Two heads are better than one: solving movement-related problems collaboratively

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Course/Context
Undergraduate Biomechanics class (KINE 4327)
Class status: Juniors and seniors
Majors: Pre Allied Health disciplines and Exercise Science
The common threads between these majors are:
1. Enhancement of movement performance
2. Injury management and prevention

Therefore, understanding the mechanics of movement (biomechanics) is essential

Question
It’s been reported that Employer priorities for college learning outcomes are problem solving, critical thinking, and analytical reasoning (Hart Research Associates, 2013). Therefore, can collaborative assignments facilitate movement-related problem solving?

First High Impact Practice Implementation

Collaborative in-class assignments
Sample problem:
How might you adapt a bilateral leg raise exercise for a sexagenarian (mass = 159 lbs.; leg length = 0.76 m) with sarcopenia?
Assume knee joint is midpoint between the ankle and anterior superior iliac spine

Instructions:
1. Time the movement and calculate the respective angular kinematics.
2. Explain why the adapted exercise might feel easier than the standard form (knees extended) using numerical data. Hint: \( I = \text{moment of inertia} = m r^2 \)
3. What’s the magnitude of the force required to maintain the rectilinear motion of the toes? Hint: \( F = \frac{mv^2}{r} \)

Presentation of results (public show of knowledge)
Group representatives are selected by the instructor, and they present their findings to the class. Then they address questions from both the instructors and their peers.

Relevance
Understanding this specific problem would equip students to effectively design and adapt movement-related interventions.

Second High Impact Practice Implementation

Final class project collaboration
Individual motion analysis projects were replaced with collaborative ones

Project description
Students film an expert and a novice perform a movement skill, e.g., golf swing

Using biomechanics software (Dartfish), students break movement into phases with appropriate anatomical and mechanical analyses.

Outcomes/discussion

Collaborative in-class assignments:
1. Increased class average on exams compared to previous class; however there may have been confounds, including students’ prior knowledge
2. Increased student engagement as evidenced by the comments I overheard students direct at their peers. These include, “I did what you told me to do;” “we forgot to convert units…;” “we were right.”

Collaborative motion analysis project:
1. The mean score for students who worked with a partner (14.30 ± 2.8 points) was higher than those who did not (10.25 ± 5.0 points). Relatedly, the median score for students who worked with a partner (15 points) was higher than those who did not (9 points).

Conclusion
Collaborative assignments in a Biomechanics class appear to have value. While it cannot be concluded that these assignments were directly responsible for the observed increases in student scores, sharing of knowledge was evident between students.

References