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A Longitudinal Study of Gifted Status and Academic Growth

Summary Points

- High achieving 3rd grade students receiving G/T services demonstrate greater academic growth through 8th grade than their high achieving peers that are not identified as G/T.
- The difference is larger in math than in literacy.
- G/T identification processes and programming may not be developed to increase test scores, but there is a consistent positive relationship with them.
- The findings are not causal, so improvement could be the result of a variety of factors including labeling, peers, parental involvement, etc.
- Districts should continue to support G/T programming for students, and evaluate the benefits of their programming.

This Brief

In this brief, we assess the relationship between being identified as gifted and academic growth among students who scored at or above the 95th percentile on state assessments in third grade. We follow five independent cohorts of these high-achieving students through eighth grade. Using regression analysis controlling for student and district characteristics, we find that students who received gifted services demonstrated statistically significantly greater academic growth on mathematics and literacy achievement across the time period examined than similarly high achieving peers that were not identified as gifted.

Introduction

In 2019-20, more than 473,000 students were enrolled in public schools in Arkansas, and 8% were identified as gifted and talented (Office for Education Policy). The Arkansas Department of Education states that Arkansas mandates all public schools to have a program for gifted and talented students. Selection criteria and services are district-dependent with guidance from the state.

Earlier research on G/T in Arkansas revealed that approximately 30% of the highest achieving 3rd graders in Arkansas are not identified as G/T by 4th grade and that among these high achievers, students from economically disadvantaged backgrounds are 11 percentage points less likely to be identified as G/T than their wealthier peers (Tran et al., 2020).

Arkansas Department of Education defines gifted and talented students as those with "high potential or ability whose learning characteristics and educational needs require qualitatively differentiated educational experiences and/or services." Particularly, the identification of giftedness and talent "will be evidenced through an interaction of above average intellectual ability, task commitment and /or motivation, and creative ability" (Division of Elementary and Secondary Education, n.d.).

Arkansas's G/T identification process follows the tradition that considers giftedness and talents as multifaceted and should be accommodated with appropriate educational services (Renzulli, 1978). The G/T identification process can occur at any grade level from Kindergarten to 12th grade, however, almost all school districts in our sample identify the majority of G/T students by the fourth grade (Tran et al., 2020).

There is no consistently applied standard across the state to identify a student as G/T, and districts have the autonomy to determine whether they will honor the gifted identification of a student transferring from another district. In terms of servicing students that are identified, districts must meet the minimum requirements of services, but there is no consistency in the way in which districts meet the needs of G/T students as local decisions lead to the implementation of services in a wide variety of ways.

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Table 1: Summary Statistics for Five Cohorts of the Top 5% 3rd Grade State Assessment Achievers

	N	% FRL	% SPED	% ELL	% Female	% White	% Black	% Hispanic	% Other Race	% Gifted
Mathematics	8,157	35	2	4	52	83	5	6	5	54
Literacy	7,706	32	1	2	68	83	6	5	5	55

Acknowledging that the identification process or the programming goals of G/T in Arkansas may not be mathematics and literacy achievement focused, using such test scores as outcomes is an important step to understanding if the programs are associated with developing these core aptitudes for schooling (Lohman, 2005).

Study Design

Our study examines the relationship between being identified as gifted and academic growth among students who scored at or above the 95th percentile on state assessments in third grade. We assume that those students who score in the top 5% of state standardized tests are high achievers and can be considered academically gifted and talented (e.g., Lakin & Wai, 2020).

We follow five independent cohorts of these high-achieving students through eighth grade and examine the difference between the longer-term academic performance of the students that were exposed to gifted and talented services compared to similarly high achieving peers that were not identified as gifted.

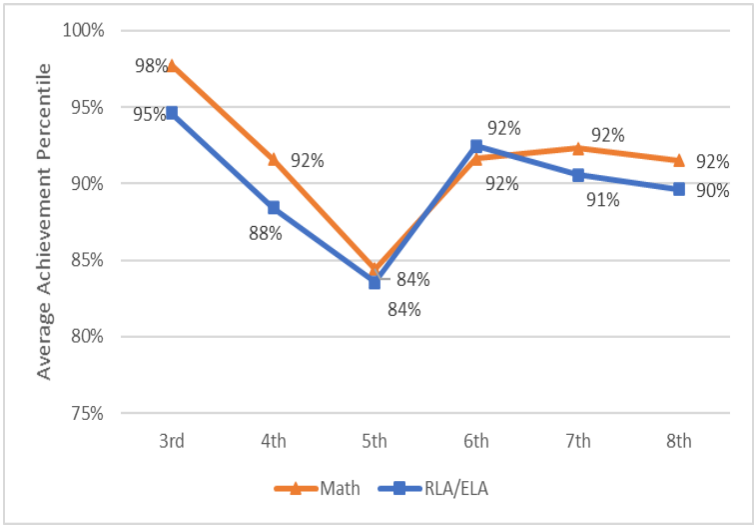
Our data are anonymized student-level assessment and demographic data from the Arkansas Department of Education. Our sample was limited to students that scored in the top 5% in the state on mathematics and, separately, literacy assessments from 3rd grade. All high achieving 3rd grade students who were consistently enrolled in progressive grades and had general Arkansas state assessment scores through 8th grade were retained in the analytical sample.

Our sample includes five independent cohorts of students from 2008-09 through 2017-18. Table 1 reports summary statistics of the five cohorts. Prior research found that about one-third of these highest achieving third grade students are not identified as G/T (Tran et al., 2020). In our analytic sample, 55% of the high achievers are identified as gifted and talented, while 45% are not. The students who are not identified as G/T become our comparison group- a group of similarly high achieving students who did not receive gifted services.

Arkansas students completed three different types of assessments during the time period examined in our study the Arkansas Benchmark Exams, the PARCC assessment, and ACT Aspire assessments. To account for differences in assessment scales, we standardized test scores within grade, subject, and year, to a statewide mean of 1 and a standard deviation of 0 (Z-score). Systematic differences in performance are, however, persistent for our sample under the PARCC assessment.

For ease of interpretation, we translate the z-scores into percentile ranks for the descriptive analysis, and Figure 1 presents the average state percentile in mathematics and literacy for Cohort 5, the most recent group of students included in the study. Students in our sample score, on average, at or above the 95th percentile in both mathematics and literacy in 3rd grade, which is expected given our sample construction. The average percentile rank of students in our sample declined somewhat in 4th grade, which is not unexpected given regression toward the mean for high achieving students. In 5th grade however, which was when the students in this cohort were administered the PARCC assessment, the students demonstrated performance that was 14 and 11 percentage points lower in mathematics and literacy, respectively, compared to 3rd grade performance. While this might be seen as fur-

Figure 1: Mean percentile on mathematics and literacy assessment, by grade, Cohort 5.
Math N =1,688, Literacy N=1,615



ther regression toward the mean, in 6th through 8th grade, the sample returned to an average score of the 90th percentile or higher. Similar patterns were present in the other four cohorts for the year in which PARCC was administered.

Descriptive Trend Analysis

For ease of interpretation, we translate the z-scores into percentile ranks for the descriptive analysis comparing the achievement of high achieving students who were identified G/T, and the similarly high achieving peers who were not identified as G/T. Figure 3 illustrates the average percentile ranks for students who scored in the top 5% on 3rd grade assessments in mathematics. We present the average achievement percentiles through 8th grade for students who received G/T services as well as for those who did not.

As shown in Figure 2, the analytic sample who received G/T services had an average 3rd grade achievement percentile in mathematics of 98 compared to an average of 97 for those students who did not receive G/T services. High percentiles are expected given the sample was limited to students scoring at or above the 95th percentile on the 3rd grade assessments.

Note that the average percentile declines in 4th grade for both G/T and non-G/T students, which is not surprising as such high achieving students generally experience downward regression to the mean. In 5th grade, students took the PARCC exam, and G/T students scored at the 87th percentile on average, while Non-G/T students scored at the 80th percentile on average. These scores represented a decline of 9 and 17 percentage points, respectively, compared to 3rd grade performance. In 6th and 7th grade, G/T students scored at the 95th percentile on average, while Non-G/T students score at the 86th and 88th percentiles, respectively. By 8th grade, G/T students score 7 percentage points higher, on average, than students who performed similarly in 3rd grade mathematics but did not receive G/T services in 4th through 8th grades.

Figure 3 illustrates the average percentile ranks for students who scored in the top 5% on 3rd grade assessments in literacy. As shown here, the analytic sample who received G/T services as well as the students who did not receive G/T services had an average of 3rd grade achievement percentile of 95. This high percentile is consistent with the sample limitation of students scoring at or above the 95th percentile on the 3rd grade literacy assessments. Like the mathematics performance, the average percentile declines in 4th grade for both groups. In 5th grade, students took the PARCC exam, and G/T students scored at the 87th percentile on average, while Non-G/T students scored at the 79th percentile on average. In 6th and 7th grade, G/T students scored at the 93rd percentile on average, while non-G/T students score at the 88th and 87th percentiles, respectively. By 8th grade, G/T students score 6 percentage points higher on average than students who performed the same in 3rd grade Literacy but did not receive G/T services.

Results are similar for other cohorts examined. While we consistently find that students who are provided access to G/T services score relatively higher on later grade assessments than similarly high-achieving students who are not identified as G/T, these are purely descriptive patterns. To determine the unique contribution of G/T programming to academic outcomes, we must look to the multivariate regression analysis that controls for demographic characteristics of students as well as district characteristics.

Figure 2: Mean percentile on mathematics assessment, by grade, Cohort 5 N =1,688.

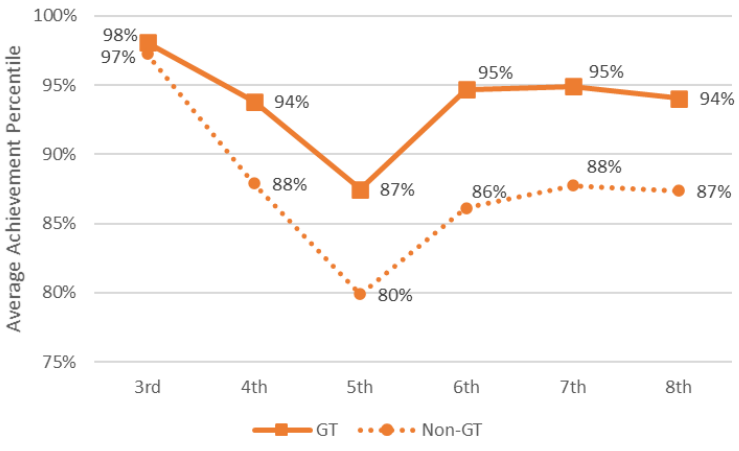


Figure 3: Mean percentile on literacy assessment, by grade, Cohort 5 N=1,615.

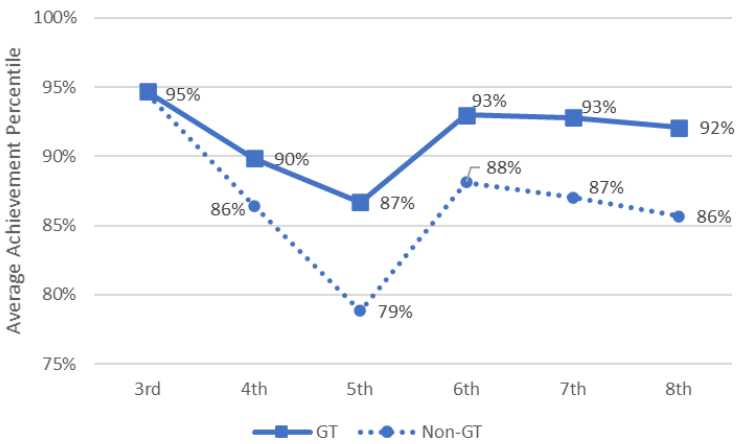


Table 2: OLS regression estimates of the relationship for high-achieving students between gifted status and student achievement on standardized mathematics and literacy assessments

Subject	Cohort	3rd-4th grade	4th-5th grade	5th-6th grade	6th-7th grade	7th-8th grade	N
Mathematics	Cohort 1	0.320***	0.343***	0.175***	0.240***	0.121***	1,596
	Cohort 2	0.340***	0.211***	0.247***	0.169***	N/A	1,660
	Cohort 3	0.316***	0.279***	0.220***	0.090***	0.392***	1,635
	Cohort 4	0.296***	0.283***	0.127***	0.139***	0.142***	1,578
	Cohort 5	0.310***	0.176***	0.256***	0.193***	0.100***	1,688
Literacy	Cohort 1	0.200***	0.125***	0.092***	0.069***	0.040**	1,461
	Cohort 2	0.134***	0.059***	0.096***	0.059***	0.163***	1,460
	Cohort 3	0.163***	0.114***	0.149***	0.097***	0.299***	1,558
	Cohort 4	0.129***	0.056***	0.228***	0.191***	0.173***	1,612
	Cohort 5	0.194***	0.237***	0.238***	0.191***	0.172***	1,615

*** p<0.01, ** p<0.05, * p<0.1

Multivariate Analysis

We used ordinary least squares regressions to examine the relationship between being identified as gifted and achievement in subsequent years for students that scored in the top 5% statewide on their 3rd grade assessments. We control for student characteristics and add district fixed effects to account for possible differences in district policy and program differences. We conduct regressions separately by year, and control for the prior year's assessment score.

Table 2 presents the regression estimates of the relationship between G/T status and student academic achievement measured by standardized state tests, for students in the top 5% on their 3rd grade state assessments controlling for student and district characteristics. Throughout all five cohorts, we consistently found thatidentified as G/T scored statistically significantly higher on standardized state assessments in both mathematics and literacy than their peers that were not identified as G/T.

For example, from 3rd to 4th grade, Cohort 5 students in identified as gifted scored 0.31 SD higher on the 4th grade state standardized mathematics assessment than the Cohort 5 who were not identified as gifted (Table 2). G/T students scored 0.18 SD higher from 4th to 5th grade, and 0.26 SD higher from 5th to 6th grade compared to their non-identified peers. From 6th to 7th grade, G/T students scored 0.19 SD higher, and from 7th to 8th grade, they scored 0.10 SD higher than non-G/T students.

The correlations were somewhat smaller for literacy achievement but were still statistically significant, with students who scored in the top 5% on their 3rd grade literacy assessment and were provided G/T services outpaced their similarly high-achieving but unserviced peers (Table 2). Overall, we found greater gains in mathematics compared to literacy across all cohort analyses. This pattern of academic gain is similar to the national trend in mathematics and literacy achievement (Hasen et al., 2018).

Conclusion

This study looked at academic achievement as a demonstration of one facet of giftedness and talents: developed mathematical and literacy achievement. We note that this approach does not address the creativity aspect of the Renzulli model and thus the associations we pick up may not necessarily capture those aspects of identification and programming. Academic growth and program evaluation is relevant to education stakeholders and policymakers (e.g., Redding and Grissom, in press; Wai & Allen, 2019).

Particularly, we investigated the relationship between G/T status and student academic growth after accounting for various selection bias factors, including prior ability or achievement. We defined a cohort as top performers from their 3rd grade, separately for mathematics and literacy, and longitudinally followed them as they progressed in their schooling.

In Arkansas, there is a strong positive correlation between receiving G/T services and academic achievement. Even though this study does not provide causal inferences, it highlights a consistent positive association between gifted services and longer-term student academic achievement for those students that perform in the top 5% on third grade state assessments of literacy and mathematics. This is in contrast to other studies that have found little to no impacts (e.g., Adelson et al., 2012; Redding and Grissom, in press).

The treatment of gifted education may range from curriculum, peer effects, to teachers' ability to identify the right students who are most likely to benefit from gifted services provided (Lakin, in press), and the motivational or labeling effect of being identified as gifted, in addition to the basic set of individual differences characteristics or aptitudes that selected students may bring (Lubinski & Benbow, 2020). While we cannot identify what aspects of gifted education in Arkansas casually contribute, individually or in combination, to increased student achievement, our findings are valuable because they provide an academic window into what happens from the 3rd through 8th grade to high achieving students across Arkansas who are and are not identified as G/T

We did not look into the black box of gifted and talented services, nor can we specifically address the possible labelling effect. Yet, it seems like the current G/T process in Arkansas is working, as supported by findings from Gentry et al. (2018) and this paper. School districts at the minimum should keep their G/T practices to help high potential and ability students until any causal mechanism is detected. Though this process is working, this does not rule out improvements or expansions to the identification or programming processes that might be useful, especially when thinking about using mathematics and literacy measures as selection tools not just as evaluation tools (e.g., Tran et al., 2020). Additionally, the success of Arkansas, in a sense, may illuminate useful strategies that may lead to more effective educational opportunities for high achieving students in other states and regions.

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