Applying learning science to medical education

Rishi Desai, MD, MPH
Rishi Desai, MD

- Has no relevant financial relationships to disclose
- Will not be discussing any unlabeled/unapproved use of drugs or products
Remember these words:

skateboard  penguin

rain       lollipop
A diagram showing the relationship between time, medical knowledge, and learning capacity. The curve labeled "Medical Knowledge" shows an increasing gap over time, indicating that the rate of knowledge acquisition outpaces the learning capacity.
Patient data

Knowledge base

Doctor

Patient
Middle East consumers ready to embrace AI and robots for their healthcare needs

Fig 1: Percentage of respondents willing/unwilling to engage with AI and robotics for their healthcare needs (by country)

- Nigeria: 6% Willing, 94% Unwilling
- Turkey: 11% Willing, 85% Unwilling
- South Africa: 16% Willing, 82% Unwilling
- Saudi Arabia: 16% Willing, 66% Unwilling
- Qatar: 24% Willing, 65% Unwilling
- UAE: 26% Willing, 62% Unwilling
- Netherlands: 39% Willing, 55% Unwilling
- Belgium: 43% Willing, 51% Unwilling
- Norway: 39% Willing, 50% Unwilling
- Sweden: 44% Willing, 48% Unwilling
- Germany: 41% Willing, 51% Unwilling
- UK: 39% Willing, 50% Unwilling
Al Khor Hospital starts telemedicine for stroke care

© 05 Oct 2016 - 1:08

By Fazeena Saleem / The Peninsula

DOHA: Telemedicine system for real time evaluation of stroke patients has been introduced at Al Khor Hospital and it has significantly helped patients’ chances of making a full recovery, said a senior official. Telemedicine is an advanced system that enables the diagnosis and treatment of patients by clinical teams situated in a different location to the patient. A collaborative initiative by teams across Hamad Medical Corporation (HMC) has led to the implementation of the system that is improving care for stroke patients at Al Khor Hospital, said Professor Ashfaq Shuaib, Director, Neurosciences Institute HMC.

“The telemedicine technology enables direct evaluation of stroke patients admitted at Al Khor’s Emergency Department and allows real time examination of the CT scan imagery by HMC’s expert stroke team based at HGH’s Stroke Ward in Doha, facilitating immediate treatment with live saving therapies,” Professor Shuaib told The Peninsula.

“Prior to the introduction of the telemedicine system, patients would often need to be transferred to HGH’s Emergency Department for a full assessment before treatment was given. By significantly reducing the time period between the onset of stroke symptoms and the start of treatment, patients’ chances of making a full recovery are greatly improved,” he added.
Telehealth visits vs. other urgent care options

- Emergency Room: $750
- Urgent Care: $140
- PCP: $95
- Telehealth: $49

Source: Healthcare Blue Book
Time is Money: In-Person vs. Online Care

**In-Person Doctor Visit**
121 MINUTES = $43 WORTH OF YOUR TIME
(Travel, wait room, forms and actual visit)

**Telehealth Doctor Visit**
15 MINUTES* = ~$5 WORTH OF YOUR TIME
(Sign up, log-in, forms and actual visit)

**Savings of Online Care**
106 MINUTES = $38 WORTH OF YOUR TIME

*Based on American Well data from Amwell, the consumer telehealth app. Download it at www.amwell.com.
Sources: JAMA Internal Medicine; Harvard Medical School; American Well
Pick two
Pick two
Empathetic listening
Motivational counseling
Cultural competency
Nutrition guidance
Teamwork
Technical abilities
Patient advocacy
Life long learning

Didactic information

Facts

Skills
Medical education

Teaching facts

Teaching skills
Empathetic listening
Motivational counseling
Cultural competency
Nutrition guidance
Teamwork
Technical abilities
Patient advocacy
Life long learning

Didactic information

Facts

Skills
This is where you lost your wallet?

No, I lost it in the park, but this is where the light is.
10-15% of medical students attend class.
Why don’t you go to class?

Many of my professors don’t teach me everything that I need for the USMLE and clinical rotations. *(My professors don’t teach me all the facts I need)*

I can’t learn by sitting for hours while someone reads me a list of bullets from a powerpoint. There are so many online resources that I’d rather use. *(I can’t learn facts this way)*

I learn a lot more just by answering questions, and then looking things up when I get stuck. *(There are more effective ways for me to learn facts)*
Why don’t you go to class?

Many of my professors don’t teach me everything that I need for the USMLE and clinical rotations. *(My professors don’t teach me all the facts I need)*

I can’t learn by sitting for hours while someone reads me a list of bullets from a powerpoint. There are so many online resources that I’d rather use. *(I can’t learn facts this way)*

I learn a lot more just by answering questions, and then looking things up when I get stuck. *(There are more effective ways for me to learn facts)*
Three curriculums

- Medical school classes
- USMLE
- Clinical knowledge
Three curriculums

Medical school classes

USMLE

Clinical knowledge
Three curriculums

Medical school classes

USMLE

Clinical knowledge
Three curriculums

- Medical school classes
- USMLE
- Clinical knowledge
Why don’t you go to class?

Many of my professors don’t teach me everything that I need for the USMLE and clinical rotations. (My professors don’t teach me all the facts I need)

I can’t learn by sitting for hours while someone reads me a list of bullets from a powerpoint. There are so many online resources that I’d rather use. (I can’t learn facts this way)

I learn a lot more just by answering questions, and then looking things up when I get stuck. (There are more effective ways for me to learn facts)
Pathophysiology

- Ischemia develops when there is an increased demand for oxygen or a decreased supply of oxygen.
- Ischemia can develop within 10 seconds and if it lasts longer than 20 minutes, irreversible cell and tissue death occurs.
- Myocardial cell death begins at the endocardium. This area most distal to the arterial blood supply.

[Image of a laptop screen displaying various medical diagrams and text about cardiac rehab and heart attacks.]
Pathophysiology

- Ischemia develops when there is an increased demand for oxygen or a decreased supply of oxygen.
- Ischemia can develop within 10 seconds and if it lasts longer than 20 minutes, irreversible cell and tissue death occurs.
- Myocardial cell death begins at the endocardium. This area most distal to the arterial blood supply.
Quiz
Memory anchor
Why don’t you go to class?

Many of my professors don’t teach me everything that I need for the USMLE and clinical rotations. *(My professors don’t teach me all the facts I need)*

I can’t learn by sitting for hours while someone reads me a list of bullets from a powerpoint. There are so many online resources that I’d rather use. *(I can’t learn facts this way)*

I learn a lot more just by answering questions, and then looking things up when I get stuck. *(There are more effective ways for me to learn facts)*
The four major classes of anti-arrhythmics are Class I, Class II, Class III, and Class IV. What channels or receptors do they predominantly block, in order of I, II, III, and IV?

A. sodium, beta adrenergic receptors, potassium, calcium

B. calcium, potassium, beta adrenergic receptors, sodium

C. sodium, beta adrenergic receptors, calcium, potassium
STUDY #1

RESTUDYING

TESTING

13% HIGHER after 6 months
better long-term retention
STUDY #2

Timing of Testing

- Read Article
- Test after 1 day
- Test after 1 week
- Test after 3 weeks

Better Recall
Learn something

Retention

Day 0

Less familiar

More familiar

Time

Review when you start to forget
When to review CV, GI, OB/GYN, etc.
Medical education

- Online
- Teaching facts
- Teaching skills
Medical education
BLENDED LEARNING

~FLIPPED CLASSROOM~

ONLINE RESOURCES + IN-PERSON INSTRUCTION

CONSUME at HOME

GUIDE on the SIDE

IN-CLASS ACTIVITIES

STUDENT FOCUSED
COGNITIVE LOAD
**ANGINA PECTORIS**

**UNSTABLE ANGINA** - pain during exercise or stress or at REST doesn’t go away.
CONTENT IMPROVEMENT

REYE(S) SYNDROME

Encephalopathy + Liver Damage

Brain Dysfunction

↑ Transaminases
* Liver enzymes

Bloodwork

↑ Prothrombin time
* Time to clot

Glycogen Storage

Hyperglycemia

Glucose → Glycogen

Hypoglycemia

↑ Ammonia
* Not being filtered out
* Higher = more severe

We've concluded most common ages to develop Reye syndrome to 5-12 years.
Platform
{c1::anki style} blanks only add {c2::deletions. You can have them all blank.
{{c3::All blank}}

1 ratings

Everyone in this module can see this question and its author.
Add tags

Published · Comment · Edit · Clone · Retire · Admin Edit · ID: 5109096
Added 2 months ago by Caleb Furnas

{c1::Ask around}
Ask if anyone knows ____?

{c2::Lend a hand}
I'm adding a mnemonic.
I'm adding some more info.

{c3::Critique}
It may not be correct.
It contains a typo/spelling error.
It may be difficult to understand.
It may not be relevant.
A 43 year old former NFL football player had a multiyear history of worsening mood swings, depression, and insomnia resulting in problems in home life and being unable to maintain employment. He had no significant psychiatric history and he had never taken performance-enhancing or illicit drugs. His family history was negative for dementia and psychiatric illness. He died of a self-inflicted gunshot wound to the chest. Post-mortem analysis of his brain showed a reduction in brain weight, neuronal loss in the hippocampus, substantia nigra and cerebral cortex, and extensive tau-immunoreactive pathology throughout the neocortex, medial temporal lobe, diencephalon, brainstem, and spinal cord. The neurofibrillary tangles seen in his brain are most similar to what other neurologic disease?

A  Alzheimer’s Dementia
   - I'm Sure
   - Feeling Lucky
   - No Clue

B  Huntington Disease

C  Progressive Multifocal Leukoencephalopathy (PML)

D  Creutzfeldt-Jakob Disease
Partnerships
CONTENT PARTNERSHIPS

Robert Wood Johnson Foundation

TRANSLATORS WITHOUT BORDERS

TED Ed

WILLIAM + FLORA
Hewlett Foundation

WIKIPEDIA
The Free Encyclopedia
**TRANSLATIONS**

- English
- French
- Arabic
- Mandarin
- Spanish
- Portuguese
- Russian
- German
- Italian
- Japanese
GROWTH

3,000,000+
video views each month
(100,000 today)

1,500,000+
problems completed each month
(50,000 today)
FACULTY FEEDBACK

“I think these short videos are excellent and love the fact that they’re open access. I’ve watched a few of the videos that cover Behavioral Science topics and think they could be a really nice supplement to some of our lecture materials. Of note, I appreciate the fact that they use the most current diagnostic criteria (DSM-V) but also reference the older criteria to talk about what has changed and why.”

-Matthew Kraybill PhD, Ross University School of Medicine

“Why would we need to travel to the other end of the city for a 1.5 hour long lecture to listen to someone talking about an aspect that could be explained in 10 minutes through YouTube? We should consider making some serious changes of the education system because the possibilities of the internet are enormous. Your channel is very helpful!”

-Medical student
Open Osmosis:
Library of Open Educational Resources (OER) for Medical Education

Authors
Authors: Ersilia M. DeFilippis1,2,*, Thasin Jaigirdar2,*, Shiv M. Gaglani3,2,*, Matthew Sakumoto4,2, Vishal Punwani2,5, Rishi Desai2,6, M. Ryan Haynes2, Michael W. Painter7

Abstract
Many resources currently available for graduate and undergraduate medical education are fragmented, difficult to access, and costly. Osmosis, a web- and mobile-based platform, was developed to create a shared and easily accessible repository of curated clinical educational resources. We have recently launched “Open Osmosis” - a public-facing portal that has become one of the largest databases of Creative Commons-licensed questions, among other open educational resources (OER), for medical education.

Key Words
medical education, open educational resources, crowdsourcing

Introduction
As the breadth and depth of medical knowledge grows exponentially, clinical students often feel inundated with content they are expected to learn during their training. However, many of these students struggle...
Medical education
BLENDED LEARNING

~ FLIPPED CLASSROOM ~

ONLINE RESOURCES + IN-PERSON INSTRUCTION

CONSUME at HOME

GUIDE on the SIDE

IN-CLASS ACTIVITIES

STUDENT FOCUSED
Thank you