

# **The Impact of Active Learning Strategies on Class Average and Grade Point Average (GPA) in Bioscience Students**

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Edmonton AB,  
CANADA**

# *Background*

- Teaching is an **art** & we are **performers**.
- Passion for teaching is different than effectively transferring knowledge from professor to students.
- Gone are the days of didactic, passive teaching!
- Modern students are demanding and appreciate various teaching modalities.



# *Background*

- The current/modern educational curriculum worldwide consists of,
  - **Student-centered**, content-driven & **evidence-based** active learning.
- A blended/hybrid learning approach that is aimed to.
  - Foster student engagement
  - Improve the subject knowledge
  - More professor-student interaction
  - Social & communication skills & critical thinking
  - Retain a long-term knowledge of the course



# Objectives



- Factors impacting teaching and learning of the courses
- To evaluate active learning strategies
- To assess the impact of these strategies on class performance & a long-term knowledge retention

# *Factors That Impact Teaching & Learning*





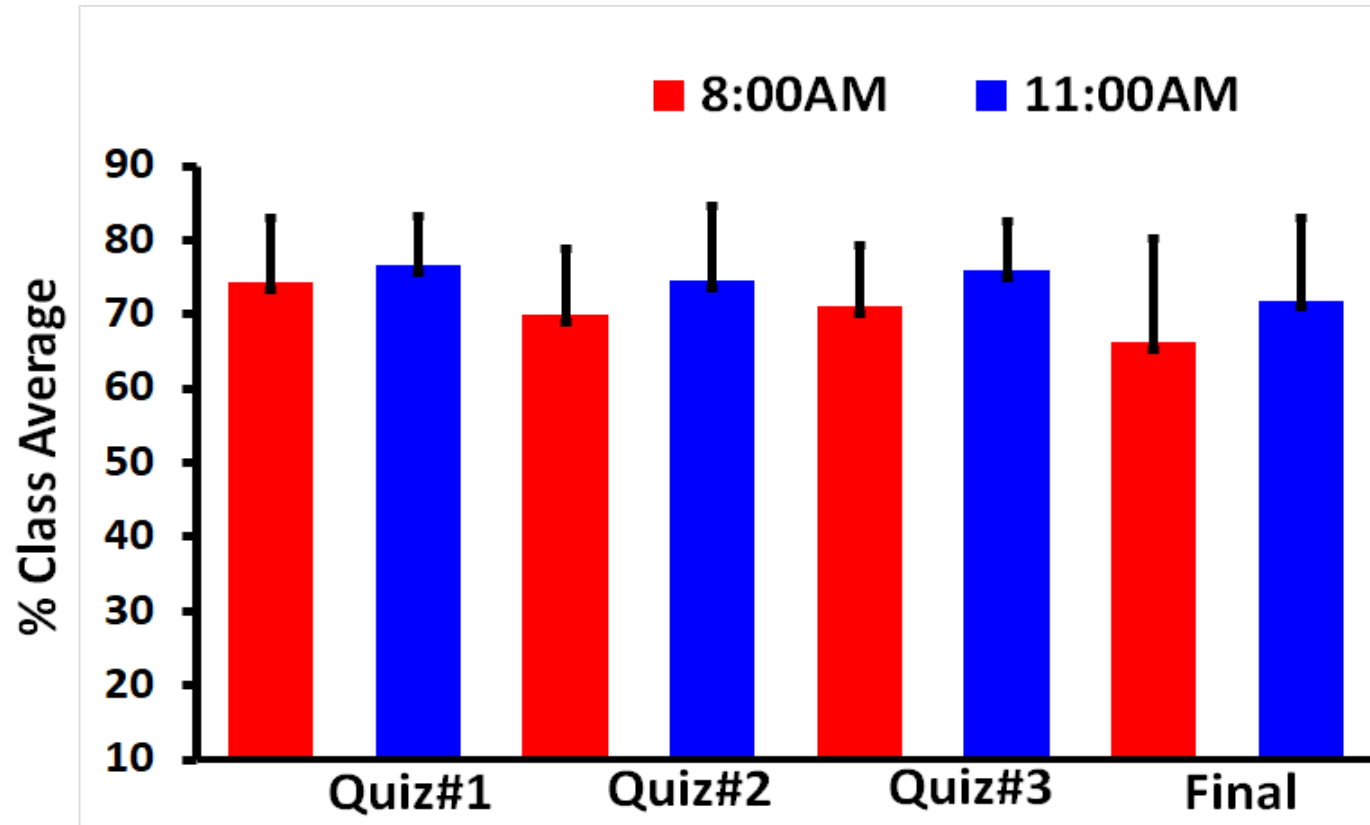
## ***Student-Related Factors Impacting Teaching & Learning of the Course***

- Inadequate time to study the courses
- Class time, attendance & the level of textbook use
- Lab experience
- English as a second language
- Prior academic achievement in sciences
- Own confidence in science knowledge
- Additional factors,
  - Prioritization
  - Self-efficacy
  - Study time & skills



## Class time

*Factors  
Impacting  
Teaching &  
Learning*



## ***Faculty-Related Factors Impacting Teaching & Learning of the Course***

- Course organization & methods of delivery
- Experience in didactic, passive teaching
- Available curriculum time
- Teaching style & strategies
- Own confidence & knowledge level





# *Course Assessment*



- How do you evaluate understanding & knowledge in your course?



# *Pre-Teaching Assessment*





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Navigation: My Blackboard, **Courses**, Content Collection

Course Content

Course Content

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Chapter-1 folder

Chapter-3 (Tissues) folder ▾

Course outlines-Winter-2020

WileyPlus FIRST DAY OF CLASS!

Left sidebar: HLSC-120-Human Anatomy, Course Dashboard, Course Content, My Grades, Student Resources, Faculty - Blackboard Help, Copyright Notice, Faculty - START HERE, **Announcements**, Email, Discussions, Tools, Help

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## Course Outline Winter 2020

### HLSC 120 – Sections BN03 & BN04 – Human Anatomy

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#### CALENDAR DESCRIPTION:

This is an introductory course in human anatomy for the health sciences. It provides students the opportunity to gain anatomical knowledge of human tissues, organs, and major organ systems in terms of its structures, the related anatomical terminology and how these structures relate to function.

Note: Students cannot obtain credit in both HLSC 120 and NURS 105.

Course Credits: 3

Pre-requisites: Biology 30

Co-requisites: None

Course Hours: Theory: 45      Laboratory: 0      Clinical: 0

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#### COURSE INSTRUCTOR:

Raj Narnaware, BSc, MSc, PhD  
Office: 9-504D  
Phone: (780) 497-5585  
E-mail: [narnawarey@macewan.ca](mailto:narnawarey@macewan.ca)

Office Hours: Wednesday & Friday: 1:00 PM – 2:30 PM, and by appointment.

Blackboard: Will be used for course-related information, announcements, readings and preparation.

Note: E-mails need to be sent through the mymacewan portal; e-mails from other sources will be regarded as spams and may not be replied back in time to address the matter at hand.

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#### LEARNING OUTCOMES:

Outcome:	Upon successful completion of this course, the student will be able to:
1	Discuss the structural and regional organization of the human body.
2	Describe the systems of the body to the tissue level.



# Class Schedule

HLSC 120 CO - BN03BN04 - RN - WI 20 (R) - Word

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Class	Date	Description
1	Jan. 08 2020	Ch. 1 – Introduction
2	Jan. 10 2020	Ch. 3 – Tissues
3	Jan. 15 2020	Ch. 5 – Integumentary System Ch. 6 – Bone Tissue
4	Jan. 17 2020	Ch. 9 – Joint (articulations)
5	Jan. 22 2020	Ch. 10 – Muscle Tissue
6	Jan. 24 2020	Ch. 8: Appendicular skeleton- Pectoral Girdle – Bones and Muscles
7	Jan. 29 2020	Ch. 8: Appendicular skeleton - Upper Limb and Hand – Bones and Muscles
8	Jan. 31, 2020	Ch. 8: Appendicular skeleton- Upper Limb and Hand – Nerves and Blood Circulation
9	Feb. 05, 2020	Ch. 13 – The Heart
10	Feb. 07, 2020	<b>MID-TERM #1</b>
11	Feb. 12, 2020	Ch. 14 – Blood vessels & Fetal Circulation Nerves Ch. 15 – Lymphatic System
12	Feb. 14, 2020	Ch. 7: Axial Skeleton – Skull -Bones, Muscles
13	Feb. 18-21, 2020	<b>READING WEEK/TERM BREAK – NO CLASSES</b>
14	Feb. 26, 2020	Ch. 7: Axial Skeleton – Vertebral Column & Rib Cage Bones, Muscles and Blood Circulation
15	Feb. 28, 2020	Ch. 23 – Respiration
16	Mar. 04, 2020	Ch. 16 – Nervous Tissue Ch. 17 – Spinal Cord and Spinal Nerves
17	Mar. 06, 2020	<b>MID-TERM #2</b>
18	Mar. 11 2020	Ch. 18 – The Brain and Cranial
19	Mar. 13, 2020	Ch. 19 – ANS (Basic anatomy)
20	Mar. 18, 2020	Ch. 21 – Special Senses
21	Mar. 20 2020	Ch. 8: Appendicular skeleton- Pelvic girdle – Bones, Muscles

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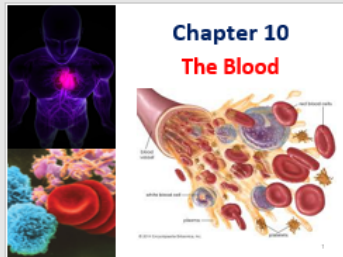


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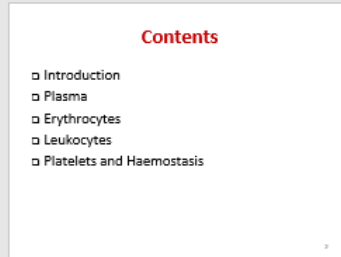
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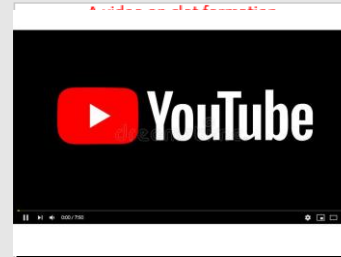
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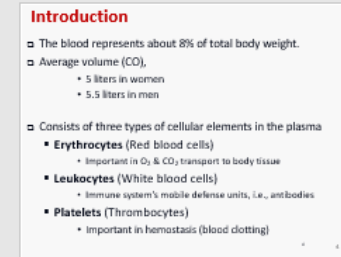
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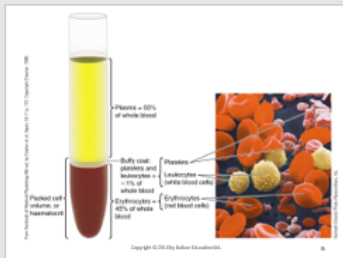
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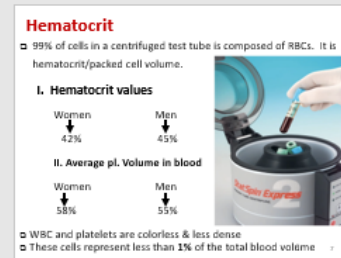
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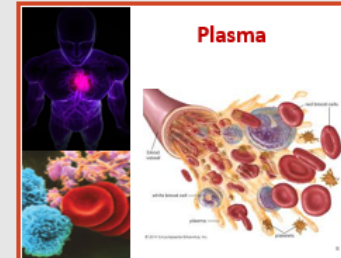
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Constituent	Function
<b>Cellular Elements</b>	
<b>Erythrocytes</b>	Transport $O_2$ and $CO_2$ , mainly $O_2$
<b>Leukocytes</b>	Phagocytes that engulf bacteria and debris
<b>Neutrophils</b>	Attack parasitic worms, important in allergic reactions
<b>Eosinophils</b>	Release histamine, which is important in allergic reactions, and heparin, which helps them tear from the blood in order to become tissue macrophages
<b>Monocytes</b>	
<b>Lymphocytes</b>	Produce antibodies
<b>B lymphocytes</b>	Cell-mediated immune responses
<b>T lymphocytes</b>	
<b>Platelets</b>	Hemostasis

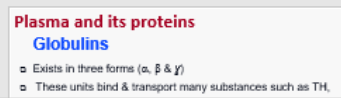
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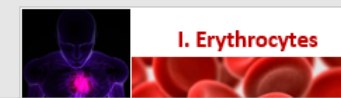
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Constituent	Function
<b>Plasma</b>	
<b>Water</b>	Transport materials, carries heat
<b>Electrolytes</b>	Maintains osmotic pressure, carries nutrients and wastes, etc.



## **Chapter-10: The Blood**

### **In-Class Activity Questions**

Q1. Why does a person suffering polycythaemia observe a high blood pressure?

Q2. Why do the hematocrit value increase during dehydration?

Q3. Detail the life cycle of an erythrocyte, including the control of erythrocyte production.

Q4. What are the different types and functions of plasma proteins?

Q5. What are the different kinds of white blood cells and how are they produced?

# Sample Practice Questions

## MCQs, True/False & Fill-in-the-blanks

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Yuwaraj Narnaware

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**MULTIPLE CHOICE**

1. About how many litres of blood are in the human body?

- a. 2
- b. 5
- c. 10
- d. 12

ANS: ☐

2. The buffy coat, which represents < 1 percent of the whole blood, comprises

- a. erythrocytes and platelets.
- b. leukocytes and platelets.
- c. leukocytes and clotting factors.
- d. platelets and clotting factors.

ANS: ☐

**TRUE/FALSE**

3. If the haematocrit is 47, this means that 47 percent of the whole blood consists of plasma.

ANS: ☐

4. The plasma is about 50 percent water.

ANS: ☐

**FILL-IN-THE-BLANKS**

5. The hormone erythropoietin is produced by the \_\_\_\_\_.

ANS:

6. \_\_\_\_\_ prevents platelets from aggregation.

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# Matching Questions

## (Q12) Column A

**1)spermatogenesis**

**2)regeneration**

**3)parthenogenesis**

**4)oogenesis**

**5)insemination**

## Column B

**a)sperm  
injection**

**b)formation of  
ovum**

**c)formation of  
sperm**

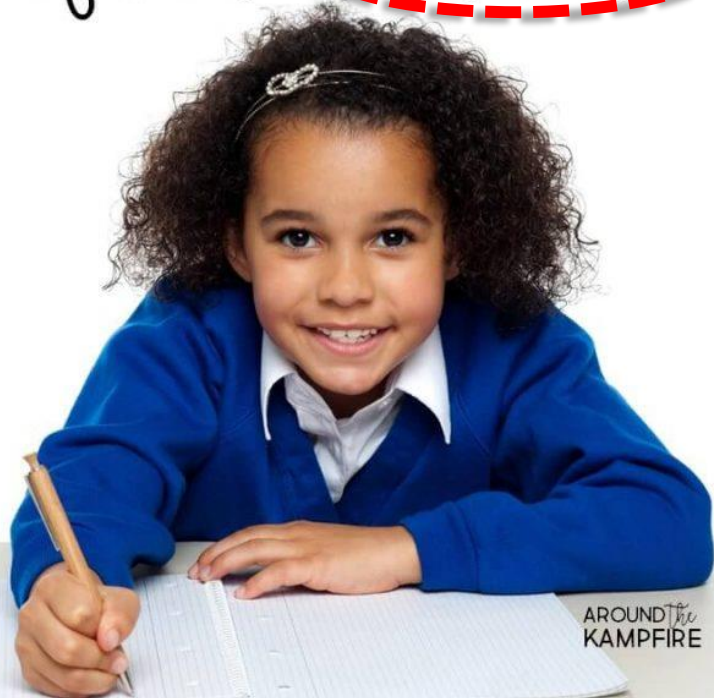
**d)repair of  
damage tissues**

**e)development  
of unfertilized  
ovum**

Getting your class

**BACK ON  
TRACK**

after a break



AROUND  
the  
KAMPFIRE

# *A Mini Break & Humour in Classroom!*





- On-line Kahoot quiz
- In-class quiz
- Student feedback & reflection
- Review quizzes & mid-terms in class





# Kahoot Time

Which of the animals below is a mammal?



Full Screen

12



Skip

**0**  
Answers



Robin



Gorilla



Shark



Snake

# In-class quiz

1. What is the most abundant type of cellular element in the blood?
  - a. Erythrocytes
  - b. Neutrophils
  - c. Leukocytes
  - d. Lymphocytes
2. Which plasma globulins are the antibodies?
  - a. Alpha
  - b. Beta
  - c. Gamma
  - d. Delta
3. What is the percentage of the average blood volume occupied by plasma in men?
  - a. 42%
  - b. 45%
  - c. 55%
  - d. 58%
4. Why is it important that biconcavity of the erythrocyte on the cell decreases its flexibility?
  - a. It prevents osmolarity changes.
  - b. It increases the rate of gas exchange across the membrane.
  - c. It provides an additional area for endocytosis.
  - d. It encourages cellular respiration.

# Class Evaluation

## Teaching/Class Evaluation

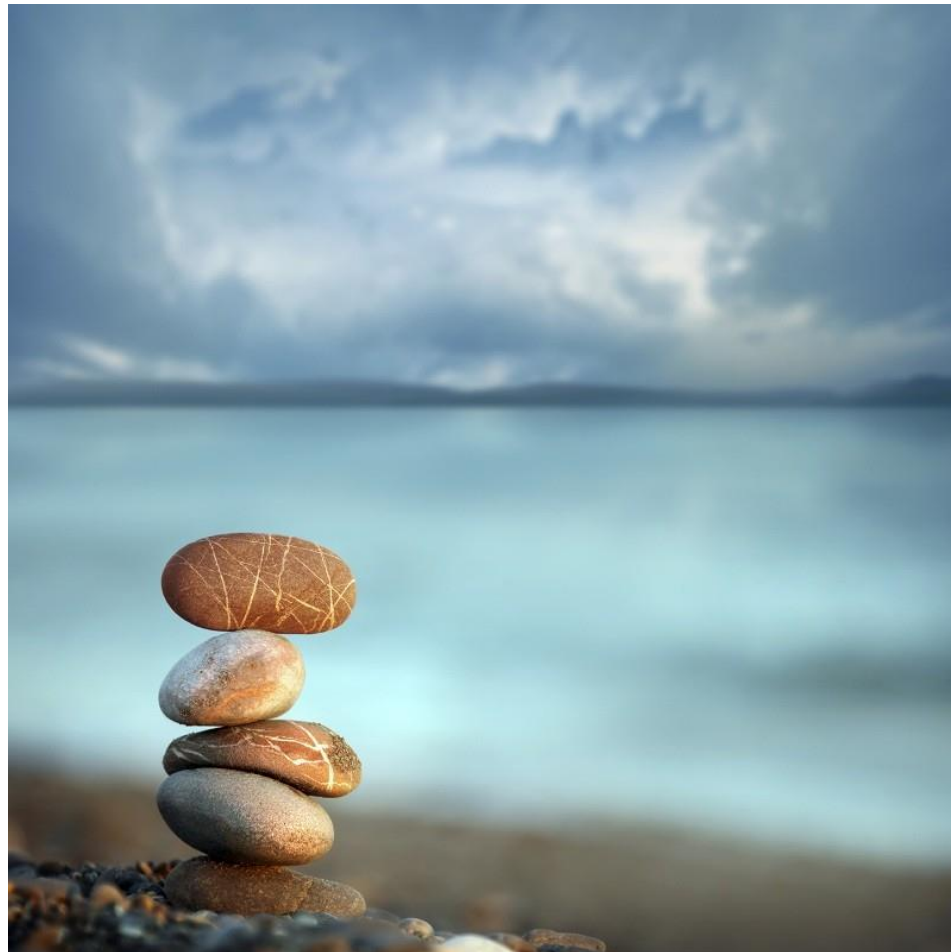
1. What are the three (3) important things/aspects you have learned from the Blood chapter?
  1. How clots are formed
  2. Different types of Anemia & their causes.
  3. Role of RBC's.
2. In what different way Raj should have taught this chapter?

Slower + provided us w/ more explanation on the details.
3. Did you find practice questions posted on Blackboard useful (circle your answer)?

☒ A. Yes                      B. No
4. Did you find in-class quizzes useful to test your knowledge of a chapter?

☒ A. Yes                      B. No

# *Impact of Various Teaching Strategies on Class Average & GPA in Nursing Students*





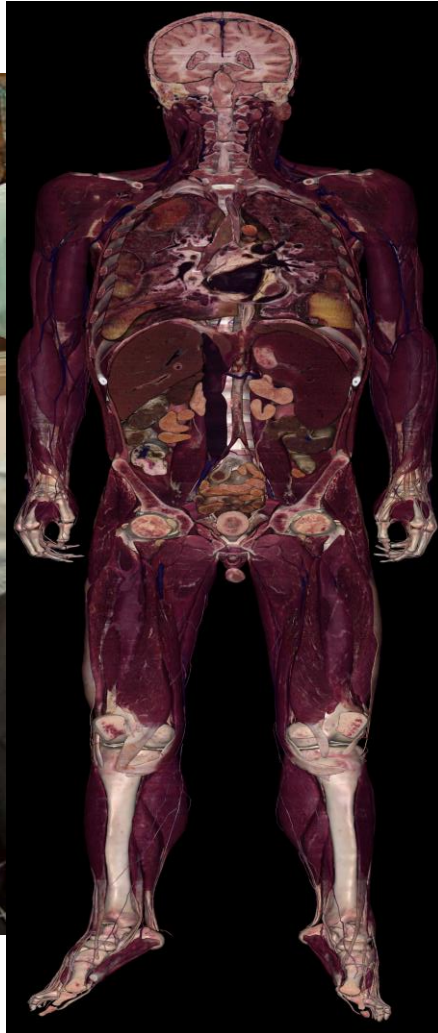
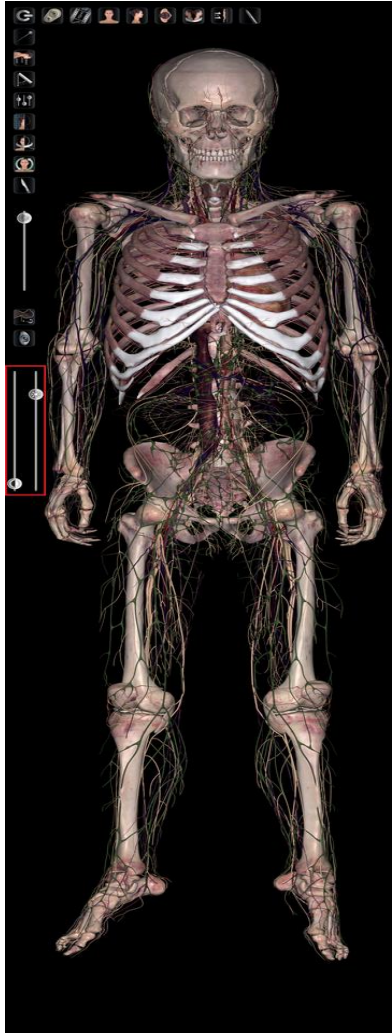
# *Active Learning Strategies in Present Study*

- Teaching Technology: 3D Virtual Human Cadaver-Anatomage
- Inclusion of the Anatomical Images in Anatomy exams
- On-line and In-class Activities
- Content Reinforcement



# Strategy I

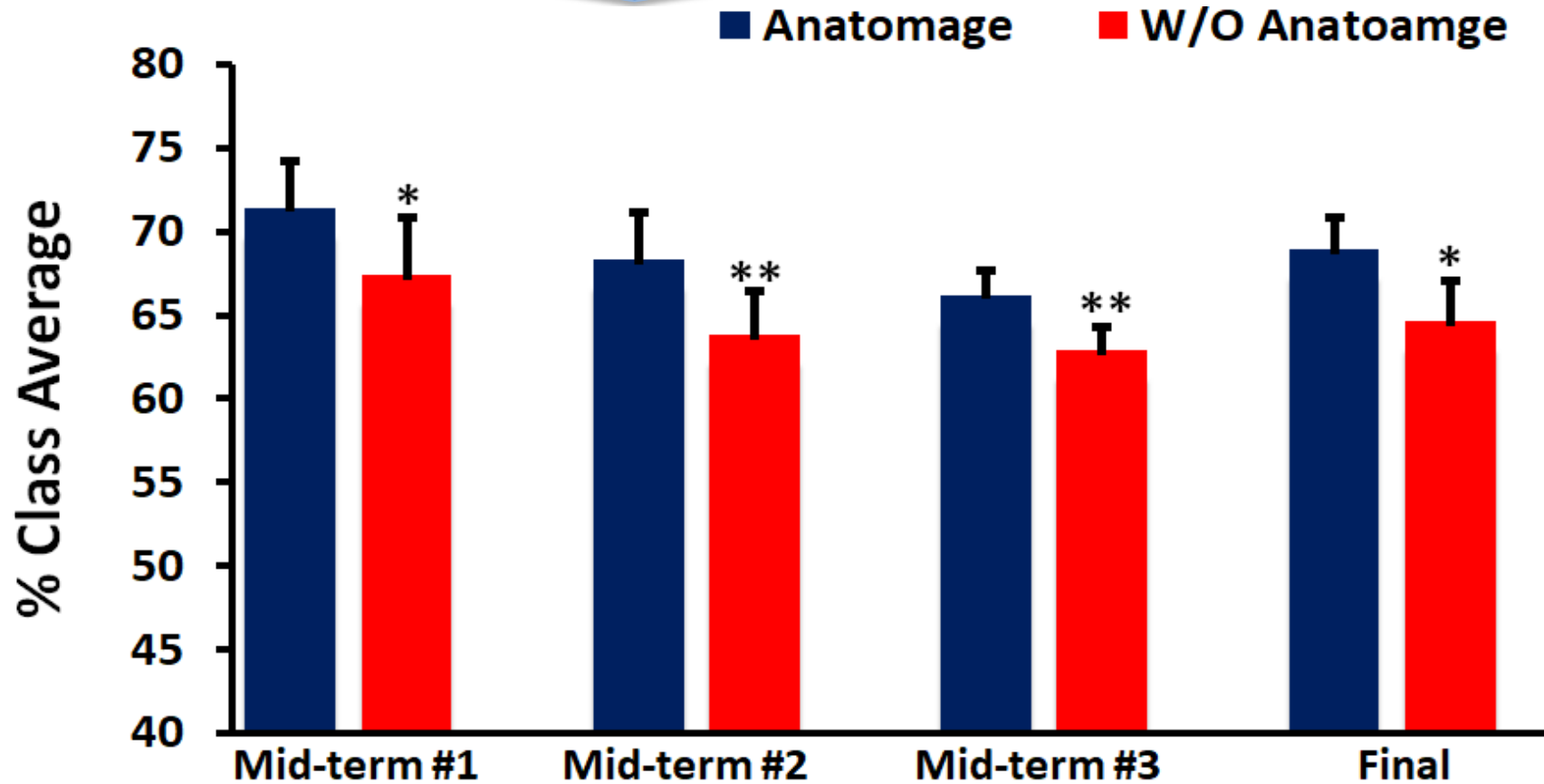
## 3D Virtual Human Cadaver- Anatomage





# Strategy I

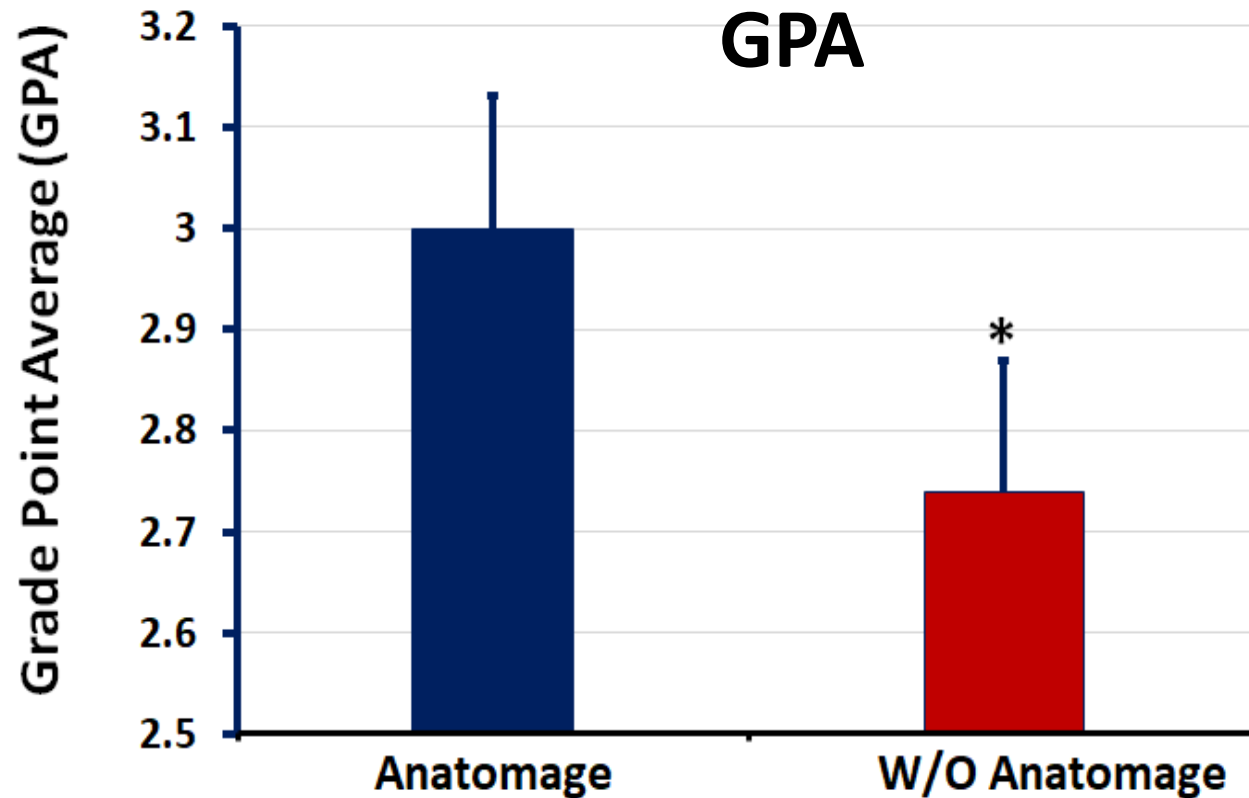
## 3D Virtual Human Cadaver- Anatomage



Narnaware & Neumeier, 2021

# *Strategy I*

## *3D Virtual Human Cadaver-Anatomage*

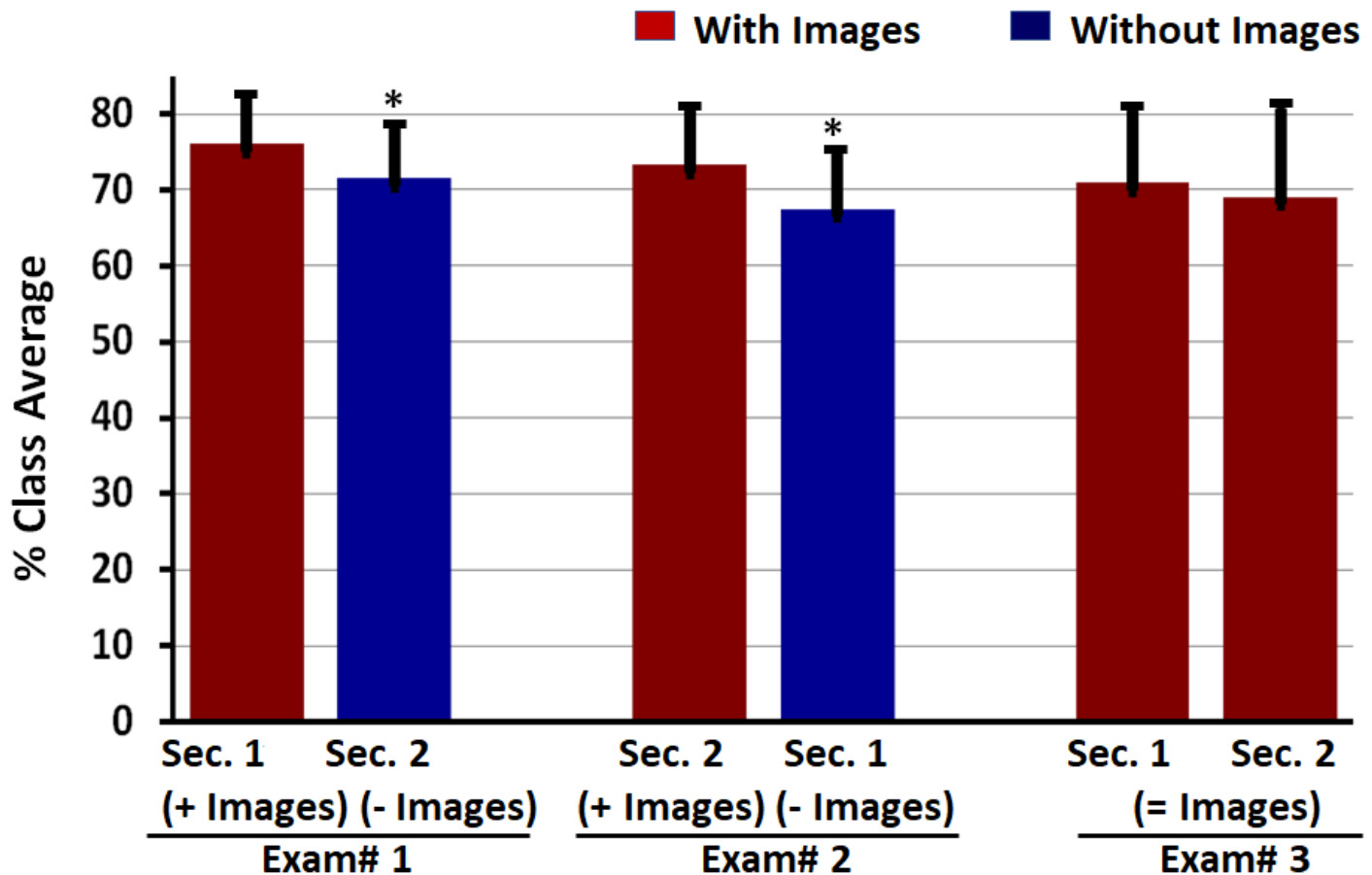


# Advantages of Using Virtual Human Cadaver

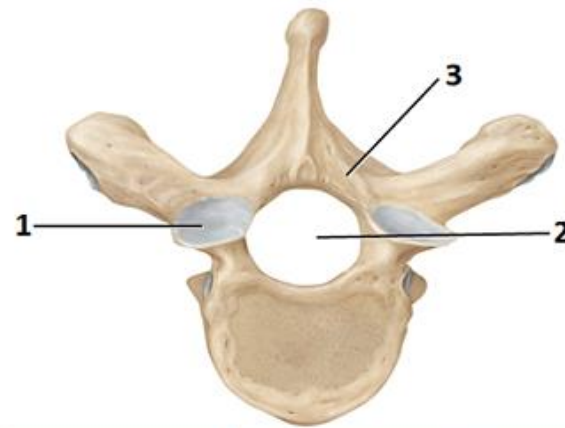
*Strategy I*  
*Virtual*  
*Human*  
*Cadaver-*  
*Anatomage*

- Provides a true perception of the human body
- Stimulate real-life learning environment
- Provide a social hub for faculty-student interaction
- Help students to develop a social & communication skills
- Provide visualizing effects that increase learning and alter cognitive load (Custers et al., 2010)
- Help recall anatomical knowledge

# Strategy II- *Inclusion of Anatomical Images in Exams*



Narnaware & Cuschieri, 2022



**Strategy II-**  
**Inclusion of**  
**Anatomical**  
**Images in**  
**Exams**

Questions	% Score with Text + Image	% Score with Text only
1. Which structure serves as the attachment site for the 'facet for the head of the rib'?	56.9%	25.9%
2. Which structure serves as a passage for the spinal cord?	79.2%	68.8%
3. Which structure separates the transverse process from the spinous process?	68.0%	59.7%

**Narnaware & Burleson, 2018**

***Strategy II***  
***Inclusion of***  
***Anatomical***  
***Images in***  
***Exams***

## **Advantages of Images in Exams**

- Increase visualization
- May reduce exam anxiety and stress in students
- Alter cognitive load (Custers et al., 2010)
- Help confidence in learning
- Help recall anatomical knowledge
- Provide a hint to an answer



# The Impact of On-line and In-class Activities

## *Strategy III* *On-line & In-class Activities*

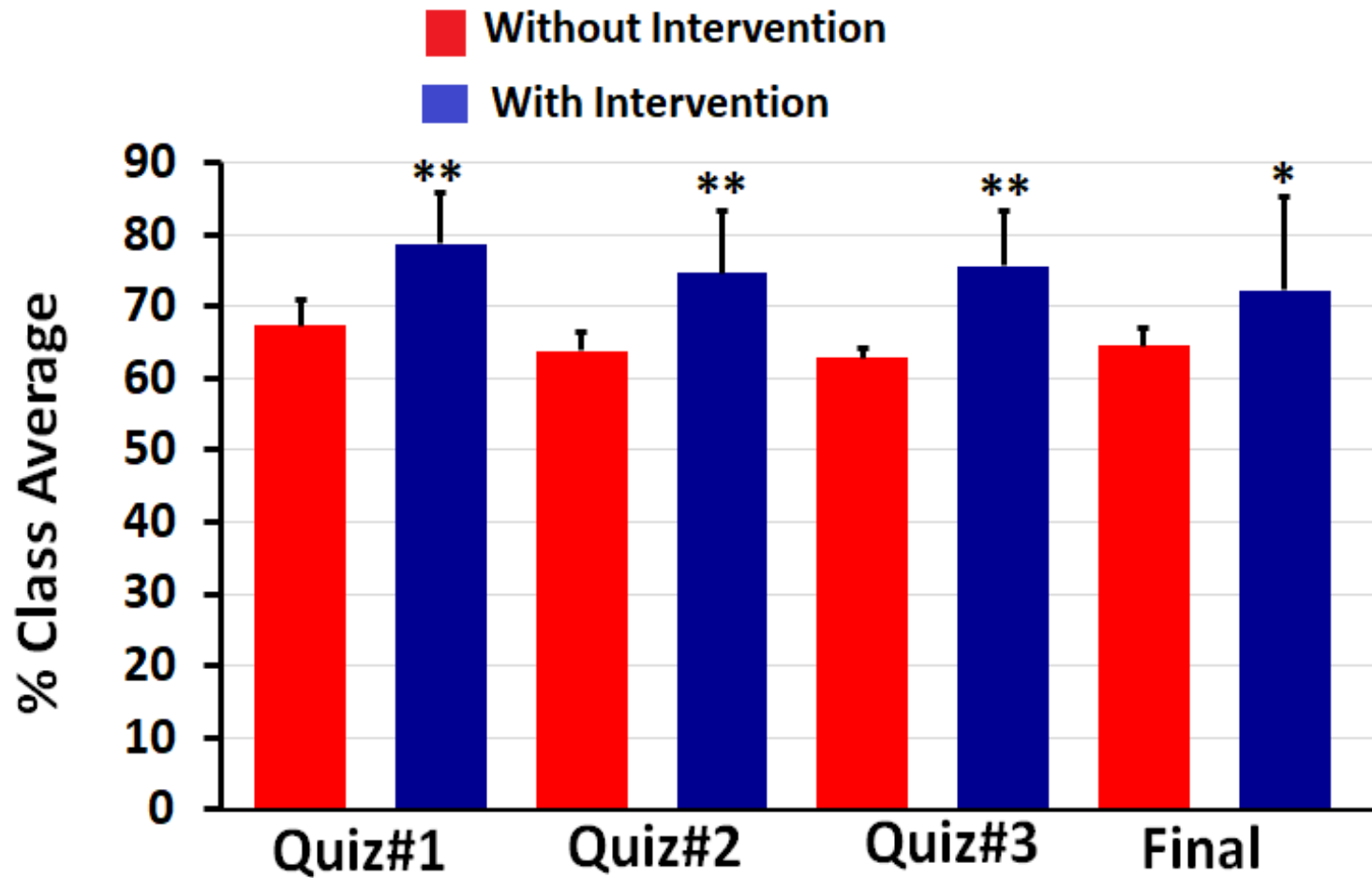
### **On-line Activities (outside the class):**

- WileyPlus & Orion
- Muscle assignments
- Practice questions on anatomy contents

### **In-class Activities:**

- Kahoot quizzes
- In-class quizzes, discussion & engagement
- Anatomical matching questions

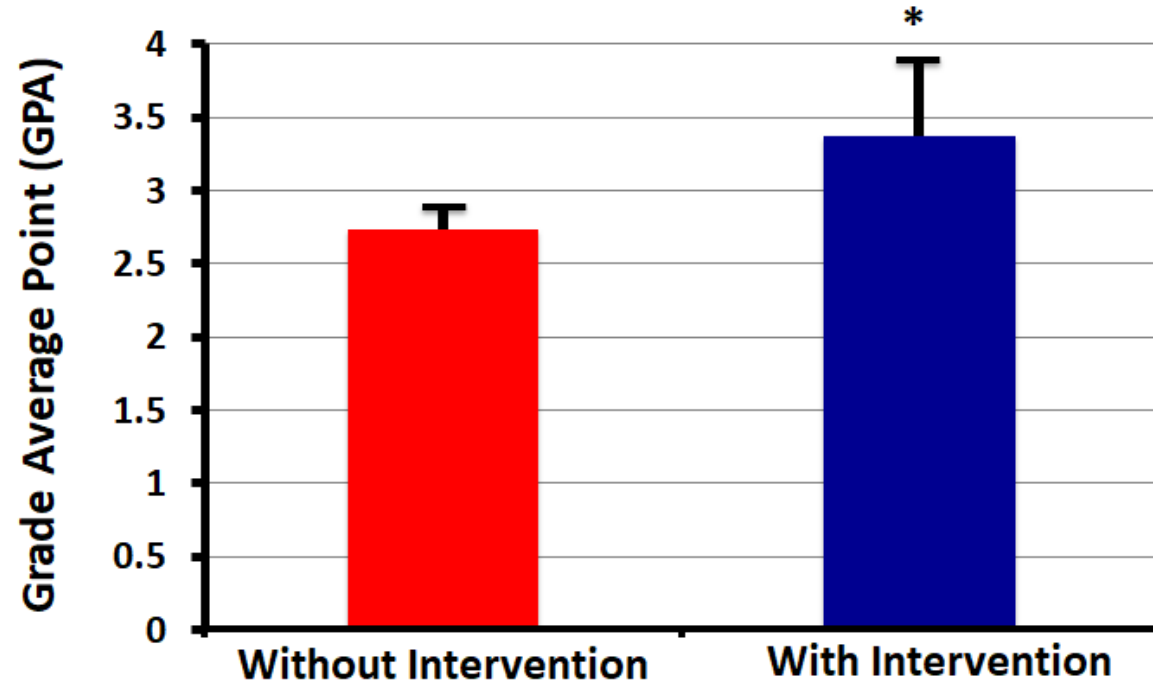
*Strategy III*  
*On-line &*  
*In-class*  
*Activities*



Narnaware & Chahal, 2019

*Strategy III*  
*On-line &*  
*In-class*  
*Activities*

## GPA

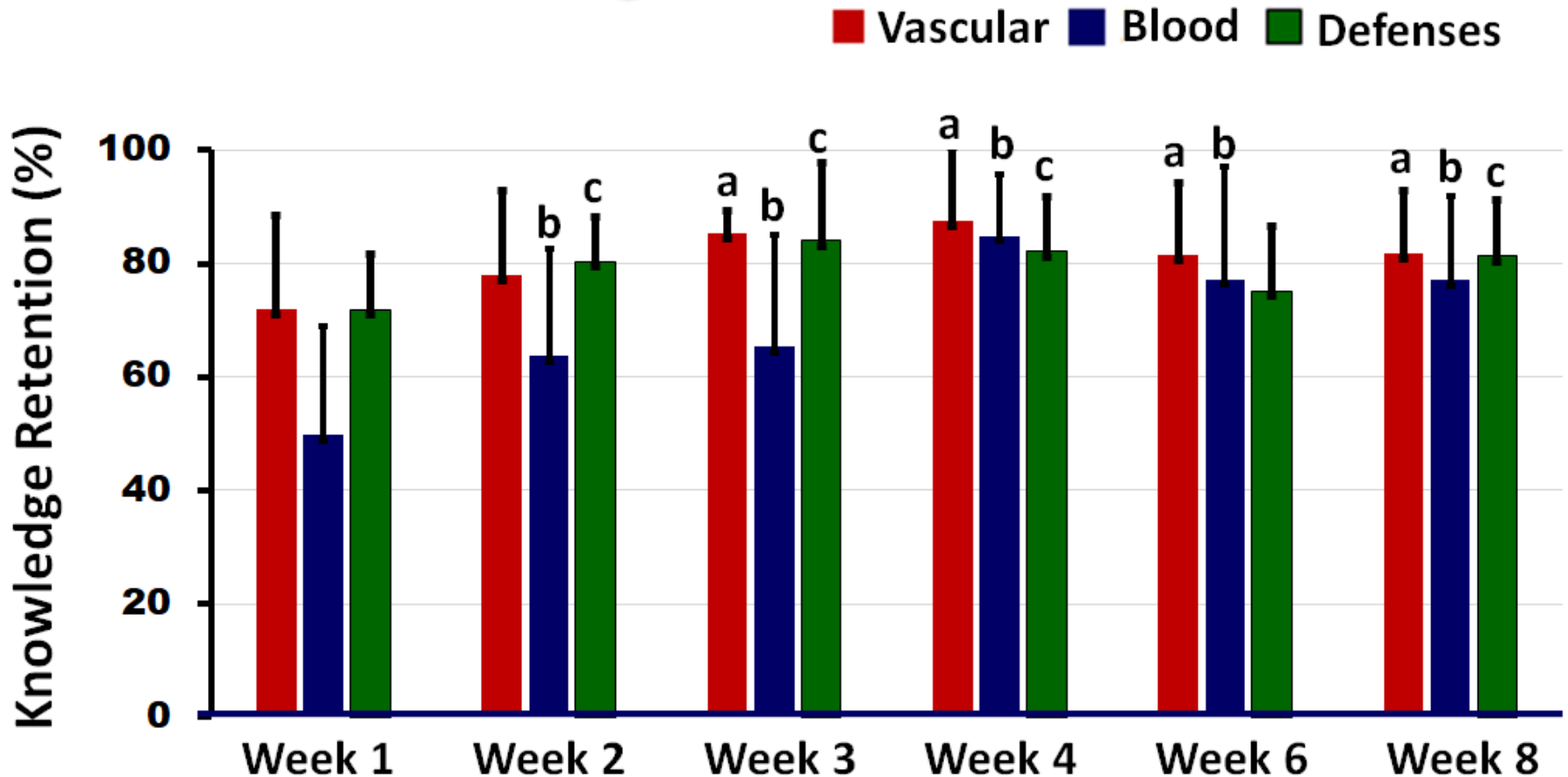


## **Advantages of On-line & In-class Activities**

- The academic performance (Class average & GPA)
- Help gain communication and social skills
- Promote active learning
- Improve class attendance and engagement
- Develop critical thinking
- Retain a long-term anatomical knowledge

## Strategy IV

### *Content Reinforcement (Repeated Knowledge Testing)*





# Future Directions



# Conclusion



➤ Multi-modal, blended pedagogical approaches may foster students engagement, improve academic performance, provide social & communication skills, critical thinking, & may help retain a long-term knowledge in students.

# Acknowledgements

**Prof. Melanie Neumeier- Collaborator**

**Prof. Sarah Cuscheiri, University of Malta**

**Prof. Karen Buro- Statistician**

**Celina Vipond- Research Assistant**

*Thank you*

