Instructional design using learning science improves outcomes in anatomy.

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Learning Objectives

By the conclusion of this presentation you should be able to:

1. Describe the unique components of teaching and learning theory utilized in the fellow’s lectures.
2. Discuss the benefits of training future educators on how to educate effectively.
3. Describe how active learning was integrated into the anatomy curriculum.
to show up or to sleep in? 5 reasons to go to class when attendance isn't mandatory.
Anatomy Fellowship

- Students receive an additional year of training
- Perform research
- Teach anatomy lectures
- Run anatomy labs
- Attractive on residency applications
- Master dissection and suturing skills
- Pursue academic medicine
History of Fellowship

• No set curriculum given to fellows.
• Self-taught
• Majority of the time was spent on research.
New Fellowship Curriculum

• Masters of Clinical Research
  • Epidemiology, Embryology, Radiology, Histology, Journal Club.
• Teaching at center of fellowship
  • Foundation of Teaching and Learning course
Foundation of Teaching and Learning Course
Curriculum

1\textsuperscript{st} semester
• Identified best teaching practices
• Learning theories
• Learning Styles (Kolb)
• Writing learning objectives
• Multiple choice questions

2\textsuperscript{nd} Semester
• Add a new lecture to the established curriculum
• Updating lecture material using learned skills
• Critique lectures
• Create curriculum

\textit{Shift focus from educator to student.}
Coronary Arteries

- LCA
  - Circ
  - LAD
    - Diagonal branches
- RCA
  - SA nodal branch
  - Conus branch
  - R. marginal a.
  - AV nodal branch
  - Posterior Descending a.
  - R. Posterolateral branch
Reducing Cognitive Load

https://www.reddit.com/r/AdviceAnimals/comments/2uaok4/the_uniform_looked_really_cool_in_person
Reducing Cognitive Load

• Intrinsic cognitive load
  – *Interactivity between learned material and working memory capacity.*
• Schemas aid in organization in information allowing elements to relate to one another.
  – *Info can be processed unconsciously and reduce cognitive load.*
• Using “big pic” drawings aide students in developing schemas.
Patient 2

A 68 year old women presents to the emergency department with indigestion and burning in the chest. Patient has history of GERD, and gastroparesis. Physical exam findings are as follows: BP 108/82 HR 39 RR 26 Pulse ox 91%. An EKG showed ST depression in lead 2, lead3, and aVF. Which cardiac vessel is compromised based on this patients presentation?

A. Right Coronary A. ★
B. Right Marginal A.
C. Left Marginal A.
D. Left Anterior Descending A.
Purpose

• By using:
  • In class drawings
  • Case based questions with pair-share/audience response systems

• Keep students engaged.
• Application of lecture material in lab.
• Improve long term retention of information.
Methods

• Retrospective study

• 2 cohorts created:
  • Academic Year 2014-15 – Traditional Didactic Style
    • College of Medicine (COM) class of 2018 – 271 students
    • College of Biosciences (COB) class of 2015 – 67 students
  • Academic Year 2015-16 – Integrated Active Learning Style
    • College of Medicine (COM) class of 2019 – 260 students
    • College of Biosciences (COB) class of 2016 – 103 students
Methods

• Compared the two cohorts based on identical MCQs
  • COM:
    • 3 identical anatomy MCQs from Neurology Final Exam
    • 8 identical anatomy MCQs from GI Final Exam
  • COB:
    • 5 identical anatomy MCQs from Anatomy Final Exam
    • The fellows were not aware of specific MCQs on the exams
• Chi-square used to analyze the data
• $p = 0.05$
Methods

• Compared the two cohorts (COM only) based on anatomy practical exam scores
  – 6 anatomy practical exams used
  – Osteology, Musculoskeletal, CP, GI, Reproduction, Neuroanatomy

• Compared individual test scores using a 2-tailed t-test.
• $p = 0.05$
Results – MCQs

- 16 MCQs total – 8 significant results

<table>
<thead>
<tr>
<th>Question</th>
<th>Percent of Students Correct</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Academic Year 2014-15</td>
<td>Academic Year 2015-16</td>
</tr>
<tr>
<td>1 (COM Neuro)</td>
<td>77.12%</td>
<td>93.08%</td>
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<tr>
<td>2 (COM Neuro)</td>
<td>95.57%</td>
<td>89.62%</td>
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<tr>
<td>5 (COM GI)</td>
<td>65.57%</td>
<td>87.45%</td>
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<tr>
<td>6 (COM GI)</td>
<td>88.64%</td>
<td>95.44%</td>
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<tr>
<td>7 (COM GI)</td>
<td>81.68%</td>
<td>51.71%</td>
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<tr>
<td>11 (COM GI)</td>
<td>83.15%</td>
<td>92.78%</td>
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<tr>
<td>12 (COB)</td>
<td>76.12%</td>
<td>99.03%</td>
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<tr>
<td>14 (COB)</td>
<td>59.70%</td>
<td>81.55%</td>
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Conclusion

• Overall (COM & COB) there were 8 statistically significant MCQs – 6 of them showed improvement

• Utilizing active learning in the classroom keeps students engaged – Critically assessing material in class.

• Staying current with new learning research and being flexible with teaching styles can help lead to better long term retention for students
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Special Thanks

Vicki Sharma
Kellee Neal
Taylor Brown
Maaheen Ahmed
Special Thanks

Dr. Schoen Kruse
Mentor and Creator of Learning Theory Course at KCU
References


## Results - Anatomy Practical

- 6 exams total – 4 significant results

<table>
<thead>
<tr>
<th>Practical</th>
<th>Average Score</th>
<th>P value (2-tailed)</th>
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<tbody>
<tr>
<td></td>
<td>Academic Year 2014-15</td>
<td>Academic Year 2015-16</td>
</tr>
<tr>
<td>Osteology</td>
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<tr>
<td>Musculoskeletal</td>
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<td>Cardiopulmonary</td>
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<td>92.56%</td>
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<td>Gastrointestinal</td>
<td>85.90%</td>
<td>88.01%</td>
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<td>Reproduction</td>
<td>82.21%</td>
<td>86.80%</td>
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<tr>
<td>Neurology</td>
<td>92.81%</td>
<td>93.42%</td>
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</tbody>
</table>
Overall Results

• MCQs
  • 16 total questions with 8 significant results
    • 6 significant results with a positive shift
    • 2 significantly results with a negative shift

• Practical Exams
  • 6 exams with 4 significant results
    • 3 significant with a positive shift
    • 1 significant with a negative shift