

Large Scale Peer-Assisted Tutoring, Corequisites, and Other Math Support for Introductory Statistics

R. Adam Molnar

~~Oklahoma State University, USA~~

Oklahoma City Community College, USA

robert.a.molnar@occc.edu

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A Full Stadium

- ❖ Non-calculus non-business introductory statistics is the largest OSU course in mathematical sciences, with over 1,450 students in calendar year 2020.
- ❖ Non-COVID semesters have about 25% DFW rate, with online student DFW rate higher.
- ❖ Substantial financial and political pressure exists to increase pass rates.
- ❖ Is it math ability?
- ❖ Something else?
- ❖ What can we do?



What's the Plan?



Mathematics Diagnostic

- ❖ Previous diagnostics exist (such as Lunsford et al.), but are not open access, so developed new 19 question diagnostic.
- ❖ Creative Commons license!
- ❖ 7 questions about concepts of number.
- ❖ 6 about fractions, decimals, and percentages.
- ❖ 6 about algebra.

Gathering A Sample

- ❖ In first semester 2019, offered extra credit (0.5% of final grade) for students to take diagnostic online.
- ❖ 210 responses of 407 eligible students, 52% rate.
- ❖ Students who completed the assignment had mean GPA 2.93 (4 point scale, Withdrawals = 0).
- ❖ Those who did not had mean GPA 2.07.



A Better Sample



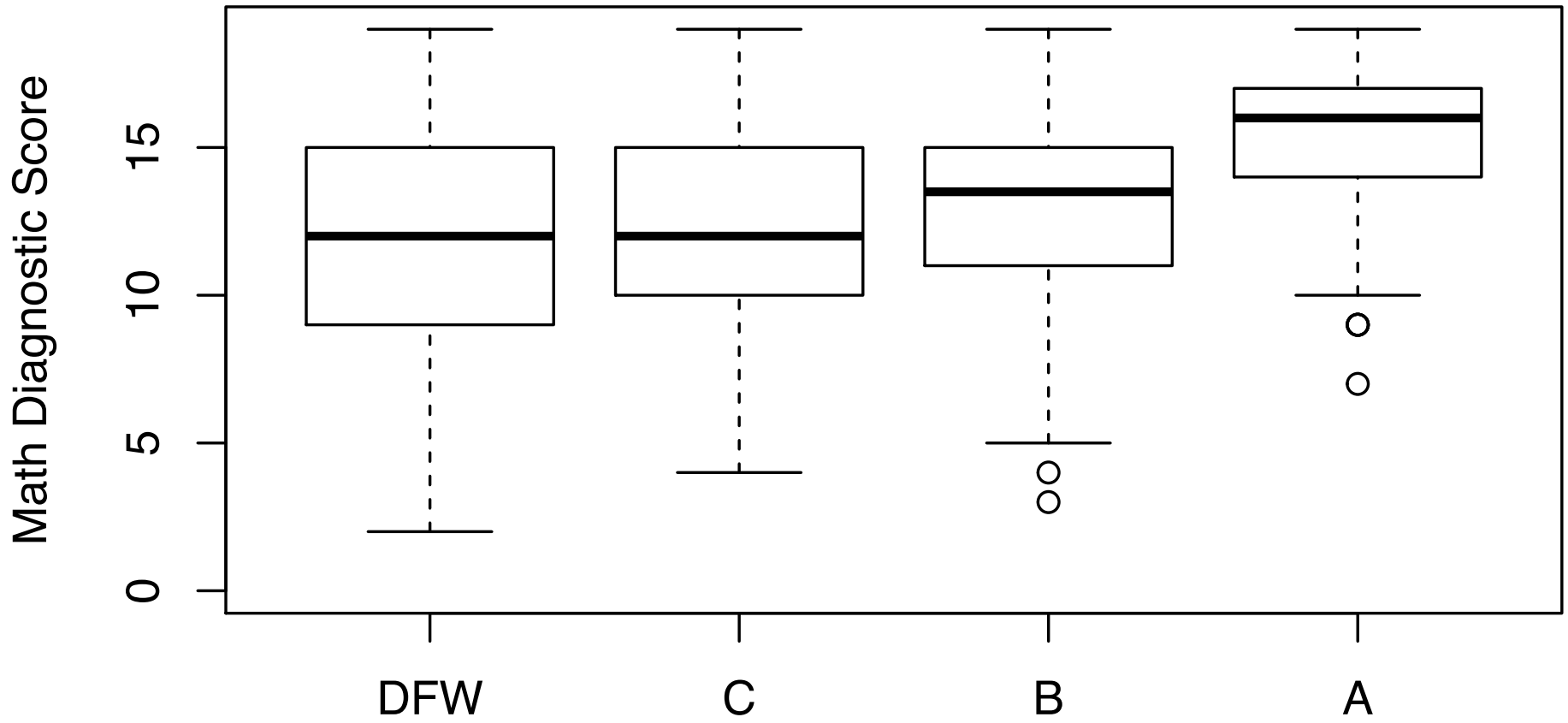
- ❖ In second semester 2019, instructors administered the diagnostic exam during first week of class.
- ❖ 400 valid responses, 88% of eligible students ...
- ❖ Although students who did not complete the diagnostic were still more likely to fail or withdraw, mean GPA 1.88 while participant mean GPA 2.54.

Consent and Sample Limitation

- ❖ Participating students could choose external publication or internal publication.
- ❖ Students who chose external publication in week 1 had higher mean grade at course end.
- ❖ Results in this presentation are from 365 students who gave external consent ...
- ❖ But generalizability is a lurking concern.



Diagnostic Score By Letter Grade
Correlation (Diagnostic, Mark) = 0.40

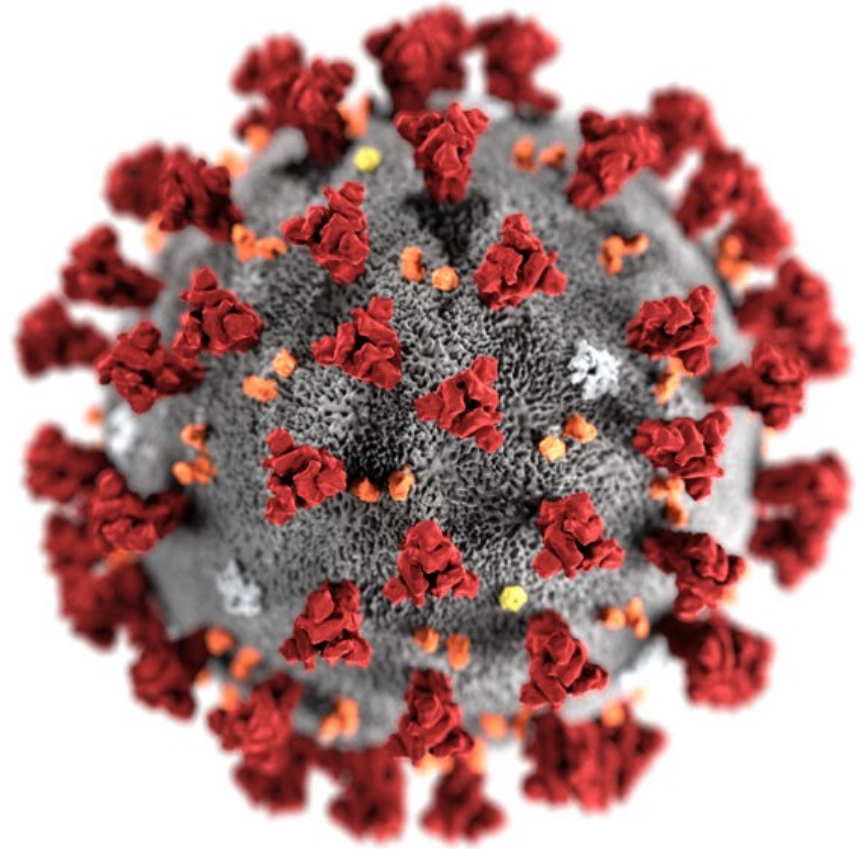


Multivariate Results

- ❖ 14 available predictors of percent mark and success.
- ❖ Overall College GPA is by far the strongest predictor, correlation with statistics grade = 0.58.
- ❖ Model on all other variables has correlation 0.47.
- ❖ Nevertheless, adding diagnostic score and highest college-level math course completed increases predictive correlation to 0.61.

What can we do?

1. Mathematics Support
2. Corequisite
3. Supplemental Peer Tutoring



Corequisite

- ❖ Introduced in 2018, but enrollment is NOT open. It's ALEKS placement 30 – 49.
- ❖ Has same instructor, one additional hour, no separate course number (but \$90 fee).
- ❖ Additional hour covers math review and statistics activity practice.
- ❖ 1 or 2 smaller sections per year, 30 – 50 students.
- ❖ Coreq students have lower diagnostic scores (mean 13.08 vs 13.79).
- ❖ Coreq grades are slightly worse (GPA 2.56 vs 2.876).
- ❖ Nevertheless, this is considered a success, because corequisite increases access.

Supplemental Peer Instruction

- ❖ Undergraduates who previously earned A in class are assigned to sections as peer tutors.
- ❖ Tutors are paid by central office. 😊
- ❖ Tutors are NOT involved in grading.
- ❖ Tutors assist during in-class practice and organize three sessions weekly. Sessions cover examples and activities related to course content.
- ❖ Supplemental sessions are completely optional; instructors do not give extra credit for attendance.

How to Analyze?

- ❖ Only 33% of eligible students attended any supplemental sessions.
- ❖ To analyze relationship, use case-control matching, with students who attended sessions compared against students with similar college GPA, math diagnostic score, and gender.
- ❖ Multiple matching methods used (IPTW, nearest neighbor).



Supplemental Session Results

- ❖ Unmatched, supplemental attendees had a 7% higher average course percentage, 84% over 77%.
- ❖ When compared to matching students, attendees had a statistically significantly better probability of successfully completing the course with grade A, B, or C [p-values from 0.002 to 0.015].
- ❖ Model estimated a 2% - 3% course grade increase.
- ❖ This is association, not causation, must consider motivation.



Summary

- ❖ Past academic performance (college GPA, math completed) is a very strong predictor.
- ❖ Nevertheless, supports such as forced corequisite and optional supplemental peer support have beneficial results.
- ❖ Motivation affects everything.



- ❖ Thank You! Gracias! 감사 합니다!
- ❖ R. Adam Molnar robert.a.molnar@occc.edu
Director of Institutional Effectiveness, OCCC