Kindergarten Based Evaluation of Core Knowledge Schools

David Grissmer- University of Virginia  
Tom White- University of Virginia  
Hank Murrah- Auburn University  
Mark Berends- Notre Dame University  
Michelle Ko- University of Virginia

Abstract

Core Knowledge (CK) is a comprehensive K-8 curriculum for language arts, math, science, social studies, visual arts, and music intended to build knowledge, concepts, and vocabulary systematically from kindergarten to 8th grade leading to substantial progress in reading comprehension (Hirsch, 2006). The primary goal of the study is to conduct a kindergarten-based lottery evaluation of the effects of Core Knowledge charter schools (CK-Charter) on 3rd grade achievement in reading, writing, English and math. The study is an RCT with mixed methods data collected from parents, teachers and individual child testing to enable a more informed understanding and interpretation of the effects and potential causative mechanisms.

The study tracked two cohorts of children (cohort 1 = 891, cohort 2 = 1362) who applied for kindergarten admission in the 2009-2010 or 2010-2011 school years to at least 1 of 14 school lotteries. The families in our study are mainly located in the middle to upper class suburban areas surrounding Denver. However, one of our schools is also an inner city school with over 50% free lunch students. This study was prospective and all lotteries were monitored during the lottery and school decision process. About 60% of applicants lost all lotteries, and about 48% of those winning at least one lottery chose to attend a CK-Charter school. We have matched 3rd grade achievement scores in reading, math, writing and English for 1584 students, or about 70% of those who applied four years earlier to a kindergarten lottery. The response rate for lottery winners was 75%, while the response rate for lottery losers was 67%. The overall and differential attrition meet liberal WWC standards.

The ITT results for single appliers show statistically significant effects for reading (effect size = .19, p < .01) and English (effect size = .20, p < .05), marginally significant for writing (effect size = .13, p < .10) and positive, but insignificant, for math (effect size = .07). The TOT effects using the methodology with two-stage, instrumental variables (Bloom, 1984) show much larger effects for children actually attending a CK-Charter school, although these remain experimental only if “non-compliers” have similar characteristics as compliers. The TOT estimates for reading (effect size = .43, p < .01) and English (effect size = .39, p < .05) are significant, marginally significant for writing (effect size = .29, p < .10), and positive but not significant for math (effect size = .15). About 20% of our sample applied to more than 1 lottery. We utilize the “risk sets” methodology (Abdulkadiro et al, 2009) to make estimates that include both single and multiple applicants and the results are very similar.

We also make school level estimates for each of the 14 lotteries. The school level samples generally lack the power to produce significant effects, but the results suggest the effects are larger for schools in low/middle income neighborhoods than higher income neighborhoods. We have one school with an over 50% free lunch population located in an inner city Denver school district. The school level ITT effects for this school are highly statistically significant in all subjects: Math (effect size = .72, p < .01), Reading (effect size = .99, p < .001), Writing (.72, p < .01) and English (effect size = .97, p < .001). The large effects are striking and suggest that students winning the lottery at these schools have scores that are 25-
30 percentile points higher than their counterparts. These results partly reflect the poor choice of counterfactual schools in this district compared to schools that are in suburban Denver school districts.

Finally, we estimate ITT and TOT effects by gender. **The ITT and TOT results show no significant effects for males, but highly significant effects in all subjects for females**: TOT effects include: reading (effect size = .52, p < .001), English (effect size = .48, p < .01), writing (effect size = .27, p < .05) and math (effect size = .33, p < .05).

We individually tested children in the summer of 3rd grade using measures linked to general knowledge and reading comprehension. The ITT effects for boys are all insignificant, similar to the 3rd grade achievement scores. ITT effects for girls show significant effects for reading (effect size = .35, p < .05), Letter-word ID (effect size = .35, p < .05), social science (effect size = .48, p < .001) and general knowledge (effect size = .36, p < .01). Effects are marginally significant for passage comprehension (effect size = .26, p < .10) and humanities (effect size = .25, p < .10).

The implications for policy include the following:

- The current results at 3rd grade could increase or fade depending on the relative effectiveness of the curriculum at later grades and longer term follow-up is essential.
- Continuing follow-up evidence for impacts of CK-Charter schools may suggest a role for such schools in both suburban and inner city districts throughout the nation.
- This intervention did not raise per-pupil costs from non-charter public schools.
- Nearly all education interventions are directed toward interventions that raise only math, reading or science alone. These results suggest that teaching a broader curriculum that emphasizes building student’s knowledge of the physical, social and cultural world may enable better contextual understanding and motivation to study in all subjects.
- Sixth, the policy significance also is enhanced since the intervention is already “scaled up”.
- The major caveat in the study include the lack of a pre-test that proved infeasible partly due to the difficulty of parental permission when children are not attending school as well as the rapidly changing lottery list as the lottery approached.
- The study cannot definitely separate to what extent the effects are due to the Core Knowledge curriculum or the charter school environment, but future analysis of mixed methods data from child testing, teacher surveys and parents can help inform this question.