



# Bring Your Own Device Initiative to Improve Engagement and Performance in Human Anatomy and Physiology Laboratories

Carol A. Britson<sup>1</sup> and Kelsey C. Hillhouse<sup>1,2</sup>

The University of Mississippi

<sup>1</sup>Department of Biology, The University of Mississippi, University, MS 38677, USA

<sup>2</sup>Sally McDonnell Barksdale Honors College, The University of Mississippi, University, MS 38677, USA



## Abstract

At the University of Mississippi, just 4.93% (2014) and 6% (2015) of Human A&P students responding to an informal, opinion survey stated that their favorite lab activity was using microscopes. To increase students' interest and engagement with microscopy and tissue examination, we purchased adapters that simultaneously connect students' smartphones to the ocular lens of a microscope. Aggregate scores (i.e., percent correct) for tissue questions on lab practicals in spring 2016 (with adapters) and spring 2015 (without adapters) were compared to assess effectiveness of the adapters as were Likert surveys to assess student's levels of engagement.

## Introduction

- Through "Bring Your Own Device" (BYOD) initiatives, educators are starting to incorporate students' mobile technology including smartphones into the classroom curriculum (Kiger and Herro, 2015). However, little research has been done to examine how the utilization of smartphones in the laboratory would impact learning outcomes, particularly in a science laboratory.
- Microscope adapters that attach simultaneously to students' smartphones and the ocular lens of a microscope were used by students in the Human Anatomy and Physiology II laboratories. These adapters allow the students to take high quality pictures through the microscope with their mobile devices by aligning the focal points.
- The hypothesis of this study was that the use of these adapters on the students' mobile devices in the laboratory will help improve student engagement and performance associated with histology based questions on practicals.

## Conclusions

- So far, the results of this study have shown that the use of student's mobile devices in the laboratory has the potential to improve student engagement in the laboratory, but the role that it plays in student performance is unclear.
- The results of this study are valuable for educators, schools, and universities and contribute to the debate of curricular incorporation of smartphones.
- This study helps to assure educators that the use of smartphones in the laboratory for learning purposes may enhance student performance and engagement.

## Methods

- Microscope adapters were used in the Human A&P II laboratories during the Spring 2016 semester. These students completed Human A&P I during the Fall 2015 semester. The students received a verbal description of the project and were given the first Likert-style survey to complete before they used the microscope adapters.
- The students were given instructions on how to use the microscope adapters and refreshers were given throughout the semester as needed.
- The students were given the second Likert-style survey to complete at the end of the lab portion of the course.
- Two, 50 question lab practicals (hands-on exams) were given during the semester with 5-10 histology based questions on each lab practical.
- Class performance (e.g., # correct responses/# total student responses) on the histology questions from each lab practical was compared between Spring 2015 (no BYOD adapters available) and Spring 2016 (BYOD adapters available) for Human A&P II.
- A two-sample t-test assuming equal variances, with the level of significance set at  $\alpha = 0.05$  was used to compare performance on the histology questions for each lab practical.
- Response data for the two Likert-style survey instruments were analyzed with a Chi-square test with the level of significance set to  $\alpha = 0.05$ .
- This experiment (Protocol #16x-162), has been approved as Exempt under 45 CFR 46.101(b)(#1 & 2) by the University of Mississippi IRB.

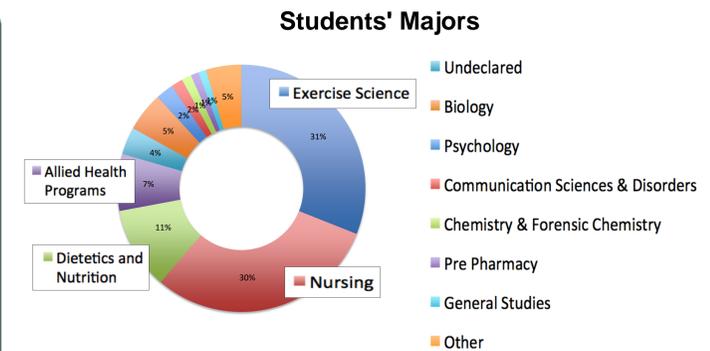
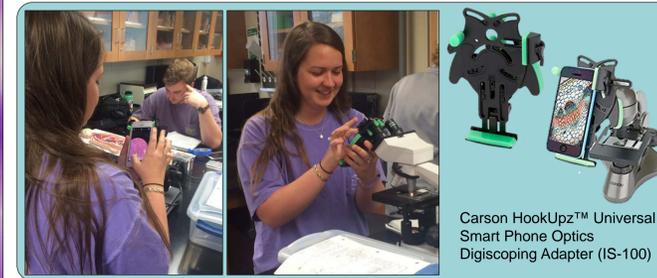
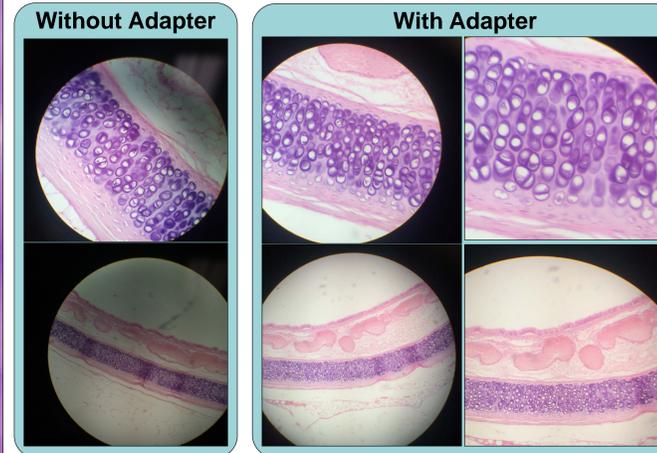
## Future Directions

- In the next part of this experiment, microscope adapters will be used in the Human A&P I laboratories during the Fall 2016 semester. These students will either be taking the course for the first time or retaking the course. Class performance on histology questions from each lab practical will be compared to the Fall 2015 lab practicals for Human A&P I.

### References

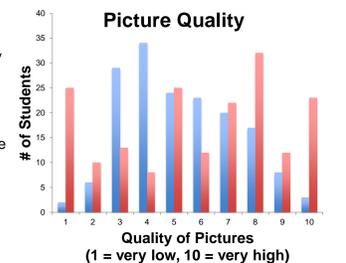
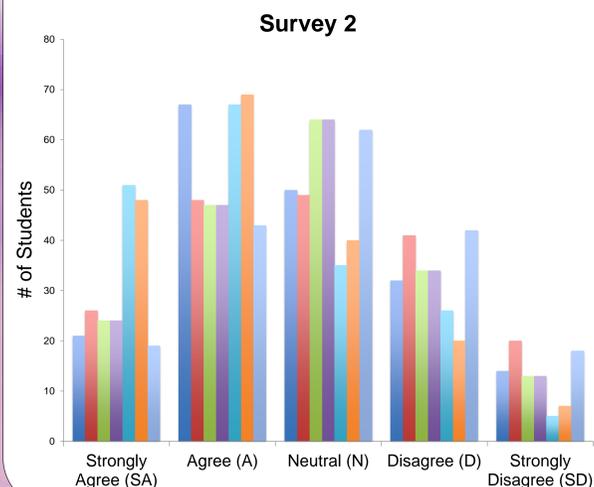
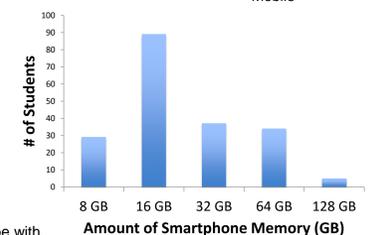
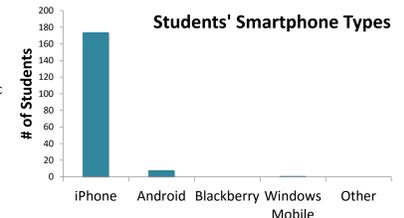
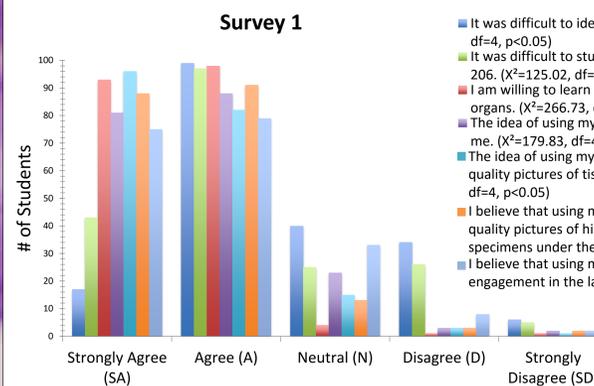
- Cogdell B, Torsney B, Stewart K, Smith R. 2012. Technological and Traditional Drawing Approaches Encourage Active Engagement in Histology Classes for Science Undergraduates. *Bioscience Education* 19:15pp. <http://www.bioscience.heacademy.ac.uk.umiss.idm.oclc.org/journal/vol19/beej-19-2.aspx>
- Dahlstrom E. 2013. BYOD and Consumerization of IT in Higher Education Research. *Educause Review* 4:1-3. <http://er.educause.edu/articles/2013/4/executive-summary-byod-and-consumerization-of-it-in-higher-education-research-2013>
- Kiger D, Herro D. 2015. Bring your own device: Parental Guidance (PG) Suggested. *TechTrends* 59(5):51-61.
- Solberg B. 2012. Digital and traditional slides for teaching cellular morphology: a comparative analysis of learning outcomes. *Clinical Laboratory Science* 25:4-18.

## Results



### Lab Practical Performance

- The average percent correct for questions on the first lab practical was lower before the use of adapters (41.11%, 2015) as compared to after adapters were incorporated into the lab (58.63%, 2016;  $p=0.062$ ,  $df=8$ ,  $t=-2.166$ ).
- The average percent correct for questions on the second lab practical (41.94% for 2015; 35.98% for 2016) were not significantly different ( $p=0.461$ ,  $df=15$ ,  $t=0.756$ ).



- Quality of pictures taken by the smartphone through a microscope lens without a microscope adapter. ( $X^2=69.18$ ,  $df=9$ ,  $p<0.05$ )
- Quality of pictures taken by the smartphone through a microscope lens with a microscope adapter. ( $X^2=32.73$ ,  $df=9$ ,  $p<0.05$ )