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Finding the Fund: A Workshop on the Howery Teaching Enhancement Fund

2020 Howery Grant Award for:

Advancing Quantitative Reasoning among
First-Generation and Racial/ Ethnic Minority Sociology Students

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Howery-Funded Statistics Tutorial: Program Description

- Goal: To improve numerical literacy, this Howery-funded project incentivized students at our HSI to participate in a research methods/statistics tutorial one month prior to the seminar itself.
- Objective: It was expected that exposure to/ engagement with quantitative course materials *prior* to the class itself would improve students' performance in the class.

Background and Practice Setting

- Social science undergraduates, and sociology majors in particular, find quantitative methods courses both challenging and burdensome
- First-generation and racial/ethnic minority undergraduates are no exception. Difficulties in acquiring numerical skills are compounded by their disadvantaged socioeconomic and culture status.

Social Science Research Methods/ Statistics, Soc 350/ Public Policy 350:
Original Tutorial Intervention:

- Social science research methods, Soc 350/ PbPI 350, at CMSV is largely quantitative. It emphasizes the rudiments of statistical analyses of hypothetical claims.
- The tutorial intervention predicts that exposure to/ engagement with statistical materials in 5 tutorial modules *prior* to the course should result in greater mastery of course materials as reflected in scores on pre and post tutorial intervention exercises, quizzes and exams.

Original Tutorial Intervention Processes

- 22 students in the course were randomized into an experimental group (n=11) and a control group (n=11) and given a baseline methods/statistics exam covering course material.
- In 4 subsequent modules, they were asked to read selections from course texts (e.g., textbook sections on calculating means or an article about coronavirus rates in the New York Times).
- The experimental group then completed an exercise, quiz or exam covering content of readings.
- The controls did not.
- All students who participated in either group received a \$15 per module financial incentive, capped at \$75.

Barriers to Implementation Participation

- Of the 22 students enrolled in the class, only seven of them consented to participate in the tutorial program: 2 experimental group members and 5 controls.
- Three barriers emerged: 1. work and familial obligations, including hospitalizations and deaths; 2. failure to understand the nature of the experiment; 3. resistance (“...if it’s not mandatory I wouldn’t participate.”).
- Moreover, a number of students (n=4) who had enrolled in the class dropped out of the class and other students joined during the add/drop period (n=6), bringing the total number of students to 24 by week 3 of the semester.

Reformulated Tutorial Intervention Processes

- Randomization into new groups was implemented, a new baseline for statistical proficiency was established (i.e., exam time 1) and the tutorial program was reformulated.
- All students took the exam and consented to participate in the experiment.
- A few days later, we uploaded a video to students' online course platform. It was an hour-long explanation of each question on the exam, including why the incorrect answers were incorrect and why the correct answers were correct. Students in the experimental group were offered \$75 to view and study from it.
- For the controls, they too were offered \$75 to view an online video but the controls' video simply encouraged them to keep up their hard work in the class etc. It contained no tutorial material.
- Additional video material covering in class exercises was developed and students incentivized (\$15 a viewing, up to \$75) to explore this tutorial material online, again, with the experimental group receiving content-related material and the controls receiving anodyne encouragement from the professor.

Table 1: Results and Outcomes

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Table 1. Descriptive and Nonparametric Multiple Comparisons of Independent Groups: Kruskal-Wallis and Dunn's Tests

	Group I Controls No Engagement (n=12)	Group II Experimental T1 or T2 Engagement (n=8)	Group III Experimental T1 and T2 Engagement (n=4)
Baseline Variables- Time 1			
Prior semester mean GPA	2.60	2.86	3.57
Significant difference in mean rank Z-score at <.05	I vs. II No	II vs. III No	I vs. III Yes
Percent Senior Class	83%	50%	50%
Significant difference in mean rank Z-score at <.05	I vs. II No	II vs. III No	I vs. III No
Median score first exam (74 total points)	37.5	39.3	43.0
Significant difference in mean rank Z-score at <.05	I vs. II No	II vs. III No	I vs. III No
Outcomes- Time 2			
Median score second exam (95 total points)	51.0	63.8	77.3
Significant difference in mean rank Z-score at <.05	I vs. II Yes	II vs. III No	I vs. III Yes
Median score overall course (479 total points)	193.0	291.0	396.3
Significant difference in mean rank Z-score at <.05	I vs. II Yes	II vs. III No	I vs. III Yes

Results and Outcomes

- For analytic purposes, the two initial groups, experimentals and controls, were divided into two experimental groups and one control group.
- The first experimental group had some exposure to/ engagement with, tutorial material, either as a member of the initial experimental cohort or as a member of the second randomization process (n=8).
- The second experimental group was exposed to/ engaged with tutorial material both prior to the class and during the second wave of the experiment (n=4).
- The control group consisted of students who were not exposed to/ did not engage with any of the tutorial materials outside of class (n=12).
- Baseline scores used to differentiate the groups show that prior to the tutorial intervention the groups did not significantly differ on their exam 1 scores.
- As expected, outcome scores, for both exam 2 and the overall class totals, were significantly higher for the experimental groups compared to the controls.
- The two experimental groups did not significantly differ between themselves with respect to the two outcomes.

Conclusion

- Students who undertook the tutorials (either before the beginning of the course or after the first exam) were more likely than students who did not, to score higher on the second exam, and to score higher overall in class.
- Does this suggest the tutorials were effective in promoting student learning? Perhaps, but there is enough ambiguity in the implementation of the experiment to warrant concern.
- Given these limitations, incentives were essential. Most students would not have done extra work outside of the classroom nor downloaded the video and studied it, unless rewarded for doing so.
- Thanks, again, to Howery funds for making this program-enhancement possible, even if the effectiveness of the tutorials remains somewhat ambiguous.

Future Implementation

- Future tutorial interventions will correct flaws in the current design by: 1. requiring participation in the modules as a part of the course curriculum; 2. developing modules and activities to take place in person, to the extent possible, and after closure of the class roster; 3. controlling course attrition, to the extent possible; 4. gathering background factors to create matched-pairs samples in case randomization fails.
- In the end, we are optimistic that exposure/ engagement enhances outcomes. We simply need to develop and test a more rigorous execution of the program.
- Again, thanks to Howery for providing funds to conduct this program.

Select References

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