School Effects Reinterpreted from the Bottom up

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Poster Abstract

This is a work-in-progress project that involves the design of an agent based model that enables educational researchers to understand school effects as an emergent process: a complex systems view on how hypothetical changes in education policy can bring about various outcomes. I define school effects as associations between school-level variables and student achievement outcomes. This is measured as the percent variation that lies between schools rather than within schools in student achievement outcomes. School-level variables consist of school attributes, which are stable traits, and treatment variables, which can be changed and hence be used as policy levers.

This project contains two parts. The first part involves a statistical analysis on a national survey data from the National Educational Longitudinal Study in the U.S., where student and school information were gathered from 8th, 10th and 12th grades. Using HLM, I examine how much of the variation in student academic achievement is explained by factors specific to school attributes, such as structure and composition, as well as school treatment variables, such as pupil-teacher ratio. I also estimate how much between-school differences account for the variability in student achievement, measured as achievement status and achievement gains. The preliminary results indicate that school level attributes and treatment variables are differentially associated with students' academic achievement gains versus achievement status. In particular, schools' treatment variables seem to matter less than schools' attributes, especially with regards to student achievement gains. This is a little disheartening, as one would hope that changes in such policy levers will have a positive impact on students' average performance over time, regardless of the location, structure, or socio-economic status of the schools.

In response to such findings, and to theorize and better explicate the mechanisms behind school effects, I have been developing a simple agent-based model using NetLogo as the second part of my project. This model uses parameter estimates of treatment and attribute variables from the HLM model. The model also allows for the possibility to include school choice to better emulate reality, particularly the current policy interest in open district enrolments. This computational model aims to illustrate how changes in treatment variables and students' school choice preferences, while accounting for school level attributes, can lead to emergent phenomena that are reflective of or different from the statistical results. Its purpose is be used mostly as a research tool for educational researchers, but also possibly a learning environment that can guide the decision making processes of policy makers, as they attempt to understand and make suggestions for improving the educational system.

Keywords