

# Effect of Workgroup Members' Prior Knowledge on Individuals' Final Grade

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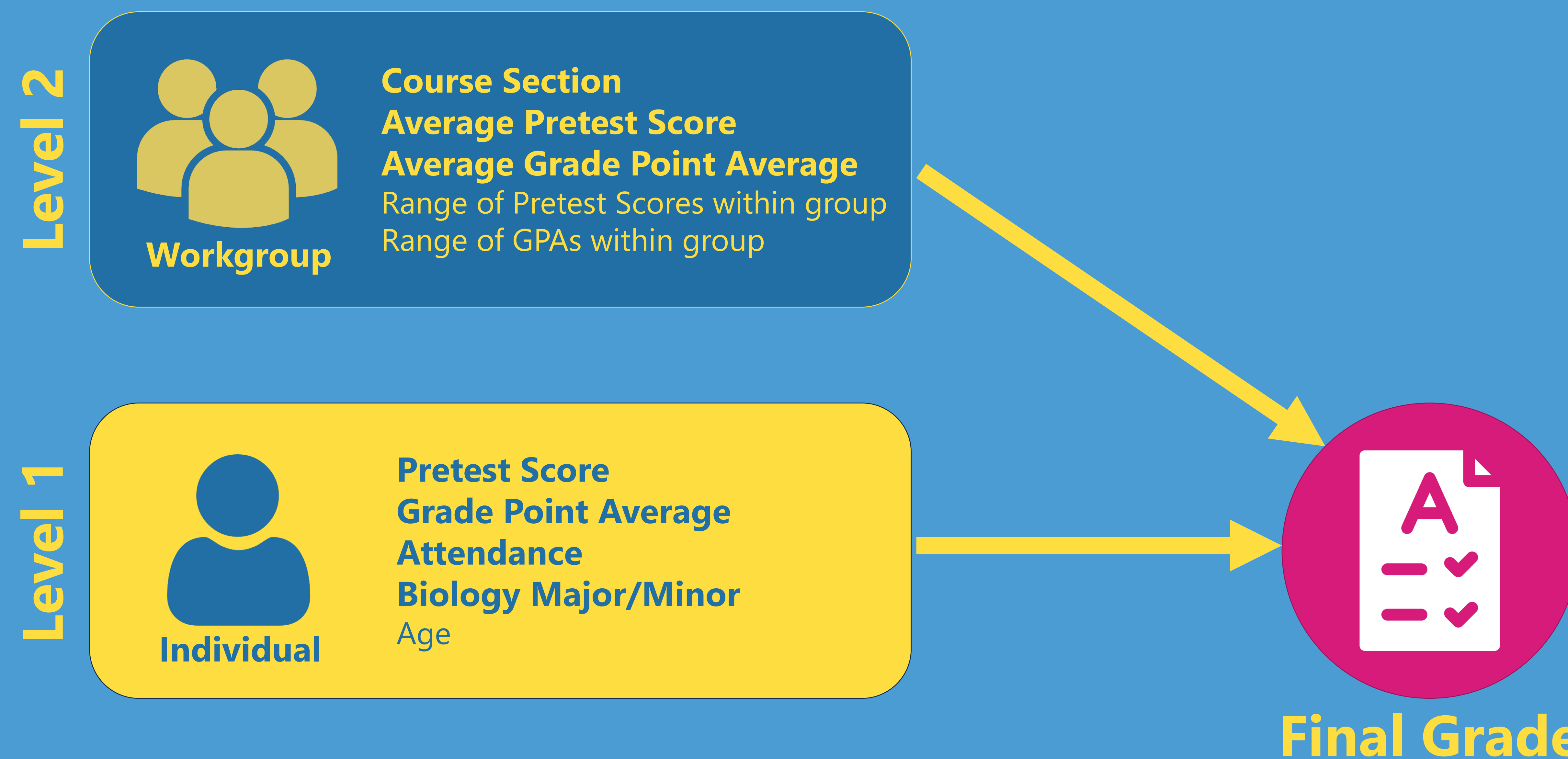
## INTRO

- Active and collaborative learning pedagogies in STEM courses have been shown to be effective at increasing student engagement and achievement.
- Undergraduate students bring a wide range of prior academic experience and content knowledge to their introductory science courses.
- Higher levels of prior academic success and content knowledge are often predictive of success in subsequent courses (e.g., final grade).
- Although the integration of small, collaborative groups in STEM course curriculums is not uncommon, less research has been done on the effects of group members' prior knowledge on individual outcomes.
- Using data from a two sections of a high-enrollment, blended format introductory biology course that utilized active learning pedagogies and permanently assigned small groups for in-class discussion and activities, we evaluated the relationship between the academic characteristics of workgroups and the final grades of their group members.

## METHODS

- Collected data from 156 students nested in 64 small, randomly assigned workgroups (i.e., 36 pairs, 28 groups of three).
- A multi-level fixed-effects regression model (MLM) was used to predict final grade.
  - At Level 1 (individual), we entered the group-mean centered variables of age, grade point average (GPA), and pretest score, along with percentage of classes attended and binomial marker for biology majors/minors.
  - The Level 2 (between group) variables used to model the intercept were the grand-mean centered group averages for GPA, GPA range, pretest scores, and pretest score range as well as a binomial indicator of course section.

Prior knowledge of workgroup members positively predicts the outcomes of individual members above and beyond their own prior knowledge.



## RESULTS

- The intraclass correlation coefficient (ICC) from the resulting model was .063, indicating that 6.3% of the variance in students' final scores were explained by their group membership.
- Although the ICC is small, this finding is still a notable given the groups were randomly assigned.
- Regression estimates for the resulting multi-level model appear in Table 1 (below).
  - Students' personal prior knowledge (i.e., pretest, GPA), level of interest (measured as biology major status), and attendance were statistically significant predictors of final grade.
  - Group prior knowledge (i.e., mean group pretest, mean group GPA) were also statistically significant predictors.

**Table 1**  
*Fixed-Effects Regression of Final Grade*

Effect	Parameter	Fixed Effect
Intercept	$\gamma_{00}$	82.43*** (0.63)
Course Section	$\gamma_{01}$	-2.61** (0.94)
Group Mean Pretest <sup>1</sup>	$\gamma_{02}$	0.13** (0.04)
Group Mean GPA <sup>1</sup>	$\gamma_{03}$	8.10*** (1.53)
Group Pretest Range <sup>1</sup>	$\gamma_{04}$	0.02 (0.03)
Group GPA Range <sup>1</sup>	$\gamma_{05}$	-0.20 (1.09)
Pretest <sup>2</sup>	$\gamma_{10}$	0.10** (0.04)
GPA <sup>2</sup>	$\gamma_{11}$	10.29*** (1.03)
Attendance	$\gamma_{12}$	9.35** (3.34)
Biology Major/Minor	$\gamma_{13}$	2.86** (0.96)
Age <sup>2</sup>	$\gamma_{14}$	-0.45 (0.46)

<sup>1</sup>Grand Mean Centered, <sup>2</sup>Group Mean Centered, \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

## Reduced form of equation:

$$Final\ Grade_{ij} = \gamma_{00} + \gamma_{01}(Section)_j + \gamma_{02}(Grp\ GPA)_j + \gamma_{03}(Grp\ Pre)_j + \gamma_{04}(Grp\ GPA\ Rng)_j + \gamma_{05}(Grp\ Pre\ Rng)_j + \gamma_{10}(GMC\ Pre)_{ij} + \gamma_{11}(GMC\ GPA)_{ij} + \gamma_{12}(Att)_{ij} + \gamma_{13}(BioMaj)_{ij} + \gamma_{14}(GMC\ Age)_{ij} + u_{0j} + r_{ij}$$

## CONCLUSION

- This study's findings suggest that students academically benefit from the opportunity to learn with knowledgeable peers and this benefit to student achievement is over and above the contributions of a student's own prior knowledge of the material or general academic skill level.

## FUTURE WORK

- Future investigations will explore other measures of homogeneity of group members' characteristics and tests of homogeneous v. heterogeneous workgroups on performance.