



RESEARCH ON THE EFFECTIVENESS OF ANATOMY IN CLAY® LEARNING SYSTEM

- 1 Arbel V, Rudd A, Muszyznski E, Growe M, Bariether J. Improving understanding of human anatomy using haptic learning through clay modeling. *FASEB J.* 2011;25:182-185.
- 2 Bareither M, Arbel V, Growe M, Muszczyński E, Rudd A, Marone J. Clay modeling versus written modules as effective interventions in understanding human anatomy. *Anat Sci Educ.* 2013;6:170-176.
- 3 Brundin, J. Building human models out of clay provides deeper anatomy learning experience. *Colorado Public Radio*, January 25, 2014.
- 4 Day M, Hecox B, Hinrichs A, Jones A, Schmitz A, Zahourek J. Comparison of three teaching protocols for gross anatomy. Poster: Annual Meeting of the American Physical Therapy Association; Kansas City, MO, June 14-18, 1983.
- 5 DeHoff M, Clark K, Meganathan K. Learning outcomes and student-perceived value of clay modeling and cat dissection in undergraduate human anatomy and physiology. *Adv Physiol Educ.* 2011;35:68-75.
- 6 Haspel C, Motoike HK, Lenchner E. The implementation of clay modeling and rat dissection into the human anatomy and physiology curriculum of a large urban university. *Anat Sci Educ.* 2014;7:38-46.
- 7 Kish S. Teaching hip and shoulder joints by building anatomy in clay. *HAPS Educator.* 2008;13:19.
- 8 Kooloos J, Schepens-Franke A, Bergman E, Donders R. Anatomical knowledge gained through a clay modeling exercise compared to live and video observations. *Anat Sci Educ.* 2014;7:420-429.
- 9 Lord, R. Maniken System Human Anatomy in Clay Learning System. *J Col Sci Teaching.* 2006;35:62-63.
- 10 Márquez S, Patel J, Rosentzveyg A, Márquez A, Pagano A. The constructive approach to teaching anatomy through clay modeling: a multi-tier educational value. *FASEB J.* 2015;29 (suppl):549.3

RESEARCH ON THE EFFECTIVENESS OF ANATOMY IN CLAY® LEARNING SYSTEM (CONT)

- 11 Massey K. Clay modeling of the musculoskeletal system: does active learning increase retention and comprehension. Paper presented at: Georgia Scholarship of STEM Teaching & Learning Conference, Georgia Southern University, March 7, 2014.
- 12 McDaniel, K, Daday, J. An undergraduate anatomy lab revision success story. HAPS Educator. 2017; 21:8-17.
- 13 Monsour, C. Anatomy In Clay Learning System. Am Bio Teach. 2011;73:188.
- 14 Motoike HK, O’Kane RL, Lenchner E, Haspel C. Clay modeling as a method to learn human muscles: a community college study. Anat Sci Educ.2009; 2:19-23.
- 15 Myers DL, Arya LA, Verma A, Buchanan EM. Pelvic anatomy for obstetrics and gynecology residents: an experimental study using clay models. Obstet Gynecol. 2001;97: 321-324.
- 16 Oh C-S, Kim J-Y, Choe Y. Learning of Cross-Sectional Anatomy Using Clay Models. Anat Sci Educ. 2009;2:156-159.
- 17 Patel J, Rosentsveyg J, Gabbur N, Marquez S. Clay modeling as a haptic model to teach a hysterectomy procedure and pelvic anatomy to obstetrics and gynecology residents. Obset Gynecol 2014;123:20S.
- 18 Patel J, Rosentsveyg J, Gabbur N, Marquez S. Clay modeling for pelvic anatomy review for third-year medical and physician assistant students. Obset Gynecol 2014;123:19S-20S.
- 19 Waters JR, Van Meter P, Perrotti W, Drogo S, Cyr RJ. Cat dissection vs. sculpting human structures in clay: an analysis of two approaches to undergraduate human anatomy laboratory education. Adv Physiol Educ. 2005;29;27-34.
- 20 Waters JR, Van Meter P, Perrotti W, Drogo C. A comparison of two approaches to an undergraduate human anatomy laboratory (clay building vs. human cadaver). Presented to the Human Anatomy and Physiology Society National Convention.
- 21 Waters, JR, Van Meter P, Perrotti W, Drogo C. Cyr RJ. Human clay models versus cat dissection: how the similarity between the classroom and the exam affect student performance. Adv Physiol Educ. 2011; 35: 227-35.

RESEARCH ON THE EFFECTIVENESS OF ANATOMY IN CLAY® LEARNING SYSTEM (CONT)

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Whisler K. Hands-on Learning using Anatomy in Clay Manikens. Presented to the Kansas Career & Technical Education Convention; Manhattan, KS, February 2017, February 2018, February 2019.



COMMENTS ON THE ACADEMIC RESEARCH

1 “Cat dissection vs. sculpting human structures in clay: an analysis of two approaches to undergraduate human anatomy laboratory education”

John R. Waters, Peggy Van Meter, William Perrotti, Salvatore Drogo, and Richard J. Cyr.

Department of Biology, The Pennsylvania State University, University Park Pennsylvania; Department of Educational Psychology, The Pennsylvania State University, University Park Pennsylvania; Life Science Department, Mohawk

Valley Community College, Utica, New York

Peer reviewed

CONCLUSION

“...students in the human clay sculpting group scored significantly higher than their classmates ... on both the low- and the high-level questions.”

2 Human clay models versus cat dissection: How the similarity between the classroom and the exam affects student performance.”

John R. Waters, Peggy Van Meter, William Perrotti, Salvatore Drogo, and Richard J. Cyr

Department of Biology, The Pennsylvania State University, University Park Pennsylvania; Department of educational Psychology, The Pennsylvania State University, University Park Pennsylvania; Life Science Department, Mohawk

Valley Community College, Utica, New York

Peer reviewed

CONCLUSION

“Students in the human clay sculpting treatment group performed best on human anatomy questions and students in the cat dissection treatment group performed better on cat anatomy questions (independent of the use of handouts) ... Human representations are most effective when teaching the human muscular system.”

COMMENTS ON THE ACADEMIC RESEARCH (CONT)

3 **Clay modeling as a method to learn human muscles: A community college study."**

Howard K. Motoike, Robyn L. O'Kane, Erez Lenchner, Carol Haspel

Peer reviewed

CONCLUSION

Testing showed that the group using clay modeling had a significantly better ability to identify the muscles on their human models compared to the same test performed by students who had learned the material using cat dissection. "This study demonstrated that clay modeling is more effective than cat dissection for learning human muscles at the community college level."

4 **"Anatomy in Clay Learning System Testing."**

Dr. Grisseel Cruz-Espailat, M.D., M.P.H.,
Christopher Stabile, Ed.D., Carlos Reyes

Keiser University, Miami, Florida

Peer reviewed

CONCLUSION

"The current study sought to answer the question: Does the administration of the Anatomy in Clay® Learning System technique assist students in better (1) internalizing and (2) retaining a working knowledge of the human muscular and skeletal systems? The results suggest that the Anatomy in Clay® Learning System process was successful in positively influencing student learning in these areas."

5 **"Teaching Hip and Shoulder Joints by Building the Anatomy in Clay® Learning System."**

Steve Kish, Associate Professor

Zane State University, Zanesville, Ohio

CONCLUSION

"The Anatomy in Clay® Learning System, developed by Zahourek Systems Inc., provides an alternative to cadaver dissections for the study of anatomy..."

COMMENTS ON THE ACADEMIC RESEARCH (CONT)

6 “Learning outcomes and student-perceived value of clay modeling and cat dissection in undergraduate human anatomy and physiology.”

Ellen DeHoff, Krista L Clark., Karthikeyan Meganathan

Science and Health Department, University of Cincinnati Clermont College, Batavia, Ohio

Peer reviewed

CONCLUSION

“Students who modeled anatomic structures in clay scored significantly higher on low-order questions related to peripheral nerves; scores were comparable between groups for high-order questions on peripheral nerves and for questions on muscles and blood vessels.” Evaluative responses from students indicated that clay modeling was preferred by students on a subjective basis regarding the value of their experience.

7 “Improving understanding of human anatomy using haptic learning through clay modeling.”

Vered Arbel, Adam Rudd, Emily Muszczynski, Meghan Grove, Jane Marone, Mary Lou Bariether

Department of Kinesiology and Nutrition

University of Illinois-Chicago

REPORT

The outcome of the study is in statistical review.

DISCUSSION

The VARK assessment tool for student learning categorizes learning preferences as: Visual (V), Auditory (A), Read/write (R), or Kinesthetic (K). Recognition of anatomy students’ learning preferences may improve teaching effectiveness. Studies suggest that hands-on (haptic) learning using clay modeling helps students learn anatomy. However, it is unknown if this technique is equally effective for students in each VARK category. Therefore, the purpose of the study was to determine if implementing haptic learning through clay modeling would improve student learning and if the degree of improvement varied between learning styles. Forty undergraduate students enrolled in a cadaver dissection course, completed a pre-assessment exam, and a validated learning style survey. Students were divided into three groups: Group A participated in a weekly one-hour class using clay models (Maniken® models); Group B participated in a weekly one-hour class answering written questions on anatomical relationships; Group C (control) studied independently.

All groups completed a post-assessment exam at the end of the course and a retention exam one semester later. We hypothesized that groups A and B would perform better than group C on the post-assessment and retention exams and that K-learners in the haptic group would perform the best overall.

COMMENTS ON THE ACADEMIC RESEARCH (CONT)

8 “Maniken® System Human Anatomy in Clay® Learning System.”

Richard Lord

Journal of College Science Teaching

CONCLUSION

The plastic model and non-hardening modeling clay used as a teaching kit is a “more diverse teaching style” for the human musculoskeletal system and is “especially helpful for kinesthetic learners.”

9 “Anatomy in Clay® Learning System.”

Chris Monsour, Department Editor

Classroom Materials Reviews

CONCLUSION

“The versatility of the kit makes it useful for teachers at any level ... the lessons are frameworks, not cookbook, and allow for creativity, which is not always the case in other classroom kits.

The product is economical because it is reusable. I have found that many times it is difficult for students to grasp the concepts of the traditional Latin and Greek terms. Having the students point out the terminology on the model and on their own body created a connection that a worksheet cannot provide.” “Overall, the Anatomy in Clay® Learning System is one of the best investments I have made for my A&P classroom ... The models really enabled my students to see that their own bodies can be the best learning resource for anatomy.”

10 “The Zoologik™ System of Kinesthetic Anatomy in Clay® Learning System.”

Science Activities

CONCLUSION

“The Zoologik™ System of Kinesthetic Anatomy in Clay® Learning System helps students learn anatomy more effectively and retain what they learn longer. The system is based on the principle that students incorporate knowledge better through experiential or kinesthetic learning. What really reinforces the learning of anatomy is when students work with plasticine clay to shape their body structures.”

COMMENTS ON THE ACADEMIC RESEARCH (CONT)

11 “Hands-on Learning using Anatomy in Clay Manikens”

Kelley Whisler

Kansas Career & Technical Education Convention

Friends University

CONCLUSION

“The results of this study indicate that adding the hands-on work with the Manikens to four Anatomy & Physiology Units (Bones, Muscles, Heart and Circulatory System) did improve student learning of anatomy in those units.”