How COVID-19 transformed *online* teaching and learning: Or did it?

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Translational Anatomy of Degenerative Diseases & Developmental Disorders

TAD4

Good Teaching is Good Teaching Whether In-Person or Online

Jonathan J. Wisco, PhD

Department of Anatomy and Neurobiology

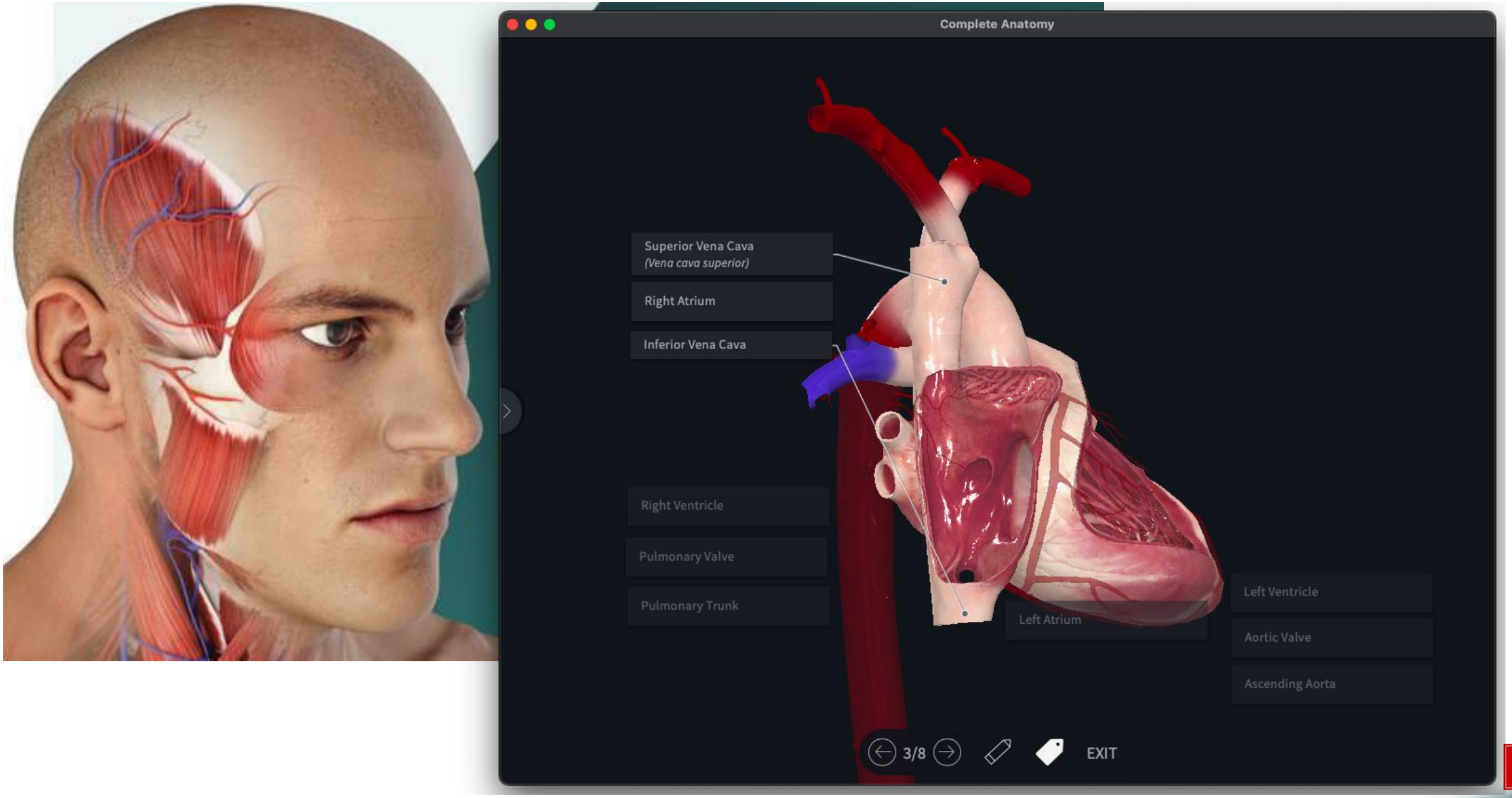
Gross Anatomy Pre-Pandemic – Dissection

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8-9	Lecture	Lab – Group A	Lecture	Lab – Group B	Lecture
9-10	Lecture		Lecture		Lecture
10-11	Lecture	Lab – Group B	Lecture	Lab – Group A	Lecture
11-12			Lecture		
12-1					
1-2	Continue Dissection or Recitation	Doctoring or Continue Dissection or Recitation	Doctoring or Continue Dissection or Recitation	Doctoring or Continue Dissection or Recitation	Continue Dissection or Recitation
2-3					
3-4					
4-5					

Gross Anatomy During Pandemic - Prosection

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8-9	Lecture	Lecture	Lecture	Lecture	Lecture
9-10	Lecture				Lecture
10-11	Zoom Recitation	Lab – Group 1	Lab – Group 2	Lab – Group 3	Zoom Recitation
11-12	Zoom Recitation				Zoom Recitation
12-1					
1-2	Zoom Recitation	Doctoring or Zoom Recitation	Doctoring or Zoom Recitation	Doctoring or Zoom Recitation	Zoom Recitation
2-3	Zoom Recitation				Zoom Recitation
3-4	Zoom Recitation				Zoom Recitation
4-5	Zoom Recitation				Zoom Recitation

Gross Anatomy During Pandemic - Prosection



Gross Anatomy During Pandemic - Prosection

***HEART IN THE THORAX*:**
Apex of heart
Base of heart
Arch of aorta
Pulmonary trunk
Ligamentum arteriosum

Sternocostal (anterior) surface
Diaphragmatic (inferior) surface

***SURFACE FEATURES OF THE HEART*:**
Coronary (atrioventricular) sulcus
Anterior interventricular sulcus
Posterior interventricular sulcus
Right and left auricles
Left and right pulmonary surfaces

Serous pericardium
Parietal layer
Visceral layer (epicardium)
Pericardial cavity
Oblique pericardial sinus
Transverse pericardial sinus

***CORONARY ARTERIES*:**
Left coronary artery
- Anterior interventricular branch/LAD
- Circumflex branch

Right coronary artery
- Anterior right atrial branch
- Sinoatrial nodal branch
- Right marginal branch
- Posterior interventricular branch/PDA

***CARDIAC VEINS*:**
Coronary sinus
Great cardiac vein
Middle cardiac vein
Small cardiac vein
Anterior cardiac veins

SURFACE FEATURES OF THE HEART:

Sternocostal (anterior) surface
- The sternocostal anterior surface of the heart is anterior, superiorly and to the left of the heart.
- It is mainly formed by the right atrium and ventricle, which are separated by a vertical atrioventricular groove.

Diaphragmatic (inferior) surface
- The diaphragmatic surface is the part of the heart that sits on the diaphragm. Consists mainly of the left ventricle and a small portion of right ventricle. The inferior vena cava (IVC) also forms part of this surface.

Left and right pulmonary surfaces
- The pulmonary surfaces, as the name suggests, are the parts of the heart that are in contact with the lungs. The right pulmonary surface is formed by the right atrium. The left pulmonary surface is formed by the left atrium and portion of the left ventricle.

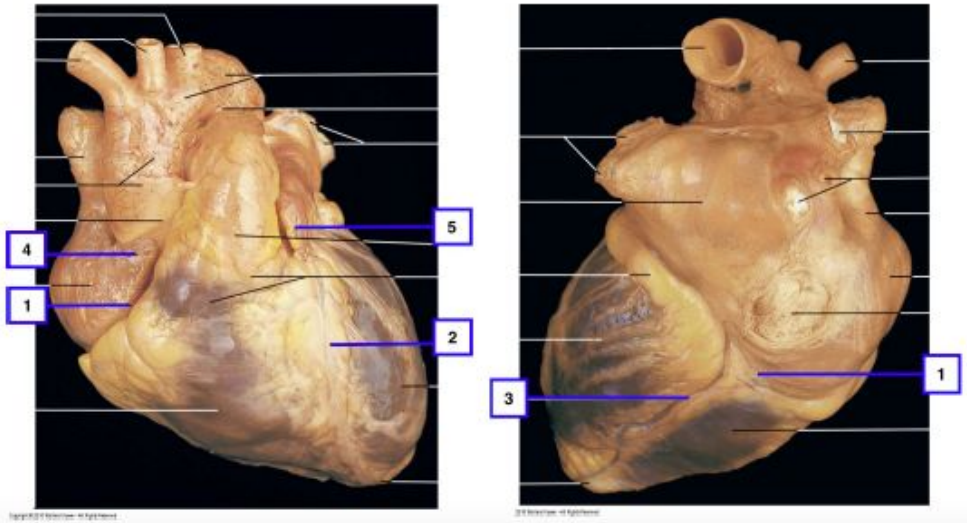
Coronary (atrioventricular) sulcus (1)
- Marks where the atria of the heart are separated from the ventricles by the coronary sulcus. The border between the Right Atrium and Aorta.
- The right coronary artery often travels along this sulcus.

Anterior interventricular sulcus (2)
- Located between left and right ventricles on the anterior surface and the anterior interventricular artery (LAD) runs along it.

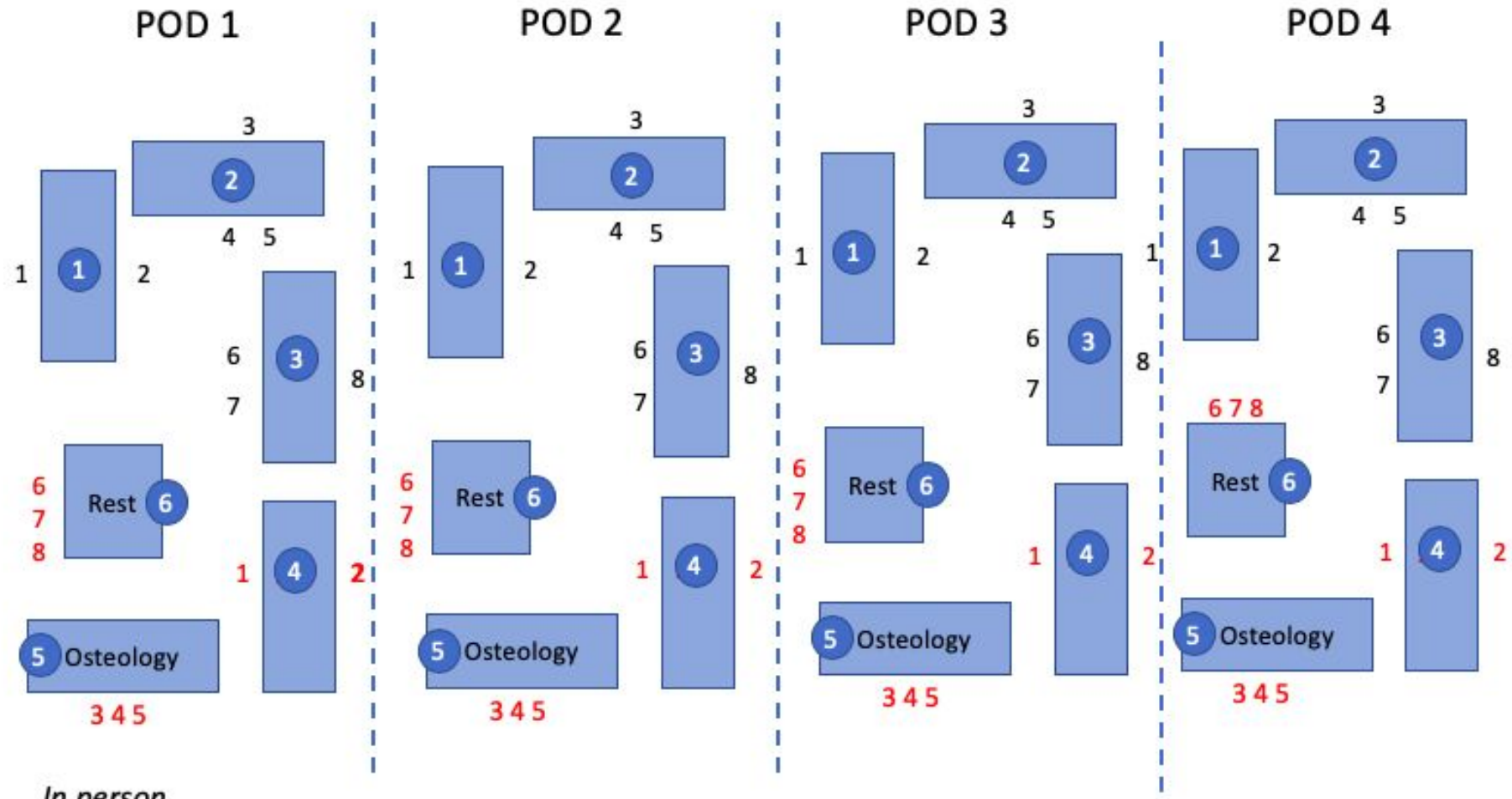
Posterior interventricular sulcus (3)
- Located between the left and right ventricles on the posterior surface, on the diaphragmatic, closer to right margin.
- The posterior interventricular (descending) artery (PDA) runs along it.
- Can also be names posterior longitudinal sulcus.

Right (4) and left auricles (5)
- Cone-shaped pouch of each atrium can also be considered primitive atrium.

Anterior view *Posterior view*



Gross Anatomy During Pandemic - Prosection



In person

- Attend once a week, with your cohort
- Each group will work together in the same region of the lab ("Pod")
- During lab, 8 person group will divide into three teams (3, 3, 2 people) who will circulate through the lab stations together.
- Explore donors to identify the content described in the lab guides

Table Conferences

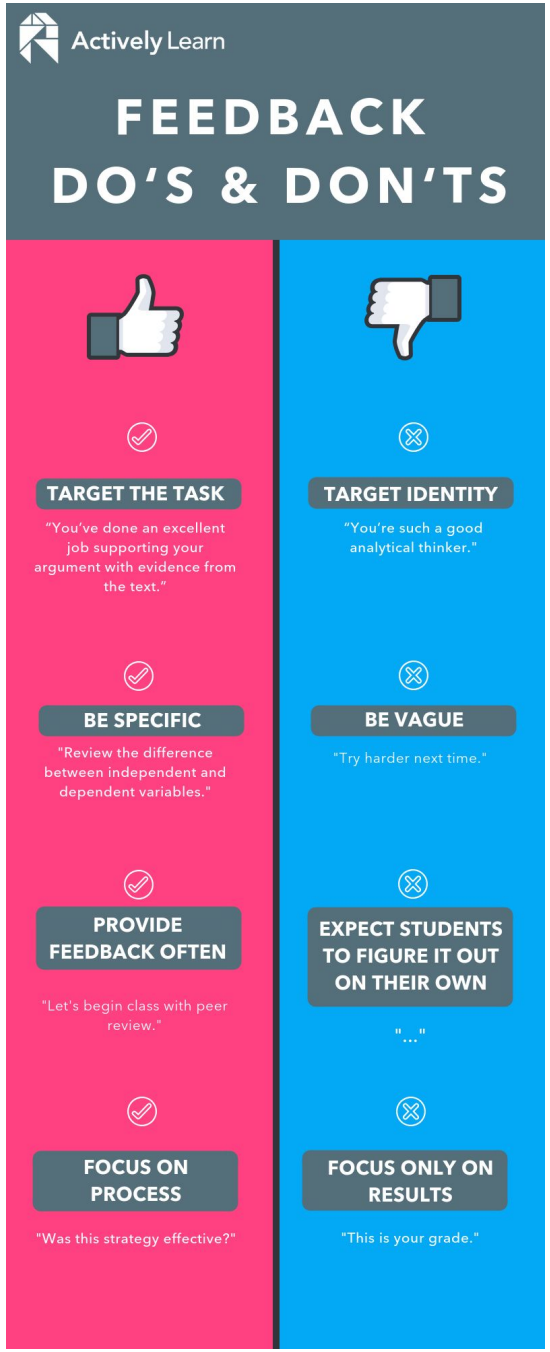
•Question types are a mix of the following:

- Show me the ____.
- Name this structure (pointing to a structure)
- What function does this structure serve? (pointing to a structure)

Zoom Recitation Sessions

Most Valued Learning Resources

- Investigated the effectiveness of new course materials developed to aid these curriculum changes.
- We performed a grounded theory thematic analysis of students' responses (80/160, 50% response) to qualitative survey questions and to focus group questions (16 students who self-selected between 4 different sessions).
- Data from both the survey and focus groups demonstrated that the vast majority of students agreed that the materials helped them navigate through learning gross anatomy.
    - Laboratory guides were used mostly for post-lab review as opposed to the intended direction during laboratory sessions.
    - **Students within all focus groups overwhelmingly touted the value of Zoom recitation sessions, with many stating that they were imperative to course success.**
- We propose that the utilization of course materials that students perceive as time saving and pertinent to their exam performance, when combined with cadaveric prosection, emphasizes the benefits of flipped-classroom learning to help students learn gross anatomy effectively and efficiently during the pandemic and beyond.



Gross Anatomy Post-Pandemic – Hybrid (current)

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8-9	Lecture	Lecture	Lecture	Lecture	Lecture
9-10	Lecture				Lecture
10-11	Zoom Recitation	Lab – Group 1	Lab – Group 2	Lab – Group 3	Zoom Recitation
11-12	Zoom Recitation				Zoom Recitation
12-1					
1-2	Zoom or Lab Recitation	Doctoring or Zoom or Lab Recitation	Doctoring or Zoom or Lab Recitation	Doctoring or Zoom or Lab Recitation	Zoom or Lab Recitation
2-3	Zoom or Lab Recitation				Zoom or Lab Recitation
3-4	Zoom or Lab Recitation				Zoom or Lab Recitation
4-5	Zoom or Lab Recitation				Zoom or Lab Recitation

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Gross Anatomy Post-Pandemic – Hybrid (future)

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8-9	Case presentation	TBL and Lab – Group 1	TBL and Lab – Group 2	Case consolidation	Exam
9-10					
10-11	Self-Guided Learning			Open Discussion	
11-12	Self-Guided Learning				
12-1					
1-2	Self-Guided Learning	Doctoring or Self-Guided Learning	Doctoring or Self-Guided Learning	Doctoring or Self-Guided Learning	
2-3	Self-Guided Learning				
3-4	Self-Guided Learning				
4-5	Self-Guided Learning				

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Lessons Learned

- Establish a culture of trust
  - Objectives and expectations that are clear
  - Activities that are engaging and valuable toward learning and integration
  - Assessments that are written fairly
    - see National Board of Medical Examiners (NBME), “Constructing Written Test Questions For the Basic and Clinical Sciences, 3rd Ed. Revised”
- **Realize that faculty are no longer the primary source of knowledge and comprehension, but are the principal mentoring source for application, analysis, synthesis, and evaluation (Bloom’s Taxonomy in the Cognitive Domain)**
- Involve students as partners in the feedback process
- Be open to the influence of feedback from students

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PBL online or in-person? An Enjoyable Teaching Approach

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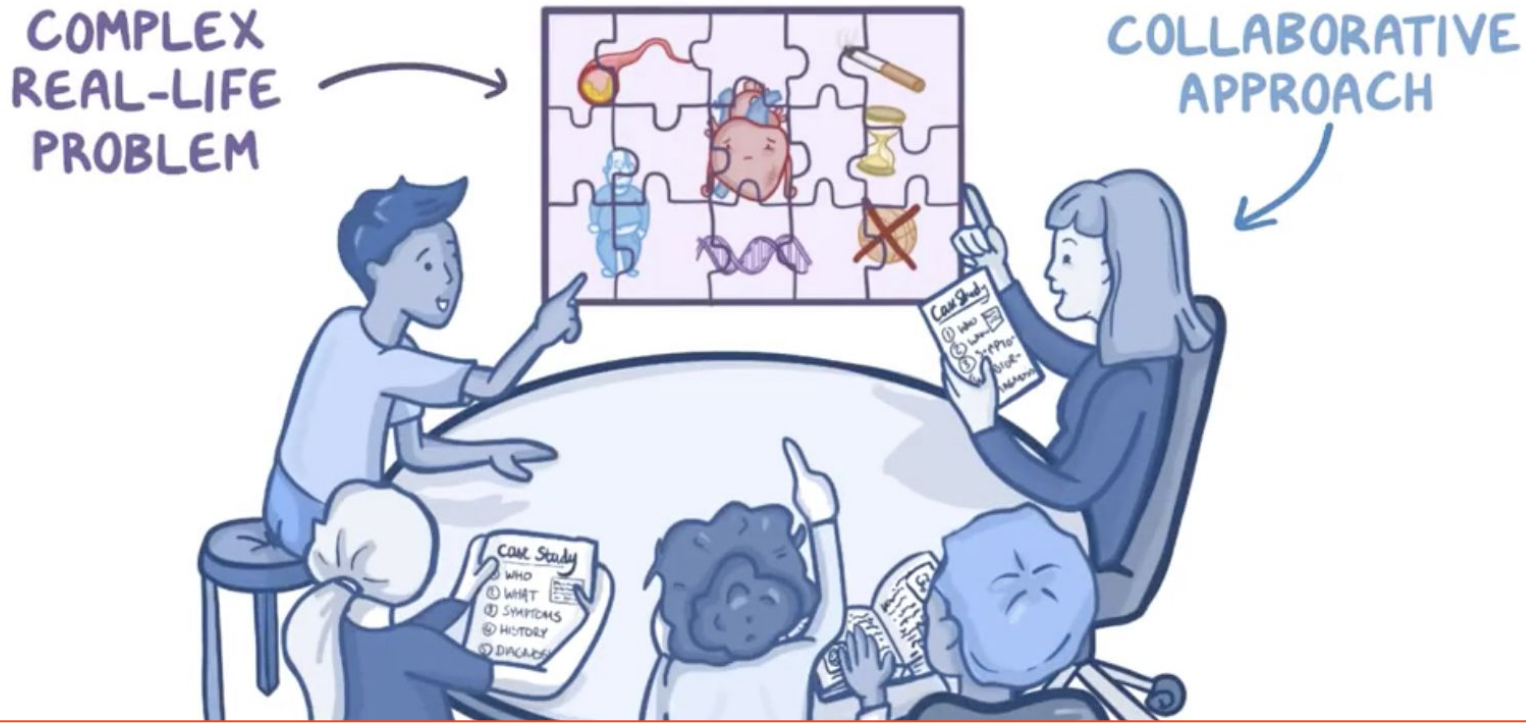
PROBLEM- BASED LEARNING (PBL)



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Does it Work?

- More enjoyable for students and teachers
- More stimulating and humane learning environment
- Self-directed learning skills enhanced and retained
- Promotes deeper rather than surface learning
- Promotes interaction between students and faculty
- Promotes interdepartmental collaboration
- Emphasizes co-operation and teamwork

Johnson and Finucane, J Eval Clin Pract 2000;6:281

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PBL Session – In-person

- Classroom with one table
- One computer and projector
- Physical White board
- One facilitator
- 5-10 students
- Work together on medical case

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Does it Work online?

- Zoom platform
- Virtual board – Google docs
- Chat feature
- Cameras should be on
- Avoid distractions (pets, restroom breaks, background noise)
- One person should speak at a time

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Medical Science Educator
https://doi.org/10.1007/s40670-020-01063-3

INNOVATION

How COVID-19 Transformed Problem-Based Learning at Carle Illinois College of Medicine

Olivia C. Coiado[1] · Jaya Yodh[1] · Roberto Galvez[1] · Kashif Ahmad[1]

Abstract

The Carle Illinois College of Medicine is creating an innovative model for medical education that integrates engineering principles into an active learning curriculum. At the Carle Illinois due to the state order of social distancing during the COVID-19 pandemic, students were mandated to terminate in-person instruction. The goal of this work is to show the pros and cons of online versus in person Problem Based Learning (PBL) sessions. In the online environment, the sessions tend to run slower since we need to pause to allow time for people to speak and others to understand. There is more risk for students to become distracted by increased screen-time and access. Thus, the facilitator has a greater role in keeping the students engaged and focused while managing time. Despite these differences, we found that overall student performance with respect to generating and researching learning issues was similar between online and in-person PBL sessions.

Keywords In person · Online · Problem-based learning · Medical education

- PBL online – sessions tend to run slower and more risk for students to become distracted.
- Chat and "emojis" great tools to engage students.
- Accessibility

Challenges

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- Not able to observe body language
- Sense of community can be lost
- Enables shy or quiet students to not participate
- Burn out, tiredeness

Lessons Learned

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PBL is fun in-person or online – use of icebreakers and games

Student-centered – evolution of the virtual white board

Requires ongoing faculty development

Learn how to deal with online conflicts

Good teacher is a good teacher!

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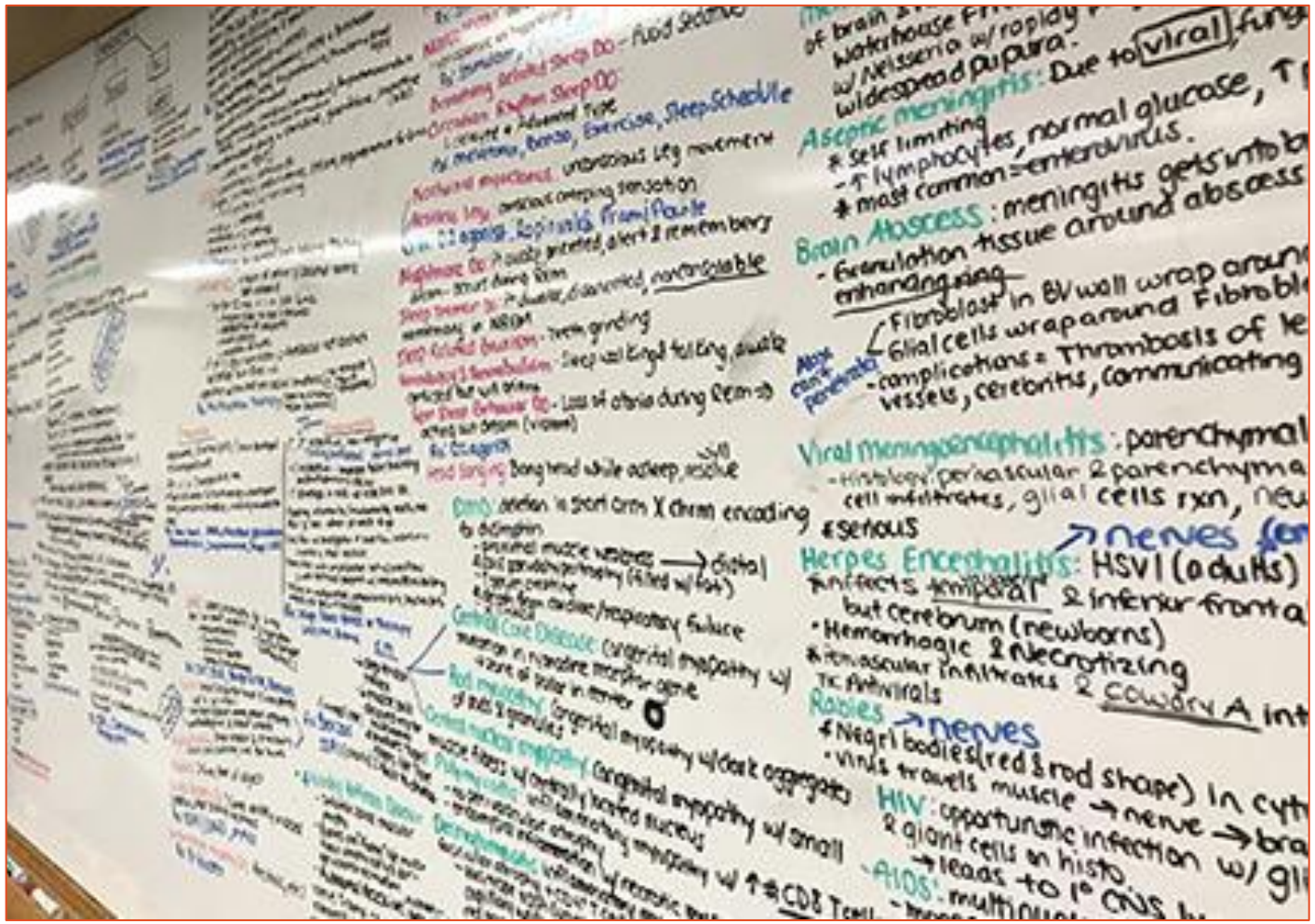
MEDICINE



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	A	B	C	D	E	F	G
1	Scribe 1	Scribe 1	Scribe 2	Searcher	Scribe 2	Synthesizer	Synthesizer
2	**Information**	**Problem List**	**Hypothesis**	**Searcher**	**Action Item**	**Learning Issue**	**Inquisitor ?'s**
3	John Jones, 60 year old RT handed male	frequent falls	Pakinson	https://pubmed.ncbi.nlm.nih.go	Any Trauma? Hematoma	What are Parkinsons plus diseases? (e.g. Wilson's disease? Onset, time course, treatment, pathogenesis)	When do you look at erectile dysfuction/chronic constipation as something that is pathologic vs. something that is not uncommon for the age of the patient?
4	semi-retired farmer from central Illinois - corn and bean farmer. worked with pesticides	tremor	~~Huntington~~		Onset?	What are the main causes of tremor? (Absence of inhibition in the motor pathways? Globus pallidus?)	
5	two ED visits in the past 3 months due to falls - fall occurred when trying to turn quickly while walking	slowed gait	Injury to Brain stem	https://www.ncbi.nlm.nih.gov/pr	Romberg Test? Negative	Autonomic nervous system review. (PNS/SNS and the neurotransmitters at first and second order neurons, locations in spinal cord, actions when activated)	
6	gait has slowed over the past few years	chronic constipation	Cerebellum		Immunization	Connection between the ANS and basal ganglia. Connection between the ANS and neurogenic orthostatic hypotension (nOH) (failure of the autonomic nervous system to regulate blood pressure in response to postural changes due to an inadequate release of norepinephrine --> orthostatic hypotension and supine hypertension)	
7	occasional tremor in his right hand, but is not bothered by it because "the tremor goes away as soon as I move my hand."	erectile dysfunction for about 5	Tumor		CN Testing	Risk factors for Parkinsons? (Low vitamin D can lead to loss of dopaminergic neurons, pesticide exposure predisposition to Parkinsons disease)	
8	denies memory changes	"bad sleeper" - moves around	Ischemia		EKG	Alcoholism and degneration of the internal cerebellar vermis contibute to ataxia and falls?	
9	Hypertension for 20 years	voice has gotten softer over the	Cardiac		Frequency?	Familial Parkinsonian symptoms (15% genetically inhereited, LRRK2, PARK7, PINK1, PRKN, or SNCA gene)	
10	Coronary artery disease – 3 vessel CABG 5 years ago	HTN	~~Medications~~		CBC, MP	How do you make a definitive diagnosis of Parkinsons? What are the first line treatments? Mr. Jone's contraindications?	
11	Diabetes mellitus type 2 for 15 years	DM	~~Lewy Body~~		A1C		
12	Vitamin D deficiency	Vit D deficiency	~~Frontal-temporal Dementia~~		Mri		
13	No known allergies	orthostatic hypotension	~~CJD~~				
14	Medications: Aspirin 81mg po QD, Vitamin D, Simvastatin 20 mg poqpm, Metformin 1000 mg po bid. He was taken off of Atenolol three months ago because of hypotension	masked facial appearance	Polio				
15	Mother: multiple strokes, Father: colon cancer		Atonic Seizures				
16	Quit tobacco ten years ago		~~MS~~				
17	heavy drinker in youth but has not had a drink in 20 years		Wilson's Disease				
18	no history of drug use		Brainstem Injury				
19	**Physical examination:**		Basal Ganglia				
20	General: Seated comfortably. No acute distress. On time for appointment. Appropriately dressed and groomed. Affect appropriately modulated. Speech is fluent and without						

Monday | Wednesday | Friday | Learning Issues

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COVID-19 IMPACTS ON PBL

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Teaching Associate Professor
Medical Education Facilitator

IAMSE Fall 2021 Webinar Series
September 30, 2021
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UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Research Studies

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Medical Science Educator
https://doi.org/10.1007/s40670-020-01063-3

INNOVATION

Check for updates

How COVID-19 Transformed Problem-Based Learning at Carle Illinois College of Medicine

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Current Study: *Exploration of Active Learning Strategies in Medical School PBL Curricula*

Radhika Duvvuri, CI MED Class of 2024

Deepak Lakshmipathy, CI MED Class of 2024

Jaya G. Yodh, PhD, CI MED Teaching Associate Professor, Medical Education Facilitator

Barbara Masi, PhD, CI MED Director of Program Evaluation & Student Assessment

RADHIKA DUVVURI

DEEPAK LAKSHMIPATHY

BARBARA MASI

JAYA YODH

Online PBL: Areas of Impact

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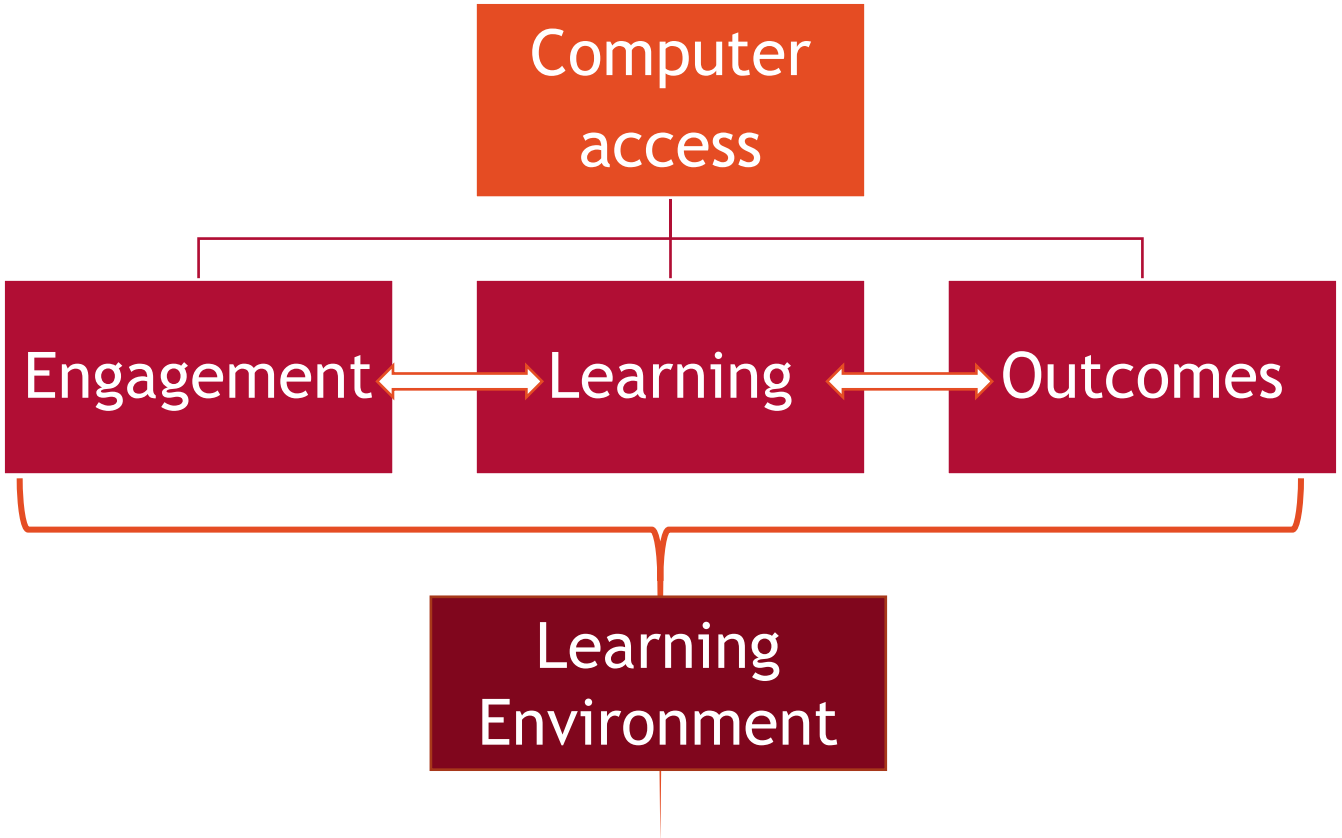
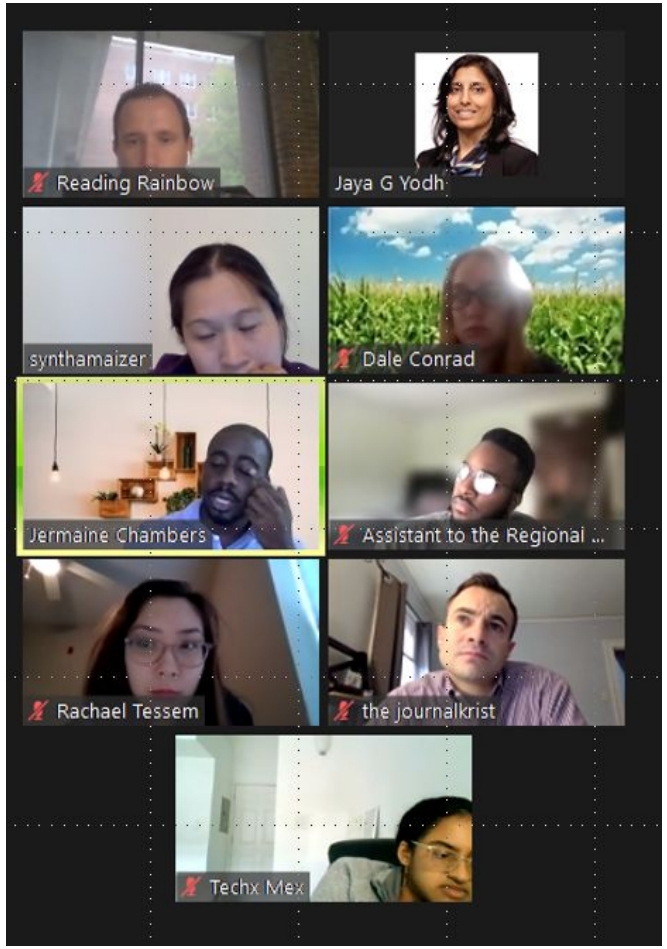


IMPACTS – Computer Access for All



Challenges	Benefits
Internet Access variability/single vs dual screens lead to engagement discontinuities	Online chat feature : immediate feedback & private communication
Higher risk of students being distracted and doing something unrelated to PBL	Improved communication for shy students
Less face-to-face communication & social clues	Electronic whiteboard -: innovations in patient data recording/analysis
More passive learning environment	More productive information searching

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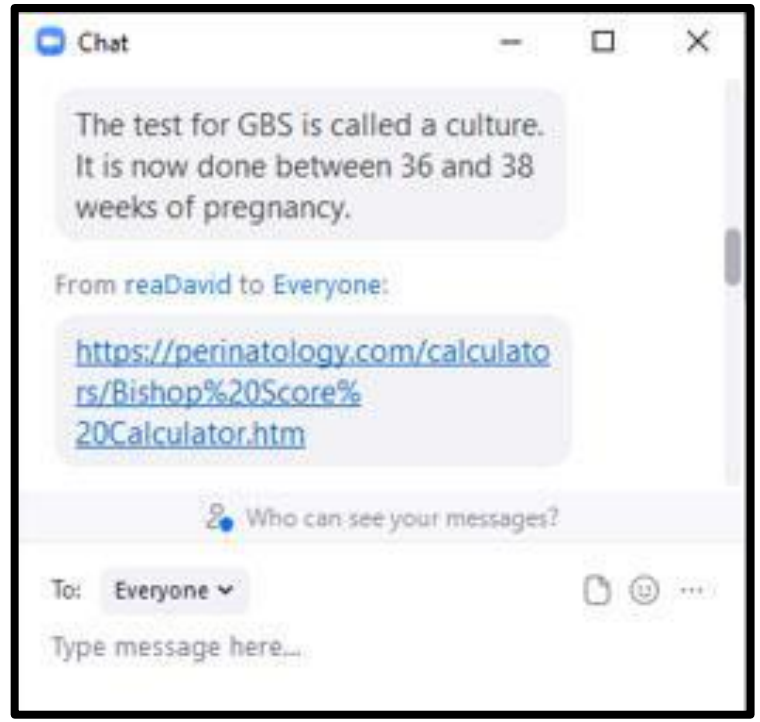
IMPACTS – Searcher/Searching

BENEFITS

Searcher role enhanced by online chat feature – more info. & references provided for entire group's benefit.

Increased engagement by all students with case material due to info. searching in real time.



In online PBL, Searching = Learning Synthesis

Impacts: Learning Environment

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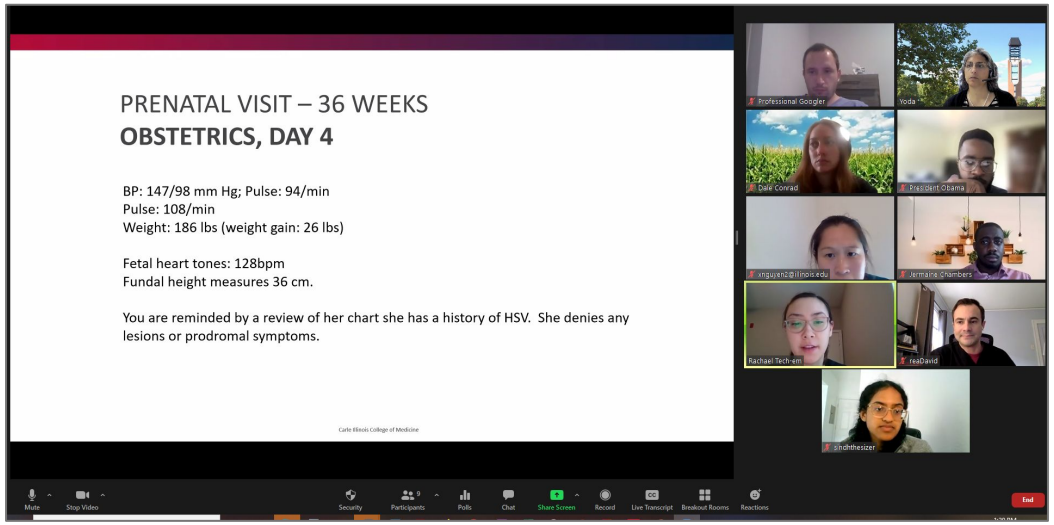
In-Person PBL



Online PBL

Online PBL Learning Outcomes

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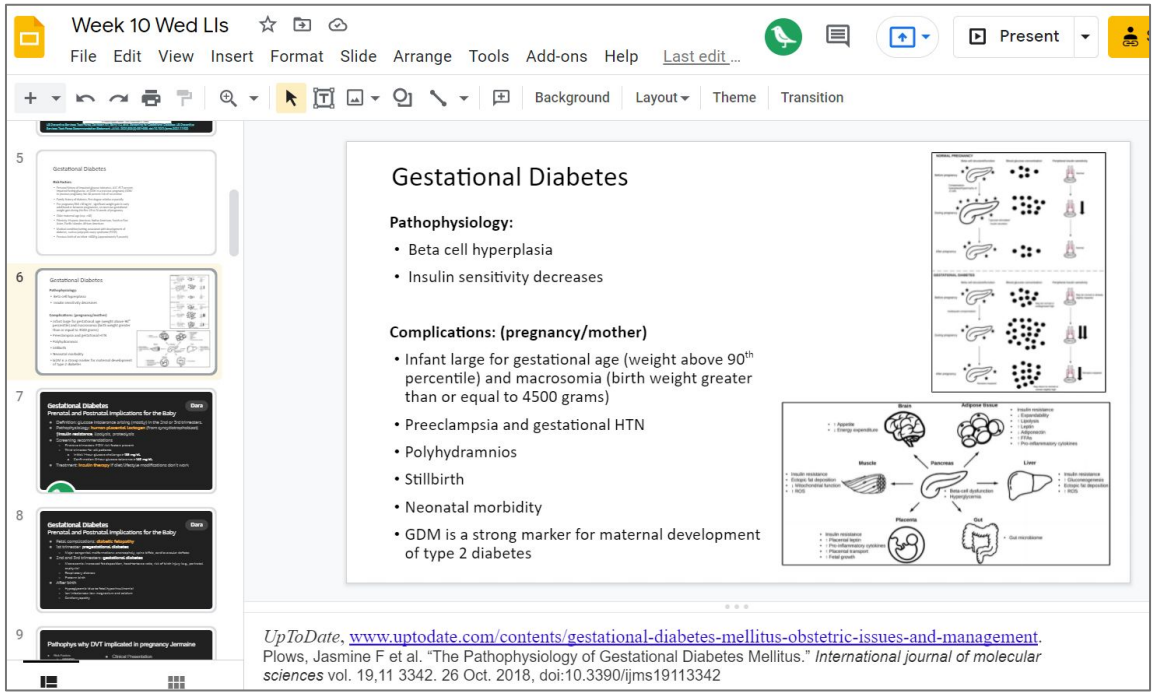
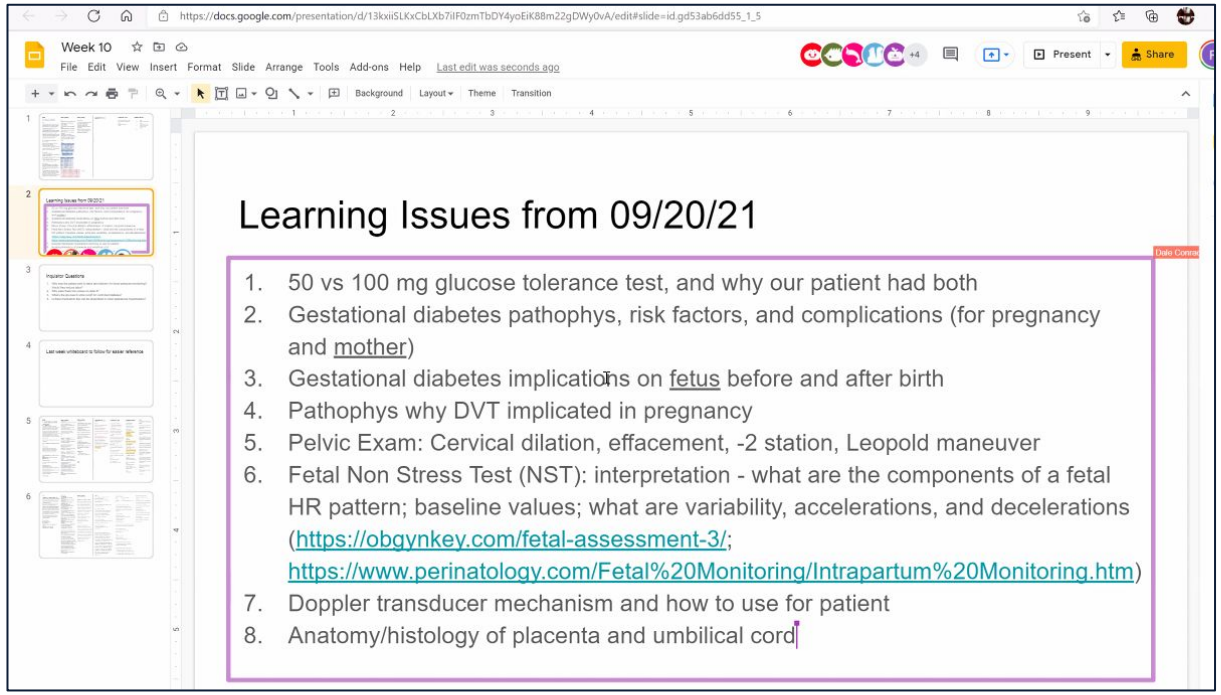
Despite the more passive learning environment in online PBL, student performance with respect to generating, researching, and presenting learning issues was similar to that found in-person PBL.





THE FUTURE OF PBL – will online PBL lead to permanent changes?

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New Applications of online PBL
- Facilitator Training & Evaluation
- Invited Guests
- Remote/Hybrid PBL accommodations

New PBL sequencing
- Incorporate online PBL for M2 students AFTER a year of in-person PBL.
  - accommodates clinical schedules
  - Increases efficiency

- Evolution of online PBL Methods
  - Provide opportunities for socially enhanced learning - competitive games, quizzes, imaging annotation
  - Develop online whiteboards to more explicitly integrate clinical reasoning and cognitive synthesis activities like concept maps
  - Expand searching space to compare and contrast resources and research results

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THANK YOU!

QUESTIONS?

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Online Learning and the Student Perspective

Luke Read

Final Year Medical Student and MClinEd Graduate

Norwich Medical School

University of East Anglia

Who am I?

NHS

UEA University of East Anglia

PBL at UEA

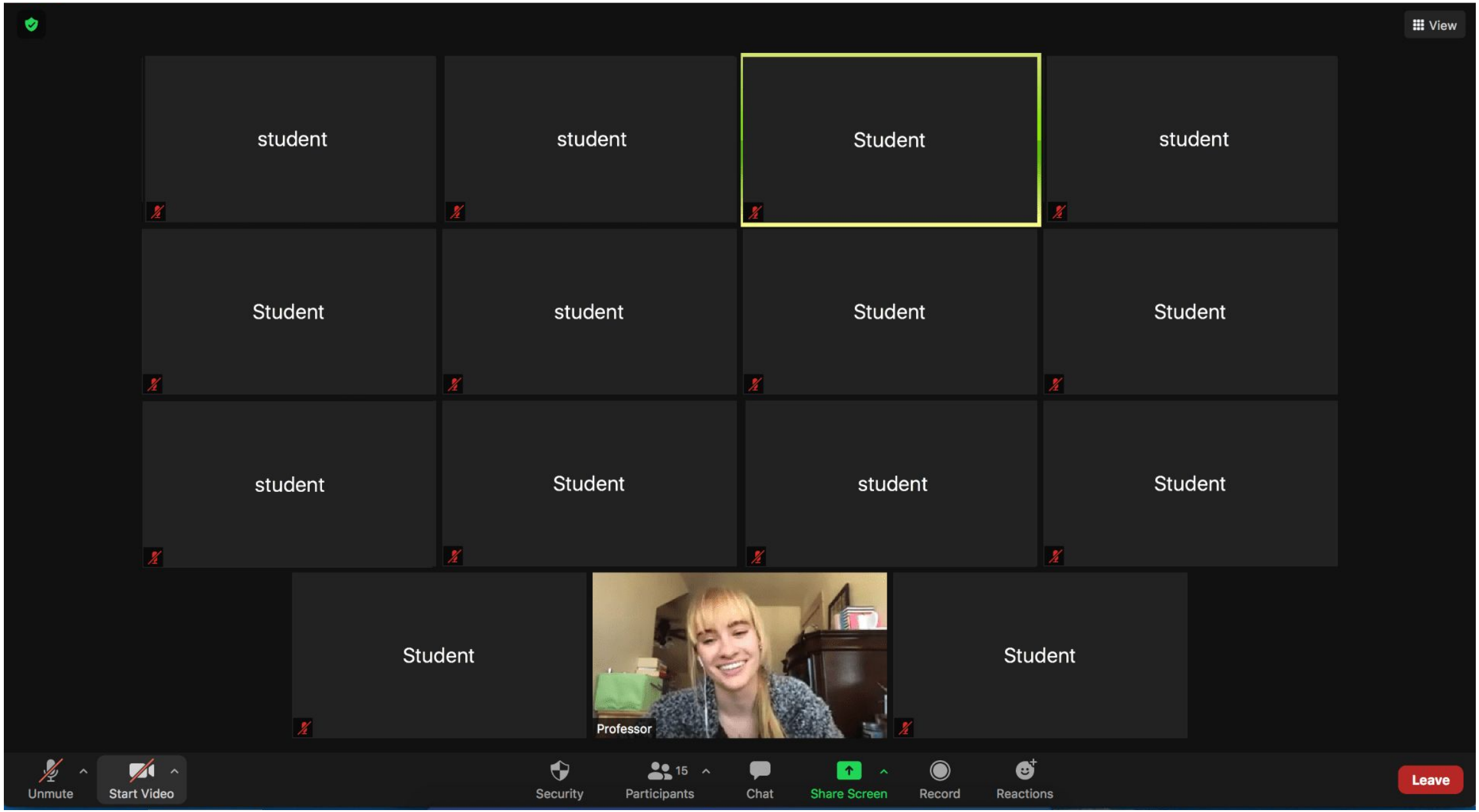
Differences to the US Model

- Mostly undergraduate learners
- Integration of core science and clinical knowledge
- Non-typical PBL model

PBL and Online Learning

- Online and in-person PBL sessions

- Changes during online PBL:
  - ↑ passive participation
  - ↑ silent pauses
  - ↓ topic discussion
  - ↓ session length
  - ↓ creativity and innovation
  - ↓ Conversation during breaks


View
student
student
Student
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Student
Student
student
Student
student
Student
student
Student
Student
Professor
Unmute
Start Video
Security
15
Participants
Chat
Share Screen
Record
Reactions
Leave

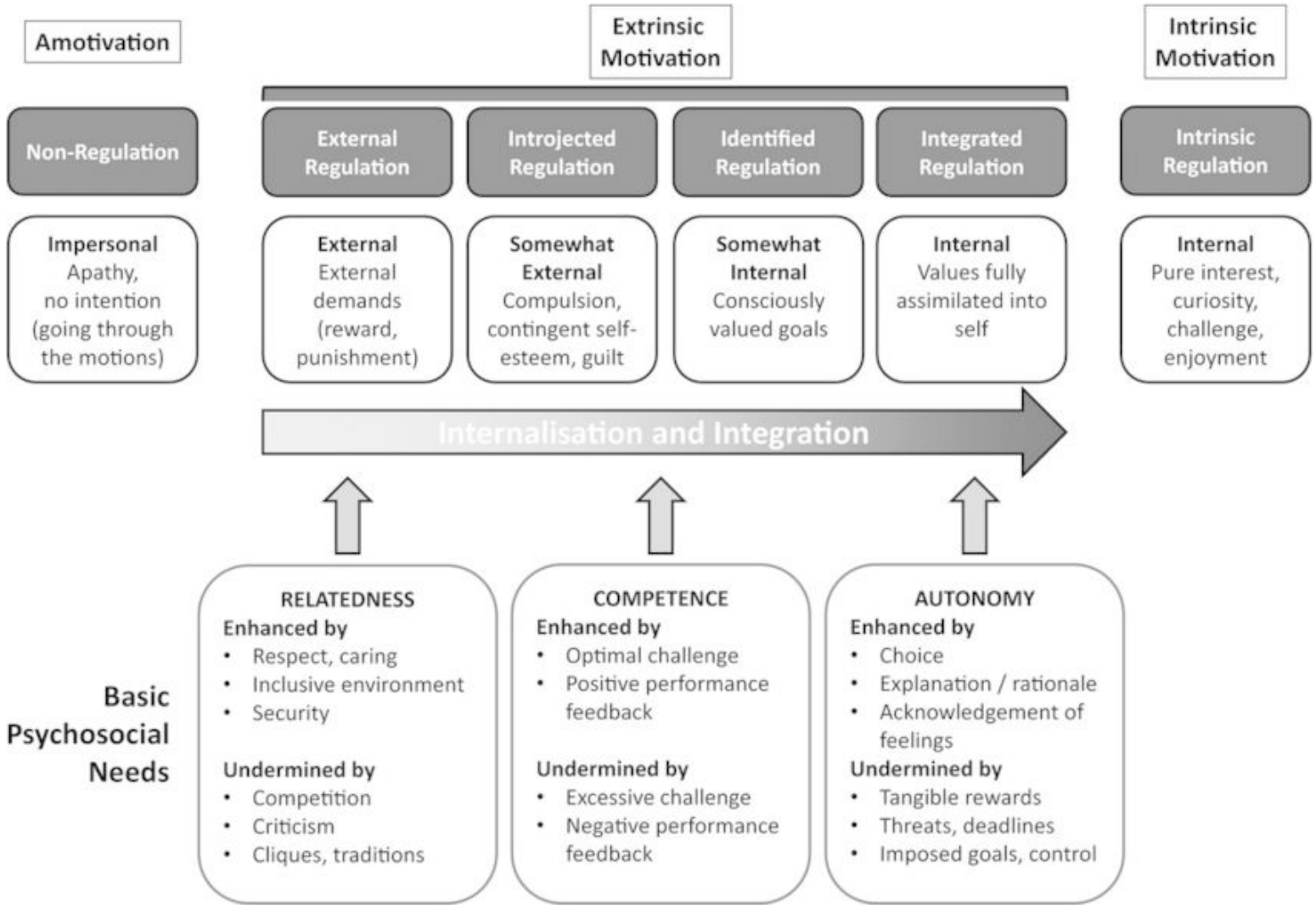
Solutions with in the Literature

- **Blended Learning** (Vallée et al., 2020)
- **Greater faculty involvement** (Coiado et al., 2020)
- **Feedback delivery methods** (Li et al., 2020)
- Choice of appropriate learning models (Kauffman., 2015)
  - Exploratory
  - Dialogical
  - Constructivist
- Other adaptations to the online environment (e.g. mandatory camera and microphones)

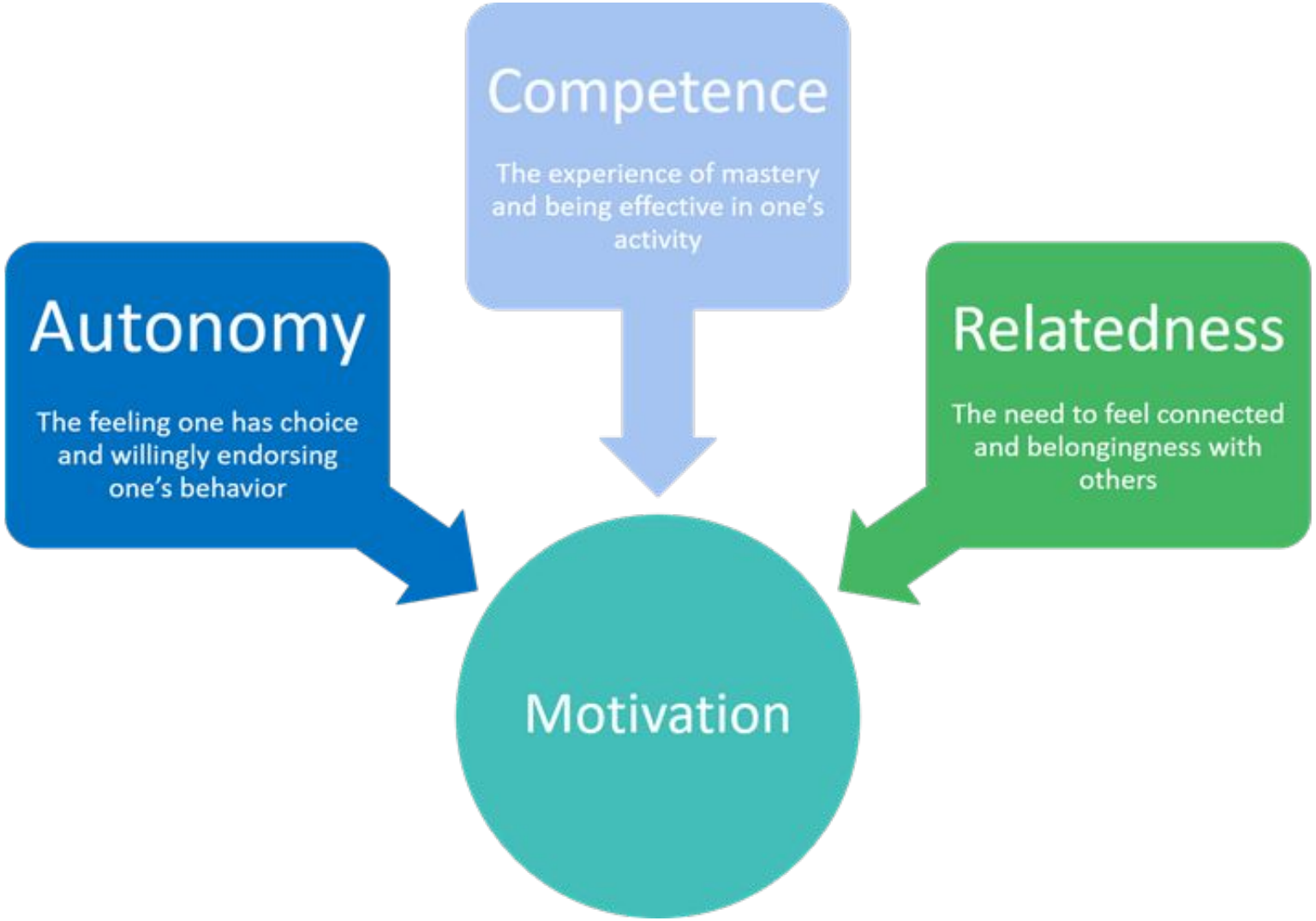
Conceptual Frameworks (Cook and Artino, 2016)

Theories to Consider

- Self-Determination
- Social-Cognitive
- Expectancy-Value
- Goal Orientation



Psychological Determinants of Motivation



Application to Practice

Autonomy and competence can be easily achieved online with a adequate lesson plan and utilisation of contemporary technologies

Online learning is a barrier to achieving maximum relatedness

- Limitations to non-verbal communication
- More distractions
- Reduced interaction during breaks
- Lack of privacy during private discussions

Understanding the Solutions

Encourages Intrinsic Motivation

- Blended Learning
- Applicable Learning Models
- Being available as an educator
- Timely and frequent feedback
- Encouraging Competition

Encourages Extrinsic Motivation

- Greater Faculty Involvement
- Mandatory Camera and Microphone Rules
- Convenience of online learning
- Cheaper education

In-person Learning

Idealised view of online learning

Realistic view of online learning

Conclusions

Online learning can overcome many barriers

While relatedness can be optimised it is unrealistic to maximise it online

Online learning is a tool and should be used when its benefits outweigh its disadvantages

Thank you!

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References

- Coiado, OC., Yodh, J., Galvez, R. and Ahmad, K. (2020) How COVID-19 transformed problem-based learning at Carle Illinois College of Medicine. *Medical Science Education,* 30, pp 1353-1354.
- Li, J., Wong, SC., Yang, X. and Bell, A. (2020) Using feedback to promote student participation in online learning programs: evidence from a quasi-experimental study. *Education Technology Research and Development,* 68, pp 485-510.
- Vallée, A., Blacher, J., Cariou, A. and Sorbets, E. (2020) Blended Learning Compared to Traditional Learning in Medical Education: Systematic Review and Meta-Analysis. *Journal of Medical Internet Research,* 22(8).
- Kauffman, H. (2015) A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology,* 23.
- Cook, DA. and Artino, AR. (2016) Motivation to learn: an overview of contemporary theories. *Medical Education*, 50(10), pp 997-1014.