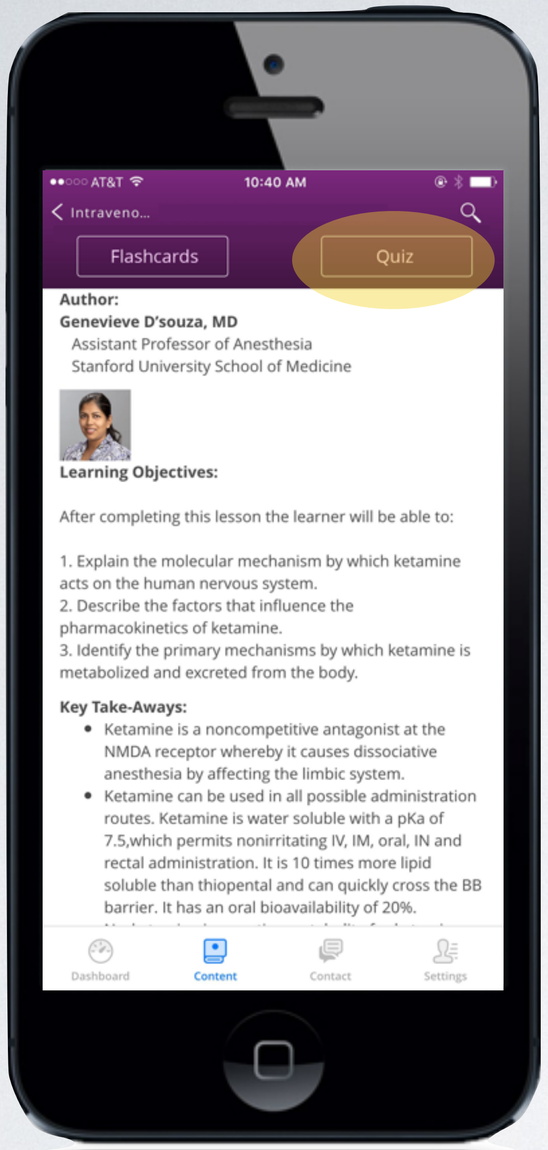

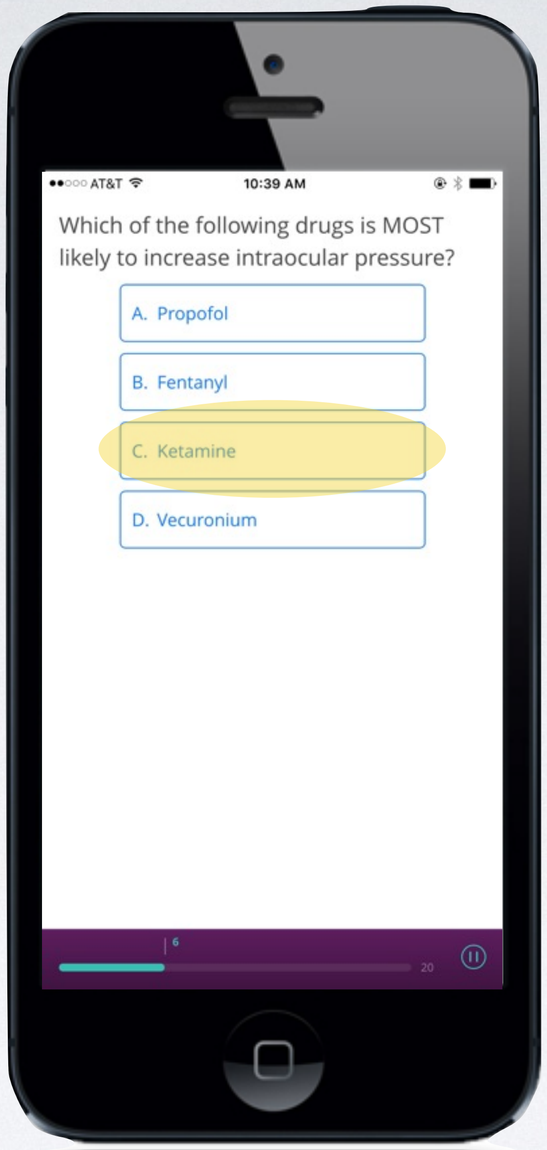

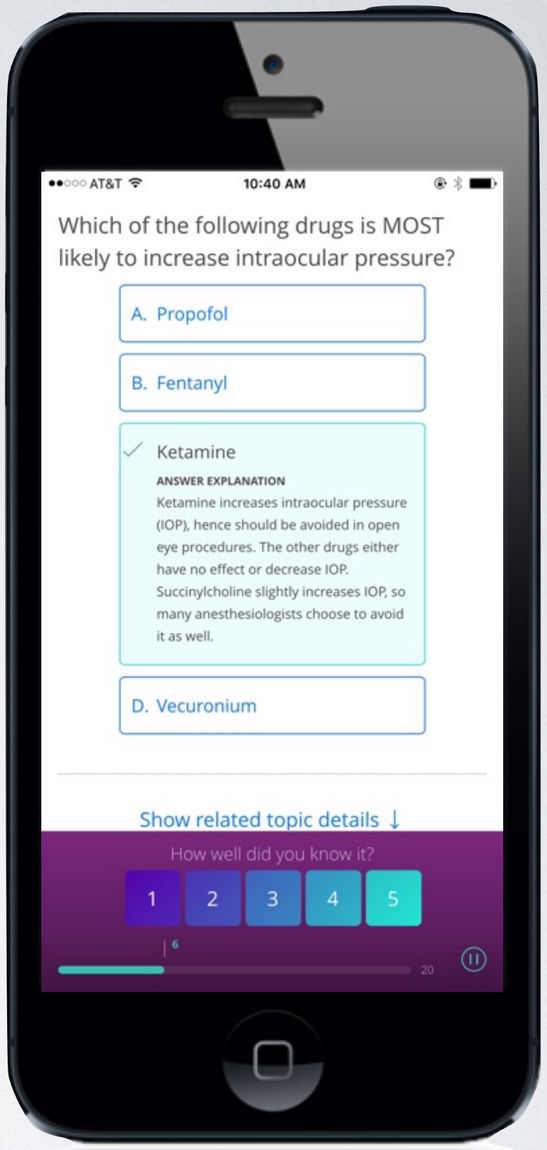

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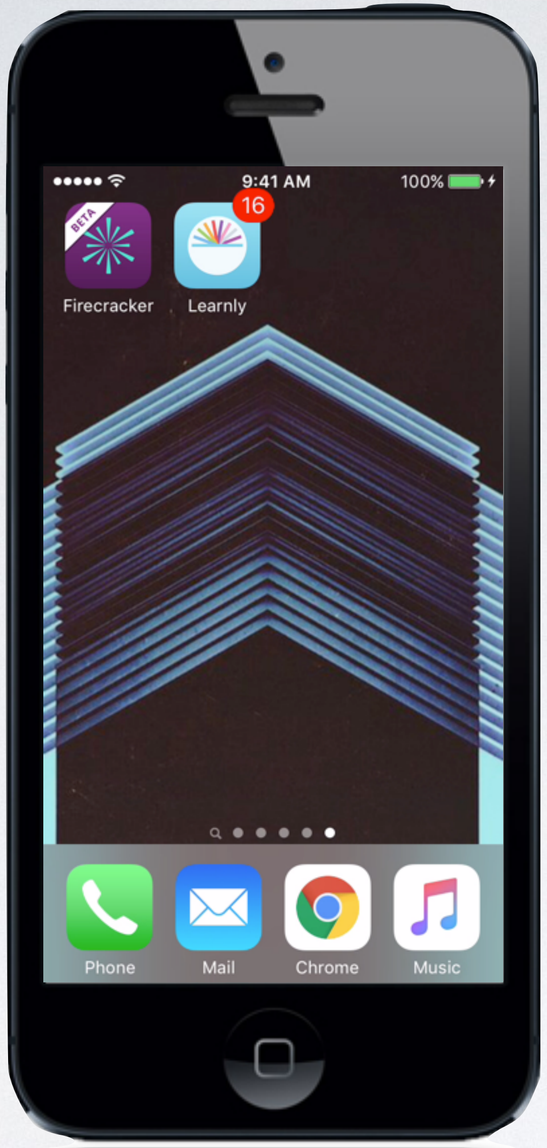

Stanford AIM learnly

AN ANESTHESIOLOGY LEARNING ECOSYSTEM

AFFECTIVE NETWORKS:
THE **WHY** OF LEARNING

Engagement

For purposeful, motivated learners, stimulate interest and motivation for learning.

RECOGNITION NETWORKS:
THE **WHAT** OF LEARNING

Representation

For resourceful, knowledgeable learners, present information and content in different ways.

STRATEGIC NETWORKS:
THE **HOW** OF LEARNING

Action & Expression

For strategic, goal-directed learners, differentiate the ways that students can express what they know.

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QUALITY OF LEARNING EXPERIENCE

ACKNOWLEDGE VULNERABILITY OF RESIDENTS

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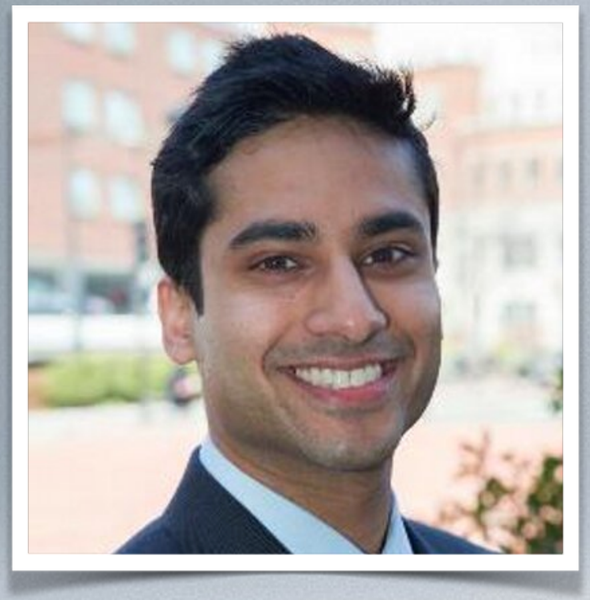
Anesthesiology, Perioperative and Pain Medicine

AIM



Dhruv Khullar, MD
MGH Resident

The New York Times

The importance of sitting with patients

"She asked me to sit for a few minutes and, shamefully, I hesitated. I had eight more patients to see before rounds and was already running behind."

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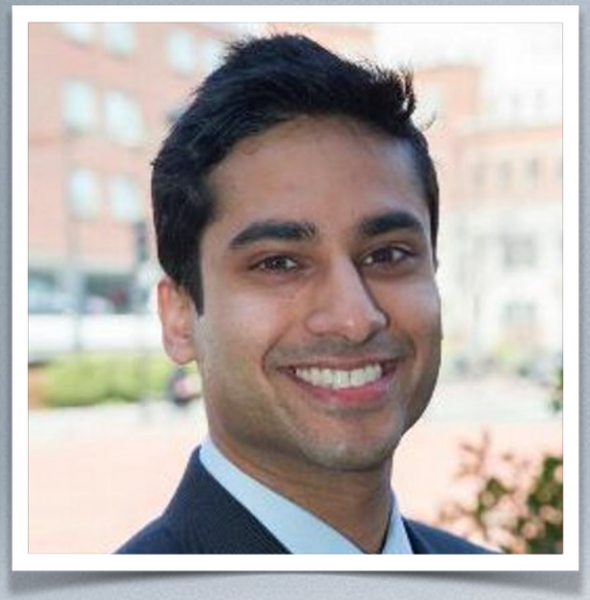

Dhruv Khullar, MD
MGH Resident

The New York Times

The importance of sitting with patients

"So far, residency educational reform has focused on the quantity of hours worked, not necessarily improving the quality of time spent at work."

STANFORD COURSEWORK

LEARNING DESIGN & RESEARCH

***EDUCATION 281X** - TECHNOLOGY FOR LEARNERS*
***ANES 204** - MEDICAL EDUCATION IN THE NEW MILLENNIUM*

NEJM FIRST AUTHOR
STARTPREP AUTHOR/EDITOR
TEACHING STARTPLUS
INSTRUCTIONAL DESIGN
RESEARCH PUBLICATIONS

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LEARNING DESIGN AND TECHNOLOGY

STANFORD GRADUATE SCHOOL OF EDUCATION

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LEARNING ADVANCED MEDIA TECHNIQUES

CLINICAL VIDEO FOR NEW ENGLAND JOURNAL OF MEDICINE

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LAUNCHED NEW PODCAST

DOWNLOADED MORE THAN 16,000 TIMES IN 47 COUNTRIES

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PLACING KNOWLEDGE INTO PRACTICE

CLINICAL ATTENDING STANFORD OPERATING ROOMS

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LECTURING ON MEDICAL EDUCATION

STANFORD COURSE ON MEDICAL EDUCATION IN THE NEW MILLENNIUM

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CUTTING EDGE TECHNOLOGY

OCULUS RIFT AT STANFORD TECHNOLOGY LABS

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LEADERSHIP ON A GLOBAL STAGE

MEDICINE X AND MEDICINE X | ED

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Best of Category Abstract *Economics, Education and Policy*

STARTprep: A 12 month multi-institutional episodic daily learning online mobile curriculum designed to prepare anesthesia residents for competency in the anesthesia basic sciences

Chandrasoma J[1], Lynn Ngai[2], Traynor AJ[3], Piehl E[3], McFadyen G[1], STARTprep Working Group[4], Chu LF[1]

STUDY OBJECTIVES

- To understand the extent to which a daily online curriculum can address the unique learning needs of today's Millennial residents
- To measure which variables in an online course significantly affect residents' performance on high stakes educational milestones
- To provide useful information to residency program directors to ultimately advance the teaching of anesthesia basics sciences in online, blended and in-person formats at their home institutions.

BACKGROUND

- Majority of current residents are millennial learners, incorporating new technologies and fast, mobile delivery of information.
- Accustomed to mobile, online learning from grade school through medical school, expecting similarly sophisticated teaching modalities in residency.
- STARTprep was created to meet this need for a time-shifted, place-shifted

METHODS

- Stanford IRB approval 27444 was obtained to distribute the online curriculum and accompanying research instruments to 37 residency programs internationally
- The course was first implemented in July 15, 2013 and ran everyday through June 22, 2013. 204 residents from 13 original institutions participated.
- The course was implemented for a second time beginning in July 15, 2014. 1374 residents from 47 institutions are participating.
- Enrollment was voluntary and performance was blinded to home institutions.
- Students receive a daily email that prompts them to log into the Moodle LMS where they read a textual chapter written by a faculty expert; complete a set of interactive flashcards; and take a daily 5 question quiz. Supplemental resources such as audio podcasts and downloadable PDFs are also provided.
- Surveys and longer assessments are

RESULTS

Who is using STARTprep?

- 1374 residents from 47 residency programs across all regions of the U.S and all program sizes
- 64% CA-1 residents; 12% CA-2s and 15% CA-3s
- 42% are females and 58% are males
- 62% are between the ages of 25-30
- 16% grew up outside the United States
- 75% hold an undergraduate degree in the sciences
- 22% serve as a primary caregiver for someone else
- 99% used learning technologies in college/medical school
- 59% completed an online course before
- 45% own a Facebook account
- 79% identify as a "joiner" or "spectator" on social media
- 37% have a "thinking" learning style on the Kolb Learning inventory
- 46% have an "experiencing" learning style

STARTprep is more engaging than other modes of studying anesthesia basic sciences.

- 81% of residents who have been using the course for at least 3 months say that STARTprep is more engaging than traditional study methods
- 86% of residents say STARTprep is more engaging than traditional lectures

Most residents are "selective users" of STARTprep.

- 37% are Sequential Users, meaning that they use almost every available resource in sequential order (chapter, quizzes, flashcards, podcasts).
- 40% are Selective Users, meaning that they read every chapter, but use the other resources selectively (quizzes,

Competency in Anesthesia Basic Sciences

- 99.2% of students enrolled in STARTprep passed the ABA basic exam 2014 vs. 96% national average.
- Performance correlated with use of STARTprep:
- Failed (2837 login/activities), Pass (4394 login/activities), Top 10% national scorers (6854 login/activities).
- 15% of STARTprep students scored within the top 10% nationally on the ABA basic exam 2014.

DISCUSSION

STARTprep is a novel 12 month multi-institutional episodic daily learning online mobile curriculum in use by more than 1300 U.S. anesthesia residents. Initial results show the program helps them feel more prepared for high stakes educational milestones, engages learners more than traditional lectures and study methods, allows residents to learn at times that are convenient to their needs and lifestyles, and reveals strenghts and gaps in residents' knowledge of the anesthesia basic sciences.

[4]WORKING GROUP MEMBERS

2013-14 STARTprep working group members include Jeffrey Berger (George Washington University), Rob Lekowski (Brigham and Women's Hospital), Meredith

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ASSISTANT PROFESSOR

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