

Use of Supplemental Spaced Digital Image Identification Improves Student Performance on Medical Neuroanatomy Digital Practical Exams

K. Ryan Dickerson, M3, MET Scholar

BRODY SCHOOL OF MEDICINE
9th Annual Medical Education Day

- K. Ryan Dickerson, BS, Brody School of Medicine-East Carolina University, PI
- Kori L. Brewer, PhD, Brody School of Medicine-East Carolina University, Department of Emergency Medicine, Faculty Advisor

Lab Based Coursework in Medical School

- Gold Standard for Gross Anatomy Courses
- Consists predominantly of dissection and structural identification
- Requires a team approach
- Integrates material taught in the classroom to real life application
- Assessed primarily via practical exams

Challenges

- Need to be physically present in lab
- Lack of verification during self study
- Practical exams are associated with increased student stress
- Growing shortage of professors in the anatomical sciences
- Significant numbers of medical students fail to pass these courses each year

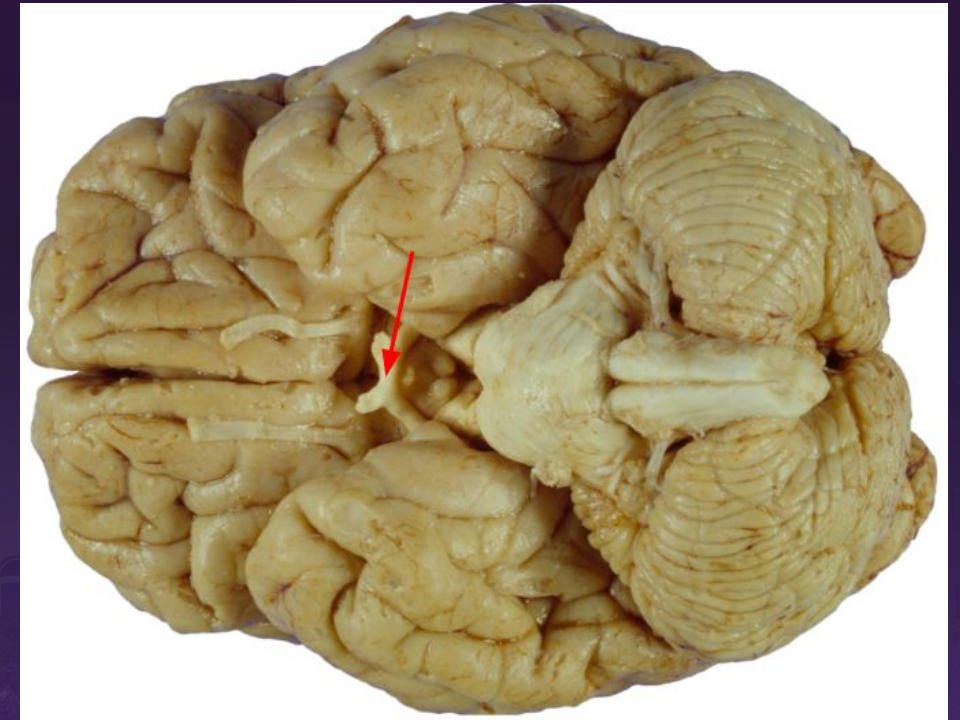
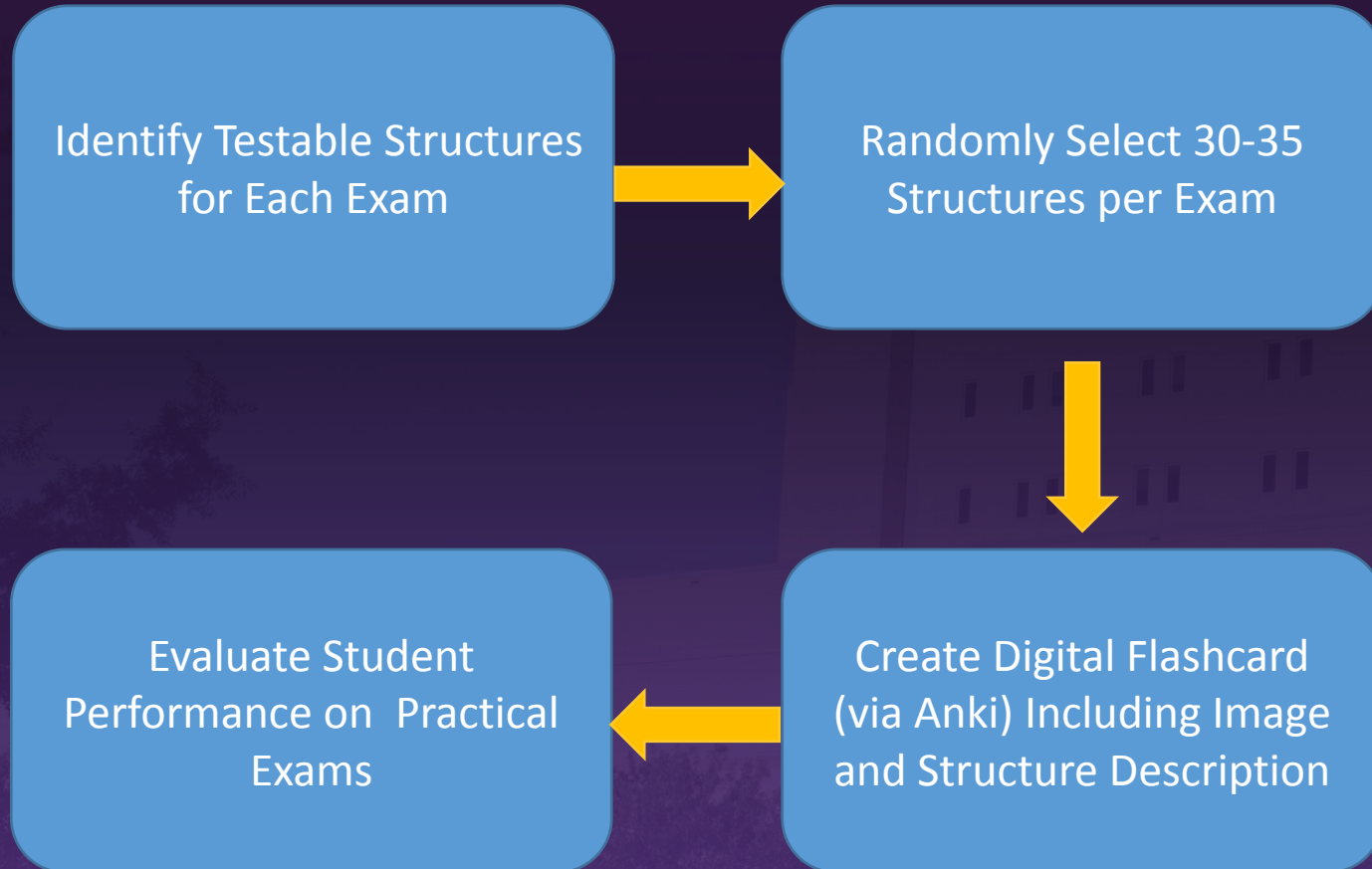
Can the use of digital image identification, delivered in a spaced repetition model, enhance student understanding and performance on medical neuroscience practical assessments?

M1 Medical Neuroscience – BSOM

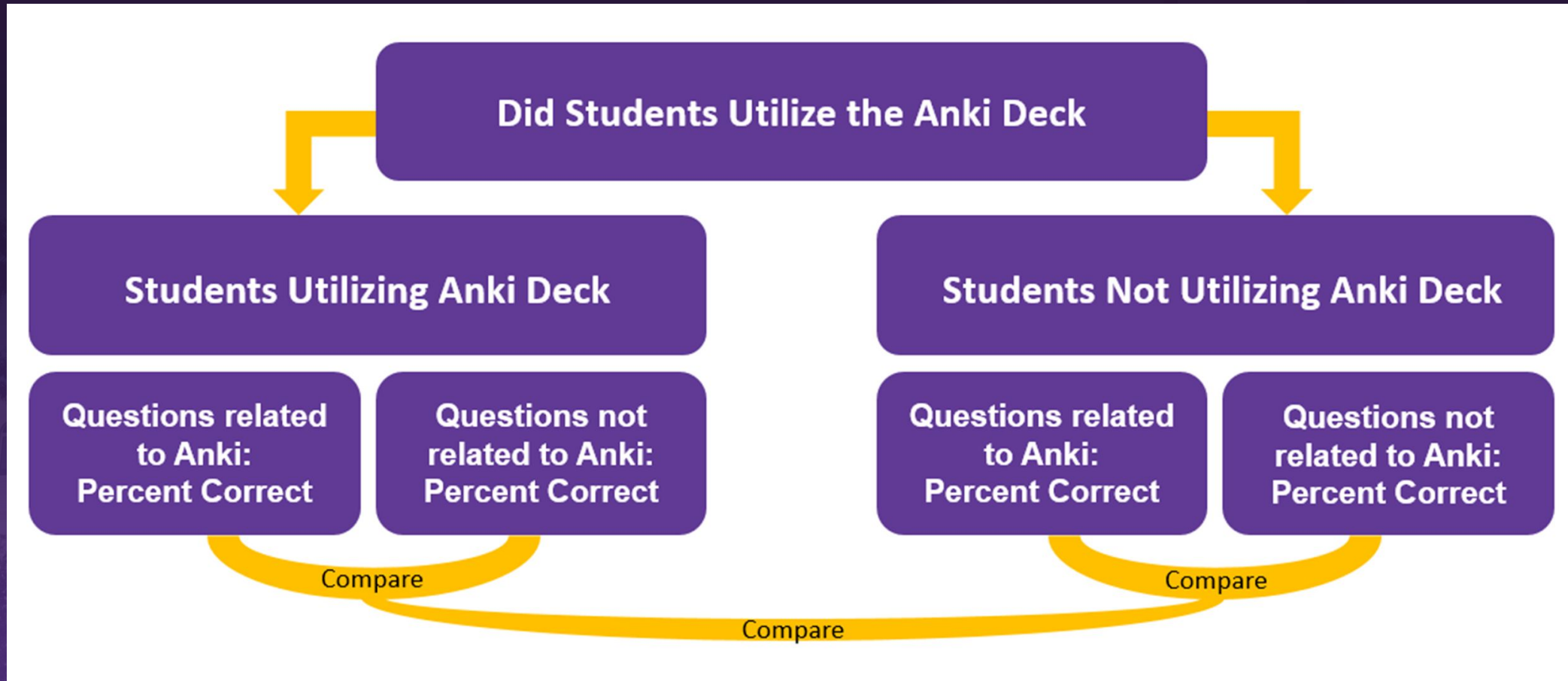
- 11 Labs distributed over four 36 question digital practical exams
- Each lab has an associated structure identification list indicating which structures students are expected to know for examinations

Considerations in Design

- How can we determine whether students using the resource are normally distributed?



Optic Chiasm: X-shaped structure demarcating the crossing over of each optic nerve. Crossing fibers from the medial retinal fields (lateral visual fields)

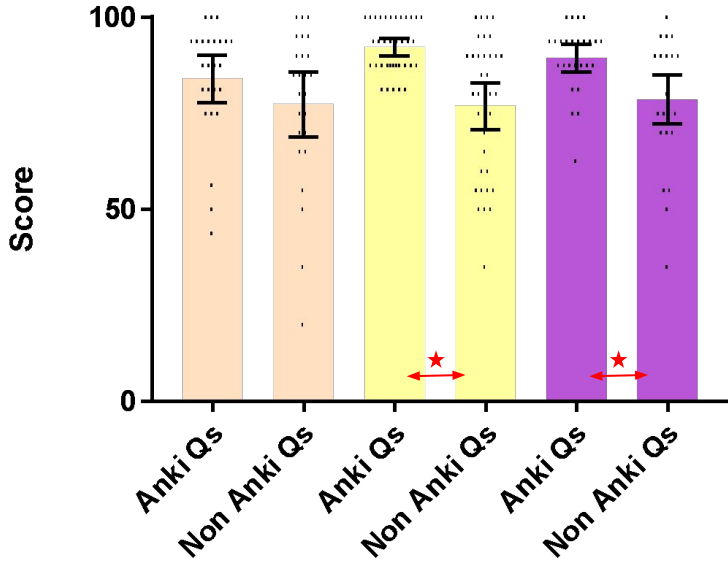


The background of the slide is a dark purple-tinted photograph of a large, multi-story university building with many windows. There are trees in the foreground and middle ground, partially obscuring the building. The overall scene is dimly lit, suggesting an evening or dusk setting.

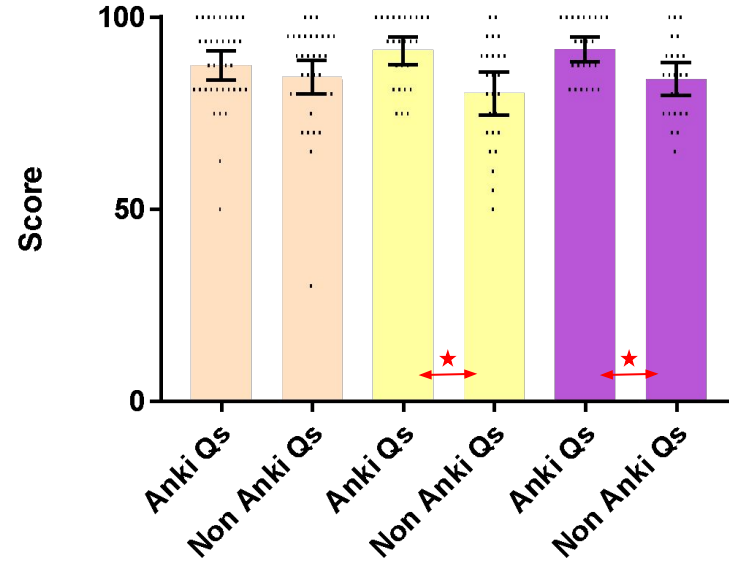
RESULTS

Student Scores on Anki vs Non-Anki Questions

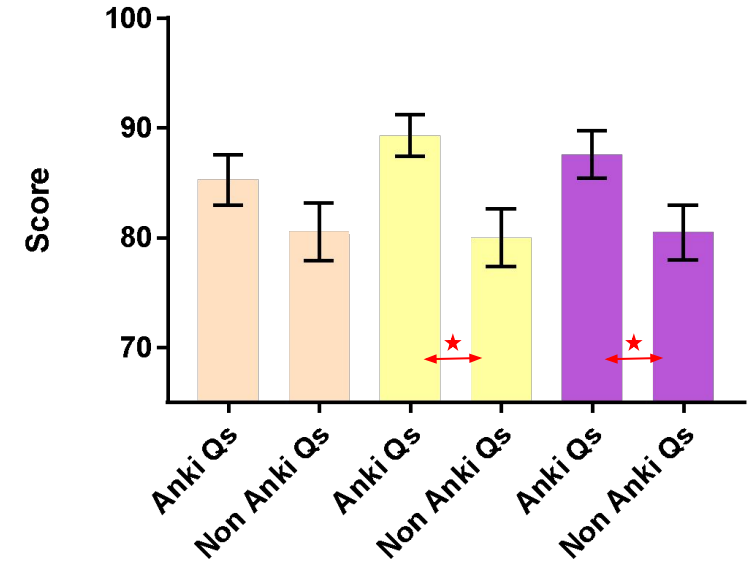
Exam 1



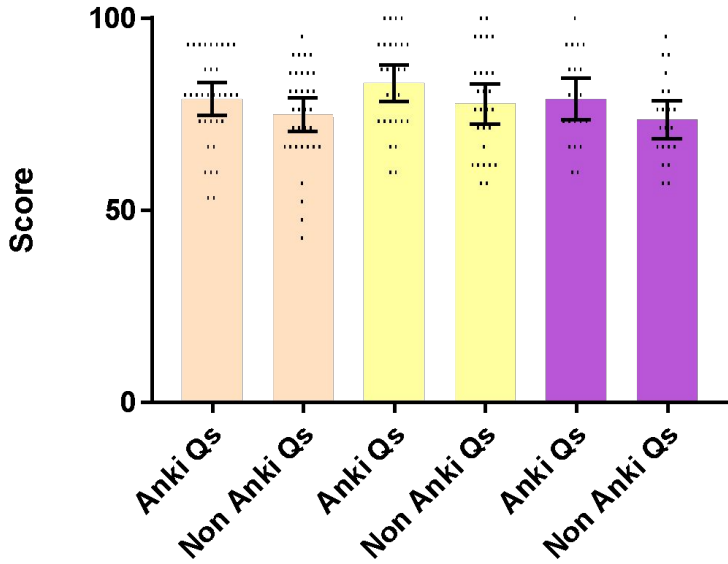
Exam 2



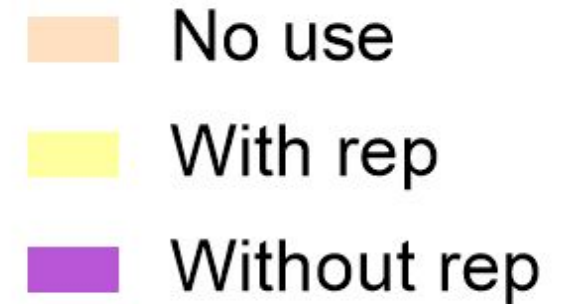
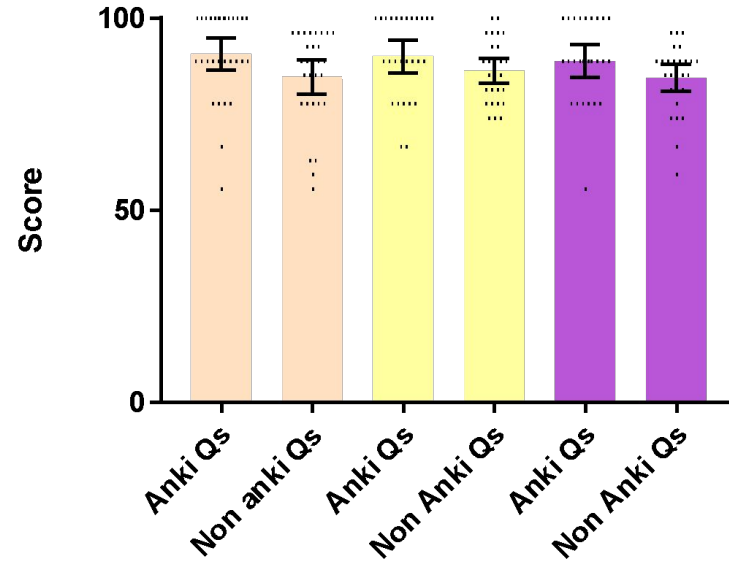
Exam 1-4



Exam 3

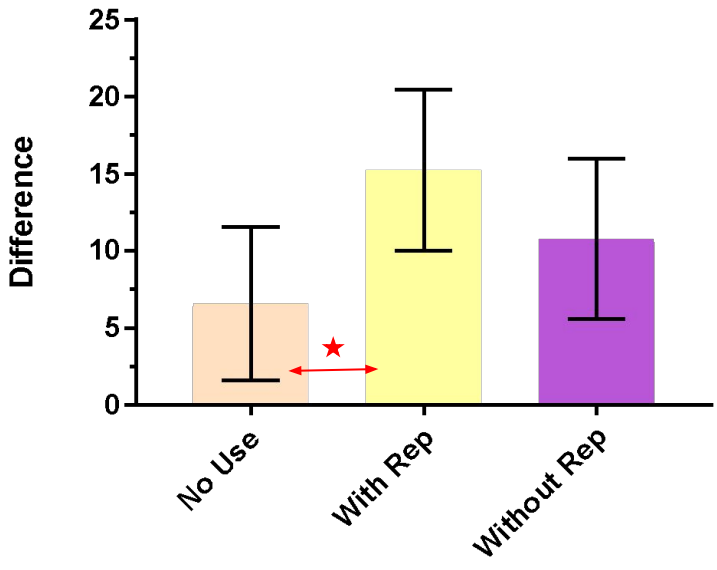


Exam 4

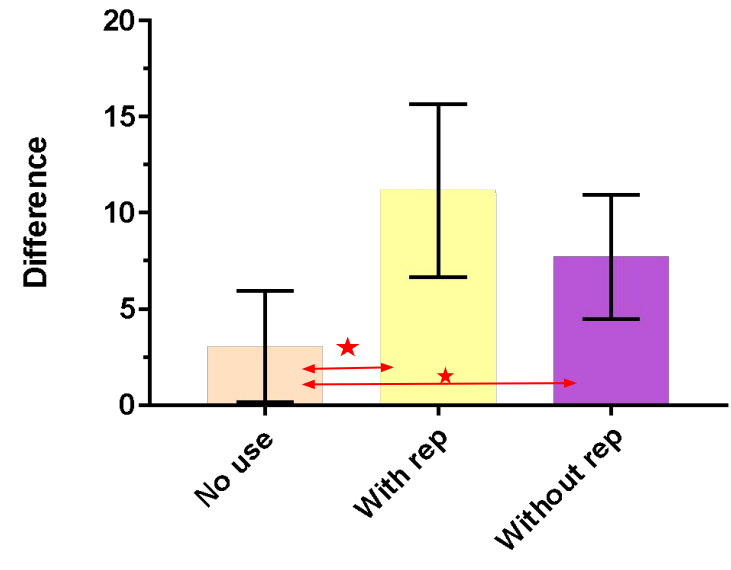


Difference Between Anki and Non-Anki Scores

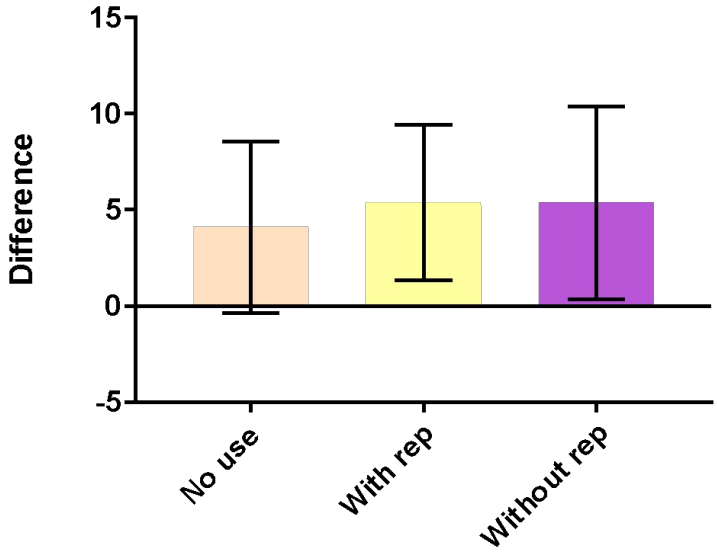
Exam 1



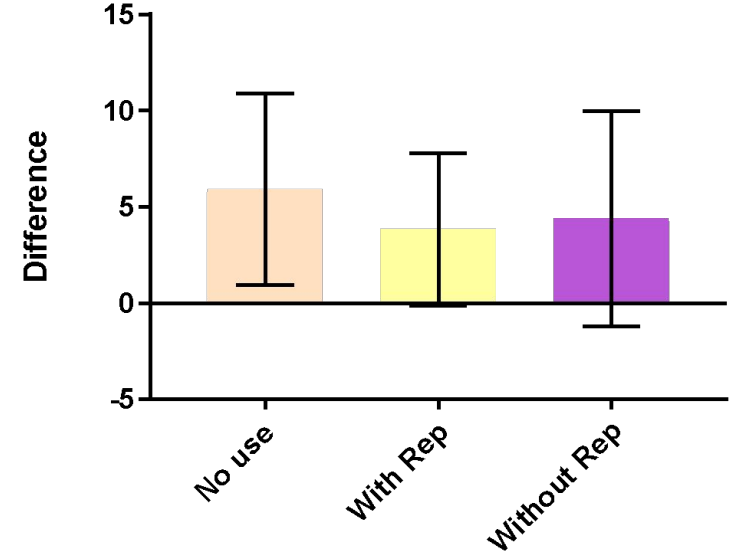
Exam 2



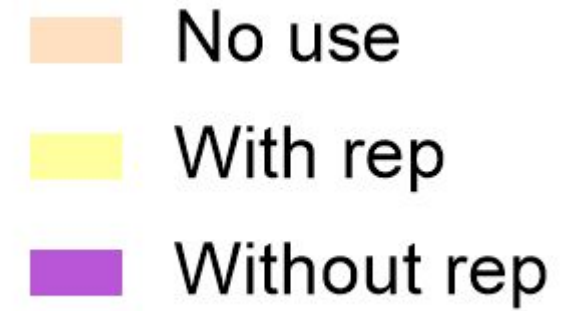
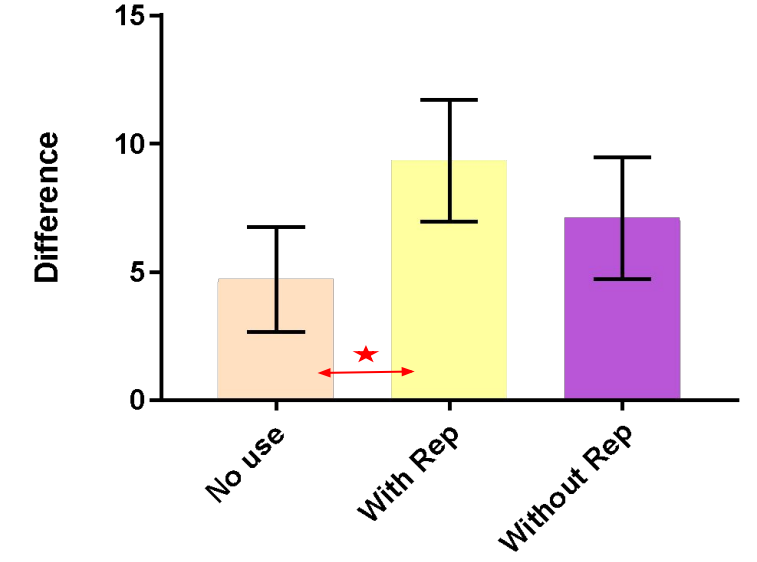
Exam 3



Exam 4



Exam 1-4



- Students selecting multiple groups
- Unequal distribution of questions
- Coding of second order questions resulting in a control delta

- Non-Random Assignment: Which students are using the resource?
- Administration of digital practical exams: Cannot generalize to in person cadaveric assessments
- No limitations on students expanding the resource deck for assessments – possible diminishing results over the course of the study

- Students utilizing spaced digital image identification outperform equated peers on associated questions
 - This finding is most pronounced early in the course
 - The decrease in trends is likely multifactorial in cause
- Future Implementations and Improvements on Resource
 - Increase the scope of the practice deck to span the entire course
 - As a large percentage of students utilized the resource without repetition or not at all, develop powerpoint files of images for easy access outside of ANKI

Do these trends extend to in person practical assessments?

Would a full course resource show significant improvement in student total scores in comparison to more traditional study methods?

Can this method of study be extended to courses outside of Medical Neuroanatomy?

We thank the Department of Anatomy and Cell Biology and the Office of Medical Education for their continued support of educational research

A special acknowledgement is extend to the donors and donor families who bequeathed their own bodies and the bodies of their loved ones to medical education and research through the Anatomical Gift Program at the Brody School of Medicine at East Carolina University

Additional Data for Questions

Comparison	Mean 1	Mean 2	Observations 1	Observations 2	P-value
Total Score: <i>N</i> vs <i>R</i>	80.33	83.72	25	36	0.364
Total Score: <i>N</i> vs <i>NR</i>	80.33	83.44	25	26	0.449
Total Score: <i>R</i> vs <i>NR</i>	83.72	83.44	36	26	0.926
Anki Qs: <i>N</i> vs <i>R</i>	84.00	92.18	25	36	0.0051
Anki Qs: <i>N</i> vs <i>NR</i>	84.00	89.43	25	26	0.120
Anki Qs: <i>R</i> vs <i>NR</i>	92.18	89.43	36	26	0.166
Anki vs N-Anki: <i>N</i> group	84.00	77.4	25	25	0.198
Anki vs N-Anki: <i>R</i> group	92.18	77.66	36	36	9.81 E-08
Anki vs N-Anki: <i>NR</i> group	89.42	78.65	26	26	0.004
Delta: <i>N</i> vs <i>R</i>	6.60	15.24	25	36	0.017
Delta: <i>N</i> vs <i>NR</i>	6.60	10.77	25	26	0.238
Delta: <i>R</i> vs <i>NR</i>	15.24	10.77	36	26	0.23

Exam 1 Data. Key (*N*= No Use, *R*= Use with Repetition, *NR*= Use without Repetition, N-Anki= Non-Anki)

Comparison	Mean 1	Mean 2	Observations 1	Observations 2	P-value
Total Score: <i>N</i> vs <i>R</i>	85.81	85.15	37	26	0.819
Total Score: <i>N</i> vs <i>NR</i>	85.81	87.38	37	24	0.569
Total Score: <i>R</i> vs <i>NR</i>	85.15	87.38	26	24	0.413
Anki Qs: <i>N</i> vs <i>R</i>	87.5	91.35	37	26	0.155
Anki Qs: <i>N</i> vs <i>NR</i>	87.5	91.67	37	24	0.200
Anki Qs: <i>R</i> vs <i>NR</i>	91.35	91.67	26	24	0.894
Anki vs N-Anki: <i>N</i> group	87.5	84.46	37	37	0.292
Anki vs N-Anki: <i>R</i> group	91.34	80.19	26	26	0.0012
Anki vs N-Anki: <i>NR</i> group	91.67	83.96	24	24	0.0048
Delta: <i>N</i> vs <i>R</i>	3.04	11.15	37	26	0.0018
Delta: <i>N</i> vs <i>NR</i>	3.04	7.71	37	24	0.035
Delta: <i>R</i> vs <i>NR</i>	11.15	7.71	26	24	0.211

Exam 2 Data. Key (*N*= No Use, *R*= Use with Repetition, *NR*= Use without Repetition, N-Anki= Non-Anki)

Comparison	Mean 1	Mean 2	Observations 1	Observations 2	P-value
Total Score: <i>N</i> vs <i>R</i>	76.63	79.96	34	28	0.252
Total Score: <i>N</i> vs <i>NR</i>	76.63	75.93	34	21	0.807
Total Score: <i>R</i> vs <i>NR</i>	79.96	75.93	28	21	0.212
Anki Qs: <i>N</i> vs <i>R</i>	79.02	83.10	34	28	0.196
Anki Qs: <i>N</i> vs <i>NR</i>	79.02	79.04	34	21	0.993
Anki Qs: <i>R</i> vs <i>NR</i>	83.10	79.04	28	21	0.250
Anki vs N-Anki: <i>N</i> group	79.02	74.93	34	34	0.703
Anki vs N-Anki: <i>R</i> group	83.10	77.72	28	28	0.123
Anki vs N-Anki: <i>NR</i> group	79.02	73.67	21	21	0.133
Delta: <i>N</i> vs <i>R</i>	4.09	5.37	34	28	0.670
Delta: <i>N</i> vs <i>NR</i>	4.09	5.35	34	21	0.709
Delta: <i>R</i> vs <i>NR</i>	5.37	5.35	28	21	0.994

Exam 3 Data. Key (*N*= No Use, *R*= Use with Repetition, *NR*= Use without Repetition, N-Anki= Non-Anki)

Comparison	Mean 1	Mean 2	Observations 1	Observations 2	P-value
Total Score: <i>N</i> vs <i>R</i>	86.30	87.24	30	27	0.697
Total Score: <i>N</i> vs <i>NR</i>	86.30	85.60	30	27	0.767
Total Score: <i>R</i> vs <i>NR</i>	87.24	85.60	27	27	0.420
Anki Qs: <i>N</i> vs <i>R</i>	90.74	90.12	30	27	0.835
Anki Qs: <i>N</i> vs <i>NR</i>	90.74	88.89	30	27	0.529
Anki Qs: <i>R</i> vs <i>NR</i>	90.12	88.89	27	27	0.675
Anki vs N-Anki: <i>N</i> group	90.74	84.81	30	30	0.052
Anki vs N-Anki: <i>R</i> group	90.12	86.28	27	27	0.146
Anki vs N-Anki: <i>NR</i> group	88.89	84.50	27	27	0.107
Delta: <i>N</i> vs <i>R</i>	5.93	3.84	30	27	0.511
Delta: <i>N</i> vs <i>NR</i>	5.93	4.39	30	27	0.675
Delta: <i>R</i> vs <i>NR</i>	3.84	4.39	27	27	0.867

Exam 4 Data. Key (*N*= No Use, *R*= Use with Repetition, *NR*= Use without Repetition, N-Anki= Non-Anki)

Comparison	Mean 1	Mean 2	Observations 1	Observations 2	P-value
Total Score: <i>N</i> vs <i>R</i>	82.36	83.95	126	117	0.304
Total Score: <i>N</i> vs <i>NR</i>	82.36	83.39	126	98	0.518
Total Score: <i>R</i> vs <i>NR</i>	83.95	83.39	117	98	0.698
Anki Qs: <i>N</i> vs <i>R</i>	85.29	89.35	126	117	0.0076
Anki Qs: <i>N</i> vs <i>NR</i>	85.29	87.60	126	98	0.155
Anki Qs: <i>R</i> vs <i>NR</i>	89.35	87.60	117	98	0.225
Anki vs N-Anki: <i>N</i> group	85.29	80.57	126	126	0.008
Anki vs N-Anki: <i>R</i> group	89.35	80.01	117	117	3.34E-08
Anki vs N-Anki: <i>NR</i> group	87.60	80.50	98	98	2.66E-05
Delta: <i>N</i> vs <i>R</i>	4.72	9.34	126	117	0.0038
Delta: <i>N</i> vs <i>NR</i>	4.72	7.10	126	98	0.134
Delta: <i>R</i> vs <i>NR</i>	9.34	7.10	117	126	0.192

Exam 1-4 Data. Key (*N*= No Use, *R*= Use with Repetition, *NR*= Use without Repetition, N-Anki= Non-Anki)