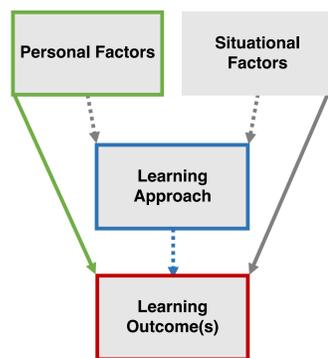


Introduction

Several indices have been investigated for their accuracy as predictive metrics of students' performance in anatomy courses. These metrics are important because they allow us to evaluate the effectiveness of curricular changes and interventions aimed at improving student learning outcomes. Both student approaches to learning and visuospatial ability have been shown to be predictive of learning outcome achievement, but their relative predictive strength has yet to be investigated.



Visuospatial Ability (VA) refers to an individual's ability to identify spatial relationships between objects and mentally rotate them in three dimensions.

Student Approach to Learning (SAL) is a framework that characterizes the depth with which students interact with course content within the context of a specific learning environment.

Adaptation of The "3P" Model of Teaching and Learning (Biggs, 2001)

Objectives

1. Evaluate **VA** and **SAL** as individual predictors of student's performance in anatomy courses.
2. Compare the predictive strengths of **VA** and **SAL**.

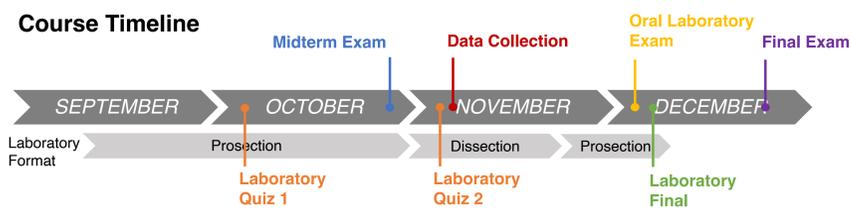
Course Design

Clinical Human Musculoskeletal Anatomy (ANAT 315)

Course Overview: The regional human gross anatomy of the skeleton, joints, muscles and neurovascular structures of the body as it relates to physical and occupational therapists and kinesiologists.

- "Flipped classroom" lecture format (2 hours/week)
- Dissection and prosection-based laboratories (2 hours/week)

Course Timeline



Learner Assessment Scheme



Methods

Undergraduate students in ANAT 315 were surveyed to collect demographic data, SAL scores, and scores. Academic performance was quantified using student grades on laboratory-based assessments in the course.

Questionnaire

Demographic Questions

Age, gender identity, and program of study were collected as demographic control variables

The Mental Rotations Test

The test contained 20 questions, each consisting of a criterion figure, two correct alternatives, and two incorrect figures. Subjects were instructed to identify the two correct alternatives that match up perfectly with the criterion image for one point.



Criterion Figure

Example adapted from the Revised Vandenberg and Kuse Mental Rotations Test (Peters, 1995)

The Revised 2-factor Study Process Questions

The Revised 2-factor Study Process Questionnaire had participants report their attitudes toward studying and learning in human anatomy using 20 Likert-type items.

1. I felt that virtually any topic could be highly interesting once I got into it.
2. I found most new topics interesting and often spent extra time trying to obtain more information about them.
3. I did not find the course very interesting so I kept my work to the minimum.
4. I learned some things by rote, going over and over them until I knew them by heart even if I did not understand them.

Example of four questions from the Revised 2-factor Study Process Questionnaire (Biggs, 2001)

Performance Data and Statistical Analysis

Grades

Grades on Laboratory-based assessments were averaged together and used as the dependent variable.

Multiple Linear Regression

A multiple linear regression model was used to assess deep and surface approach to learning scores and VA as covariates that influence grades, while controlling for age, gender identity, and program of study.

Results

Participants: Total n = 133; 78.2% female; average years of age = 19.45, *SD* = ±1.03. The participants were students enrolled in kinesiology (56.4%), physical therapy (20.3%), occupational therapy (20.3%), and other (3.0%) programs.

	β	SE_{β}	<i>P</i>
Constant	33.76	20.39	0.100
VA	0.477	0.191	0.014
DA	0.537	0.162	0.001
SA	-0.162	0.189	0.393
Age	1.356	0.951	0.156
Gender identity	0.847	2.386	0.723
Program of study	-3.448	1.168	0.004

Note: β = unstandardized coefficient; SE_{β} = standard error; *P* = significance; bolded values indicate significant influence at $P \leq 0.05$.

Discussion

VA and DA had significant positive correlations with grades, indicating that they can independently predict performance on laboratory-based assessments in human anatomy.

A one-point increase on the deep approach scale was slightly more beneficial than the same point-increase on the Mental Rotations Test. DA was a stronger predictor than VA; however, the advantage was minimal (+0.06%).

Both metrics should be used to evaluate teaching innovations!

Future Directions

- ☐ Evaluate **VA**, **DA** scores, and **SA** scores covariates that influence grades on written and oral assessments in the course.
- 🔍 Investigate the relationship between **SAL** and the time taken to complete the Mental Rotations Test in the questionnaire.
- 🖥️ Apply this model of assessment (using both SAL and VA) to improve quantitative evaluation of recent curricular changes and innovations (e.g., remote and blended learning during the COVID-19 pandemic, use of mixed reality for the integration of medical imaging and cadaveric dissection, etc.).

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