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Never Heard That Before!: Interventional Strategies to Improve Anatomical Knowledge in Nursing Education

Raj Narnaware & Melanie Neumeier

Dept. of Health & Sciences, Faculty of Nursing, MacEwan University

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Background

- Nursing students perceive anatomy & physiology as anxiety-provoking & stressful subjects.
- They experience difficulty to acquire, transfer, retain and confidently apply bioscience knowledge to subsequent years of nursing education.
- Insufficient bioscience knowledge can result in nursing errors.
- Nursing students are unable to put bioscience knowledge into practice.

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Objectives

- To evaluate knowledge acquisition in first-year & its retention and application in the second-year
- Identify factors affecting knowledge acquisition, retention, and application
- Discuss experiential learning strategies to improve knowledge retention
- Design your own project to identify knowledge gaps and appropriate learning and retention strategies

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Pre-Assessment

Project Design

- How do you evaluate understanding in your course?

- Assess knowledge acquisition in first year and its in retention & application in the second-year.

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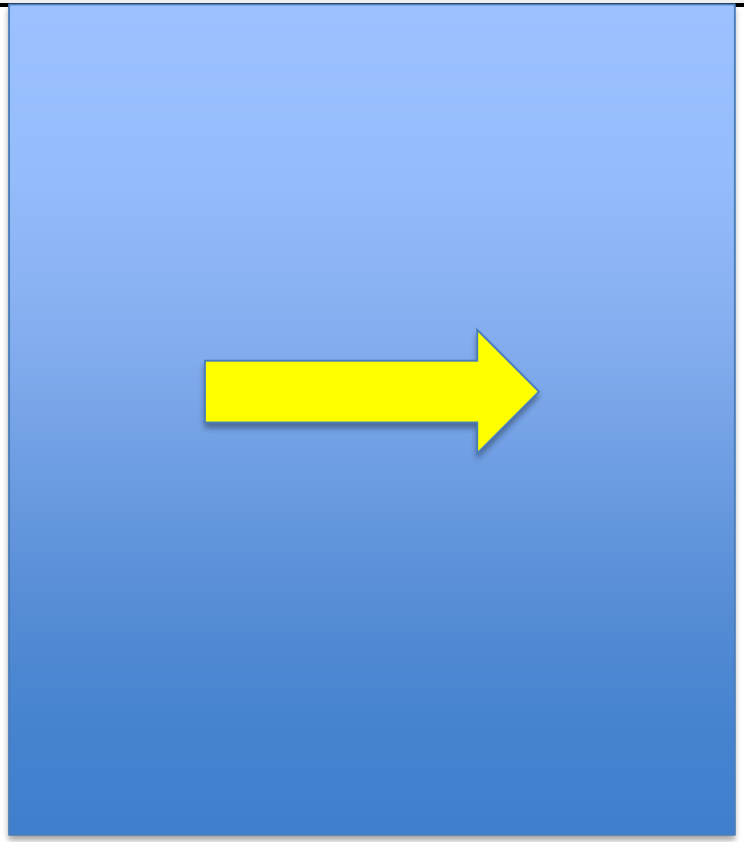
Knowledge Acquisition & Retention

Knowledge Acquisition in First-Year Nursing Students

Organ system	Year 1 Mean ± SD	Year 2 Mean ± SD	% Knowledge lost	P -values
Integumentary system	90.6 ± 6.8			
Head and neck lymphatic	91.4 ± 11.7			
Special Senses	88.4 ± 6.9			
Gastrointestinal	63.6 ± 6.9			
Respiratory system	72.9 ± 5.8			
Vascular system	83.5 ± 5.4			
Nervous system	83.9 ± 8.1			
Cranial nerves	88.2 ± 4.4			
Musculo-skeletal system	88.0 ± 7.0			
Genitourinary system	80.4 ± 16.4			



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Knowledge Acquisition in Second-Year Nursing Students

Organ system	Year 1 Mean ± SD	Year 2 Mean ± SD	% Knowledge lost	P -values
Integumentary system		70.7 ± 25.4	19.9%	.197
Head and neck lymphatic		34.02 ± 25.6	57.4%	.001
Special Senses		67.08 ± 22.9	20.6%	.181
Gastrointestinal		53.34 ± 14.9	10.3%	.014
Respiratory system		61.43 ± 22.1	11.5%	.249
Vascular system		37.39 ± 21.4	46.1%	.003
Nervous system		58.77 ± 19.6	25.1%	.0001
Cranial nerves		47.01 ± 19.5	41.2%	.0001
Musculo-skeletal system		57.27 ± 32.9	30.7%	.007
Genitourinary system		64.0 ± 28.1	16.4%	.097

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Kahoot Time

Which of the animals below is a mammal?

Full Screen

Skip

12

0
Answers

Robin

Gorilla

Shark

Snake

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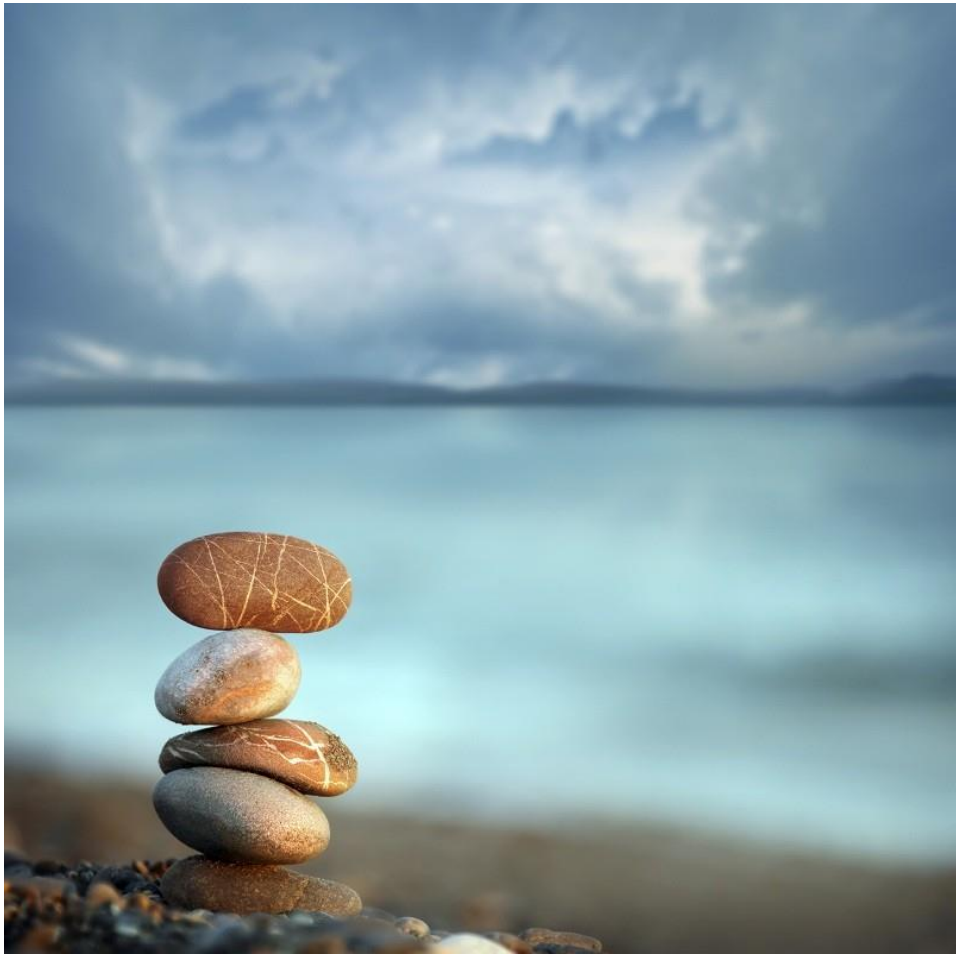
Results



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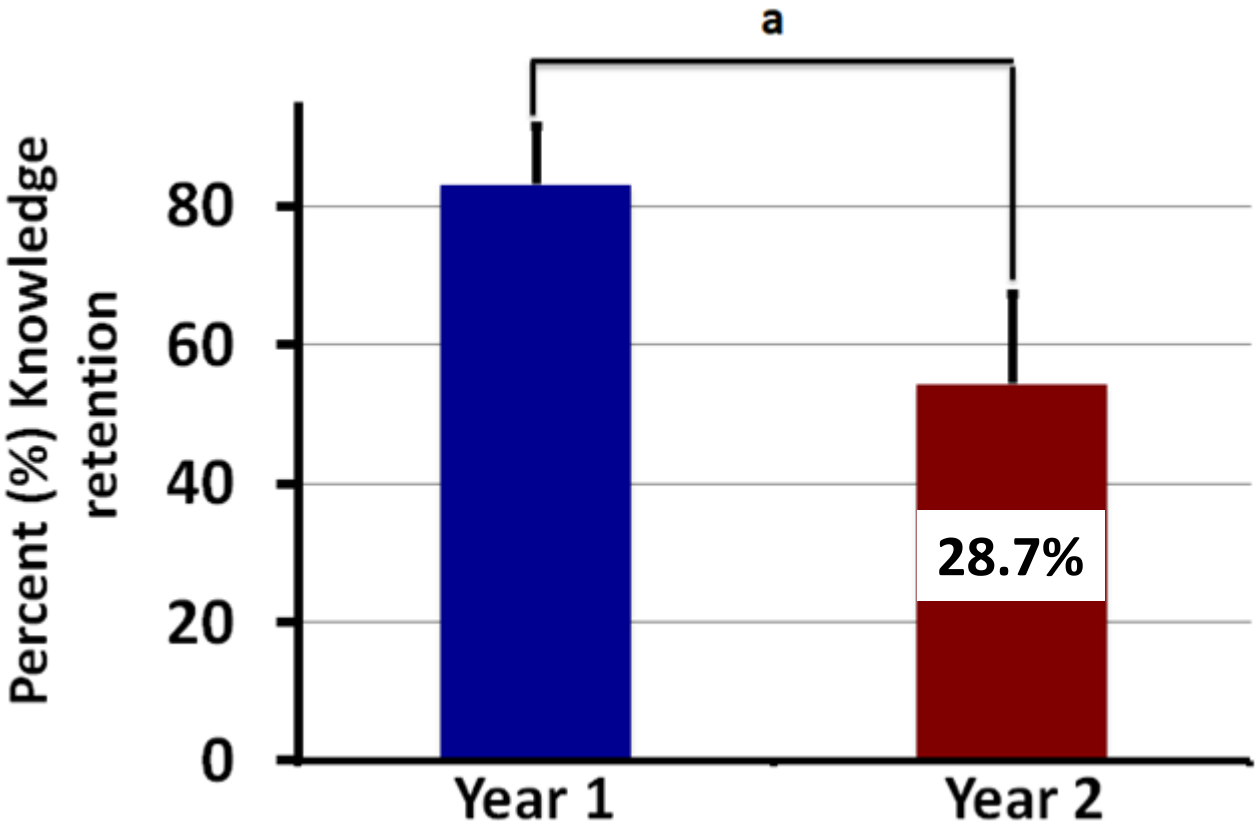
Anatomical knowledge retention in second-year

Knowledge Acquisition & Retention



Narnaware & Neumeier, ASE, 2020

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Genitourinary system	80.4 ± 16.4	64.0 ± 28.1	16.4%	.097

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Factors That Impact Knowledge Acquisition & Retention

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Student-Related Factors Impacting Knowledge Acquisition & Retention of Bioscience

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

McVicar et al., 2014; 2015)

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Faculty-Related Factors Impacting Knowledge Acquisition & Retention of Bioscience

- Course organization and methods of delivery
- Experience in didactic, passive teaching
- self-efficacy
- Available curriculum time
- Teaching style and strategies
- Own confident and knowledge level

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Factors Impacting the Knowledge Acquisition & Retention

Teaching/Contact hours

Body organ system	Teaching hours
Integumentary system	1.2
Head and neck lymphatic	1.2
Special Senses	1.2
Gastrointestinal	1.2
Respiratory system	1.2
Vascular system	2.4
Nervous system and cranial nerves	1.2
Musculo-skeletal system	9.6
Lymphatic system	1.2
Genitourinary	2.4
Review	1.2
	Total: 26.4

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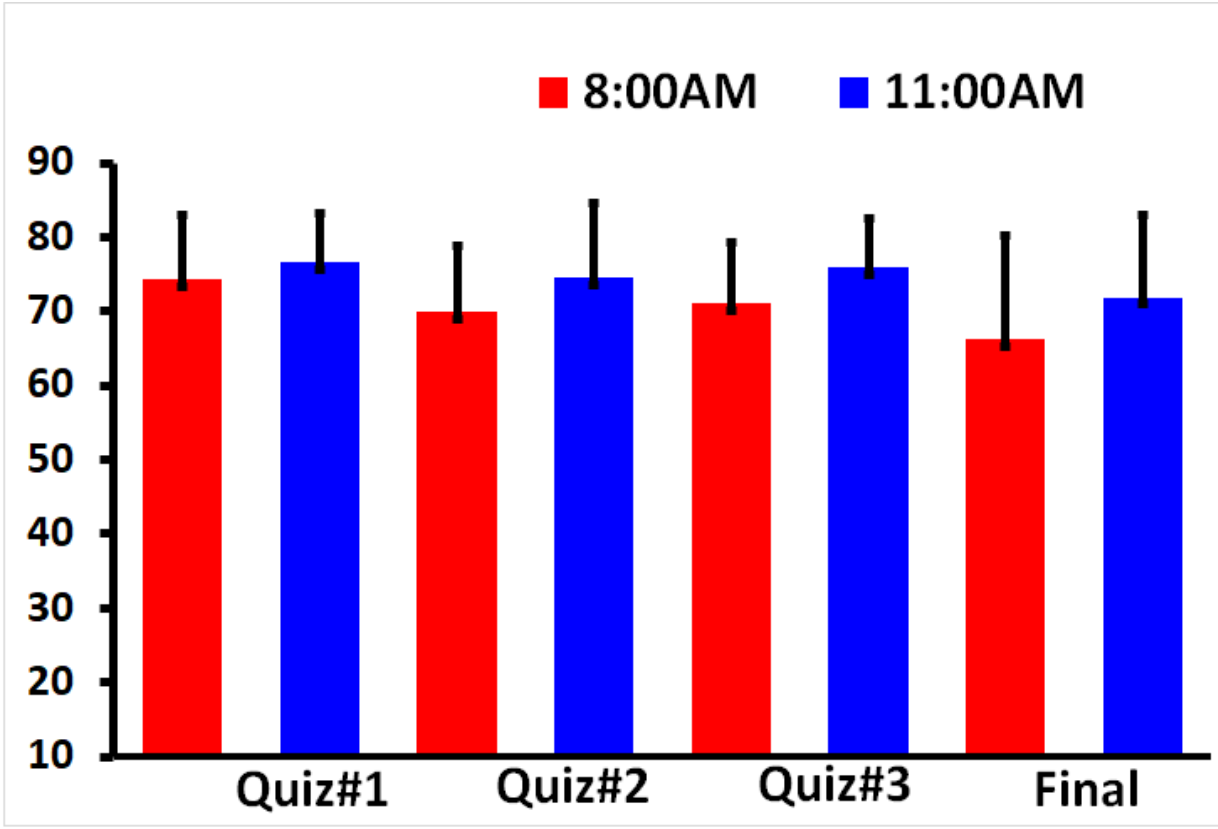
Class time

Factors Impacting the Knowledge Acquisition & Retention



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Interventional Strategies

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Known Interventional Strategies

- Lab sessions
- Cadaver dissection
- Use of the teaching technology
- Increasing simulation, practical/clinical hours
- Didactic passive learning
- Continuous reinforcement of knowledge
- Reciprocal peer tutoring
- Active learning strategies
- Access to tutor
- Active & cooperative learning method

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Interventional Strategies in Present Study

- Introduction of a Virtual Human Cadaver-Anatomage
- Inclusion of the Anatomical Images in Anatomy exams
- On-line and In-class Activities (content Reinforcement)

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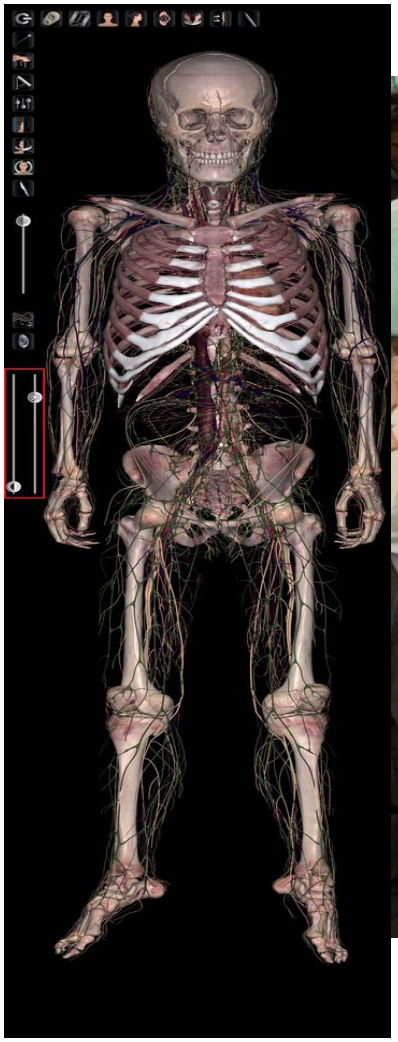
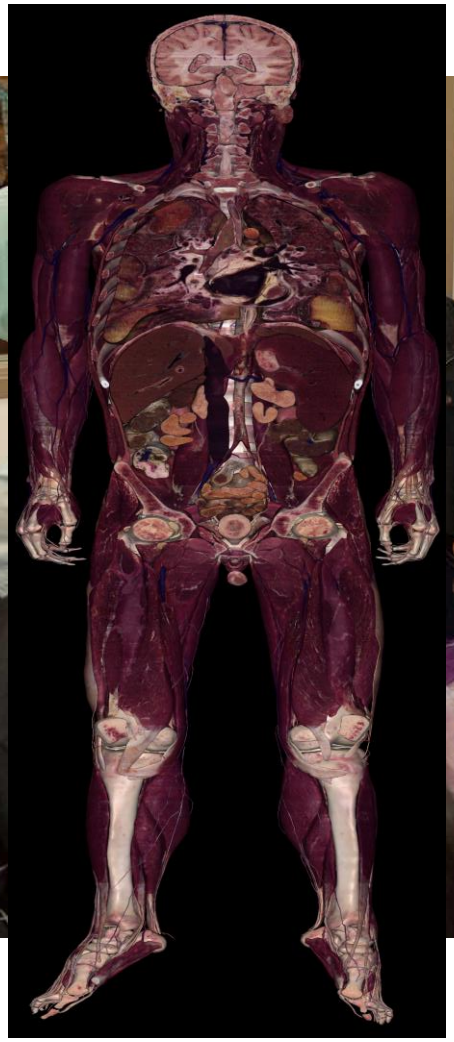
Strategy I
3D Virtual Human Cadaver- Anatomage





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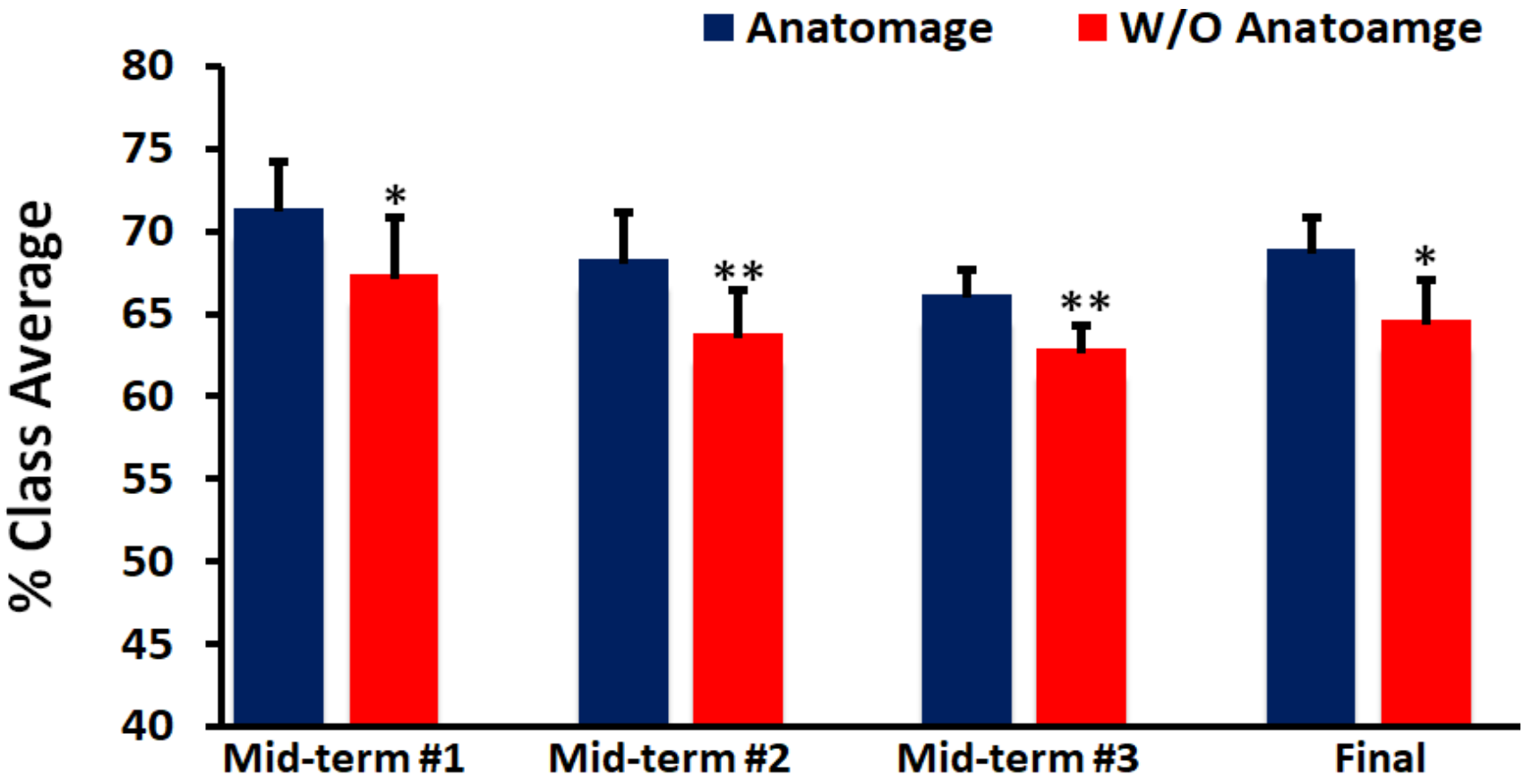

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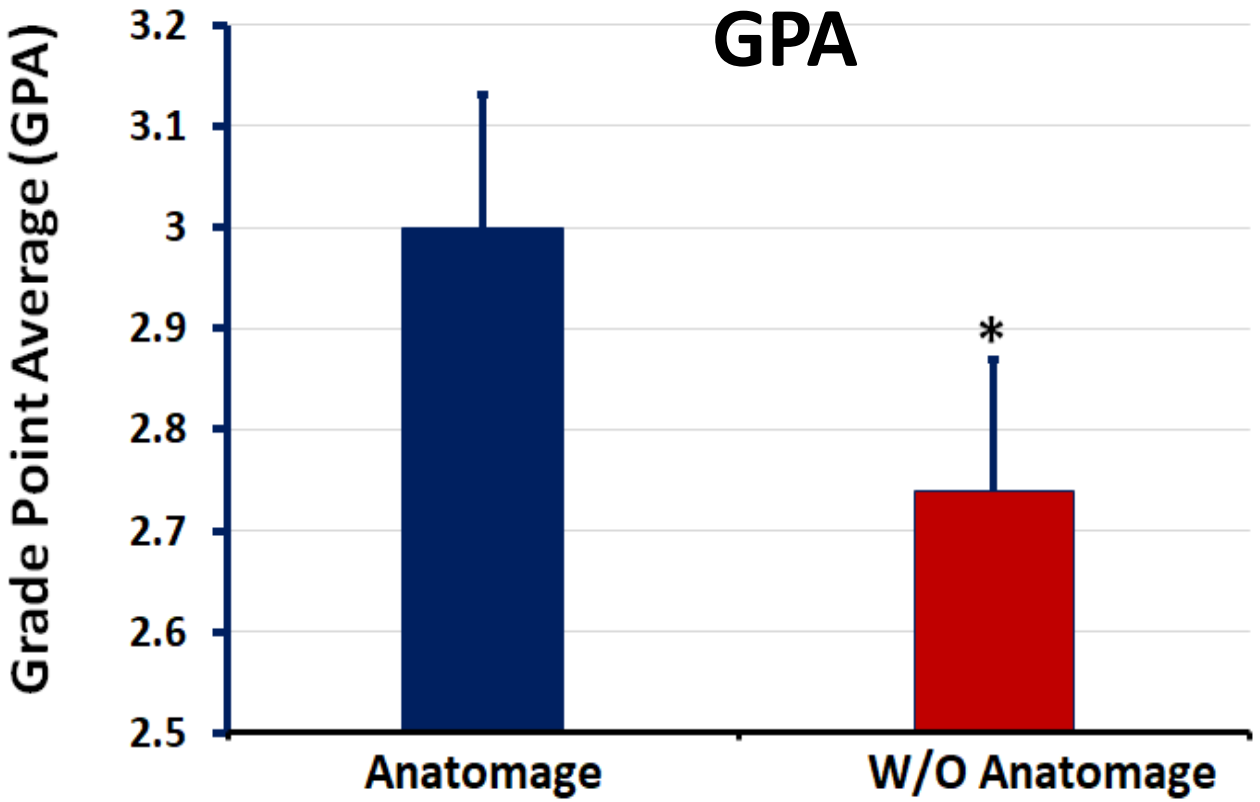

Narnaware & Neumeier 2021 (submitted)

Advantages of Using Virtual Human Cadaver

Strategy I
Virtual Human Cadaver-Anatomage

- Provides a true perception of the human body
- Reduce anxiety related to cadaver use
- 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

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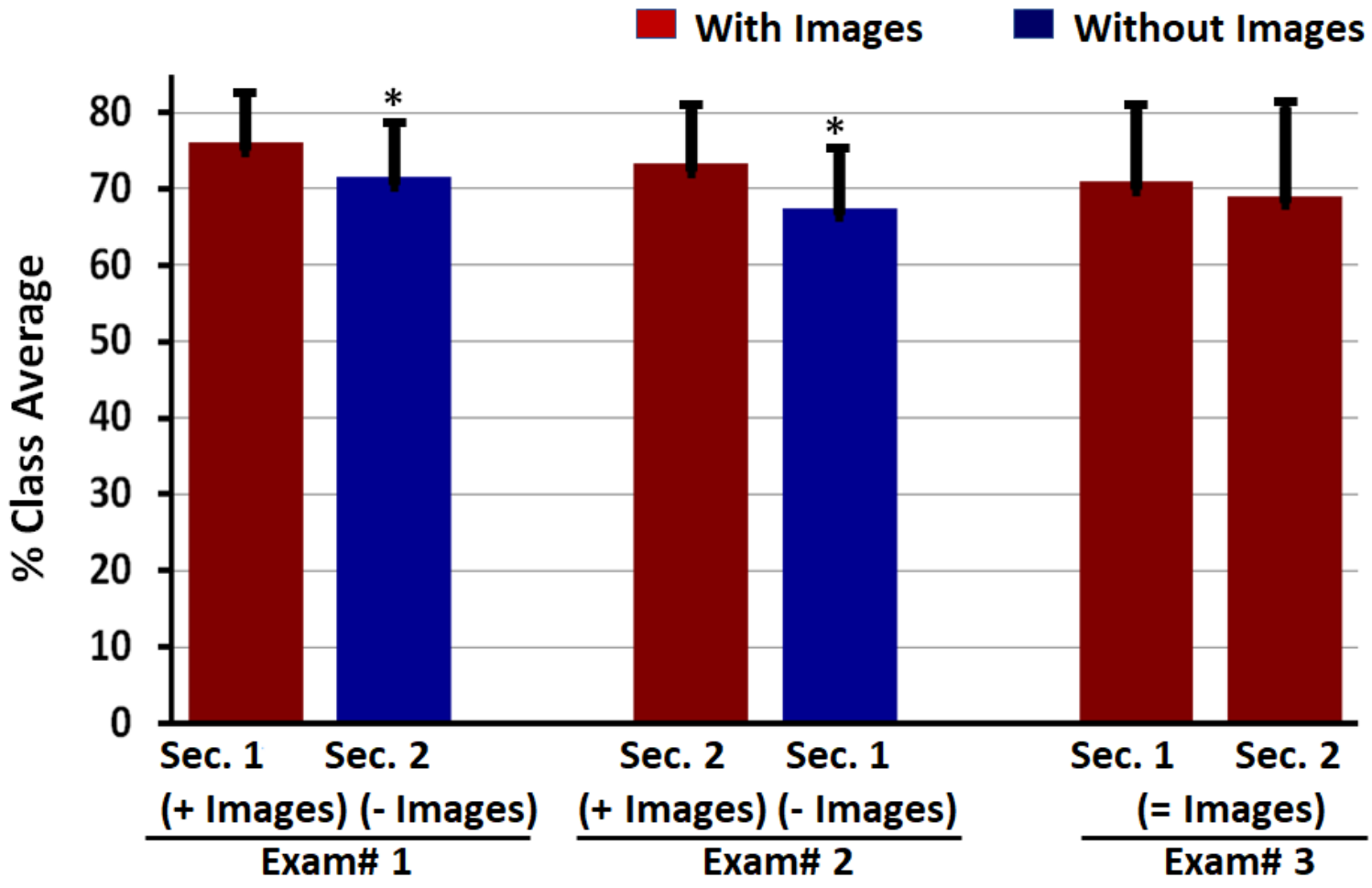
Strategy II- Inclusion of Anatomical Images in Exams



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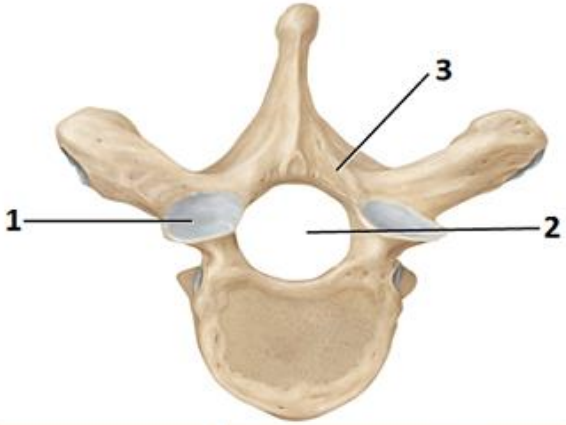

Strategy II- Inclusion of Anatomical Images in Exams

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, FASEB, 2018

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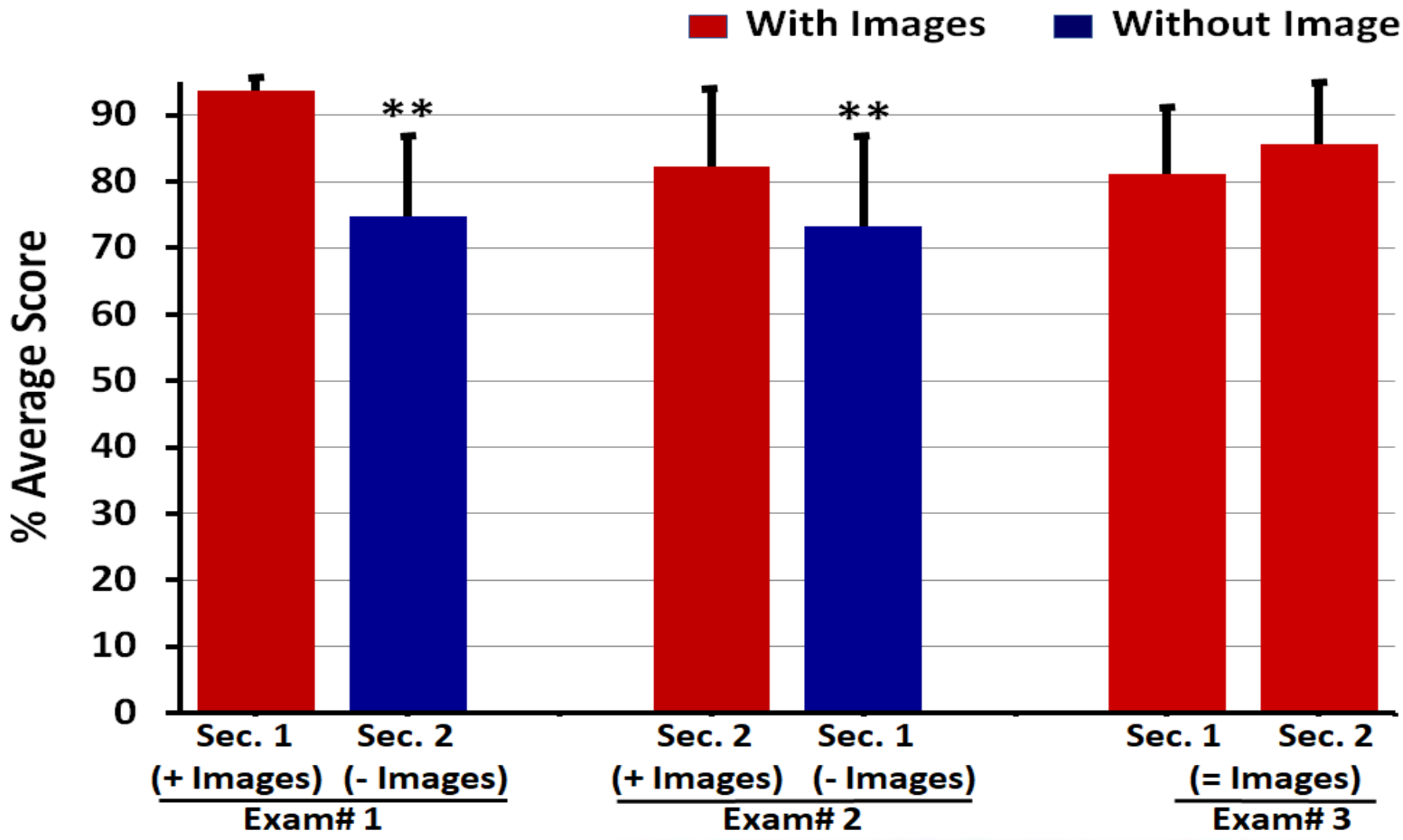
Strategy II- Inclusion of Anatomical Images in Exams



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Advantages of Images in Exams

Strategy II
Inclusion of Anatomical 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

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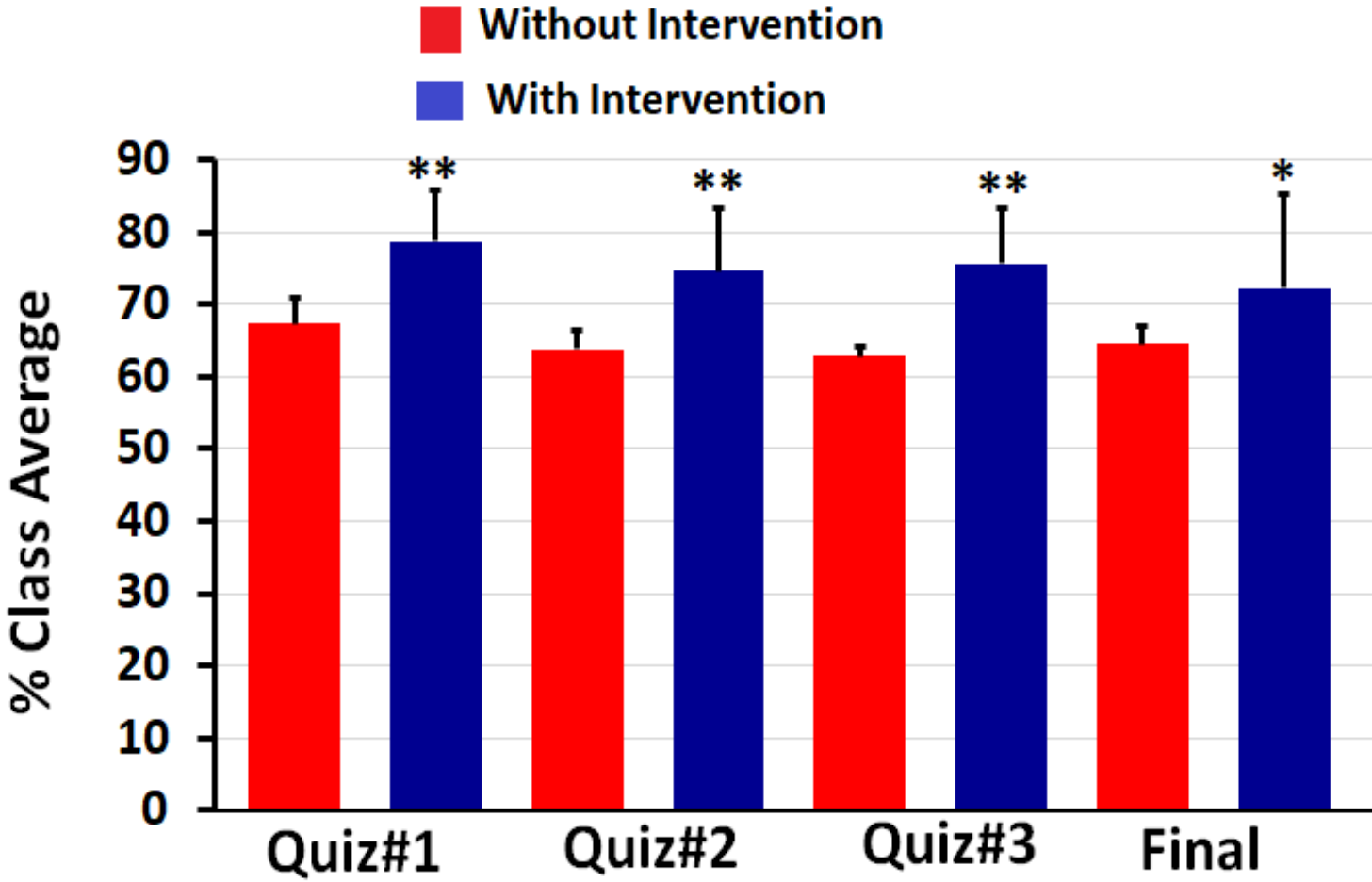
Strategy III
On-line & In-class Activities



Narnaware & Chahal, HAPS 2019

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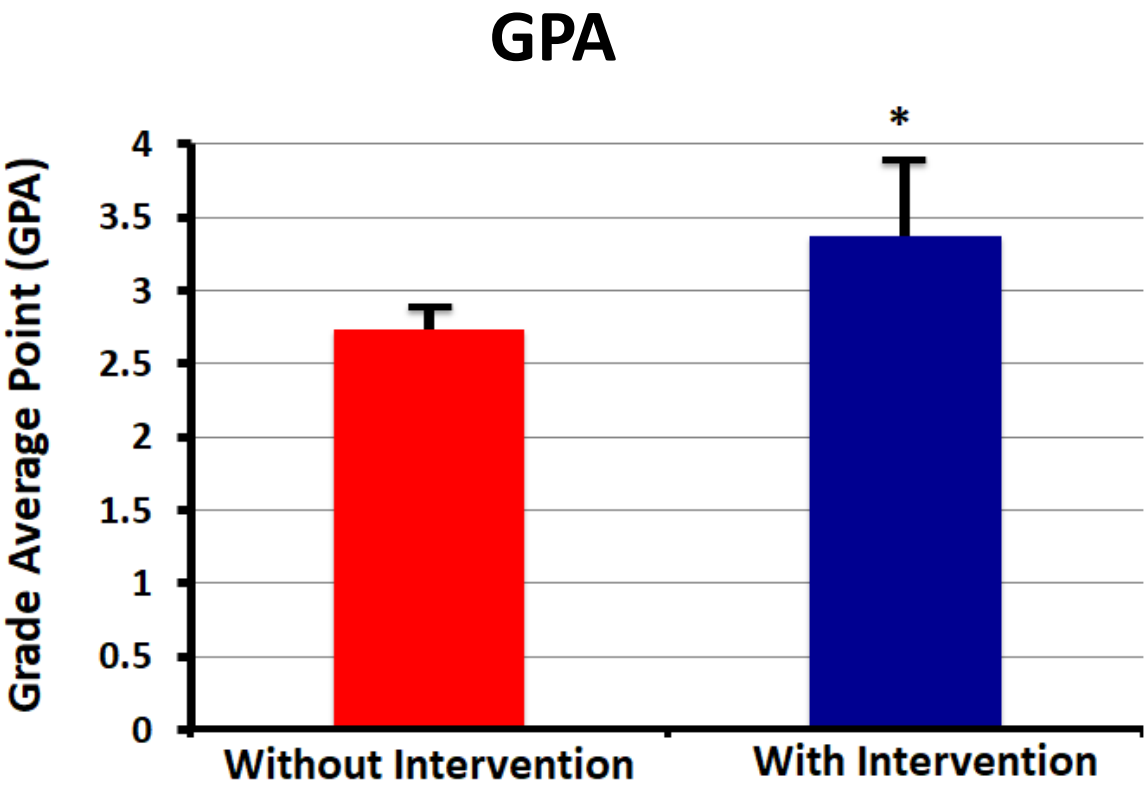
Strategy III
On-line & In-class Activities



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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 long-term anatomical knowledge

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Future Directions

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Post-Assessment

Conclusion

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

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Thank you