Issue Brief № 56

K-12 STEM Education in Alabama's Black Belt

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> *"Our rural communities have always valued STEM skills, but few of our schools have adequate resources to ensure our students acquire those skills. Now, in the wake of a year like no other, we have a once-in-a-generation chance to strengthen our rural communities by improving STEM education for our students."*[1]

In the Education Policy Center's (EPC) *Black Belt 2020* series, an issue brief on K-12 enrollment in Alabama's Black Belt noted a 13% reduction in enrollment from 1995-96 to 2019-20;[2] in the following school year, 2020-21, combined Black Belt school enrollment fell nearly 4% more—from 106,801 students to 102,697.[3] While the Black Belt continues to suffer from falling enrollment in its K-12 schools, it also struggles to provide adequate access to STEM resources and fails to meet STEM proficiency metrics compared to the rest of Alabama.

STEM (Science, Technology, Engineering, and Math) is increasingly emphasized as a necessary field of study for students in primary and secondary education. From 2020-2030, STEM jobs will grow by more than 10%, while non-STEM jobs will only grow 7.5%.[4] Jobs in STEM also provide median annual wages that are more than double that of non-STEM—$89,780 compared to $40,020.[5] Given the current and projected growth of STEM jobs, it comes as no surprise that institutions are becoming more concerned with providing the tools for better STEM education.

Alabama is no different, as Governor Kay Ivey noted the continued growth and demand for labor in STEM sectors as she established the Alabama STEM Council in 2020. The Council "will play a vital role in ensuring that our state's future leaders have the opportunity to learn STEM-based skills that will help them transition into successful career pathways upon graduation."[6]

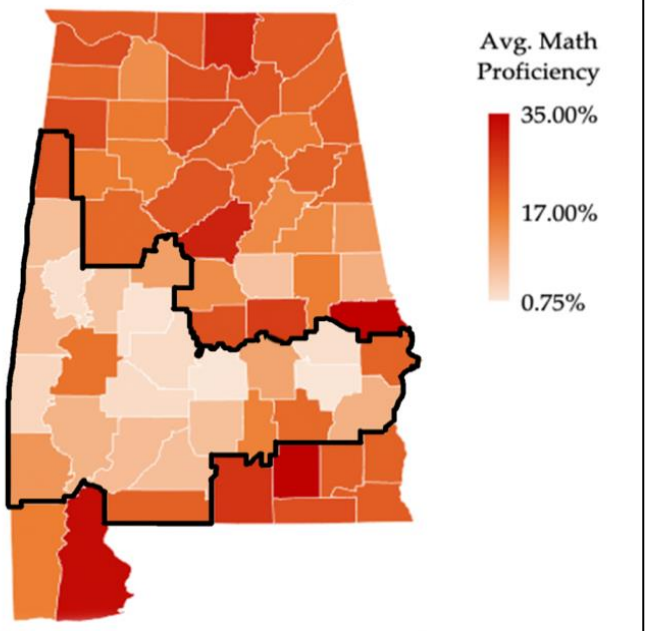
Math and Science Proficiencies

Alabama's statewide proficiencies for math and science are one of the lowest in the nation, receiving a grade of "F" from Education Next, Alabama's National Assessment for Educational Progress (NAEP).[7] The state ranked in the bottom 20% of states in each of the following assessments: 4th grade math, 8th grade math, 4th grade science, and 8th grade science.[8] ACT scores in math and science reveal low benchmarks (benchmarks are the ACT's minimum scores required for students to have a reasonable chance of success in college-level courses) at the high school level as well, with less than 25% of students in Alabama meeting testing expectations in either subject area.[9]

The disparities run even deeper when analyzing Alabama at the county level. The best performing counties are those with typically higher income levels and/or lower poverty rates like Baldwin, Shelby, and Madison counties. The worst, by contrast, reside in Alabama's Black Belt. Despite schools in the Black Belt spending, on average, $800 more per student than non-Black Belt schools ($10,538 compared to $9,734), Black Belt schools perform significantly worse than the rest of the state in math and science.[10]

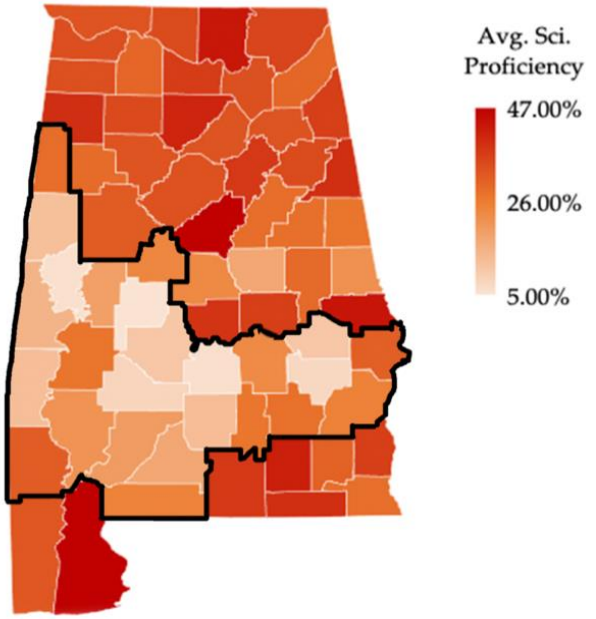
The percentage of students scoring "proficient" on state assessments, adjusted for student population, shows that math proficiency rates are just 11% in the Black Belt—less than half of the 23% in non-Black Belt counties. Figure 2 displays this stark contrast. None of the top 10 math proficient counties are in the Black Belt, but they account for 9 of the bottom 10 and 18 of the bottom 20 counties. Of those 9 poorest performing Black Belt counties, 8 are majority-minority counties, and the bottom 2, Lowndes and Bullock counties, score below 1% math proficiency.[11] Only one of the 25 Black Belt counties, Lamar County, exceeds the state's math proficiency average of 21.5%.

Figure 1. Math Proficiency by County



Science proficiency yields similar results, with Black Belt schools reaching only 22% proficiency compared to 36% for non-Black Belt schools. Out of the 67 counties in Alabama, not one of the top 30 in science proficiency is in the Black Belt; yet 23 of the bottom 30, and all 10 of the least science proficient are Black Belt counties. Seven of those worst-performing 10 are the following majority-minority counties: Dallas County (11%), Macon County (11%), Wilcox County (8%), Bullock County (7.5%), Lowndes County (6%), Greene County (6%), and Perry County (5%). Combined, the majority-minority counties average a science proficiency an additional two percentage points lower than the Black Belt, at just under 20%. None of the counties in the Black Belt meet the state's average of 34% proficiency, as shown in Figure 2, highlighting that students in the region are significantly underprepared for the STEM workforce or college education.[12]

Figure 2. Science Proficiency by County



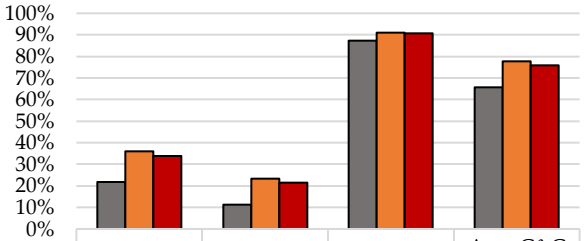
Graduation and College & Career Readiness

By 2025, it is estimated that 60% of Alabama's jobs will require education beyond a high school diploma.[13] Figure 3 underscores that Black Belt

schools are disproportionately lower performing than non-Black Belt by graduation and college & career readiness rates.

Graduation rates among Black Belt schools (87%) are far less disparate than other rates, only 3% less than the state average of 90.6% and roughly 4% less than non-Black Belt schools' average of 91%.

Figure 3. Percent of Students with Proficiency/Attainment

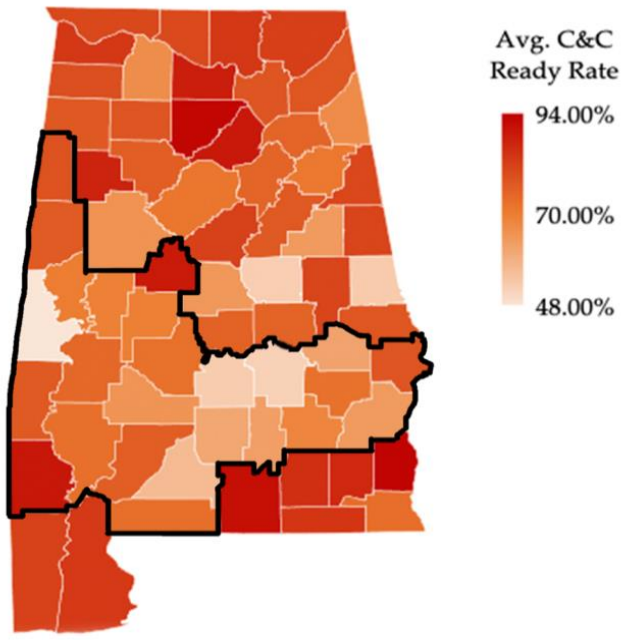


	Avg. Sci. Proficiency	Avg. Math Proficiency	Avg. Grad Rate	Avg. C&C Ready Rate
Black Belt Counties	21.92%	11.32%	87.31%	65.75%
Non-Black Belt Counties	35.92%	23.27%	91.14%	77.71%
State of Alabama	33.95%	21.59%	90.60%	76.03%

The twelve majority-minority counties in Alabama's Black Belt have even lower graduation rates, averaging just over 85%. The data on graduation rates is, however, less disparate than that of math and science proficiency; while Black Belt counties make up 8 of the bottom 10 counties (5 of which are majority-minority counties), many Black Belt counties fall near the middle of pack and the two counties with the highest graduation rates—Pickens County (98%) and Washington County (96%)—are also in the Black Belt.[14] The counties with sub-90% graduation rates are distributed nearly equally within and outside of the Black Belt: 16 Black Belt counties and 14 non-Black Belt counties.

The average College & Career Readiness rate for the state of Alabama is 76%, propped up by non-Black Belt schools at nearly 78%. Black Belt schools, as shown in Figure 4, average just 66%. The College & Career readiness rate is calculated using six indicators: ACT Benchmarks, ACT WorkKeys Score, AP Tests, industry-recognized credentials, college credit, and military enlistment.

Figure 4. College/Career Ready Rate by County



Supporting an overall trend, the rate for majority-minority counties in the Black Belt is even lower at only 59%. Eight of the bottom 10 counties—five of which are majority-minority—are Black Belt counties.[15] Despite the higher investment per student within the Black Belt, the lower graduation and college & career readiness rates reveal significant, systemic challenges that cannot be solved with anything less than significant and systemic solutions.

Potential Factors for Lower Black Belt Proficiencies

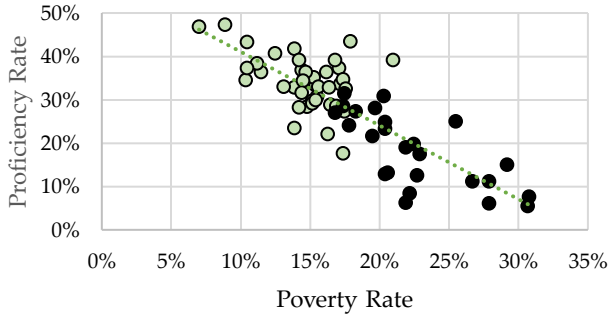
The disparities between Black Belt and non-Black Belt schools are significant and explaining why these disparities exist is complex. From the myriad causal effects of countywide poverty—which often disproportionately impact minorities and other marginalized

communities—to inadequate technology, and teacher shortages, a wide array of factors impact both access and outcomes of STEM education.

The Black Belt suffers from persistent poverty, which has become "one of the most prevalent indicators of academic achievement."[16] While Alabama has a statewide poverty rate of just under 15%, the Black Belt's average poverty rate is over 22%.[17] The University of Alabama's Center for Business & Economic Research (CBER) noted in 2019 that the Black Belt suffers the worst child poverty in the state.[18] A quantitative analysis of the link between county poverty and math & science proficiency rates shows a statistically significant correlative relationship.

Figure 5A. AL County Math Proficiency by Poverty Rate

Figure 5B. AL County Science Proficiency by Poverty Rate



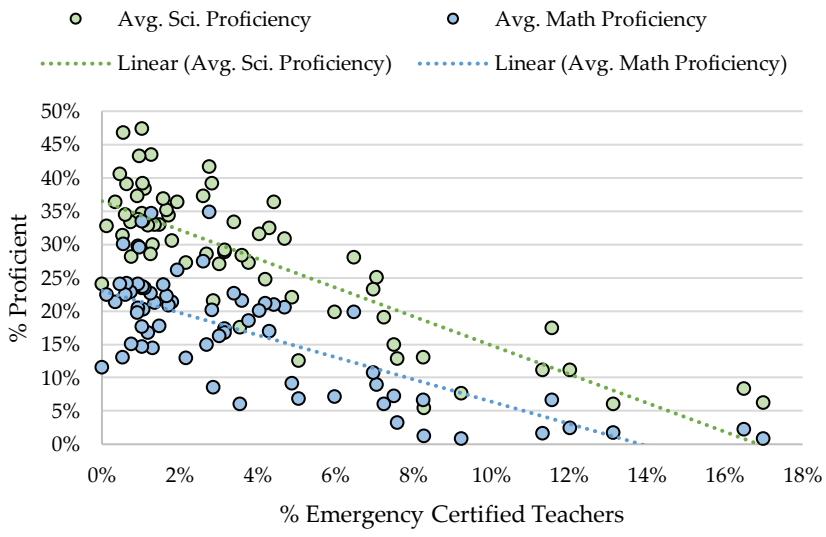
In Figures 5A & 5B, black points denote Black Belt counties, while blue or green points denote non-Black Belt counties.

Figures 5A & 5B show that as a county's poverty rate increases, its proficiency rate, in either math or science, will generally decrease; each point represents a county, with Black Belt counties being denoted by their black color. The relationship between a county's poverty rate and proficiency rates further show that for approximately every 1%

increase in a county's poverty rate, a decrease of 1.3% and 1.7% is expected for math and science proficiencies respectively. Much of the Black Belt suffers from persistent poverty—all 19 persistent poverty counties in Alabama are located within the Black Belt.[19] This connection between socioeconomic status is most evident at the extremes, with the most impoverished counties, like Bullock or Perry, ranking worst or near worst in math and science, while low-poverty counties like Shelby and Baldwin maintaining some of the state's highest proficiency rates. Given the higher spending per student among Black Belt schools, the correlation between proficiencies and countywide poverty reveals that increasing school funding alone is insufficient to improving educational outcomes; the issue is more systemic.

Another factor affecting STEM education and proficiency in Alabama's Black Belt is the shortage of teachers, especially highly trained teachers. Counties in the Black Belt are much more reliant on emergency certified teachers—teachers who have a bachelor's degree but no education experience in the area they're teaching. A study

Figure 6. AL County Proficiency Rates by % Emergency Certified Teachers



from 2018, which focused on eighth graders in Alabama's Black Belt, found a negative, statistically significant relationship between emergency teacher certification and math achievement standards.[20] Figure 6 demonstrates this negative relationship, which is particularly concerning given the list of shortages—created by the Alabama Math and Science Teacher Education Program (AMSTEP) in 2019—revealed that some counties, like Perry and Marengo County, have approximately 80% of their math and science teachers teaching without full certification.[21] Overall, more than 7% of all of teachers in Black Belt schools are emergency certified, compared to less than 2% among non-Black Belt K-12 teachers. Nearly 17% of all teachers in Lowndes and Wilcox County schools are emergency certified. As with proficiencies, the problem of emergency certified teachers is concentrated not just in the Black Belt, but specifically in its majority-minority counties, with seven of the 10 most heavily emergency certification reliant counties being majority-minority. Figure 6 supports the findings of previous studies that as the percentage of emergency certified teachers increases, proficiency rates will generally decrease.[22]

Policy Recommendations

In order to alleviate some of the disparities seen between the Black Belt and non-Black Belt counties in Alabama, it is integral that substantial measures be taken to mitigate and eliminate poverty, attract and retain quality educators, and invest in adequate technologies for students. While there are additional factors which likely contribute to the STEM outcomes in the Black Belt's K-12 schools, focusing on the following improvements would be an important start.

Alleviating poverty has always been an objective by governments and non-profits, the Black Belt being no exception. Despite many attempts, persistent poverty remains an issue for much of the Black Belt.[23] Given the complex nature that surrounds the persistence of poverty, a holistic strategy that focuses on new economic development and opportunities is needed. Additionally, youth development and educational improvements—like quality pre-K programs, afterschool programs, tutoring, and e-learning opportunities—support long-term economic well-being and can short-circuit the cycle of poverty. Community-wide poverty can be alleviated with other strategies, such as welfare expansions, financial literacy initiatives, and/or community development to improve educational outcomes. A coming issue brief in the *Black Belt 2022* series will address poverty directly in more depth but breaking the education and poverty cycle requires other interventions and improvements, like those below.

One of the biggest challenges limiting educational institutions in Alabama's Black Belt is their shortage of teachers. The COVID-19 pandemic has only worsened the state's shortages, as more than half of school staff and teachers in Alabama's K-12 system reported considering leaving their jobs at the end of 2021; citing low pay, high student-to-teacher ratios, large workloads, burnout, and general disrespect as reasons for considering retirement or re-location.[24] Some programs have already been implemented to recruit and retain teachers in the Black Belt, like the Black Belt Teacher Corps (a program which offers financial support to current and future educators in exchange for teaching in the Black Belt), but it hasn't been enough to close the gap. While the Black Belt Teacher Corps has seen some

success, the demand for teachers, especially qualified STEM teachers, remains high; alongside the need for statewide legislation, districts can offer increased pay and benefits, student loan repayment/forgiveness programs, and other incentives to recruit and retain teachers, according to Alabama Commission for Higher Education (ACHE) director Jim Purcell.[25]

To address both teacher shortages and student technologies, Black Belt schools should use the 2021 American Rescue Plan's funds distributed amongst the states' educational agencies. These funds can help empower students by bringing technology into their community; funding could be utilized to improve the limited or complete lack of quality internet and broadband access in the Black Belt. Broadband access opens the door to many industries, interests, and e-learning opportunities that aren't currently available. Pam Buffington, the Director of Rural Initiatives at the Education Development Center, argues that funds can also uniquely bring students together with their environments in a STEM-enriching manner.[26] By attaching STEM to the environmental issues and concerns of Black Belt communities, they can become more adept in fields and careers within STEM sectors that are unique to the Black Belt. Further investing in technologies for those students only makes it easier for them to connect with their environments and communities, as well as improve their educational opportunities.

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