GLOBAL TEACHING PROJECT

2017-2018

Mississippi Advanced STEM Access Program

EXECUTIVE SUMMARY

The Global Teaching Project (GTP) is an education company that provides a scalable, digital platform for extraordinary teachers from leading schools around the world to deliver a blended, Advanced Placement© (AP) curriculum to students everywhere, at no cost to the learner.

GTP has a simple premise: *bring great teachers to everyone, everywhere, along with extensive academic supports*. GTP recognizes that great teaching by extraordinary teachers is the most proven way to learn. Thus, GTP leverages technology to provide world-class teachers as lead instructors for comprehensive AP courses that are presented in a blended format. In-class teachers build on the subject matter taught by the lead instructors, implementing lesson plans and providing additional instruction. In turn, locally-based AP-certified master teachers support the in-class teachers, developing lesson plans and supervising instruction. Tutors from prominent universities such as the University of Virginia, Stanford, and Yale are assigned to each class, and conduct regular live tutoring sessions, often several times each week. Students also are provided textbooks and very substantial online resources, and are prepared for the rigor of the AP curriculum through a university-based, residential summer program.

Student enrollment in AP courses correlates strongly with college and career success. Thus, access to AP courses increasingly distinguishes the educational haves from the have-nots, particularly in STEM subjects. Though AP courses have greatly increased—approximately 5 million AP tests were given in 2017, quadruple the total from 2000—demand for AP has vastly outpaced the supply of qualified teachers. That shortage is most acute in rural and low-income areas—47% of rural school districts offer no AP courses. As a consequence, students with the aptitude and work ethic required to succeed at a high level academically often lack access to the advanced courses needed to fulfill their potential. Overcoming those educational disparities is critical to the success of both students and the communities in which they live.

In 2017-18, GTP initiated a unique, grassroots partnership with the Mississippi Public School Consortium for Educational Access (Consortium), a group of 8 rural, low-income public school districts. Through the Consortium, GTP launched a Pilot Program to bring its inaugural course, AP Physics 1, to member schools. That course, the first of three in the AP Physics curriculum, is taught by Professor Meg Urry, Director of the Yale Center

for Astronomy and Astrophysics. Additional AP courses, and school districts, will be added as the program progresses.

GTP is working to provide talented, but underserved, students access to more rigorous curricula by developing a scalable educational template to benefit students everywhere. In doing so, GTP fosters substantive mastery of advanced content, but it also does more—GTP builds a community of achievement in which students both seek to fulfill their own high potential, while also serving as exemplars for others.

Disparate Access to Advanced High School Courses

Across the U.S., students who have the aptitude and work ethic to succeed in a rigorous curriculum often do not have access to the higher-level courses they need to achieve their full potential.

The Department of Education's Office of Civil Rights has reported that up to 25 percent of U.S. high schools do not offer more than one of the basic courses in the typical sequence of high school math and science education—such as Algebra I and II, Geometry, Biology, and Chemistry.

Access to higher-level courses is even more limited. Nationwide, 40 percent of high schools do not offer Physics of any type—AP, honors, or even basic high school Physics—and over half do not offer any Calculus. Moreover, the percentage of schools offering those courses has declined in recent years.

The failings of U.S. schools have been evident in the performance of U.S. students in international tests. The December 2016 results for the most widely utilized metric for international achievement, the Trends in International Mathematics and Science Study (TIMSS), show that U.S. student scores in both math and Physics have declined over the past 20 years. Perhaps even more alarming, the study reported that just 4.8 percent of U.S. high school students even take Physics; by contrast, in France, 21.5 percent do.

The lack of access to higher-level courses is particularly evident with respect to AP subjects.

The College Board estimates that 60 percent of U.S. high school students who have "high potential" to excel in AP science courses do not take any, largely because their schools lack qualified instructors to teach those subjects. As *U.S. News and World*

Report reported, "Students Want STEM, but Schools Can't Find the Teachers". Though harder to quantify, based on anecdotal evidence and the assessments of educators across the U.S., quality instructors in AP humanities and languages are also in short supply.

Because AP courses increasingly are a standard component of a college preparatory curriculum, access to AP courses increasingly distinguishes the educational haves from the have-nots. Eighty five percent of selective colleges report that a student's AP experience favorably impacts admission decisions, and millions of students have been able to graduate from college more quickly and at significantly less cost because thousands of colleges and universities award credit for qualifying AP scores.

(A qualifying AP score, the standard metric for AP "success", is typically a score of 3 on the AP scale of 1-5, with 5 as the highest. In some states, state law requires public colleges and universities to award college credit for an AP score of 3 or above. In other states, educational institutions set their own policies for AP credit. Colleges and universities in Mississippi are not required by the State to award AP credits, but they widely do so. At some schools, such as the University of Mississippi, scores higher than 3 are required for credit in certain subjects.)

In 2017, over 2.7 million students took approximately 5.0 million AP exams; both numbers have more than tripled since 2000. Yet thousands of U.S. high schools do not offer AP courses at all, and thousands more offer AP courses only in a very few subjects.

The lack of AP course offerings, though evident across the country, is particularly severe in rural areas and in schools serving low-income and minority students.

A 2015 report by Douglas Gagnon and Marybeth Mattingly, researchers at the University of New Hampshire, found that 2,465 rural school *districts*—nearly half of all rural districts—had *no* students enrolled in AP courses, and those students who did take AP courses in rural schools had far lower AP success rates than their non-rural peers.

Using data collected by Department of Education's Office of Civil Rights for the 2011-2012 school year, Gagnon and Mattingly calculated that 47.2 percent of rural districts did not have a single student in any AP course, compared with just 5.4 percent of suburban districts. Among districts characterized as serving a "smaller population" (that is, less than 450 high school students), 69.7 percent did not offer a single AP course. In

addition, among the relatively few rural students enrolled in AP classes, just 32.2 percent earned at least one qualifying score, well below national norms.

Low-income students and other historically underserved populations also have particularly limited access to AP courses. A 2016 Government Accountability Office report to Congress found that the number of high-poverty public schools serving primarily Black and Hispanic students more than doubled between 2000 and 2014, and less than half such high schools offer *any* AP courses; even fewer offer AP STEM.

In recent years, the U.S. Department of Education's Office of Civil Rights increasingly has on disparate access to advanced courses as a key concern, concluding in a 2016 release that "Student enrollment in Advanced Placement (AP) courses is unequal", with minorities, English learners, and students with disabilities constituting a much smaller percentage of AP students than among students generally.

That disparate access to AP courses has highly adverse consequences. Whenever students are denied the means to excel academically, they also are deprived of the ability to advance economically. As a result, those students must limit, or even abandon, their ambitions, with calamitous effects upon both their lives and their communities.

As the Equity and Excellence Commission, an advisory committee chartered by Congress, concluded in its 2013 report to the U.S. Secretary of Education, *For Each and Every Child: A Strategy for Education Equity and Excellence*, "[I]nequities are perpetuated [through] coursework that is low in academic rigor....Moreover, schools in poor communities often do not provide the full array of Advanced Placement courses [that] schools in wealthier areas offer, further limiting students from high-quality instruction." The Commission further listed the lack of AP courses as among the factors "that aggravate the achievement gaps in urban, suburban and rural schools alike, and impair our ability as a nation to raise student achievement."

The Need for Greater Access to AP Instruction in Mississippi

Mississippi presents a unique opportunity for developing solutions to reduce educational disparities by facilitating access to advanced subject matter for all high school students, regardless of where they live or their family circumstances.

Schools across the U.S. particularly struggle to teach advanced subject matter to rural, minority, and low-income students. In Mississippi, those categories converge—the State is among the nation's most rural, has the highest percentage of African American residents, and has the nation's highest poverty rate.

In Mississippi, 43.7 percent of all public school students are enrolled in rural schools, according to a 2017 report, the third highest percentage in the country. Of the 3,261 school districts that the U.S. Department of Education recently characterized as being located in a "City" or "Large Suburb", just nine were located in Mississippi. Instead, 83.4 percent of Mississippi school districts were characterized as being "Rural" or in a "Remote Town".

Although almost no Mississippi school districts do well on AP exams relative to national metrics—according to a 2015 presentation prepared by the Mississippi State Board of Education, only the Oxford district, home of the University of Mississippi, exceeded national averages for both AP passage and participation—more densely populated areas, particularly near the Gulf Coast, tend to do better relative to the rest of the State. Conversely, Mississippi's many rural districts tend to have no AP programs at all. Thus, in a majority of Mississippi school districts, less than one percent of graduating high school seniors earned a 3 on an AP exam.

The demographic profile of rural Mississippi is also unique in that 44.5 percent of the rural student population are minority—by far the highest percentage among the ten states with the highest percentage of rural students. More generally, 37.7 percent of Mississippi residents, and 48.9 percent of the state's 482,000 K-12 students, are Black.

Though many Black residents of Mississippi heroically have overcome many disadvantages to achieve great academic and career success—Ericka Wheeler of Greenwood, a graduate of the Mississippi School for Math and Science, recently was named a Rhodes Scholar—minority students continue to face long odds, and many attend schools with limited curricula, particularly at higher levels.

AP performance statistics are one measure of just how much work remains to be done to close educational disparities. In 2017, Black students from Mississippi took 979 AP exams in 12 math and science subjects, and earned 90 scores of 3 and above.

Persistent poverty, often extending across generations, often presents the greatest impediment to educational achievement for Mississippi students of all backgrounds.

Poverty in Mississippi in not only severe, it is widespread, and particularly afflicts the young:

- Mississippi's overall poverty rate, at 20.8 percent, is the nation's highest.
- Of the State's 82 counties, 79 had poverty rates above the national average in 2015, and 81 counties had a median per capita income below the national median.
- Perhaps most troubling, 31.5 percent of the State's children—that is, over 225,000 residents 17 or younger—live in poverty. In some school districts—such as Holmes County, Quitman County, and Coahoma AHS, all of which are Consortium members—over half of school age children are from impoverished homes.

Mississippi's pervasive poverty has many deleterious effects. Families—even the most well meaning—often lack the financial means or knowledge base needed to help their children achieve their full potential. That is particularly true for students capable of high achievement, who require extraordinary resources to realize that promise.

Poverty and attendant limited resources also force Mississippi schools to conduct budgetary triage. As a result, the needs of less numerous groups—such as the most exceptional, highest-aptitude students—are, by necessity, given lower priority. Thus, at a time when even affluent school districts have difficulty in hiring teachers in advanced subjects, particularly STEM, Mississippi's disadvantages are even more pronounced.

In part because of the State's educational deficiencies, Mississippi's economy remains sluggish—unemployment recently tied for seventh highest in the country—and the State's population is in decline—Mississippi is one of only five states, and the only one in the South or West, that lost population in both 2015 and 2016.

Although Mississippi has many needs, among the most pressing is to develop and retain high-achieving students. That, in turn, requires providing students who have the aptitude and work ethic needed to succeed at advanced subject matter access to those courses. Moreover, that must be done without excessively burdening school district budgets, particularly districts in rural and low-income areas. The Mississippi Public School Consortium for Educational Access was formed to address that need.

The data below, which includes information from Consortium member school districts, starkly present the challenges Mississippi faces, and the economic and educational disparities residents of the State must overcome.

Jurisdiction	Ages 5-17 Poverty Rate[1]	Minority Student %[2]	Students taking AP exams[3]	AP exams Taken[3,4]	APs taken per 1,000 public H.S. students[4]	APs passed per 1,000 public H.S. students[4]
U.S.	19.5%	51.8%	2,665,203	4,803,422	283	159
Mississippi	30.1%	55.6%	10,580	16,068	104	33
Aberdeen School District	34.2%	97.7%	0	0	0	0
Booneville School District	36.3%	25.1%	0	0	0	0
Coahoma AHS School District	52.3%	100%	0	0	0	0
Holmes County School District	51.3%	99.1%	0	0	0	0
Pontotoc County School District	20.5%	18.8%	0	0	0	0
Quitman County School District	56.0%	97.4%	0	0	0	0
Scott County School District	29.9%	47.5%	0	0	0	0
South Panola School District	32.9%	58.9%	62	95	81	14

1 Poverty data from the U.S. Census Bureau Small Area Income & Poverty Estimates (SAIPE) for School Districts, Counties, and States, and 2015 figures for children ages 5-17 living in poverty as a percentage of all children ages 5-17 in school district. Full Coahoma County data shown for Coahoma AHS district.

2 Minority student populations shows other than non-Hispanic White student enrollment for K-12 public school students in jurisdictions shown. U.S. student totals from U.S. Department of Education (USDE) Fall 2017 enrollment data; totals include 25.9% Hispanic, 14.9% Black, 5.5% Asian/Pacific Islander, 1.0 % American Indian/Alaska Native, and 2.5% two or more races. Mississippi student totals from Mississippi Department of Education; totals include 48.9% Black and 6.8% other minority enrollment. District student totals from the USDE Office for Civil Rights. Coahoma AHS and Quitman Counties have no minority students other than Black; Aberdeen and Holmes less than 1%; Booneville less than 3%; South Panola 3%; Scott 8.3%; and Pontotoc 8.6%.

3 U.S. and Mississippi test data from College Board 2017 AP participation and performance data; includes exams taken by both public and private school students. School District AP test data from U.S. Department of Education Office of Civil Rights most recent (2013) data.

4 Student totals from USDE enrollment data. Exam data and student totals include public school students only. "Passed" is a score of 3 on 1-5 scale. South Panola data on total number of exams taken and passed is an estimate

based on number of students who took and passed exams multiplied by 1.536, the average number of AP exams taken by each Mississippi student who takes any AP exams.

The Lack of Qualified Teachers for Advanced Courses in Mississippi

Mississippi is particularly afflicted by the national shortage of teachers in advanced subjects. Furthermore, Mississippi's already grave problems in teacher recruitment and retention are poised to get worse, as teachers leave the profession and are not replaced.

The Mississippi Excellence in Teaching Program, a collaboration between the University of Mississippi and Mississippi State, offers full, four-year scholarships, funding to study abroad, and other incentives for future teachers. Yet those two universities, combined, enroll only about 50 prospective teachers a year in the program, an exceedingly small number relative to the state's approximately 478,000 elementary and secondary school students. Prospective teachers in advanced subjects are particularly scarce—in 2015, Mississippi's teaching colleges produced a *total* of one Physics teacher for some 135,000 high school students.

AP Exam Participation and Performance in Mississippi

Data from the U.S. Department of Education's Office of Civil Rights quantify how the lack of quality teachers has led to a paucity of higher-level offerings in Mississippi high schools. Dozens of school districts across the state, including relatively large jurisdictions, offer no AP courses at all, and others offer courses that are not taught by qualified instructors with a proper substantive grounding in the subject they teach.

As a result, Mississippi students take AP exams at less than half the national rate, according to data from the College Board, the entity that administers AP exams. Nationally, about 18 percent of all high school students, including over a quarter of high school juniors and seniors, took AP exams in 2017; in Mississippi, only about 8 percent of high school students did so.

In addition, the relatively few Mississippi students who took AP tests took exams in fewer subjects, on average, than students nationwide, and scored much worse than their peers nationally.

In 2017, Mississippi public high school students took barely one-third as many AP exams (104 per thousand students), on a per capita basis, as the national average for public school students (283 per thousand), and passed barely one-fifth the number of AP exams (33 per thousand) as the national pass rate (159 per thousand). Less than one-third of AP exams taken by Mississippi public school students in 2017 achieved a score of 3 or above on a scale of 1-5, typically the score deemed "passing" and needed to earn college credit; nationally, 56 percent of AP exams taken by public school students earned a qualifying score.

According to the 2014 College Board *AP Report to the Nation*, just 4.4 percent of Mississippi high school graduates scored a 3 or above on any AP exam while in high school, less than a quarter of the national rate of over 20 percent for all public high school graduates. Perhaps even more troubling, every other state but one (Louisiana) had *more than twice* as many students, as a percentage of all high school graduates, score a 3 or above.

Mississippi students fared particularly poorly in AP math and science exams, taking disproportionately few tests and scoring lower on exams taken. That trend also is evident in the data relating to the Consortium's inaugural course, AP Physics 1.

Nationally, over 1.5 million AP exams were administered in 2017 in 12 math and science subjects: Biology, Calculus AB, Calculus BC, Chemistry, Computer Science A, Computer Science Principles, Environmental Science, Physics 1, Physics 2, Physics C (Electricity and Magnetism), Physics C (Mechanics), and Statistics. In 9 of those subjects, over half of the examinees from across the country earned a score of 3 or above.

By comparison, Mississippi students took just over 4,000 AP exams in those 12 subjects, that is, less than one third of the national AP participation rate for math and science exams. In 9 of those 12 exam subjects, the mean score of Mississippi students was below a 3. Moreover, the math and science exams for which Mississippi students had mean scores of above 3 had too few examinees to be statistically meaningful—97, 13, and 44, respectively.

In AP Physics 1, the subject of the Consortium's inaugural course, of the 66,017 students nationally who scored 3 or higher, just 175 were from Mississippi, of whom 130 attended public school.

Jurisdiction	AP Physics 1 exams taken	AP Physics 1 exams passed	AP Physics 1 exams taken per 1,000 public H.S. students	AP Physics 1 exams passed per 1,000 public H.S. students
U.S.	162,425	66,017	9.6	3.8
Mississippi	527	175	3.3	1.0
Aberdeen, MS School District	0	0	0	0
Booneville, MS School District	0	0	0	0
Coahoma AHS, MS School District	0	0	0	0
Holmes County, MS School District	0	0	0	0
Pontotoc County, MS School District	0	0	0	0
Quitman County, MS School District	0	0	0	0
Scott County, MS School District	0	0	0	0
South Panola. MS School District	1	0	0.8	0

U.S. and Mississippi test data from College Board AP participation and performance data for 2016; U.S. and Mississippi data includes exams administered to both public and private school students. U.S. and Mississippi student totals from U.S. Department of Education enrollment data; School District AP test data from U.S. Department of Education Office of Civil Rights. Exam data and student totals include public school students only (92.5 percent of U.S. secondary students); "passed" is a score of 3 or above (on 1-5 scale) on an AP exam, the most common threshold for a qualifying score to earn college credit or advanced placement in college courses. South Panola data based on school self-reporting.

Maintaining even those modest numbers for AP STEM participation and passage rates will be a challenge. The Mississippi School for Math and Science, which many of the State's highest achieving students have attended in recent years, cut enrollment recently due to funding constraints. In 2013, 61 of that school's 230 students took at least one AP course, including 18 in math and 49 in science (127 students took Physics of varying levels), and of the 54 students who took AP exams, the vast majority, 46, earned qualifying scores. However, enrollment at that school has been reduced by 12 percent from the levels of five years ago, to 238 students for the 2016-17 school year.

A substantial body of research quantifies both the adverse consequences of Mississippi's lack of educational opportunity, and the benefits that would result from addressing the State's educational needs.

The Distressed Communities Index, a metric developed by the Economic Innovation Group, a bipartisan public policy organization, assesses a community's status based on seven factors: the percentage of adults with a high school diploma, the housing vacancy rate, the percentage of adults not currently in the work force, the poverty rate, median income, change in the number of jobs from 2011 to 2015, and change in the number of businesses 2011 to 2015. Communities are ranked from zero to 100, with 100 being most distressed.

Nationally, 15.2 percent of the population lives in a "distressed" zip code, that is a zip code that has a Distressed Communities Index in the lowest quintile of zip codes nationally. In Mississippi, nearly triple that number, 43.0 percent, of residents live in distressed areas. No other state is over 36 percent; only two other states are above 32 percent. Seven of the eight Consortium districts are in counties with a Distressed Communities Index between 85 and 99, that is, among the very lowest in the country. Just 6.1 percent of Mississippians live in a "prosperous" zip code, less than one-quarter the rate nationally.

The current state of those Mississippi communities is deeply troubling. More troubling still is what data suggests about the future prospects of their residents.

The Equality of Opportunity Project, a joint initiative of Harvard, Brown, and Stanford, has examined geographic variations in upward mobility in America. The Project found that the likelihood of children of parents in the lowest 20 percent of income distribution reaching the top 20 percent differs dramatically among 741 metro and rural areas that together comprise the U.S.

In particular, the Project determined that areas in the Mississippi Delta and central Mississippi served by the Consortium are in the lowest decile of social mobility, and, together with adjacent areas of other southeastern States, comprise what is, by far, the nation's largest contiguous geographic area in the lowest tier. Low-income students in other parts of the country are far more likely—in many cases, more than three times as likely—to advance to the upper-income cohort. (Upward mobility is particularly common in the Mountain West, the Great Plains, and along the upper Mississippi River.)

Yet there is some reason for hope. Low-income students who excel in high school, and earn admission to selective colleges, tend to stay on high-achieving paths after completing their educations. As a July 2017 study by researchers at Stanford, Brown, UC-Berkeley, and the U.S. Treasury Department showed, low-income students who are admitted to selective colleges go on to similar careers, and earn similar amounts, as students at those colleges from high-income households.

However, if students from low-income backgrounds are to earn admission to selective college, they must have access to the rigorous curricula needed to excel academically. That is the Consortium's mission.

About the Mississippi Public School Consortium for Educational Access

The Mississippi Public School Consortium for Educational Access is based on the recognition that there are talented students across the State, very much including rural and low-income areas, who are capable of high academic achievement if given the opportunity.

The Consortium was formed to ensure that all students, regardless of their circumstances, have access to the same instruction as students fortunate to attend extraordinary schools. In the 2017-2018 school year, the Consortium initiated a program to teach AP subject matter in several underserved school districts, with an initial focus on rural and low-income areas, where shortages of qualified teachers are most acute. The pilot program is provided free to participating students and schools.

The notion that animates the Consortium is that all students should have the opportunity to learn from teachers who are not just as good as those at high-achieving schools, but from *the very same teachers teaching the very same subjects, and with the same educational resources*. To do so, the Consortium, with curricular and logistical support from leading educators in the State and around the country, leverages technology to replicate and scale much of the substance and interactive elements of classroom instruction at highly successful schools, and provides the same texts and online resources as are commonly used at those schools. That content is presented in a blended format in classrooms with on-site instructors, with further academic support by Mississippi-based master teachers and an extensive network of tutors comprised of

undergraduates majoring in the relevant subjects at some of the nation's leading universities.

The Consortium consists of school districts from across Mississippi with varying demographic and economic profiles, though each district is affected by the educational disparities afflicting rural and disadvantaged students.

The Consortium member school districts are:

- Aberdeen School District
- Booneville School District
- Coahoma AHS School District
- Holmes County School District
- Pontotoc County School District
- Quitman County School District
- Scott County School District
- South Panola School District

In addition, the Consortium contemplates adding additional districts in future years, as it scales to benefit greater numbers of students, and as lessons learned from the initial pilot program are used to refine course content and improve its efficacy.

Consortium students in lab exercise demonstrating rotational momentum

AP Physics 1 Course

The inaugural course offered through the Mississippi Public School Consortium for Educational Access is AP Physics 1, the first of three AP Physics courses. The AP Physics 1 course was chosen based on assessments by Mississippi educators of their most pressing curricular needs. Students enrolled in the AP Physics 1 course are expected to take the AP Physics 1 exam in May 2018.

The AP Physics 1 course comports with the course outline developed by the College Board, and is being presented in a blended format with various components of instruction and academic support:

- Each student has been provided with a new copy of a leading textbook aligned with the AP Physics 1 course, *Giancoli, Physics: Principles with Applications, 7th Edition*, as well as access to *MasteringPhysics*, a very substantial online resource from Pearson that includes an electronic version of the textbook, lesson plans,

demonstrations, exercises, review questions, and sample exams. The course also uses TIPERs workbooks, another Pearson product.

Professor Meg Urry, Director of the Yale Center for Astronomy and Astrophysics, teaching AP Physics 1.

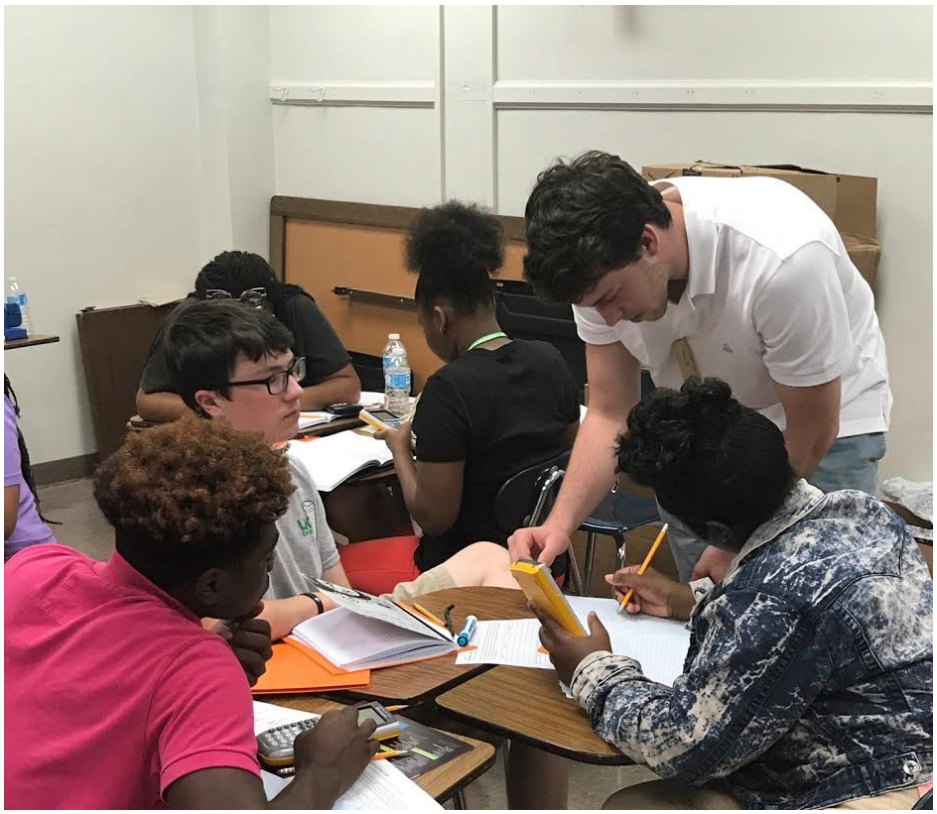
- Professor Meg Urry, director of the Yale Center for Astronomy and Astrophysics and a member of the National Academy of Sciences, is the lead instructor in the course. Professor Urry is one of the world's most prominent physicists. She has over 230 publications in refereed journals, and lectures regularly around the world. Professor Urry's current research includes work on the evolution of galaxies and supermassive Black holes. Though Professor Urry provides instruction primarily via asynchronous video, she also will, from time to time, instruct live via videoconferencing. She also has come to the State to teach in person, as she did at the Consortium's AP Physics 1 summer preparatory program at Mississippi State University.

- Two Mississippi-based master teachers with substantial experience teaching AP Physics are responsible for creating and administering the online platform, preparing weekly lesson plans, structuring labs, supporting on-site teachers, and addressing miscellaneous issues relating to academic content and instruction that may arise.

- On-site teachers are physically present in each classroom. Although that teacher may not, in all instances, have an extensive substantive background in Physics—if such

teachers were available in each district, there would be no need for the Consortium—each on-site teacher is a capable and experienced instructor with, at a minimum, strong math skills. Also, each on-site teacher has extensive curricular and substantive support. The on-site teacher presides over a blended classroom, in which the teacher builds upon the subject matter taught by Professor Urry and the online learning resources. The on-site teacher implements lesson plans, leads discussions, supervises assignments, directs labs, responds to questions, and conducts assessments of student work.

- Physics students from Yale and the University of Virginia serve as tutors. Each Mississippi school is assigned at least one dedicated tutor, and those tutors work with the students by video conference, typically multiple times each week.



Yale Physics student works with Consortium AP Physics 1 students.

- The Consortium conducted a summer residential program at Mississippi State University prior to commencement of the course to help students prepare for the rigor of AP Physics 1. The summer program helped students build a substantive foundation in math and Physics, permitted them to experience life at a major university, and provided students an opportunity to work with students and faculty

from MSU, the University of Mississippi, Yale, and Stanford. Students also were taught basic elements of the time management and study skills needed to succeed at a high academic level.

Consortium 2017 summer Physics preparatory program at Mississippi State University (not all participants pictured)

- The University of Mississippi is working with the Consortium to offer a second residential program for students, over a break during the school year, to provide further academic support to the students.

- The Consortium also conducts supplemental programs specific to particular schools that the Consortium determines would benefit from additional support. For example, the Consortium has conducted a weekend program for students from certain districts with particularly limited educational resources. Doing so reinforces lessons, and permits students to receive in-person instruction from teachers who work elsewhere during the week.

Consortium students at weekend supplemental session (November 2017)

Students are selected for the Consortium's AP program by their school districts, which identify particularly promising students who seek, and would benefit from, the challenge of academic rigor. Enrollment in the pilot program is limited to a few students in each district. Each student must have demonstrated the requisite aptitude and work ethic needed to handle AP subject matter, even if they require further academic preparation.

The principal prerequisite for students taking the Consortium's AP Physics 1 course is a strong commitment to learn. AP Physics 1 requires less advanced math than subsequent AP Physics courses—it is Algebra-based, and so the AP Physics 1 exam does not require knowledge of Calculus.

Nonetheless, considerable work still is required to ensure that students are adequately prepared. For that reason, the Consortium provides substantial assistance to help participating students establish the academic foundation needed to succeed in the AP Physics 1 course, beginning with the residential summer preparatory program at Mississippi State University, and continuing with extensive tutoring throughout the academic year.

Building a Community of Achievement

The Mississippi Public School Consortium for Educational Access teaches advanced subject matter to Mississippi students, but it also aspires to do more—the Consortium seeks to promote a community of achievement in which students strive to excel and, through their example, encourage others to do so as well.

The AP Physics 1 exam will provide some data to assess the progress of the pilot program. Additional data will be collected and analyzed with the assistance of Mississippi State University and other educational partners. Almost certainly, initial progress will be quite slow, and gains will be incremental. However, even modest gains will constitute material progress relative to the status quo, and, of course, those modest gains could be transformational in the lives of individual students who are helped.

The school districts comprising the Consortium also recognize that, in the short term, the most important gains achieved by mitigating disparate access to advanced high school courses may not be evident in test scores. Instead, the most consequential changes may be in how students view themselves and what they aspire to achieve.

Scott County, Mississippi AP Physics 1 students (Morton, Lake, and Scott Central High Schools)

As detailed in a seminal 2013 study by economists Caroline Hoxby of Stanford and Christopher Avery of Harvard, a key determinant of whether high-achieving, low-income students enroll in selective colleges and universities is whether they act in an "achievement–typical" rather than an "income-typical" manner—that is, whether they share the ambitions of students with similar academic profiles rather than those with similar household incomes. Achievement-typical students, for example, are far more likely to seek admission to highly selective colleges and universities than income-typical students with similar credentials.

As Hoxby and Avery documented, even talented students are strongly predisposed to limit their aspirations to those of other students to whom they are exposed. Yet high-achieving peers whom other talented students may look to as examples tend to be most scarce in places where low-population density and high-poverty rates converge, such as Mississippi. Hoxby and Avery calculate that while "Only 21 percent of achievement-typical students live in a nonurban area…47 percent of income-typical students live in a nonurban area." For the same reasons, Hoxby and Avery observe that income-typical students tend to come from smaller, more rural schools.

The Mississippi Public School Consortium for Educational Access permits students in remote locations and low-income schools to identify with accomplished students beyond their own classrooms. Once those virtual communities of achievement take root in the schools that participating students attend, those communities can then begin to grow to include other students elsewhere, no matter the remoteness of the schools or the economic status of the students.

Mississippi students in the Consortium's AP Physics 1 course are being challenged, but they also are being provided the support necessary to succeed. Through that experience, and by virtual inclusion in a class comprised of students headed to leading universities, the Mississippi students are learning about the elements of success. In turn, those Mississippi students will be able to serve as exemplars not just to their classmates, but around the State and beyond.

In fact, small town and rural communities, such as those the Consortium serves, are very attentive to, and proud of, their success stories, particularly among their young people. Thus, if the Consortium's AP initiative is able to help one of its students achieve at a high level, it can have an impact far beyond that student, as he or she will serve as

an exemplar to their communities to an extent not found in more populous or more cosmopolitan areas.

That dynamic is evident in many examples, such as in a recent Brookhaven (MS) *Daily Leader* article, "Local graduates headed to Yale University". The article affirms the prominence of high achievers in small Mississippi towns, and the civic pride in their success. It also illuminates the means by which that success is achieved.

The talents of promising students in underserved areas almost never develop to an advanced level unless they are given access to quality instruction and advanced subject matter. One of the students mentioned in the article went to the Mississippi School for Math and Science, an excellent, but very small, public, magnet, boarding school for exceptionally talented students. The other student went to his local public school, but was able to participate in a program to help him realize his academic potential. According to the article:

> The summer before his senior year, he completed the Minority Introduction to Engineering and Science, or MITES, at the Massachusetts Institute of Technology. MITES is a program for students who are passionate about science, technology, engineering or math. [The student] received two director's awards, which exemplified his character and academic ability. "This program was the single most transformative academic and social experience of my life."

That type of "transformative" experience is precisely what the Consortium aspires to create. With it, underserved students can overcome a great deal, and their lives can take on a very different trajectory, allowing them to achieve their full potential. Programs like MSMS and MITES are worthy, but finite in capacity—MSMS enrolls just over 200 of Mississippi's roughly 133,000 public high school students. Thus, the Consortium seeks to create, even in a very modest form, similar exemplary programs for promising students *within* the schools in the rural, low-income communities the Consortium serves.

A 2013 *New York Times* op-ed by Travis Reginal, a 2012 Mississippi public high school graduate who grew up in challenging circumstances, but overcame those impediments to earn admission to Yale, attests to the transformative impact of exemplary programs in local high schools. Mr. Reginal has since graduated from Yale, and serves as an advisor to GTP and the Consortium.

Travis Reginal addresses students at Consortium residential summer program.

In his op-ed, Mr. Reginal reflected on some of the factors that helped set him on a high-achieving path. Most important was his personal resolve, but two other factors are particularly relevant to the Consortium's work. First, he and his peers formed a community of achievement in which they pushed and inspired one another. (His Murrah friend and classmate, Justin Porter, went on to attend Harvard.) Second, his school, Murrah High School in Jackson, offered numerous advanced courses that challenged him to develop his potential.

The Consortium seeks to develop an educational template that permits scaling that dynamic to benefit students elsewhere in the State and beyond. Over time, providing bright students in rural, low-income schools access to rigorous courses through which they may achieve their potential will promote a virtuous cycle— high achievement fuels high aspirations, which leads to even higher achievement.

FURTHER INFORMATION

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