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WHAT CAN WE LEARN ABOUT IMPROVING GIFTED IDENTIFICATION BY STUDYING HOW ACCURATE THE PROCESS IS IN ARKANSAS?

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November 4, 2020

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EXECUTIVE SUMMARY

How might we improve gifted and talented (G/T) identification by learning about the process in Arkansas (AR)? In this study, we examined the accuracy of the gifted identification process in AR by comparing the degree to which students who were academically talented in the top 5% on the 3rd grade state assessment in reading and mathematics in AR were identified for G/T. Across five years of independent cohorts, we replicate the finding that roughly 30% of the students in the top 5% in both reading and mathematics on the 3rd grade state assessment are not identified as G/T. Multivariate models indicate that high achieving students participating in the Federal Free/Reduced Lunch program were 11 percentage points less likely to be identified as G/T. Our study has policy implications for AR's G/T screening strategies, and more broadly for G/T identification of low-income and historically marginalized groups. Using student achievement on the 3rd grade state assessment in reading and mathematics as a 'universal screening' tool could help these students receive the academic services they need to develop their talent to the fullest.

Keywords: gifted education, gifted identification, minority high achievers, policy research, Arkansas

I. Introduction: Why Be Concerned About Gifted Students?

The distinguished gifted education scholar James Gallagher (1994, p. 83) asked the question: Why should we be concerned about gifted and talented students if they are already performing above average? To him, the answer is intertwined with the future of our society. Our scientists, artists, writers, businesspersons, political leaders, and inventors are highly likely to come from the gifted population (Terman & Oden, 1959; Deary et al., 2008; Lubinski et al., 2014; Bernstein et al., 2019; Wai, 2013). Fully developing gifted and talented (G/T) students means moving our society forward to tackle existing and future challenges for all of us (Subotnik et al., 2011).

This paper presents a description of the G/T identification process in Arkansas (AR). We sought to study the G/T screening process in AR to help improve the system to serve these students better. We first start by presenting a literature review of G/T identification in the U.S. and AR. We then sought to identify trends in G/T identification in AR. Finally, we discuss findings, limitations, policy implications, and future research.

History Of Gifted Identification

The idea of gifted identification is not new. Many ancient thinkers and societies paid significant attention to nourishing people with special abilities, especially in academics and physical aspects, which needed to be identified for special attention in the first place. To identify gifted individuals, Plato in *The Republic* suggests an ability-tracking system to bring peace, harmony, and prosperity to his city. Ancient China sought to identify the most able candidates through civil service examinations (Kracke, 1947).

In the U.S., Lewis Terman (1877-1956) was the architect of the Stanford-Binet test and creator of the term “intelligence quotient” (I.Q.), which we still use in our daily conversations. In his career, Terman produced “many valuable insights about cognitive ability and its relationship to academic, vocational, and psychological outcomes” (Subotnik et al., 2011, pp. 4-5). This strand of giftedness pioneered by Terman focuses on the “quality of an individual that needs to be recognized and revealed through some type of cognitive assessment or I.Q. test” (Subotnik et al., 2011, p. 5). The broader purposes of gifted education scholars who seek to use ability or other tests as identification tools is to help match students at their level of current developed abilities (Lohman, 2005, 2006) to educational programming that is aligned with their learning rates. This is essentially the idea of appropriate developmental placement (Lubinski & Benbow, 2000).

Many researchers have conducted research at the national and local levels on exceptionally high academic achievers employing testing as the common denominator in identifying gifted and talented individuals In 1971, Julian Stanley, at John Hopkins University, launched the first large-scale testing of 7th and 8th graders using the mathematics section of the Scholastic Aptitude Test (Assouline & Lupkowski-Shoplik, 2012, p. 46). This would lead to the lifespan developmental longitudinal study known as the Study of Mathmatically Precocious Youth (SMPY). SMPY is still ongoing as one of the oldest large-scale longitudinal studies on gifted education in the U.S.

The Duke University Talent Identification Program (Duke TIP) is another center for nation-wide talent search. Duke TIP uses above-grade-level testing to identify academically talented students. The center was established in 1980 and served “more than 450,000 students in grades four through twelve annually through its Academic Talent Search and educational programs" (Duke TIP) as of 2020, the year in which the talent search was formally ended (Boyd, 2020). Many other university-based talent searches also rely on this cognitive approach, including Northwestern, Johns Hopkins, The University of Iowa, Carnegie Mellon, the University of Washington, California State University, and the Center for Bright Kids in Denver (Assouline & Lupkowski-Shoplik, 2012 p. 48).

GIFTED IDENTIFICATION IN ARKANSAS

In AR, G/T education in public schools was mandated by the AR General Assembly when they passed Act 106 of 1979. The Standards for Accreditation of Arkansas Public Schools adopted by the State Board of Education on February 22, 1984, included a provision that all districts must provide a program for gifted and talented students. In 1983, the School Finance Act provided funding to develop and operate G/T programs. Act 917 of 1995 changed the funding process to local school districts. The most recent standard for G/T education and identification "Gifted and Talented Program Approval Standards" was adopted in 2009. Each school district must use these described standards to screen gifted and talented students and provide them with an approved gifted program.

AR's G/T identification process follows the tradition that looks at giftedness and talents as multifaceted and should be accommodated with appropriate educational services (Renzulli, 1978). The identification process has several stages and can occur at any grade level from Kindergarten to 12th grade. Typically, the students must be nominated for consideration as G/T. This nomination can come from various sources, including teachers, parents, counselors, and students. Next, data must be collected on the nominated students using, per state requirement, at least two objective and two subjective measures with at least one of those being a creativity assessment. A committee consisting of at least five professional educators chaired by a trained specialist in gifted education will decide to place the student in appropriate programs based on the collected information. This committee can be per campus within the districts and/or at the district level with representatives from each campus (Robinson et al., 2014). There is, however, no consistently applied standard to identify a student as G/T. Districts can determine their process, and identification may not remain with the student if they transfer districts. District's gifted program must have an annual evaluation through a state program approval report. (Robinson et al., 2014, p. 351).

In terms of servicing students that are identified, districts must meet the minimum requirements of services. From Kindergarten through 2nd grade, districts generally provide weekly whole-group enrichment classes. Between 3rd and 12th grade, once students are identified as in need of the gifted and talented program, they are required to receive a minimum of 150 minutes a week of G/T services. Those services vary widely across the state, especially in the secondary setting from G/T seminar and Honors courses to AP/Pre-AP/Concurrent classes. However, there is no consistency in how districts meet the needs of G/T students as local decisions lead to the implementation of services in a wide variety of ways. G/T teachers have to pass the Gifted Education Praxis Examination and meet licensing standards for an add-on endorsement/licensure in gifted education (Robinson et al., 2014, p. 351).

THE CURRENT STUDY

Our study focuses explicitly on the identification process of gifted and talented students in AR. This descriptive analysis examines whether academically gifted students in AR are being overlooked in the G/T identification process and, as a result, are not being provided the opportunity to participate in G/T or other programming that is tailored to their needs (Assouline et al., 2015; Lubinski & Benbow, 2000; Subotnik et al., 2011; Wai et al., 2010).

II. DATA AND SAMPLE

In this study, we examine the alignment between students identified G/T in 4th grade and those who performed in the top 5% of the state in both reading and mathematics on their 3rd grade assessments. Although G/T students can be identified at any grade, we find that 96% of AR school districts identify the majority of G/T students by the fall of 4th grade. Students complete the first statewide assessment of reading and mathematics in the spring of their 3rd grade year. 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., Acceleration Institute, 2020; Lakin & Wai, 2020; Wai et al., 2012). At the Acceleration Institute at the Belin-Blank Center for Gifted Education and Talent Development at the University of Iowa, researchers also recommend using the 95th percentile threshold to define "who has mastered the classroom curriculum and needs an intervention that provides more advanced work in a specific subject" (Acceleration Institute, 2020). In this study, we proceed with students who score at or beyond the 95th percentile in state standardized tests, in both mathematics and reading.

We use student 3rd grade reading and math achievement in the years 2013, 2014, 2016, 2017, and 2018 and their 4th grade gifted indicator in the years 2014, 2015, 2017, 2018, and 2019. Note that our analysis does not include the cohort of 4th graders from 2016, as the G/T indicator was not included in the data provided for that year.

The data are anonymized student-level assessment and demographic data from the AR Department of Education. Publicly available district-level characteristics were then matched with student-level data. We included five years of data with a total N of 173,133 students. Table 1 reports summary statistics of the five cohorts. Across our sample, 65% of students are

Free/Reduced Lunch eligible, 49% are female, 12% have Special Education status, 9% are English Language Learners, 61% are White, 20% are Black, 13% are Hispanic, and 12% are gifted and talented.

Within the group of top 5% achievers, 70% of students were identified as G/T by 4th grade, whereas 30% were not. White and female students were overrepresented in the group of students who scored in the top 5% on 3rd grade assessments. In contrast, Black and Hispanic students, as well as those participating in FRL, identified as SPED, or identified as ELL were less likely to be in the high achieving group relative to their share of the 4th grade population.

Table 1: Summary Statistics of Matched 4th Grade Demographics and 3rd Grade Reading and Mathematics Achievement, Full Sample

	State (4th Grade) N=173,133		Top 5% (3rd Grade) N=4,330		Mean Difference
	Mean	*Std*	Mean	*Std*	(Top 5%-State)
FRL	0.653	*0.476*	0.298	*0.458*	-0.354
SPED	0.121	*0.326*	0.016	*0.124*	-0.105
ELL	0.087	*0.282*	0.016	*0.124*	-0.071
Female	0.491	*0.500*	0.578	*0.494*	0.087
White	0.614	*0.487*	0.800	*0.400*	0.185
Black	0.201	*0.401*	0.038	*0.192*	-0.163
Hispanic	0.130	*0.336*	0.067	*0.250*	-0.063
Other race	0.054	*0.226*	0.095	*0.293*	0.041
Gifted	0.122	*0.327*	0.697	*0.459*	0.575

IV. Method

Our method involves two steps. In step 1, we investigated four different groups of students. These groups were:

1. G/T: Students identified as G/T in 4th grade.
2. Top 5%: Students scoring in the top 5% in both reading and mathematics on 3rd grade state assessments.
3. G/T & Top 5%: Students identified G/T in 4th grade who scored in the top 5% on 3rd grade state assessments.
4. G/T but not Top 5%: Students identified G/T in 4th grade but who did not score in the top 5% on 3rd grade state assessments.

We further investigated the same four groups of students, adding more demographic indicators, including Free/Reduced Lunch (FRL) status as a proxy for low socio-economic status (SES), race/ethnicity, Special Education (SPED) status, English Language Learner (ELL) status, and gender. We also controlled for district variables, including region, enrollment, poverty level, and urban indicators. As mentioned, districts vary in their gifted screening process and implementation so controlling for district variables was important for our analysis. With this step, we broadly aimed to explore the G/T identification process' accuracy rate concerning high achieving students from different backgrounds and minority groups.

In step 2, we ran linear probability models to predict the likelihood that students who scored in the top 5% on 3rd grade state assessments would be identified as G/T by 4th grade. In other words, we limited our investigation to only those who scored at and beyond the 95th percentile on 3rd grade standardized assessments and predicted their likelihood of being categorized as G/T controlling for various demographic factors including race/ethnicity, SES, and gender. Considering that G/T identification is largely a matter of district discretion, we also included the school district that the student attends in our models. Our goal was to answer this core question: knowing that these students have demonstrated similar high academic performance, are there any student-related or district-related factors associated to G/T identification?

We run two separate models, one focused on accounting for student level characteristics and the second accounting for both student- and district-level characteristics. In model 1, we include student-level characteristics. In model 2, we add district-level characteristics. The equations—written in the style of econometrics—are as follows:

$$gifted_i = \beta_0 + \beta_1 X_i + \varepsilon_i \ (1)$$

where $gifted$ takes the value one if the student i was identified as G/T in 4th grade and 0 otherwise; X_i is a matrix of student-level covariates;

$$gifted_i = \beta_0 + \beta_1 X_i + \beta_2 D_i + \varepsilon_i \ (2)$$

where ; D_i is a matrix of district-level covariates (Schmidt, 2012, p. 4). District characteristics include district enrollment, levels of poverty, regional locale, and urban locale.

V. FINDINGS

Figure 1 presents an illustration of the relationship between the populations, the top 5% of achievers, and G/T identification for 4th graders in the 2019 cohort.

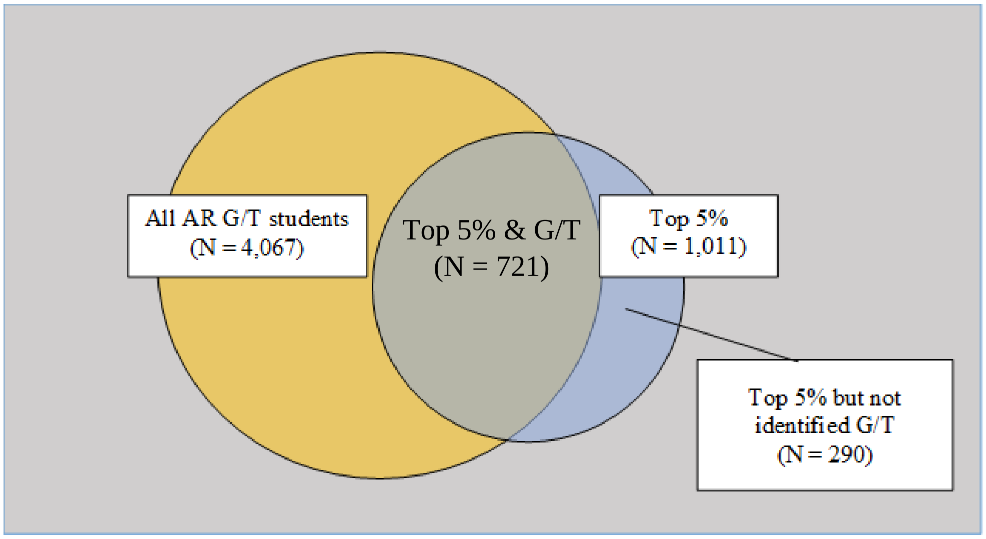

Figure 1. Venn Diagram for 2019 4th Grade G/T Students and Top 5% Students on 2018 3rd Grade Reading and Mathematics Assessments

In the year 2019, 4,067 students were identified as G/T by the 4th grade; 1,011 students scored in the top 5% on both mathematics and reading assessments at the state level. Among these top 5% students, 721 were identified G/T, which equals 71.31%. Among 4,067 G/T students, 3,346 did not score in the top 5% on both assessments, which equals 82.23%. That means only 17.73% of G/T students were academically high achieving on state assessments.

Table 2 presents more detailed information regarding the four groups mentioned in our methodology, using the 2019 4th graders' gifted status matched with their top 5% status in 3rd grade. Column 1 shows the student demographics, including race/ethnicity, FRL status, SPED and ELL status, and gender. Column 2 presents the number of students in each category across the full sample. Column 3 shows the demographic breakdown for G/T students. Similarly, column 4 shows the breakdown for the top 5% of students. Column 5 shows the breakdown for students identified as G/T and in the top 5%. Lastly, column 6 presents G/T students' demographic breakdown who did not score in the top 5% on the state assessment in the 3rd grade. Patterns were consistent and replicated across other years (see Appendix A).

Table 2: Student Demographic Breakdown by G/T Status in 4th Grade and Top 5% Status in 3rd Grade, 2018-2019 Cohort

	State	**G/T**	**Top 5%**	**G/T & Top 5%**	**G/T not Top 5%**
Total N	35,471	4,067	1,011	721	3,346
FRL	23,721	2,003	324	221	1,782
SPED	4,715	99	16	12	87
ELL	2,823	77	1	1	76
Female	17,270	2,160	555	383	1,777
White	21,264	2,768	797	564	2,204
Black	7,069	606	44	34	572
Hispanic	5,004	393	72	48	345
Other race	2,134	300	98	75	225

Next we describe some noteworthy data patterns from Table 2. First, 11.5% of all 4th graders were identified G/T. Among them, almost 70% were White, 15% Black, 10% Hispanic, and 5% are from another race/ethnicity. There were more female G/T students than male G/T students. In addition, 49% of G/T students had FRL status. On the other hand, only 2.9% of all students were in the top 5% on all state assessments in 3rd grade. Among this group of highest achieving students, 79% were White, 4% were Black, 7% were Hispanic, and 10% were another race/ethnicity, 32% participated in the FRL program, and 50% were female. White students and students from backgrounds of higher economic status were more likely to be in the top 5% in both reading and mathematics on state assessments.

The 721 students who were identified G/T and in the top 5% on state assessments accounted for 2% of all students in the 2019 3rd/4th grade cohort. Among them, 78% were White, 5% were Black, 7% Hispanic, 10% from another race, 31% were FRL eligible, 2% were SPED participants, 0.1% were identified as ELL and 53% were female. There were 3,346 students (9.4% of all students in AR) who were identified as G/T in 4th grade but did not score in the top 5% on state assessments in the 3rd grade. Among them, 66% were White, 17% were Black, 10% were Hispanic, 7% were from another race, 53% were FRL eligible, 2.6% SPED status, 2.3% ELL status, and 53% female.

Overall, we observed that about 70% of students who scored in the top 5% in both reading and mathematics on 3rd grade state assessments were identified as G/T. Among the students who were identified as G/T, most of them did not score in the top 5%. The current G/T system in AR appears to overidentify certain students when considering the top 5% achievers in math and reading. On the one hand, we can see many minority students, students from lower SES backgrounds, ELL, and SPED students had the G/T status even though there were fewer of them in the top 5% of math and reading achievement.

In addition, comparing the two columns "G/T & Top 5%" and "G/T not Top 5%," we found that even though only 4.7% of the "G/T & Top 5%" are Black, Black students made up

20.5% in the "G/T not Top 5%" group. Similarly, we saw higher rates in "G/T not Top 5%" for Hispanic, FRL, SPED, and ELL students compared with the "G/T & Top 5%" group.

Table 3: 4th Grade G/T Status Matched 3rd Grade Top 5% Status and District Characteristics in 2019, Cohort 2018-2019

	School District N	Total Students	G/T	Top 5%	G/T & Top 5%	G/T not Top 5%
Region						
Northwest	76	12,728	1,317	466	323	994
Northeast	67	7,081	696	147	98	598
Central	48	10,502	1,453	323	236	1,217
Southwest	38	3,372	401	59	50	351
Southeast	24	1,788	200	16	14	186
Poverty level						
Low level (0; 43%)	25	6,621	695	318	210	485
Lower middle (43%; 52%)	27	5,177	573	175	115	458
Upper middle (52%; 66%)	61	7,441	786	202	145	641
High (66%; 100%)	140	16,232	2,013	316	251	1,762
District Enrollment						
Very small (0; 500)	46	1,292	140	27	16	124
Small (501; 1,000)	87	4,620	515	73	57	458
Medium (1,001; 2,600)	77	8,982	847	193	114	733
Large (2,601; 6000)	31	8,782	801	231	160	641
Very large (>=6001)	12	11,795	1,764	487	374	1,390
Urbanicity						
City	27	9,629	1,289	307	231	1,058
Suburb	17	4,946	503	164	104	399
Town	55	7,566	790	181	133	657
Rural	154	13,330	1,485	359	253	1,232

Table 3 reports the number of total students, G/T students, students in top 5% on both mathematics and reading assessments, students identified G/T and in the top 5%, and students who were identified G/T but not in the top 5%, by geographic region, district enrollment, and district poverty levels for 253 school districts in 2019. Sixty-five percent of the student population was located in the Northwest and Central regions. Consistently, 68% of the G/T identified students, and 78% of the students in the top 5% group lived in these regions. Central AR has the most G/T students whereas Northwest AR has the most students in the top 5%. There were consistent regional differences in identifying the top 5% of students as G/T across the five years examined. For example, in 2019, although 71% of the top 5% scoring students were identified as G/T statewide, regional G/T identification rates for high achieving students ranged from 67% for students in the Northeast to 88% in the state's Southeast region.

While we might be concerned that the top 5% of students may not be identified as G/T due to a lack of available resources (class space, personnel, etc.), we found this was not the case. As presented in Table 2, over 82% of students identified G/T in 4th grade did not demonstrate high academic performance on 3rd grade state assessments. In Northwest AR, 75% of G/T students were not in the top 5%, which reaches a high of 93% for the Southeast. In short, we observe that some regions are more likely to label top 5% students as G/T to accommodate them, but they also over-accommodate the service to students who are not in the top 5%, which does not indicate a lack of available resources.

Second, examining the four groups by district poverty rates provided additional insight. Districts with the highest level of poverty (> 66% FRL) also identified the highest percentage of students as G/T at 12% and were also most likely to identify students in the top 5% as G/T

(79%). Districts in the lowest level of poverty had the highest percentage of students in the top 5% but only identified about 2/3 of those students as G/T.

Third, the largest districts had the highest percentage of students identified G/T (15%) and students identified in the top 5% (4%). Small districts (501-1000 students) and the largest districts identified the highest percentage of top performers as G/T at rates of 78% and 77%, respectively. We again observed the phenomenon of over-identifying G/T students and under-accommodating the top 5% across all district sizes.

Fourth, compared with cities, suburbs, and towns, rural districts enrolled the most students in AR, approximately 38% of all 4th grade students in 2019. Together with school districts in cities, rural school districts had the most G/T students and top 5% students on all state assessments. However, under-accommodating the top 5% of students and over-identifying G/T students is again replicated when examining urbanicity. For example, in 2019, rural school districts had the most G/T students, but 83% of them did not score in the top 5% on all state assessments. The number was 82% for cities, 79% for suburbs, and 83% for towns. Simultaneously, in rural schools, 70% of the top 5% of students were also G/T students. The number was 73% for towns, 63% for suburbs, and 75% for cities. It appears that high achieving students in urban school districts are somewhat more likely to receive G/T services.

In short, from a descriptive analysis of Tables 1, 2, and 3, we identify three core concerns regarding existing in G/T programs in AR. The first concern is that around 30% of students who objectively scored in the top 5% on both state assessments (mathematics and reading) are not identified as G/T by 4th grade. This bright group of students is not provided a service that may help their further talent development. Second, a high percentage of identified G/T students did not demonstrate academic excellence (top 5%) on state assessments. These students may not top benefit from gifted programming as much as the students who have demonstrated academic excellence. Finally, because the percentage of students in the G/T group that did not demonstrate academic excellence was so large, efficiency and adequacy of resource usage and distribution are worth thinking more deeply about. If we could improve the identification process to provide more alignment and/or matching, ensuring that students identified as G/T are in need of the services, resources might be more appropriately allocated.

The student- and district-level characteristics that we examined descriptively in Tables 1, 2, and 3 are often correlated, so we proceeded to step 2. In step 2, we used linear probability models to predict the likelihood of being identified G/T by 4th grade, given that the student was in the top 5% of performers on the 3rd grade state assessments in reading and mathematics. In other words, what student and district characteristics are related to a high performing student being identified as G/T?

Column 1 reports the probability of being identified as G/T in 4th grade for students in the top 5% of state reading and mathematics assessments in 3rd grade controlling for student demographics. We found that students with FRL status were nine percentage points less likely to be identified as G/T even though they are academically advanced ($p < 0.01$). We did not find any differences between SPED, ELL, and female students and peers. Black students in the top 5% were nine percentage points more likely to be identified as G/T than similarly high achieving White students ($p < 0.01$).

Column 2 reports the probability of being identified as G/T in 4th grade for students in the top 5% of state reading and mathematics assessments in 3rd grade, controlling for both student- and district-level characteristics. We found that controlling for district-level factors further reduced the likelihood that high performing FRL students were identified as G/T. In particular, FRL students in the top 5% on 3rd grade assessments were 11 now percentage points less likely to be identified as G/T ($p < 0.01$). Once district characteristics were included in the model, however, there was no significant difference in Black students' likelihood to be identified as G/T. We continued to find no differential identification probabilities among SPED, ELL, female, or students from another race/ethnicity.

When examining the relationship between district size and the likelihood of identifying top 5% students as G/T, we found that small, large, and very large school districts were more likely to identify their top 5% students as G/T compared with medium-sized school districts. Small school districts were seven percentage points more likely ($p < 0.05$), large districts were 11 percentage points more likely ($p < 0.01$), and very large school districts were 21 percentage points more likely ($p < 0.01$) to identify their top 5% students as G/T.

Table 4: Linear Probability Model Prediction of High Achieving 3rd Grade Students Being Identified as G/T in 4th Grade, Full Sample

Variables	**Student-level characteristics (1)**	**Student and District-level characteristics (2)**
FRL	-0.092***	-0.112***
	(0.016)	(0.017)
SPED	-0.049	-0.048
	(0.058)	(0.059)
ELL	0.051	-0.018
	(0.058)	(0.056)
Female	-0.005	-0.001
	(0.014)	(0.014)
Race (base: White)		
Black	0.093***	0.035
	(0.035)	(0.033)
Hispanic	0.004	-0.015
	(0.030)	(0.030)
Other race	0.001	-0.019
	(0.024)	(0.024)
Region (base: Northwest)		
Northeast		0.034
		(0.023)
Central		0.054***
		(0.017)
Southeast		0.152***
		(0.030)
Southwest		0.085*
		(0.052)
Poverty level (base: Upper middle [52%;66% FRL])		
Low level (0%; 43%)		-0.089***
		(0.021)
Lower middle (43%; 52%)		-0.077***
		(0.024)
High (66%;100%)		0.093***
		(0.019)

Table 5 (cont): Linear Probability Model Prediction of High Achieving 3rd Grade Students Being Identified as G/T in 4th Grade, Full Sample

Variables	Student-level characteristics (1)	Student and District-level characteristics (2)
District Enrollment (base: medium [1,001;2,600])		
Very small (0; 500)		-0.050
		(0.050)
Small (501; 1000)		0.067**
		(0.030)
Large (2,601; 6,000)		0.114***
		(0.024)
Very large (>= 6001)		0.206***
		(0.025)
Urbanicity (base: city)		
Suburb		0.030
		(0.025)
Town		0.106***
		(0.027)
Rural		0.030
		(0.021)
Constant	0.721***	0.543***
	(0.020)	(0.035)
Observations	4,330	4,330
R-squared	0.011	0.060

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

When examining the relationship between district size and the likelihood of identifying top 5% students as G/T, we found that small, large, and very large school districts were more likely to identify their top 5% students as G/T compared with medium-sized school districts. Small school districts were seven percentage points more likely ($p < 0.05$), large districts were

11 percentage points more likely ($p < 0.01$), and very large school districts were 21 percentage points more likely ($p < 0.01$) to identify their top 5% students as G/T.

There were significant differences by geographic region in the likelihood of high achieving students being identified as G/T. Compared with Northwest AR, Central AR school districts were five percentage points more likely to identify their top 5% students as G/T ($p < 0.01$). Southeast AR school districts were 15 percentage points more likely ($p < 0.01$), and Southwest AR school districts were eight percentage points more likely ($p < 0.01$). Urbanicity also played a significant role in the likelihood of high achieving students being identified as G/T. Compared with school districts in cities, we found that school districts in towns were 11 percentage points more likely to identify their top 5% as G/T ($p < 0.01$). There was no significant difference in identification likelihood for students in suburbs or rural settings.

The last comparison of identification likelihood by district poverty levels suggests that districts with a higher poverty level were more likely to identify the top 5% of students as G/T. In particular, compared with school districts in the upper-middle level of poverty (52-66% of students FRL), high achieving students in the high-level poverty school districts (> 66% FRL) were nine percentage points more likely to be recognized as G/T ($p < 0.01$). Conversely, high achieving students in school districts with a low level of poverty (0-43%) were nine percentage points less likely to be identified as G/T ($p < 0.01$), and those in lower-middle poverty level districts (43-53% FRL) were eight percentage points less likely to be identified as G/T ($p < 0.01$)

VI. Discussion

We used the 4th grade G/T identification rates of students in the top 5% of achievement on the 3rd grade state assessment in reading and mathematics as a way to identify students who are demonstrating high academic performance. Overall, the findings suggest that 30% of 4th grade students who scored in the top 5% on both reading and mathematics assessments in 3rd grade are not identified as G/T, and so are not receiving services matched to their learning rate intended to support the further academic development of such high achieving students. Conversely, many G/T identified students were not in the top 5% of the achievement distribution. To be clear, we are not arguing that these relatively lower-scoring students identified are not gifted. To some extent, G/T is a somewhat arbitrary designation on various continuums that depend on definitions of various abilities or talents and corresponding cut scores (e.g., McBee & Makel, 2019; Wai & Lakin, 2020). G/T students who are not in the top 5% may have creative giftedness and talents required by AR state's guideline on G/T identification. What is at stake here is that 30% of the students in the right tail of 95th percentile cross all the years we studied are not given G/T services. Had the identification system included this achievement, perhaps we would not have missed a large portion of students who are ready to be developmentally placed at a higher level of curriculum to help develop their talents to the fullest. AR indeed has the resources to accommodate all top 5% students because the total number of all top 5% students is much smaller than the number of all G/T students across the state. At present, then, having such high scoring students get G/T services available in their district would seem appropriate.

Of particular concern is the likelihood that a high achieving student from an economically disadvantaged background will be identified as G/T. Multivariate models indicate that high achieving students participating in the Federal Free/Reduced Lunch program were 11 percentage points less likely to be identified as G/T. This may be due to a lack of teacher, parent, or counselors' likelihood of referring these students for G/T assessments, or other factors. Using student achievement on the 3rd grade state assessment in reading and mathematics as a 'universal screening' tool could help these students receive the academic services they need to develop more optimally.

On a positive note, we found no statistically significant differences in the likelihood of G/T identification of high achieving students by race, gender, or special program status (SPED, ELL). In other words, Free and Reduced Lunch was the only subgroup that we detected a potential bias in the G/T identification process in AR. In addition, although some student groups are less likely to be in the top 5% of achievers, all student groups are represented in the G/T population. We find no consistent pattern between the likelihood of G/T identification of high achieving students and district characteristics, perhaps reflecting the inconsistency in identification processes. Using universal screening in AR, or moving more towards that goal, could potentially increase alignment between district identification, identify more high achieving students from economically disadvantaged backgrounds as G/T, and help address the missing of 30% academically achieving students in the G/T category.

VII. LIMITATIONS

We still face several limitations in our study. First, we limited our analysis to the top 5% of achievers on 3rd grade assessments in reading and mathematics. We assumed the restriction would create two comparable groups within the highest achieving students: those identified G/T by 4th grade those not identified as G/T. We then controlled for a rich set of both student level and district level observable characteristics. However, other unobservable factors may influence students' G/T identification, such as parental involvement, student classroom performance, or teacher quality (Hanushek et al. 2019). In addition, we did not have data to look into the identification of spatially talented students. Researchers have argued that adding spatial reasoning measures to the talent search process will improve the gap in the representation of marginalized students at every level of education (Wai & Lakin, 2020; Lakin & Wai, 2020).

VIII. CONCLUSION

Our study is among the first on the identification accuracy of G/T programs in AR. Our evidence suggests two issues in the current G/T system: the underrepresentation of objectively high achieving but disadvantaged students and considerable variation in students' achievement levels who make it through the G/T identification process. The current G/T system misses a noticeable proportion of objectively gifted math and verbal achievers scoring in the top 5% of the state achievement distribution. That this group of academically talented students is not being identified for G/T services may represent a potential loss both to the students, the state, and beyond. Combining findings from our two analyses, we suggest AR districts consider revising G/T identification procedures, perhaps using the state assessment as a universal screener as a first step. Many individual studies, as well as meta-analyses on G/T programs' effects, have suggested participation in enrichment and advancement programs can be associated with both academic and social development for students (Kulik & Kulik, 1984; Rogers, 1992; Steenbergen-Hu & Moon, 2011; Rogers, 2015). If our goal is to create a system that includes more students deserving to be identified and provided with G/T services, our study provides some strategies and policy recommendations that can help.

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APPENDIX

*Appendix A: Student demographic breakdown by G/T status in 4th grade and top 5% status in 3rd grade, Cohort 2018, 2017, 2015, 2014**

Year 2018	State	G/T	Top 5%	G/T & Top 5%	G/T not Top 5%
Total N	35,854	4,110	1,134	760	3,350
FRL	23,668	1,895	344	219	1,676
SPED	4,374	76	15	11	65
ELL	3,075	122	13	10	112
Female	17,650	2,192	631	424	1,768
White	21,572	2,725	893	604	2,121
Black	7,397	697	39	30	667
Hispanic	4,814	395	84	51	344
Other race	2,071	293	118	75	218
Year 2017	State	G/T	Top 5%	G/T & Top 5%	G/T not Top 5%
Total N	35,864	4,210	865	595	3,615
FRL	23,841	1,958	280	178	1,780
SPED	4,302	73	16	9	64
ELL	3,356	173	25	18	155
Female	17,693	2,281	461	328	1,953
White	21,822	2,896	685	475	2,421
Black	7,225	709	32	24	685
Hispanic	4,859	360	59	42	318
Other race	1,958	245	89	54	191
Year 2015	State	G/T	Top 5%	G/T & Top 5%	G/T not Top 5%
Total N	32,698	4,238	637	469	3,769
FRL	20,795	1,773	147	95	1,678
SPED	3,873	76	9	5	71
ELL	2,963	149	10	5	144
Female	15,969	2,248	393	284	1,964
White	20,585	3,039	526	380	2,659
Black	6,530	692	24	21	671
Hispanic	4,005	289	38	29	260
Other race	1,578	218	49	39	179

Year 2014	State	G/T	Top 5%	G/T & Top 5%	G/T not Top 5%
Total N	33,246	4,499	683	475	4,024
FRL	20,978	1,773	197	110	1,745
SPED	3,682	91	12	4	84
ELL	2,889	165	19	14	151
Female	16,400	2,418	464	325	2,093
White	21,141	3,154	562	390	2,764
Black	6,665	787	27	17	770
Hispanic	3,803	309	37	24	285
Other race	1,637	249	57	44	205

* Note: G/T identifier not available for 2016

*Appendix B: 4th grade G/T status matched 3rd grade top 5% status and district characteristics Cohort 2018, 2017, 2015, 2014**

Year 2018	School district N	Total students	G/T	Top 5%	G/T & Top 5%	G/T not Top 5%
Region						
Northwest	76	12,830	1,281	545	344	937
Northeast	67	7,088	696	164	101	595
Central	48	10,654	1,562	348	255	1,307
Southwest	38	3,418	394	61	47	347
Southeast	24	1,864	177	16	13	164
Poverty level (%FRL)						
Low level (0%; 43%)	26	6,546	651	373	230	421
Lower middle (43%; 52%)	29	5,356	633	192	132	501
Upper middle (52%; 66%)	61	7,373	758	207	128	630
High (66%; 100%)	137	16,579	2,068	362	270	1,798
District size (enrollment)						
Very small (0; 500)	43	1,241	111	25	13	98
Small (501; 1,000)	92	5,034	538	99	62	476
Medium (1,001; 2,600)	76	9,055	770	193	112	658
Large (2,601; 6000)	30	8,447	865	245	166	699
Very large (>=6001)	12	12,077	1,826	572	407	1,419
Urbanicity						
City	26	9,803	1,382	441	307	1,075
Suburb	14	4,937	506	133	83	423
Town	54	7,685	733	166	119	614
Rural	159	13,429	1,489	394	251	1,238

Year 2017	School district N	Total students	G/T	Top 5%	G/T & Top 5%	G/T not Top 5%
Region						
Northwest	76	12,833	1,269	407	277	992
Northeast	67	6,940	792	119	82	710
Central	48	10,550	1,579	269	188	1,391
Southwest	38	3,582	391	48	36	355
Southeast	24	1,959	179	22	12	167
Poverty level (% FRL)						
Low level (0%; 43%)	20	5,910	598	247	150	448
Lower middle (43%;52%)	25	4,224	433	99	67	366
Upper middle (52%; 66%)	70	9,690	1,091	220	150	941
High (66%; 100%)	138	16,040	2,088	299	228	1,860
District size (enrollment)						
Very small (0; 500)	47	1,352	144	21	10	134
Small (501; 1,000)	84	4,601	456	67	41	415
Medium (1,001; 2,600)	79	9,296	907	172	106	801
Large (2,601; 6000)	32	9,160	994	195	142	852
Very large (>=6001)	11	11,455	1,709	410	296	1,413
Urbanicity						
City	26	9,580	1,364	308	220	1,144
Suburb	19	5,146	579	125	83	496
Town	58	7,983	810	139	103	707
Rural	150	13,155	1,457	293	189	1,268

Year 2015	School district N	Total students	G/T	Top 5%	G/T & Top 5%	G/T not Top 5%
Region						
Northwest	75	11,529	1,256	300	216	1,040
Northeast	68	6,601	757	85	63	694
Central	44	9,753	1,637	191	139	1,498
Southwest	38	3,085	382	39	33	349
Southeast	24	1,730	206	22	18	188
Poverty level (%FRL)						
Low level (0%; 43%)	18	5,122	663	171	124	539
Lower middle (43%;52%)	24	3,726	393	90	56	337
Upper middle (52%; 66%)	75	9,086	1,148	171	125	1,023
High (66%; 100%)	132	14,764	2,034	205	164	1,870
District size (enrollment)						
Very small (0; 500)	41	1,092	161	16	10	151
Small (501; 1,000)	88	4,246	535	74	50	485
Medium (1,001; 2,600)	76	7,892	803	110	73	730
Large (2,601; 6000)	33	8,655	917	161	115	802
Very large (>=6001)	11	10,813	1,822	276	221	1,601
Urbanicity						
City	19	8,584	1,290	224	174	1,116
Suburb	18	4,709	624	77	57	567
Town	55	7,218	778	116	82	696
Rural	157	12,187	1,546	220	156	1,390

Year 2014	School district N	Total students	G/T	Top 5%	G/T & Top 5%	G/T not Top 5%
Region						
Northwest	75	11,497	1,275	285	186	1,089
Northeast	68	6,730	767	114	75	692
Central	44	10,110	1,822	215	165	1,657
Southwest	40	3,171	403	52	41	362
Southeast	24	1,738	232	17	8	224
Poverty level (% FRL)						
Low level (0; 43%)	21	5,311	636	175	110	526
Lower middle (43%;52)	25	4,034	396	85	50	346
Upper middle (52%; 66%)	82	10,203	1,303	196	140	1,163
High (66%; 100%)	123	13,698	2,164	227	175	1,989
District size (enrollment)						
Very small (0; 500)	41	1,054	146	18	10	136
Small (501; 1,000)	92	4,498	557	80	54	503
Medium (1,001; 2,600)	75	8,139	878	140	89	789
Large (2,601; 6000)	32	8,581	885	148	95	790
Very large (>=6001)	11	10,974	2,033	297	227	1,806
Urbanicity						
City	21	8,562	1,472	227	170	1,302
Suburb	19	4,928	631	92	66	565
Town	58	7,241	771	108	74	697
Rural	153	12,515	1,625	256	165	1,460

* Note: G/T identifier not available for 2016