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The Promise of Economic-Integration: Examining the Relationships Among School Poverty, Individual Poverty, and Reasoning Skills

Michelle Rogers, Ph.D.
Educational Specialist, Center for Teaching and Learning
Des Moines University
3200 Grand Ave
Des Moines University, 50312
michelle.rogers@dmu.edu

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Abstract

This study examines the relationships between school poverty status, family income status, and reasoning ability for the purpose of understanding the role of school poverty on reasoning skills. Cognitive ability scores of students attending mixed-poverty schools were compared to their counterparts attending institutions with low, high, and extreme poverty. Results showed that students attending economically-integrated schools had similar reasoning skills to those attending schools with low and high poverty. The largest differences were between students attending economically-integrated schools and those enrolled in schools with extreme poverty. Irrespective of school poverty status, individual income status had a strong, significant effect on reasoning skills. In general, those who participated in the federal free-reduced lunch program possessed less advanced reasoning skills than their economically advantaged peers. Research findings have important implications for economic-integration school policies.

Keywords: school poverty, economic integration, reasoning skills

Introduction and Background

With one-fifth of American children living in poverty, many schools are enrolling high numbers of low-income students (Kena et al., 2015). Unfortunately, this enrollment is not equally distributed, but concentrated by residential areas. This is

troubling given the established relationships between high poverty schools and schooling outcomes (Aud et al., 2010; Kena et al., 2015). Research shows that who you go to school with matters. The socioeconomic background of one's peers can have just as much of an impact on educational outcomes as one's own income status (Caldas and Bankston III, 1997; Coleman et. al, 1966; Hoffer & Shagle, 2012; Weiland & Yoshikawa, 2014). The Condition of Education 2010 Report indicated that students attending high poverty schools performed lower than their counterparts on the National Assessment and Educational Progress (NAEP), dropped out of high school at higher rates, and were less likely to pursue an undergraduate education (Aud et al., 2010). Researchers have found similar relationships with individual poverty (Caldas & Bankston III, 1997; Bumgarner & Brooks-Gunn, 2013; Coleman et. al 1966; White et al., 2016).

It is well-known that the peer and individual-level family background have a significant impact on achievement (Anyon, 2014; Coleman et. al, 1966; Paypay, Murnane & Willet, 2013). Coleman concluded in his report, "*Children from a given family background when put in schools of different social compositions will achieve at quite different levels*" (1966, p 22). Past efforts to close the achievement gap and increase diversity have focused on changing up the racial composition of schools via the use of racial integration policies. However, racial-based assignment policies have not panned out quite as well as policy makers would have hoped.

60 years after the *Brown vs. Board of Education* decision to integrate schools for the purpose of equalizing opportunities between poor, minority school districts and more affluent, white districts, American schools are still racially segregated and there are still stark differences between the opportunities some students are afforded versus others (Black, 2012; McUsic, 2004). Part of the reason why the policies have failed can be attributed to race being used as a proxy for a social class issue (Aberger, 2009). General findings from racial integration studies are that equal expenditures per pupil does not equate to equal access to quality education. Hence, funding alone is not sufficient for providing a comparable education to a wealthier school. Rather, poor children tend to perform better when they attend schools with more affluent peers (McUsic, 2004).

The Promise of Economic Integration

In order to combat the effects of poverty, some researchers and policy makers are proposing to economically integrate schools (Black, 2012; Dyson, 2014; Kahlenberg, 2013). The rationale is that by having schools integrate by income, students with a lower economic status will have access to a higher quality education and experience gains in achievement. Research investigating the impact of school poverty on educational outcomes suggests that the integration policy holds promise for mitigating some of the adverse effects associated with poverty (McMillian et al., 2015; Mickelson, Bottia & Lambert, 2015). Most of the research literature regarding this topic has focused on achievement. Like achievement, reasoning skills are important developed cognitive abilities. Being able to reason using words and symbols is crucial for school learning (Lohman, 2012). Reasoning skills are both the essential raw materials and products of the educational process (Snow and

Yalow, 1982) and thus associated with achievement in high school, college, and graduate school (Burton et. al, 2009; Roth et al., 2015; Wood et al., 2015). Likewise, they are predictive of occupational and educational attainment, even after controlling for background and socioeconomic status (Kuncel et. al, 2014;).

Contemporary views on intelligence suggest that IQ is a developed ability that can be improved with more schooling and under favorable circumstances. It would be useful to know if economic integration serves as one of the favorable circumstances associated with higher reasoning skills. Research specifically examining the relationships between individual income status, school economic-integration, and reasoning skills is sparse. Given the important outcomes that reasoning skills are predictive of and the recent consideration for school economic-integration, these are useful relationships to consider. Some important questions are being posed about the efficacy of economic integration. Can this policy mitigate the effects of poverty while benefiting the disadvantaged and more affluent? This study assists in answering this question while contributing to the literature on mixed-income schools in several ways. Using standardization data from the Cognitive Abilities Test Form 7 (CogAT7), I compare: (1) reasoning skills of students attending mixed-poverty schools to those at educational institutions with low-, high-, and extreme - poverty, (2) reasoning skills of economically disadvantaged and advantaged students, and (3) reasoning skills of these students to their peers across all gradations of school poverty.

Purpose of the study

Researchers have devoted considerable attention to the role of school and family poverty status on cognitive abilities (Atkins et al., 2012; Aud et al., 2010; Coleman et al., 1966). Nevertheless, there is still a dearth of empirical literature on this topic within the context of economic integration of schools. With the consideration for mixed-income assignment policies, new questions and concerns are arising that need to be addressed. Questions have primarily centered on achievement outcomes of low-income students attending mixed-poverty schools. Given the important outcomes reasoning skills are predictive of, it would be worthwhile to examine possible differences in cognitive abilities of students attending mixed-income schools in comparison to those attending other types of schools. Furthermore, it is important to understand the effect of income status on reasoning skills, within the context of school poverty. The purpose of this study is to examine the relationships between school poverty, family income status, and reasoning skills by answering the following questions:

1. *How do reasoning skills of low-income students compare to those of middle-class students?*
2. *How do reasoning skills of students attending mixed-poverty schools compare those enrolled in poor and wealthier schools?*
3. *How do reasoning skills of low-income and middle-class students attending mixed-poverty schools compare to skills of students enrolled in poor and wealthier schools?*

Methods

Because students within school buildings are more similar than a random sample of students, a linear mixed model was used. School poverty, free-reduced lunch status, and an interaction of both were analyzed as fixed effects. School buildings were analyzed as random effects. Because of the small sample sizes for the schools with mixed-poverty, high poverty, and extreme poverty, bootstrapping was utilized to acquire more precise standard errors. 1000 samples were drawn using a random stratified sampling technique in SPSS.

Sampling

For this study, I have cross-sectional national standardization data taken from the 2010 CogAT7 administration (Lohman, 2012). Although the CogAT data was collected a little more than five years ago, it still reflects the state of school poverty in the United States. The 2015 Condition of Education report showed that approximately 1 in 5 children are still living in poverty, and this percentage has not changed substantially since 2010 (Kena et al., 2015). The original standardization was randomly stratified at the major unit level (school building) by region of the country, district-size, and school socioeconomic status. Public and private schools that were randomly selected according to each stratum were asked to participate in the standardization. Grades K-12 were sampled for the standardization. I have chosen to focus on public K-8 schools, since poverty is most pronounced at the elementary level (Aud et al., 2010). After filtering out private schools and buildings at the secondary level, and removing schools with fewer than 50 individual cases, a total of 180 schools were left in the sample.

In the standardization data, schools were originally classified into three socioeconomic status (SES) categories based on their Title I status: Non–Title I, Non–School-wide Title I, and School-wide Title I. Title I is financial assistance provided by the federal government to meet the needs of "at-risk" students. There are two types of Title I designation: school-wide and non-school-wide. A school that is eligible for school-wide Title I assistance must have at least 40% or more of its students qualifying for free or reduced lunch (FRL). Non-school wide Title I assistance is provided to particular students who are deemed to be "at risk." An example might be individuals who require special services as a result of a neurological, physical or cognitive impairment. For the purposes of this study, Title I status was not used to define building poverty because of the large proportion of schools that receive this financial assistance irrespective of their poverty concentration. Figure 1 summarizes the percentage of public schools receiving Title I funding by poverty concentration status (Aud et al., 2010).

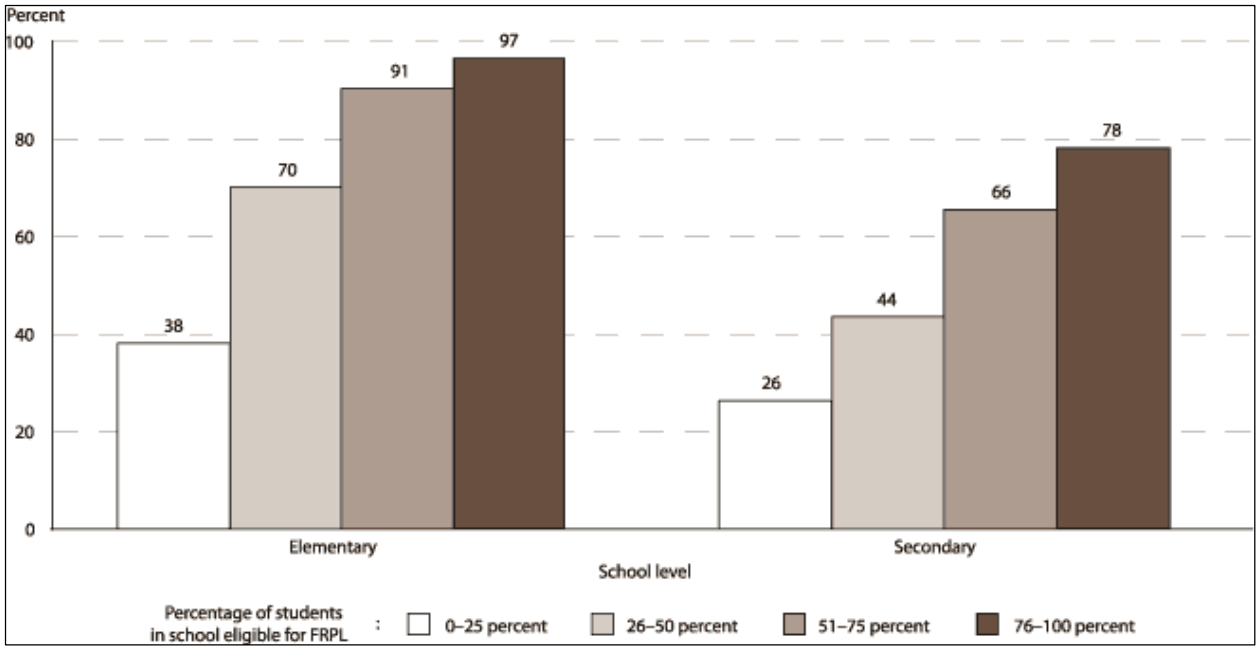


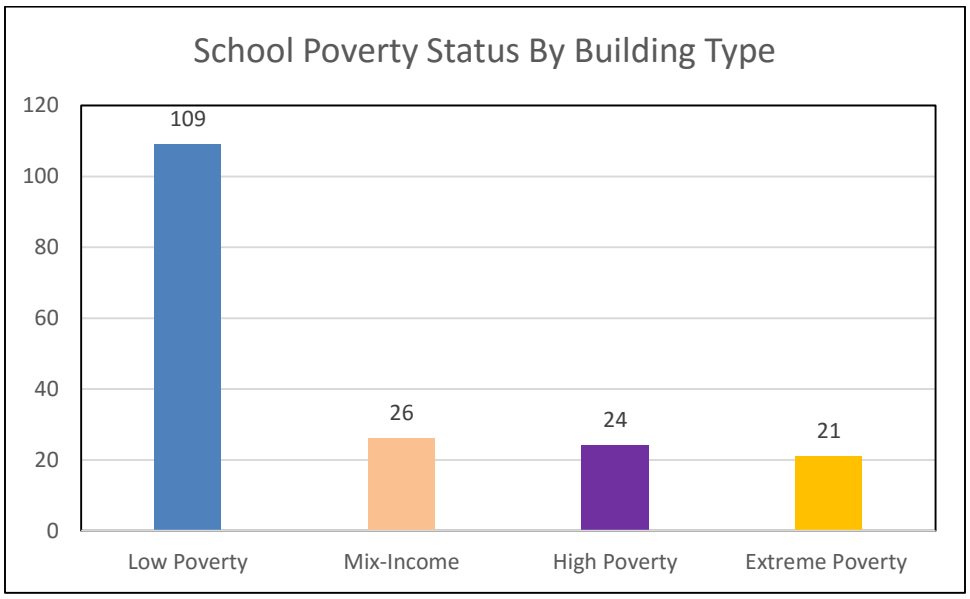
Figure 1 Percentage of Schools Receiving Title I Funding by School Poverty Status
2010 Condition of Education Report

In this study, school poverty was defined by the proportion of students eligible for FRL. While some researchers argue that FRL status is an imperfect measure of poverty (Harwell and Lebeau, 2010), it is often the only measure used by administrators for school re-assignment. Since this study investigates outcomes associated with economic integration of schools, it is appropriate to use FRL status.

Independent variables

The independent variables in this analysis included measures of individual and school level poverty. FRL eligibility (those with incomes below 130% of the poverty line) defined the individual and school poverty indices. Students who were coded in the data set as receiving FRL were classified as low-income.

Since FRL status is often the only variable available to measure income, it is common practice to aggregate the data to estimate school poverty. The proportion of students that qualified for free or reduced lunch was calculated for each school. Schools were identified as "*low-poverty*" if less than 26% of the individual cases qualified for free and reduced lunch, "*mixed-income*" if 26 to 50% qualified, "*high poverty*" if 51%-75% qualified, and "*extreme*" if 76% or higher qualified. These indices were selected because they are common criteria for school poverty (Nicholson et al., 2014). 180 schools were included in the sample with 109 (59.2%) classified as low poverty, 26 (14.1%) classified as mixed-income, 24 (13.0%) classified as high poverty, and 21 (11.4%) classified as extreme poverty.



Dependent variables

Because abilities may be unevenly developed, composite and battery scores from the CogAT7 were examined. Accordingly, the dependent variables in this analysis were measures of general, nonverbal, quantitative, and verbal reasoning skills.

Instrument

The CogAT7 was designed to assess general, nonverbal, quantitative, and verbal reasoning using a total of nine subtests. Each battery consists of three subtests. Paper folding, figural matrices, and figure classification make up the nonverbal component of the test. Number series, number analogies and number puzzles

measure quantitative reasoning skills. Verbal classification, verbal analogies, and sentence completion define the verbal reasoning construct. The general reasoning is a composite of the nonverbal, quantitative, and verbal scores. All items underwent an extensive try out process that entailed screening for difficulty, discrimination, fairness, and differential item functioning. For each battery, K-R 20 reliabilities were above .9. The CogAT7 reports scores based on an individual's age, or Standard Age Scores (SAS). The SAS compares an individual to other children of the same age. The highest SAS that a child can score on the CogAT7 is 160. The typical SAS is a 100. Scores typically vary anywhere from +/- 16 points away from the mean (Lohman, 2010).

Results

Table 1 compares the estimated marginal general, nonverbal, quantitative and verbal reasoning scores by individual income status. Pairwise comparisons were made between low-income and middle-class students. Students who qualified for the FRL program were less proficient in reasoning skills than their counterparts. Individuals ineligible for FRL had average reasoning skills. Low-income students were more similar in quantitative and nonverbal reasoning skills to middle-class students than they were in general and verbal reasoning abilities. Medium effect sizes were typically found, with values ranging from -.27 to -.41 (Cohen, 1988). This is equivalent to a 4-6 SAS point difference between the two groups. All pairwise comparisons between economically advantaged and disadvantaged students were significant at the $p<.05$ level.

Table 1: Free-Reduced Lunch Status Effect on Reasoning Skills

	General Reasoning	Nonverbal Reasoning	Quantitative Reasoning	Verbal Reasoning
FRL Students	94.76(.41)	96.20(.37)	96.28 (.37)	94.29(.39)
Non-FRL Students	100.36(.22)	100.50(.22)	100.09(.34)	100.11(.36)
Effect Size (*d*)	-.39	-0.30	-0.27	-0.41

()=Standard Error
All pairwise comparisons were significant at $p<.05$

Table 2 summarizes the reasoning proficiency of students attending schools with varying levels of poverty. Pairwise comparisons were made between students enrolled in economically-integrated and other types of schools. Students attending integrated schools had average reasoning skills and performed most similarly to those enrolled in low-poverty schools. The difference in proficiency was generally less than a point. Those attending high poverty schools tended to perform less well than those at integrated schools. Typically there was a 2-3 SAS point difference between high and mixed-poverty schools. All pairwise comparisons were statistically significant, with effect sizes ranging from -.14 to -.21. All pairwise

comparisons between students attending integrated schools and those at schools with extreme poverty were significant at the p<.05 level. Effect sizes ranged between medium and large by Cohen's standards. There was a 5-7 SAS point difference between schools with extreme and mixed poverty.

Table 2: School Poverty Effect on Reasoning Skills

	General Reasoning	**Effect Size**	**Nonverbal Reasoning**	**Effect Size**	**Quantitative Reasoning**	**Effect Size**	**Verbal Reasoning**	**Effect Size**
Low Poverty Schools (0-25% FRL students)	100.35(.25)	0.04	100.55(.25)	0.02	100.97(.23)	0.03	100.08(.25)	0.03
Mixed-Poverty Schools (26-50% FRL students)	99.76(.31)	__	100.13(.26)	__	100.41 (.31)	__	99.57(.32)	__
High Poverty Schools (51-75% FRL Students)	96.98(.34)*	-0.19	98.08(.35)	-0.14	98.04(.32)*	-0.16	96.52(.34)*	-0.21
Extreme Poverty Schools (76-100% FRL Students)	92.67(.23)*	-0.51	93.94(.94)*	-0.43	95.41(.21)*	-0.36	92.23(.23)*	-0.54
()=Bootstrapped standard error Pairwise comparisons for mixed-income schools P<05*								

The first four rows of table 3 compare reasoning skills of poor students attending economically-integrated schools to poor students enrolled in very poor or wealthy schools. Statistically significant differences in reasoning ability were found between poor students in mixed-poverty schools and poor students in schools with extreme poverty. The largest gap was in verbal proficiency of students attending mixed-poverty schools versus those at institutions with extreme poverty. There was a medium effect found and typically a 2-4 SAS point difference between the two groups. While students in mixed-poverty schools had higher scores than their counterparts, reasoning skills were not that dissimilar from those at low-poverty and high poverty institutions. There was typically no more than a point difference between the two types of schools and small effect sizes were found.

The latter four rows of table 3 summarize the effect of having middle-class status in a mixed-poverty school. With the exception of those attending schools with extreme poverty, middle-class students tended to perform about average on the CogAT7. There were small differences in reasoning skills between middle-class individuals attending schools with mixed-poverty and those attending high or low poverty schools. However, a notable effect was found for middle-class individuals attending schools with extreme poverty. There was a 4-7 SAS point difference between these

individuals at economically-integrated schools and those at educational institutions with extreme poverty.

Table 3: The Interactive Effect of Free-Reduced Lunch and School Poverty Status on Reasoning Skills

	General Reasoning	Effect Size	Nonverbal Reasoning	Effect Size	Quantitative Reasoning	Effect Size	Verbal Reasoning	Effect Size
Students Eligible for Free-Reduced Lunch								
Low Poverty Schools	94.47(.80)	-0.11	96.14(.71)	-0.07	96.10 (.65)	-0.06	94.06(.69)	-0.12
Mixed-Poverty Schools	96.05(.40)	_____	97.26(.46)	___	97.04 (.39)	_____	95.86(.40)	_____
High-Poverty Schools	94.53(.37)	-0.10	96.56(.39)	-0.04	96.32 (.35)	-0.05	94.36(.36)	-0.10
Extreme Poverty Schools	92.30(.24)*	-0.27	93.62(.25)*	-0.25	95.09 (.23)*	-0.14	91.84(.25)*	-0.30
Students Ineligible for FRL Lunch								
Low Poverty Schools	100.45(1.00)	-0.11	100.62(1.03)	-0.08	101.06(.97)	-0.10	100.18 (.97)	-0.11
Mixed-Poverty Schools	102.06(.86)	_____	101.90(.89)	___	102.52(.84)	___	101.86(.82)	___
High-Poverty Schools	100.39(.87)	-0.11	100.64(.87)	-0.09	100.99(.88)	-0.11	100.15(.87)	-0.12
Extreme Poverty Schools	95.83(.76)*	-0.44	96.74(.77)*	-0.36	98.16 (.77)*	-0.31	95.56(.76)*	-0.45

()=Bootstrapped standard error
Pairwise comparison for mixed-income schools
P=.05*

Discussion and Implications

The primary purpose of this study was to examine the relationships between individual income status, school poverty, and reasoning skills with the goal of understanding the impact of economic-school integration on cognitive abilities. Results from this study showed that when students are matched by income status (FRL to FRL; Non-FRL to Non-FRL), those enrolled in mixed-poverty schools reason as well as SES peers attending low-poverty schools. Surprisingly, reasoning skills of students attending mixed-poverty schools were not very dissimilar from those attending high poverty schools. There was a 1-3 SAS point difference between mixed- and high-poverty schools, with effect sizes ranging from -.14 to .-21. One important finding was that regardless of income status, students attending economically integrated schools had noticeably more advanced reasoning abilities than peers enrolled in institutions with extreme poverty. This was important because it suggests that middle-class status alone is not sufficient for eradicating the effects of attending a school with extreme poverty. In this case, it seems that school poverty may have a negative impact that is difficult to overcome. These findings point to the promise of mixed-income schools—particularly for those attending schools with extreme poverty.

Although not an initial question posed by the researcher, an interesting finding emerged about the role of school poverty status in reducing reasoning skill gaps between middle-class and low-income students. There was no conclusive evidence found in this study to substantiate the argument that income-based assignment policies *alone* can help to decrease performance gaps between middle class and low-income students. This is supported by the fact that middle class students had more advanced reasoning skills than low-income students regardless of school poverty status. The results from this study call into question the naïve assumption that simply changing the economic dynamics of a school is sufficient for equalizing the significant differences in non-school experiences of poor and middle-class students.

Limitations

The researcher notes several limitations of this study. Because of the nature of descriptive data, causal inferences about economic integration could not be made. Thus, there is insufficient evidence generated from this study to conclude that implementing an income-assignment policy are sufficient for eradicating the effects of extreme poverty on reasoning skills. Because of the lack of causal inferences, there are other explanations that could account for significant differences between schools with mixed- and extreme poverty. Research literature suggests that schools with extreme poverty may be organized in ways that could pose a hindrance to student learning (Caldas and Bankston III, 1997). Schools with extreme poverty tend to have higher teacher turnover rates and students that leave the district more frequently. Also, aggregated data is less telling about individual cases. There were some schools with extreme poverty that had students who performed just as well

as those at low and mixed-poverty schools. However, this was not generally the case.

Recommendations for Future Research

Based on the findings from this study, there economic integration of schools is a promising initiative, with the potential to assuage some of the negative effects of extreme poverty. However, to fully understand the effects of economic integration school policies, more research is needed. Thus, future work that could help to illuminate this area of study might include strong quasi-experimental studies such as regression-discontinuity designs that have the potential to elicit information about causal effects. Also, mixed-methods research that take into consideration quantitative and qualitative data can increase understanding about important variables operating in the school environment associated with reasoning proficiency.

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