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

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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!
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