



Can formative assessments pave the way for summative success?

Correlating anatomy clinical integration laboratories with examination performance

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Introduction

Background Problem

Cadaver-based anatomy education remains essential but faces high content demands, limited physical and personnel resources, and a continually condensed timeline.^{1,2}

Clinical Integration Laboratories at OUWB

OUWB's M1 Anatomical Foundations of Clinical Practice (AFCP) **Clinical Integration Laboratories (CILs) incorporate student-led discussions, formative vignette-style assessment, and donor structure identification.**

- CILs promote active learning, connect anatomy to clinical practice, and prepare students for summative assessments.
- Pedagogical research supports active learning strategies like CILs for better retention, engagement, and application.³
- Despite formal positive student feedback, the quantitative relationship between CIL performance and summative exam scores is unknown.

Purpose

- This innovation utilizes the iClicker audience response system to collect data during active CILs to determine the statistical relationship between CIL scores and AFCP exam performance.
- Findings will offer data-driven insights into cadaver-based teaching under time and resource constraints.

Hypothesis

CIL scores will positively correlate with AFCP exam performance, particularly in CIL-related items.

Objectives

1. Introduce a CIL data collection method compliant with the laboratory's ban on personal electronics (e.g., smartphones), while privately capturing student-level performance.
2. For each of the 6 CILs, determine whether CIL score correlates with:
 - a. Written examination score
 - b. Written examination sub-scores mapped to CIL cases
 - c. Practical examination scores
 - d. Practical examination sub-scores mapped to CIL cases

Approach/Process

- At CILs, small groups (n=12 students) rotate through six case-based stations in the OUWB anatomy lab, answering a multiple-choice clinical vignette, discussing answers, and identifying structures on unfamiliar donors.
- *Addressing Objective 1:* In Fall 2025, students will use assigned iClickers (Macmillan Learning, New York, NY) to answer vignette questions individually (Figure 1).
- AFCP course director will export individual iClicker responses (n=125) to Excel (Microsoft Corp, Redmond, WA) for each CIL.



Image generated by the authors using ChatGPT-4 (Open AI, San Francisco, CA) on April 2, 2025.

Figure 1. Novel data collection method at CIL

During a CIL station, the student facilitator (right) will guide the team through a clinical case on the monitor. Other students (left) will use iClickers to respond to a case-related multiple-choice question. The team's anonymous aggregate responses are displayed for discussion about differing answer choices. After reviewing the correct answer together, the team identifies relevant anatomical structures on the station's donor relating to the clinical scenario. Teams rotate through the stations every 14 minutes.

Evaluation Methods

- CILs for a given unit and their associated exams, are presented as timeline in Figure 2.
- Two variables will be analyzed each exam:
 - **Exam score:** overall performance on that exam
 - **Sub-score:** performance on CIL-related exam content
- Course director will match CIL iClicker scores to the appropriate **exam scores** and **sub-scores**, and de-identify and import data into SPSS (IBM, Armonk, NY).
- *Addressing Objective 2:* Pearson correlations ($\alpha=0.05$) will be used to determine whether CIL scores are correlated with **exam scores** and with **exam sub-scores**.

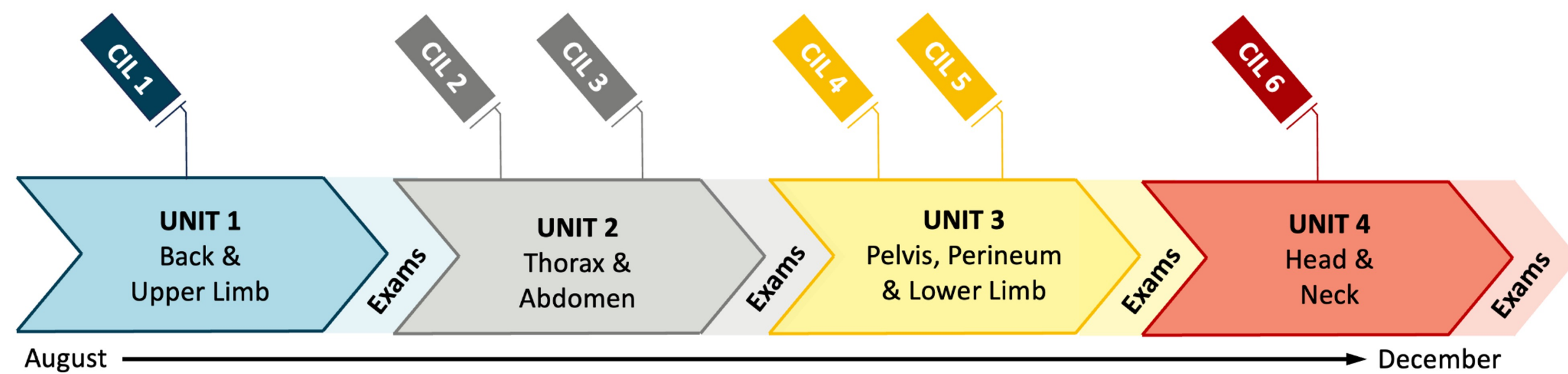


Figure 2. 2025 Data collection timeline.

The Anatomical Foundations of Clinical Practice curriculum is divided into four discrete units, each culminating in two exams: a written exam and a practical (laboratory) exam. Each unit lasts approximately four to five weeks and includes one to two clinical integration laboratories (CILs).

Intended Outcomes

It is intended that CIL scores will be significantly and positively correlated with **examination scores** and **sub-scores** mapped to CIL cases.

Discussion

Challenges and Solutions

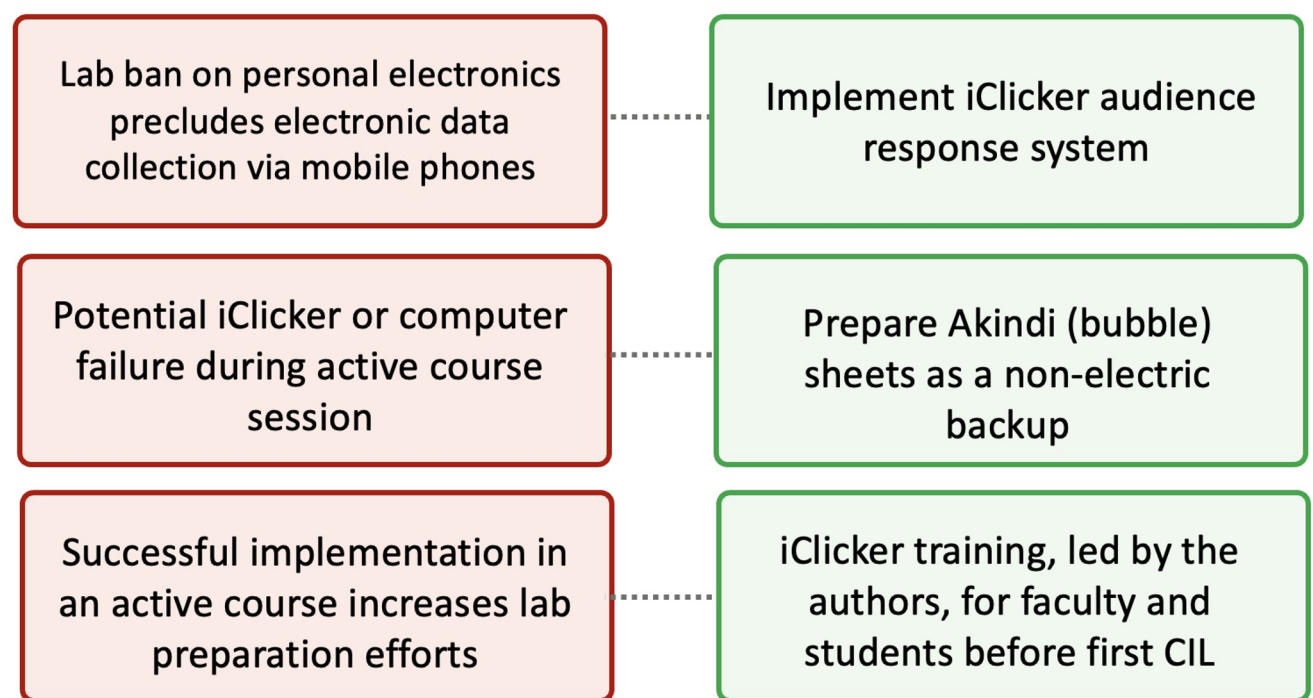


Figure 3. Challenges and solutions

Challenges encountered (left) matched to solutions (right)

Limitations

Small sample size (n=125) limits statistical power and generalizability.

Application

The project exemplifies feasible methods for educators aiming to:

- offer electronic student performance data collection method in technology-restricted labs for any educator.
- enable private data collection without learning environment disruption.
- use existing course data—no added burden or separate study for students, and individual-level exam data authentically reflects student effort and performance.

Future Studies

- Multi-institutional studies to assess the broader impact of CIL-style learning across diverse medical school curricula and students.
- Examine the impact of CIL-type formative assessments on students at different stages of medical education to understand their influence on learning and development.⁴

References

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