Engaging students in forensic anthropology learning: A comprehensive pedagogical model

Min Zhang[1]*, **Emmanuel Atta-Obeng[2]**

[1]*Department of Criminal Justice, College of Behavioral and Social Sciences, Coppin State University, 2500 W. North Avenue, Baltimore, Maryland 21216 *corresponding author: mzhang@coppin.edu*
[2]*Department of Natural Sciences, College of Arts & Sciences, and Education, Coppin State University, 2500 W. North Avenue, Baltimore, Maryland 21216*

Abstract: Forensic anthropology is a popular course in forensic or anthropological disciplines. Many institutions offer forensic anthropology courses to prepare students to continue their education, pursue careers, or improve their knowledge in related fields. However, the pedagogical models of this course vary widely among programs. Knowledge in forensic anthropology and practical abilities are necessary for students to pursue employment in the field. A single pedagogical style, like the lecture technique, results in learning outcomes that lack practical skills; the lab-dominated pedagogy restricts the role of theoretical knowledge in this topic. Therefore, there is a need to develop an integrated pedagogical model that engages students in the learning of forensic nthropology. This article describes a comprehensive forensic anthropology pedagogical model comprising several modules. The work herein provides detailed information on this model for delivering experiential forensic anthropology education.

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Keywords: forensic anthropology, pedagogical model, learning outcomes, evaluation

Introduction

Forensic anthropology is a sub-discipline of forensic science. It is an applied field of biological anthropology that utilizes the science, methods and techniques of biological anthropology, related knowledge, and experience to help solve forensic problems such as personal identification and circumstances surrounding death (1). Forensic anthropologists specifically examine unidentified skeleton remains or other conditioned bones and tissues to ascertain whether they are human or not, examine biological profile (2), estimate postmortem interval (PMI) and provide opinions regarding the circumstances surrounding death (3). Investigations involving deaths, missing persons, cold cases, and many other types of cases benefit greatly from the application of forensic anthropology.

A range of degree programs offer courses in forensic anthropology with the goal of preparing students to advance their education, seek employment, or broaden their knowledge in related fields. There are significant differences in the pedagogical models used in this course between programs, such as the blended in-person lecture and lab format (4), online lecture format (5), and in-person lecture format (6). The disparities in pedagogical models are evident. To our best knowledge, there is yet no reference descriptive pedagogical model in forensic anthropology. Given the popularity of forensic anthropology education, there is an urgent need to develop an integrated pedagogical model that engages students in the learning of forensic anthropology. This paper describes a comprehensive pedagogical model to fulfill the above gap and provides detailed information on this model, to offer educational experiences in forensic anthropology.

Methods

Syllabi Collection, Review and Analysis

Twenty undergraduate Forensic Anthropology course syllabi used in the last seven years in twenty different institutions in the United States were collected via the institutions' open source and peer sharing with legitimate permission. The syllabi were reviewed and analyzed based on variables including credit hours, teaching format, textbook recommendation, virtual forensic anthropology platform/database adoption, and assessments.

Curriculum Design

The syllabi analysis result, course goal setting, and strategies for students to achieve learning outcomes were considered in the curriculum design of a comprehensive pedagogical model. The Carnegie Unit contact hours recommendation (7) was used in this model.

Teaching and Evaluation

The authors' institution's Spring 2022 Forensic Anthropology course was taught using the pedagogical model. The effectiveness of this model and the learning outcomes of the students were assessed through students'

evaluation, student feedback, and peer comments. Peer and student evaluations of the course were conducted using the authors' institutional evaluation criteria. Students' showcase of their learning in this course was submitted to the professional conference for external peer feedback.

Results

The disparities are evident in reviewed undergraduate Forensic Anthropology syllabi (**FIGURE 1**).
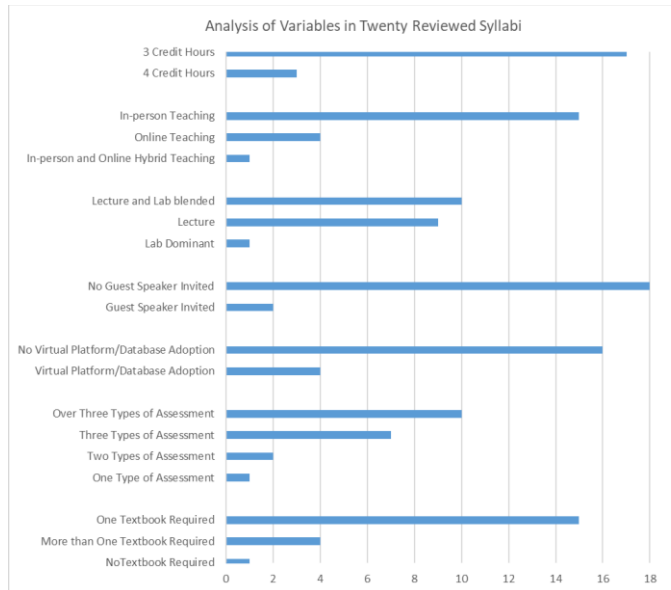

FIGURE 1 Analysis of variables in reviewed syllabi. The variables include course credit hours, interaction format (online or in-person), instruction type (lecture or lab), guest speaker invitation, virtual platform/database adoption, types of assessment and textbook requirement.

The curriculum was designed with lectures, practical exercises, professional conversation and lecture by a guest speaker, learning through virtual platforms and databases, and case studies. For instruction, a required textbook (2) was used. Over the course of a 15-week semester, the instructor and students met for 2.5 hours of instruction time per week. The class met twice a week for eighty minutes each time; if an extended hour-long activity was planned to accommodate the student's learning needs, that activity took up the entire week's allotted instructional time.

The topics covered in the lecture module and the interaction hours on each are listed in **TABLE 1**.

TABLE 1 *Forensic anthropology lecture topics and instructional time.*

Lecture topics	Instructional time
Introduction to Forensic Anthropology	1.25 hours
Human Osteology and Odontology	2.5 hours
Skeletal Examination and Documentation	1.25 hours
Medicolegal Significance	1.25 hours
Forensic Taphonomy and Forensic Archeology	2.5 hours
Scene Processing Method, Processing and Preparing Remains	1.25 hours
Biological Profile (Age, Sex, Ancestry and Stature) Estimation	5 hours
Individual Skeletal Variation	1.25 hours
Analysis of Skeletal Trauma and Personal Identification	1.25 hours
Total	17.5 hours

There were four hands-on activity sessions as shown in **TABLE 2** to complement the corresponding lectures.

TABLE 2 *Hands-on activities and instructional time.*

Hands-on activities	Instructional time
Students' osteology and odontology activities	2.5 hours
Skeletal examination and documentation practice	5 hours
Mock scene processing	5 hours
Use online auxiliary tools to estimate biological profiles (virtual platforms and databases module)	5 hours
Total	17.5 hours

As a guest lecturer, a field researcher was invited to discuss with the students his thoughts on the relationship between forensic botany and anthropology. Students showed great interest in this session, and they had a professional discussion about the topic, real-world

problems, their interests in research, and future career prospects with the guest speaker.

Using internet auxiliary tools to estimate biological profiles activity in **TABLE 2,** the virtual platforms and databases module was presented in person. The recommended auxiliary tools and their functions in biological profile estimation are shown in **TABLE 3**.

TABLE 3 *Online auxiliary tools and their functions.*

Auxiliary Tools	URL	Function
Macromorpho-scopic Databank	http://macromorphoscopic.com/links/	Ancestry estimation
(hu)MANid	https://anthropologyapps.shinyapps.io/humanid/	Ancestry estimation
Osteoware	https://www.dropbox.com/s/zxbhl88q8vb4qfn/Osteoware%20240-37.zip?dl=0	Sex and age estimation
SAMS	https://osteomics.com/SAMS/	Sub-adult age estimation
The London Atlas	http://www.ibossolutions.com/qmul/v3/	Sub-adult age estimation
Anthropomotron	https://keithcchan.com/professional/anthropomotron	Stature estimation

The authors' institutional Urban Garden served as the site for the outdoor project module. The plastic skeleton teaching model was used in this project (**FIGURE 2** and **FIGURE 3**).

FIGURE 2 Outdoor Project. A student using a metal detector to locate metallic items such as coins, a soda can and jewelry (items not shown) in this mock burial site. Photo by Min Zhang.

FIGURE 3 Outdoor Project. The mock burial site was recovered. Photo by Min Zhang.

During the semester, students provided positive feedback regarding their engaged learning. An internal peer who was invited by the authors to observe the teaching also provided positive feedback on teaching innovation.

The modes of assessment were 4 types including class participation/discussion, weekly assignments, midterm exam and final project. The results of the assessment are shown in **TABLE** 4.

The 60th annual meeting of the Academy of Criminal Justice Sciences (ACJS) accepted a student showcase on Mock Scene Processing (**FIGURE 4**) and gave it positive feedback from external peers.

TABLE 4 *Students Assessment.*

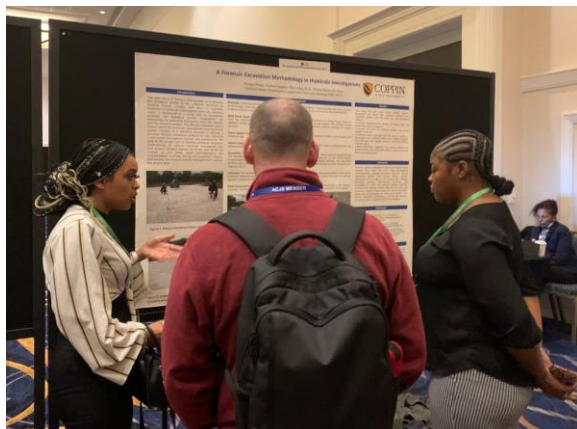| Modes of Assessment	Weighted Average
Class Participation/Discussion	83.8%
Weekly Assignments	81%
Midterm Exam	92.7%
Final Project	95%

FIGURE 4 *Students presented the mock scene processing practicum at ACJS annual meeting in March 2023. The poster showcase acceptance by ACJS suggests positive feedback by external peers. Left: Nydiera Vaughan 24'; right: Morgan Pettus 23'.   Photo by Min Zhang.*

As a practical discipline, forensic anthropology demands that students obtain both theoretical knowledge and hands-on experience in the field (8). While lab-dominated instruction lacking adequate theoretical knowledge teaching hours does not fulfill our undergraduate-level course requirements, lecture-oriented instruction alone has certain limitations when it comes to assisting students in achieving practical learning outcomes. The lecture and hands-on activity modules were proportionately scheduled to complement each other (**TABLE** 1 and **TABLE 2)** to support students in achieving learning outcomes. This was done based on the analysis of the disparities of the existing curricula (**FIGURE 1**), considering contact hours for a three-credit course (7) and recommended students' learning outcomes in forensic education (8). The outdoor project in this model (**FIGURE 2** and **FIGURE 3**) assessed students' theoretical understanding of the material and practical application of their skills. Our proposed model balanced an appropriate blend of lecture and lab instruction format, according to the weighted average student assessment results (**TABLE 4**).

Even though this model allowed students to work on practical projects, the real world is very different from the simulations. Students were able to envision the real world, enhance their perceptual knowledge, and explore their career interests in forensic anthropology with the inspiration from the guest speaker's lecture and professional conversation. Researchers in forensic anthropology stress the value of case studies in developing theories and evaluating hypotheses (9). Case studies are frequently employed in forensic science education to demonstrate how a theory or concept is applied to actual circumstances (10). In forensic anthropology, case studies are also thought to be an important teaching tool (2). Therefore, once students have mastered the fundamental theoretical concepts and practical abilities, the case study module becomes a crucial component of their forensic anthropology coursework.

Virtual platforms and databases are auxiliary tools in biological profile estimation in contemporary forensic anthropology (11). These databases and platforms were created in accordance with research findings derived from a substantial amount of data from actual cases, and their function is to link concepts and knowledge students acquire from lectures with data-approved online tools. Due to the widespread use of virtual platforms and databases in investigations, forensic anthropology education today cannot ignore their importance (12). These platforms serve as open supplementary resources to expert experience-based biological profile estimation, much like the sources mentioned in Table 3. If funding for teaching forensic anthropology courses is adequate, it is advised to use statistics-based software, such as Fordisc (13), to complete the learning of virtual platforms and databases.

The aim of this comprehensive pedagogical model is to assist students in achieving the expected learning outcomes while engaging them in the study of forensic anthropology. The evaluations by students and internal peer, external peer feedback, and student assessment all indicated that this is a suitable model for teaching forensic anthropology in our capacity. There are possible implementation challenges in adapting this model, such as the capacity of the institution's facilities and access to different sources. We advocate a shared resource platform that includes institutions, field teams, research laboratories, archaeology and other resources in the region. It is expected that under the shared platform, forensic anthropology teaching, research, and practice can benefit each other to greatly improve this discipline.

Acknowledgments

Finally, we express our gratitude to Ms. London Beckett for her help in organizing the course materials.

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