

Algebra Project DR K-12 Cohorts  
Demonstration Project

Summative Evaluation Report  
Appendices

Appendix I: Representation of Demonstration Sites by  
Year

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Sites

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## Appendix I Representation of Demonstration Sites by Year

The four charts below offer a numerical representation of the four sites by year and identify the math topics or materials covered each year for Cohort 1.<sup>1</sup>

### Demonstration Site Summaries by Year

<b>Yr 1 2009-10</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>	<b>Totals by year</b>
<b>Schools</b>	1	1	1	2	<b>5</b>
<b>Students</b>	19	40	40 <sup>2</sup>	86	<b>185</b>
<b>Teachers</b>	1	2	2	4	<b>9</b>
<b>Classes</b>	1	2	2	3	<b>8</b>
<b>Students in 2009 summer program</b>	41 <sup>3</sup>	5 <sup>4</sup>	11 <sup>5</sup>	50	<b>96</b>
<b>9<sup>th</sup> grade math modules/ curriculum</b>	Trip Line Road Coloring Racing Against Time Teacher supplements	Trip Line Road Coloring	Trip Line Road Coloring addition and subtraction worksheets	Trip Line Road Coloring	

The sites started with 8 cohort classes taught by 9 teachers serving 188 students. All teachers minimally used AP's Trip Line and Road Coloring with students the first year.

<sup>1</sup> The numbers of students represent our best effort to track changes across years but may not be entirely accurate.

<sup>2</sup> This school started with 40 students in two classes but one of the teachers resigned and students decreased to 24 at mid-year.

<sup>3</sup> In 2009 36 students worked with YPP and 5 attended Chicago summer institute. Twelve 8<sup>th</sup> grade students attended a summer institute Summer 2008 at this site.

<sup>4</sup> Students who attended Chicago summer institute

<sup>5</sup> Of the 11 who attended the Chicago summer institute, only 3 actually entered the cohort class in 9<sup>th</sup> grade because they others went to other schools.

<b>Yr 2 2010-11</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>	<b>Yearly totals</b>
<b>Schools</b>	1	1	1	2	<b>5</b>
<b>Cohort 1 Students</b>	25	35	19 <sup>6</sup>	56	<b>135</b>
<b>Students in other cohorts</b>	0	20 <sup>7</sup>	0	18 <sup>8</sup>	<b>38</b>
<b>Teachers</b>	1	1	2 <sup>9</sup>	4	<b>8</b>
<b>Classes</b>	1	3	1 <sup>10</sup>	4 <sup>11</sup>	<b>9</b>
<b>Students in 2010 summer program</b>	16	14	18 <sup>12</sup>	25 <sup>13</sup>	<b>73</b>
<b>10<sup>th</sup> grade math modules/curriculum</b>	AP Geometry	AP Racing Against Time, AP polynomials, supplement with text and worksheets	AP geometry materials, Discovering Geometry text	Racing Against Time, AP geometry	

Two sites added new cohorts in Year 2, two teachers left, and two of the first year cohort classes merged into one at Sites 3 and 4. All but one site used AP geometry materials as well as other materials.

<sup>6</sup> During the summer there were 24 students but at the beginning of the year 5 of them dropped, moved, or disappeared.

<sup>7</sup> A new freshmen class was added.

<sup>8</sup> Cohort 2 started with 25 but by mid-year there were 18.

<sup>9</sup> A second teacher worked with about half the class.

<sup>10</sup> This school combined their two cohort classes into one in the middle of Year 1 because the district dismissed one teacher. A new teacher was hired and in Year 2 two teachers co-taught the Cohort 1 class.

<sup>11</sup> A new freshman cohort class was added.

<sup>12</sup> Estimated that three quarters of the 24 cohort students rotated through the Secondary Math Lab offered by the Michigan demonstration site.

<sup>13</sup> Rising freshmen students entering Cohort 2

<b>Yr 3 2011-12</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>	<b>Yearly totals</b>
<b>Schools</b>	1	1	1	2	<b>5</b>
<b>Cohort 1 Students</b>	14	17	19	35 <sup>14</sup>	<b>85</b>
<b>Students in other cohorts</b>	18	12	0	0	<b>30</b>
<b>Teachers</b>	2	1	1	2 <sup>15</sup>	<b>6</b>
<b>Classes</b>	2	3	1	2	<b>8</b>
<b>Students in 2011 summer program</b>	NA <sup>16</sup>	12	11	0	<b>22</b>
<b>11<sup>th</sup> grade math modules/curriculum</b>	AP quadratics, trig, Flagway	Teacher created worksheets from Algebra 2 text, Road Coloring; AP quadratic polynomials; AP geometry	Teacher created worksheets using Algebra 2 text and other resources	AP geometry, polynomials, trig	

The number of Cohort 1 students dropped to less than half of the original number. One teacher moved to a different school and left the program. The course materials varied across sites.

<sup>14</sup> Classes combined at both schools so that one cohort class remained at each school.

<sup>15</sup> One teacher dropped the AP class and one transferred to another school.

<sup>16</sup> Sites 1 and 2 held their student summer institute jointly.

<b>Yr 4 2012-13</b>	<b>Site 1</b>	<b>Site 2</b>	<b>Site 3</b>	<b>Site 4</b>	<b>Yearly totals</b>
<b>Schools</b>	1	1	0	2	<b>4</b>
<b>Cohort 1 Students</b>	14	20	6 <sup>17</sup>	26	<b>66</b>
<b>Other cohorts</b>	Cohort 2: 10 Cohort 3: NA	10	0	0	<b>20</b>
<b>Teachers</b>	2	1	0	2	<b>5</b>
<b>Classes</b>	3	2	0	2	<b>7</b>
<b>Students in 2012 summer program</b>	NA <sup>18</sup>	8	0	0	<b>8</b>
<b>12<sup>th</sup> grade math modules/ curriculum</b>	Review Algebra 2, AP discrete math and polynomial calculus modules	Statistics (Budzban), college preparation, Contemporary College Mathematics (SIU)		Statistics text, AP discrete math and polynomial calculus modules, Rossman Statistics text, college preparation	
<b>Graduating students</b>	14	17 <sup>19</sup>	16 <sup>20</sup>	26	<b>73<sup>21</sup></b>
<b>Students in 2013 summer program</b>	13	8	NA	0	<b>21</b>
<b>Students attending college 2013</b>	13 <sup>22</sup>	10 <sup>23</sup>	8 <sup>24</sup>	19	<b>50<sup>25</sup></b>

The district and school at one site decided to disband the cohort in Year 4.

<sup>17</sup> 4-6 students met with their former teacher, YPP, and a university liaison every other Saturday during what would have been the fourth year of the cohort.

<sup>18</sup> Some Cohort 1 students attended the student summer institute offered jointly with Site 2, but the numbers are unavailable.

<sup>19</sup> One was killed in a car accident and two moved away.

<sup>20</sup> The cohort disbanded in the summer before Year 4 but the site provided graduation data for the students.

<sup>21</sup> This number is higher than the number of students in Cohort 1 because it includes Site 3's estimate of students who graduated even though the cohort had been dissolved the previous year.

<sup>22</sup> One joined the Marines

<sup>23</sup> Two others are taking online courses

<sup>24</sup> There are possibly 5 more in college but not confirmed.

<sup>25</sup> This is an estimate based on sites' data in Fall 2013.

## APPENDIX II

### Profiles of the Four Cohort Demonstration Sites

#### **Southern Illinois: A Coalmining Community**

##### *Community and school selection*

The efforts at this site began in October 2008. This site devoted Year 1 to community and school organizing, developing of relationships with key players, and preparing for the cohort to be implemented beginning Fall 2009. The first event was held at a local university, and Dr. Moses spoke and others from the Algebra Project attended. An invitation letter to the event was sent from President's Office to roughly 40 school superintendents in the university's service region. Teachers and administrators from 12 school districts attended this event. The attendees came from all-white schools where children of laid-off coalminers see little value in education, from all-black schools in more urban areas where the legacies of race and poverty have stunted youths' ability to see greater possibilities, and from small town and rural schools where black, white, and Latino students too often see education as a necessary evil rather than as a path to achievement.

Five schools received applications and three schools completed the packet, which the university point person for the cohort demonstration program had created. The selection criteria set by the university point person were institutional flexibility and demographics, administrative support, and teacher enthusiasm to seek to become the NSF "Demonstration Cohort." One high school was selected primarily because of knowledge of and interest in the Algebra Project on the part of one math teacher at the school and the commitment of the School Board president. The teacher had first learned of the Algebra Project while doing graduate studies with the university point-person for this cohort demonstration site. She completed most of the materials for the application. Other supporters of the program were the high school principal/superintendent (same person), the head guidance counselor at the high school who selected the cohort students and managed the scheduling that required double periods of math, and the president of the School Board, who advocated for launching a cohort site. He and the superintendent/high school principal are both lifelong members of the community. The School Board President demonstrated his support by visiting the 2009 summer cohort professional development institute in Chicago and working with the cohort leadership team to bring resources to the program, such as funding for a third teacher to attend the professional development institute.

The high school is relatively small with approximately 400 students from a community of approximately 4000 residents. Coalmining was traditionally the primary employer in the town, but with mines closing the job market is tight. All students know each other and have gone to school together for years. Other distinctive characteristics of the community are that parents and students often do not view college attendance as desirable, and high school pregnancies and drug use are relatively commonplace.

Dr. Moses and another member of the Algebra Project leadership team and the university point person presented the program to all incoming freshmen and their families in Spring 2009 prior to entering high school.

### *Students and their experience*

The high school guidance counselor in consultation with a middle school math teacher was primarily responsible for identifying the 40 entering freshmen that would form the first two cohort classes. By Year 2 (2010-11), 35 of the original students remained in the two cohort classes, and another freshman class of 20 Cohort 2 students was added for a total of 56 students. By 2011-12 more students had dropped and the two original classes, now juniors, combined into one class with 17 students. The Cohort 2 class (sophomores) had decreased to 12 students. By Cohort 1's senior year, the student count was back up to 20, with new students joining. Seventeen of these students graduated. Of the three who did not, one tragically died in a car accident just before graduation and two moved away.

The cohort student learning experience looked different than the regular math classes. Students did not sit in rows, and students sometimes worked together. The teacher tried to minimize lecture and provide a context for the mathematics. She took more of a discovery approach, which meant engaging students in dialogue about the topic before teaching it and not telling students what they needed to know in a lesson. For example, when teaching polynomials, she did not tell students the definition of a polynomial but gave them a chart with polynomials and other types of equations and let them figure out their own understandings of what a polynomial is. Working in groups and reporting out about their work, two mainstays of AP pedagogy, continued to be a challenge for the students.

The primary enrichment activities students experienced during the school year happened in class. The Young People's Project began in Fall 2010 with a student research assistant and two College Math Literacy Workers (CMLW) coming into the cohort class. YPP's overarching goal was to try to get students to see that the cohort was about more than math: It is also building community leaders through

outreach work with middle and elementary school students. The YPP coordinator spent a week in the classroom at the beginning of the school year to conduct community-building activities. YPP continued coming to the high school, offering paid opportunities for the cohort students to work with elementary students doing math games after school. About four cohort students were taking advantage of this opportunity on Inverness' first site visit in Spring 2012. By Cohort 1's senior year, only one student was still working as a Math Literacy Worker after school, and one junior student in Cohort 2.

The summer prior to the beginning of the first year of Cohort 1, five students attended the Algebra Project project-wide student summer institute in Chicago. In Summer 2010, the site offered its first student summer institute jointly with another cohort demonstration site which was close by. Approximately 30 students were in residence on the university campus, 14 of who were from this site. The university point person with assistance from a colleague and a graduate research assistant designed the summer institute as an orientation and enrichment program to introduce students to the notion of college and this university, in particular. Activities included enrichment in mathematics and English, study and life skills, and test preparation. The admissions office talked to students about scholarships. The site created a video of the summer institute that gives a good flavor of the kinds of activities the students engaged in. The site continued to offer joint student summer institutes through Summer 2013. In 2011, 12 students attended. Eight students attended the final two summer institutes.

### ***Teachers and teacher supports***

Two teachers began teaching the cohort classes in Fall 2009, and both attended the AP summer professional development for teachers in Chicago along with the two other teachers from the math department at the school. By the middle of the first year, one cohort teacher, who was struggling with the AP materials and pedagogy and had a negative attitude, was dismissed from the school. The other cohort teacher took over both AP classes. A third class was added Fall 2010 for a total of three cohort classes—two sophomore and one freshman—taught by the same teacher.

The remaining cohort teacher attended AP summer professional development every summer for the duration of the program, and professional development for professional developers (PDPD) in Summer 2010.<sup>26</sup> The university point person was available by phone to plan with the cohort teacher on weekends,

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<sup>26</sup> This teacher attended the PDPD because SIU had applied for an i3 grant to spread the cohort program to more schools in the area. The thinking was that this teacher would be offering professional development to teachers if they won the grant, which did not happen.



and he started an online group for the project-wide cohort group of teachers to share tests and materials they created. He came into the cohort classes one day each week and often taught the class on that day.

### *Classrooms and curriculum*

The teacher used AP materials but also created her own lessons using math content from textbooks to help students understand traditional presentation of the math concepts to prepare them for standardized tests. In Year 1 the class materials were AP Trip Line and Road Coloring. In Year 2, students studied AP Racing Against Time and polynomials supplemented by lessons adapted from a *Discovering Geometry* textbook and worksheets. Year 3 materials were AP Road Coloring, quadratic polynomials, and geometry and teacher-created worksheets from an Algebra 2 text. For the final year of Cohort 1, the materials were statistics, college applications, and a non-math major college-level course from the local university. The university liaison taught the course with support from the cohort teacher, and students had the option to receive dual credit. By passing the college-level final, they would have satisfied their university basic education math requirement. However, few students were motivated to take advantage. Across the four years, the teacher wrote her own tests at the end of each week, and the university liaison usually provided the end-of-unit and semester tests.

A Cohort 1 class we observed junior year was taught by the university liaison. The class ran for approximately 1 hour 45 minutes with a 25-minute break for “activity time” in the middle. Total class time was about 80 minutes. The content of the class centered on maximizing the area of a garden plot that the class was preparing to build as a gift to the school. In the first part of class, students divided themselves up into four groups of their choice to work on different aspects of the activity, which the university liaison assigned to each group. Each group was expected to produce a poster to use in explaining their work to the class, and later in the day at a family night meeting. Some students engaged and others did not. Their tasks included finding different possible shapes for the plot, and the perimeter and area of each, finding the vertex and  $x/y$  intercepts and what the parabola looks like when graphed. They had to produce scale drawings using 60 feet of materials. After the break, the cohort teacher took a more active role and asked students to share their posters with the class. Students were reluctant to share, and most of the 45 minutes was spent persuading students to share out and to come to the family night meeting that evening.

The sophomore cohort class on the same day learned about groups of symmetry and modular arithmetic. Students mostly worked independently, some were engaged in the mathematics, and others were not, and the university liaison presented the content through lecture.

### *Parent and community support*

The cohort effort at this site was never able to generate widespread community support. The university point person said that in retrospect he would have spent more time on this component of the cohort model. He said, “In our setting, if the structure of the program had permitted, I would have spent an entire year in the community prior to it, making contacts and making people understand what was about to happen. A design year. The i3 had that. The community relations are important.” The teacher also said that in hindsight “if we had come in and first of all embraced the football team and the basketball team, then, it might have made a difference. The football coach, let them see you at the game, go to every game, you know.”

Neither the teacher nor the university liaison was from the community of the students, and this was a hindrance to understanding the community and winning community advocacy for sustaining the cohort. In fact, they were both surprised to learn that many families did not value the primary goal of the cohort program, which is college attendance. Instead, many parents had grown up in the community, worked in the coalmining industry, and believed that the same scenario would work just fine for their children even though coalmining jobs were in major decline. The cohort had to shift its focus away from college attendance to other ways of defining success to engage some students. For instance, the university liaison began to talk to a student who wanted to be a truck driver about what he might need to do to prepare himself to own his own trucking company.

The cohort had a few strong parent supporters however. A supportive mother attended meetings for parents, chaperoned for the student summer institute, and maintained communication with the university liaison and the YPP coordinator. She offered high praise for her daughter’s experience in the cohort saying:

“The math started making sense to her... When something defeats you over and over, when you turn it inside out and it makes sense, it’s a wonderful thing.”

She said that the program is about more than math; it is trying to make better people: “These kids are doing community service, self-esteem, confidence, being assertive and standing up for themselves.”

### *Challenges and lessons learned*

One outstanding dimension of the cohort work at this site was the joint student summer institute offered for four years. This institute was a university residential program that focused on offering the students, many of whom had never been away from home overnight, a wide range of enriching experiences. It offered mathematics as a context for students from an all-white mining community to interact with African American students from a different state while learning about college. Students’ lives were changed for the better.

Several challenges persisted at this site. The lack of community involvement with the cohort meant that the program slipped out of the public’s eye. If the community had supported and advocated for sustaining the cohort program, perhaps the school would have continued it. As it was, the high school stopped offering cohort classes when Cohort 1 graduated. The junior cohort class disbanded for their senior year.

This site also learned how important the choice of teachers is. After losing the second cohort teacher in the middle of the first year, no replacement was ever found. The one remaining cohort teacher was isolated and did not have the benefit of collaboration with other teachers to reflect with on quality of teaching and student work, how to create a student culture that advocates for math literacy, to name a few of the classroom challenges. This teacher continued to find the recommended pedagogy difficult to realize with the cohort students, and support from another teacher would have been valuable.

## Central Ohio: A Rustbelt Community

### *Community and school selection*

In the 1980's, the *New York Times Magazine* described this mid-size manufacturing town as the “quintessential American city.” With recent slowdowns at its automobile production plant and the closure of Ohio Brass, the community is in the rustbelt transition and suffering economically. Currently, there are two predominant low-income groups: Appalachian white and African-American. The medium size district has one high school with serves approximately 1,400 students of which 39 percent are African-American. According to an Ohio Department of Education report, the high school did not meet AYP in 2011.

The Algebra Project appealed to two professors from the local university for its potential to transform a community and empower students to pursue higher education, since many of the traditional manufacturing jobs no longer exist. The professors contacted the Algebra Project in 2007. Around that time, the professors also received a two-year outreach grant from the university that allowed them to recruit 8<sup>th</sup> graders into the Young People's Project (YPP) after-school program, organized by three teachers paid through the grant. The YPP's College Math Literacy Workers (CMLW) have a strong presence at the university. They work with the high school students (known as Math Literacy Workers) who are in turn paid to work with elementary students at other schools in the district. The students, who were in 8<sup>th</sup> grade at the time, graduated from high school this past spring (2013) having spent four years in an Algebra Project Cohort 1.

Unique to this site's story is the early work they did with the Cohort 1 students while they were still in 8<sup>th</sup> grade, which set the stage and prepared them for their high school cohort. This modification of the cohort model seemed to make a difference in the adaptation of the students to the cohort once they entered high school. They entered the cohort with an established relationship with their math teacher for the next four years.

Before the AP Cohort project started, the professors were already garnering community support for the AP. They met with the then-new superintendent in 2008, and he was and continues to be very supportive of the Algebra Project. According to one of the professors: “I think he sees us as really, really good public relations. But he has put his money where his mouth is. He has helped us in concrete ways pretty much since we got started and so we are very grateful for his support.” The other professor added, “and the school board supports him.”

These professors also fostered support for AP among the community leaders from the university, business and city government. One explained:

“At the University, we have a group that is coming out of the board of trustees of the University that reaches out to the minority members of our community, pastors, various leaders and we have met with them on two formal occasions and one more informal occasion and they are very strongly supportive. In fact, when we were trying to get more students up from the eight that we had had in the summer, they divvied up 45 students’ names and went and called the parents and talked to them about the program and encouraged them to come and so, I think we have started an important process of bringing the community in and getting their support as well... That group at the University includes both prominent business people, but also the mayor who was the first African-American mayor.”

2009-2010 was the first year in their effort to implement the cohort model. They began with one 9<sup>th</sup> grade class. Now, throughout the district, they are taking the principles of the AP model and applying them to math from kindergarten through 8<sup>th</sup> grade, in literally every school in the district. They have “developed” two cohorts of teachers who have been through training with Algebra Project professional developers. The teachers are doing lesson study together.

According to the superintendent:

“We have collaborated with [the University] and the Algebra Project to take the principles of the Algebra Project and look at our kindergarten through 8<sup>th</sup> grade math instruction. We have developed two cohorts of teachers now that have been through training this year on Algebra Project principles with the idea that we would build some capacity for really looking at mathematics instruction in a different way. Each elementary then will have teacher leaders that will work within their groups. The Algebra Project really has formed a foundation for math instruction for our district... We have [one Algebra Project professional developer from a university] and she is very connected with our teachers and [another AP professional developer] and they are our trainers. They meet probably every nine weeks or so and so they have formed a group... It is the model that we are putting together and really they look at a different approach to curriculum in the Algebra Project principles that we have engrained in our system.

The superintendent said the district has “bet the farm” on AP. The superintendent said, “It is pretty much driving what we are doing...It is not an off-the-shelf program that you buy and you implement and you raise scores. It is really about creating a culture. That is what we have been about.”

He also sees it as fitting into the district’s efforts to expand the community’s vision for what is needed for their children to escape the “tyranny of poverty.” He said:

“It is an idea that you really want to expand your world and the environment and not think about a limited look. A lot of schools perpetuate a remedial kind of approach... We’re focused on how to work with people to empower them... The Algebra Project fits in a big system that we have here and it is just not an isolated initiative and it really is part of our big puzzle.”

The community is interested in the approach, but the parents are not actively involved; yet, they trust the teachers and the schools. According to the superintendent, if the teachers are enthusiastic about the AP, then the community will follow suit. The fact that the first AP cohort teacher was from the community rallied support. She said:

“I think the first year they were very skeptical and we had some parents like one dad [who] was like, ‘I don’t know if I believe this. [My son] is going to trust you, so we are going to trust you and, so you got to make sure that we are actually doing math’ and actually we did have an issue with that student. He was going into Division I basketball and the NCAA weren’t going to accept the Algebra Project as [high school] math classes. So we had to get that all worked out and, so that was pure faith on [the part of] his parents and us because we almost blew it for him. It was almost a huge issue. But the parents have been wonderful and they have stuck with us, and they believe in the program. They came the night that we tried to get the freshmen set up and we had a couple of parents talk and say, ‘you really need to get your kids in this program.’ Things like that and the parents have been really involved.”

The superintendent of the district and a professor from the university negotiated with the NCAA to get them to accept AP as high school math credits.

### Schools

The high school implemented the cohort for four years, and the district is now adapting the AP approach for use in all schools in the district.

### Partnership with the University

The University, and more specifically two professors there, has been very helpful for bringing in extra funds and other forms of support. For instance, in 2011-2012, Cohort 2 was added because the professors received a Board of Regents college access grant that paid for a second Algebra Project teacher. They also started a pre-service program at the University, based on the AP approach.

### ***Students and their experience***

In Year 4 there were three high school cohorts: Cohort 1 graduated in 2013, Cohort 2 was a 10<sup>th</sup> grade cohort, and Cohort 3 was a 9<sup>th</sup> grade cohort. The intention was to start a new 9<sup>th</sup> grade cohort with a third teacher at the high school in the next fall, with the goal of having one cohort class each year at the high school.

### Student learning experience in classes

We observed Cohort 1 classes three times and students presenting at a Family Science night once. In the classroom, the students sat in groups with the teacher or YPP facilitators rotating among the groups, and the learning experience was more of an active community experience than a traditional math class. The students were actively participating in the lesson, using the AP curriculum as a guide but not simply completing problem after problem as is so common in math classes guided by textbooks. The teacher and facilitators asked questions along the way to both guide and contribute to the discussion. For example, after the students had participated in one activity, the teacher asked, “If there are only two people playing, who is guaranteed to win? Everyone think about it. Does it matter who I pick to go first? Can it be random?” A student responded, “No, it doesn’t matter.” The teacher asked of the other students, “Do you all agree with that? Put your hypothesis on the board.” After all students had written their hypotheses, the group reviewed each and came up with a conclusion regarding strategy.

During one class we observed, there were 19 individuals present—14 Cohort 1 students, the teacher, and five YPP facilitators—and all were highly engaged. When facilitators asked the group to make observations or hypotheses, all members of the group actively participated in the discussion, and the discussion was about the math. In addition, when facilitators or students were writing on the board, all eyes were on them.

Describing her students' experience in the cohort since 8<sup>th</sup> grade, the Cohort 1 teacher said:

“It is a close-knit bunch and it is nothing like anything I have ever taught before because not only have I had these kids for four years, but two periods for four years, and we have taken them on trips and last year we went to Southern Illinois for two weeks and they think of me as their second mom. It is definitely different, but it is not all hugs and kisses. We definitely have our struggles and they definitely have times when they just want to be silly and throw things and act up and that kind of thing, but usually if I get on them, they are very respectful of me. They are teenagers and they still step out of line from time to time.”

Only two students did not pass the Ohio Graduation Test (OGT) in math but they were not required to because they had IEPs. Notably, by 11<sup>th</sup> grade, nine Cohort 1 students had passed the math OGT already and of them, four had passed at the *accelerated* level. The Cohort 1 teacher said that as soon as the students started doing well on the OGT, they realized that the AP was actually working for them. When asked how her students have benefited most from the AP, she said:

“For me it is a community of learners, and we have taught them how to be successful learners and that takes into consideration all of that stuff that you just said [the curriculum, the approach, their relationship with the teachers, their four years together, etc.]...What we have taught them is, they need support people, they need people like me and they need people like [the university professor] that they can go to...but then they also need their friends. They need to know how to study in groups, because that is huge in college...so we have created that atmosphere. They now know that they can do well in group studies. They have also the idea...that math can be something that they can achieve and so that is huge. So I think the idea of creating these learners and how to be successful learners in lots of different ways and talking about it. Now they can talk about mathematics because they can support their work and that is huge.”



This site had an English language arts component to Cohort I. A former site director for the National Writing Project worked with cohort students on their writing.

Cohort 1 had 14 seniors by Year 4, and all of them graduated in 2013. All of the Cohort 1 members are going to college except two, one who joined the marines and another who went to culinary school. Two students received basketball scholarships. Some students are staying local at the university and some are going away. Some students placed into credit-bearing math courses as college freshmen but other had to take remedial math.

Cohort 2 lost about half of the students for a variety of reasons. Both the Cohort 1 and Cohort 2 teachers said this winnowing down had helped the dynamic in the classroom a great deal, since there were students who had significant learning challenges who were not prepared for the open-ended problems and group-work that the AP approach requires. They were placed in a different program.

Having a cohort that has been successful serves as an example for incoming cohorts and their parents and is a powerful recruiting tool and proof of concept. Unlike Cohort 1, subsequent cohorts were not involved with YPP as 8<sup>th</sup> graders prior to forming a cohort, so they were not as prepared for the experience. However, seeing that Cohort 1 has successfully completed four years in AP math has been helpful for convincing future cohort students and parents of the validity of the AP cohort approach.

### *Teachers and teacher supports*

In Year 4 of the project, there were two AP teachers (one who had taught for 17 years and one who had taught for at least 10) and the district plan was to have three (the same two plus a new teacher) the following year. The Cohort 1 teacher attended this same school as a student and is “of” the community. She went to school with many of her students’ parents and currently lives in the community. The Cohort 2 teacher is not “of” the community in the same way. However, because the Cohort 1 teacher recommended her for the position, she has more credibility than a complete outsider.

## Curriculum

Of her students' perceptions of the curriculum, the Cohort 1 teacher said:

“They loved Road Coloring, they loved Race Against Time. The [AP] Geometry they really liked... the idea of symmetry and carrying that all the way throughout. I never had a problem last year. Geometry was really good. We really liked that.”

She felt that the Geometry unit in 10<sup>th</sup> grade was very conducive for students working in groups and presenting. Both teachers discussed the challenge of starting the 9<sup>th</sup> grade cohort with TripLine and the Cohort 2 teacher said one of the professional developers told her they are rewriting it. The Cohort 1 teacher contrasted Geometry with Trip Line:

“The materials, like I said, the sophomore material, the Year 2 material is good. It is a unit and you can take it and you can run with it and so there is not a whole lot of teacher supplementing [needed for] that material or making sense of the material. It is what it is.”

But then this Cohort 1 teacher also said of Trip Line:

“I will say that this year, I enjoyed going through it again, so I whacked it a lot, but you know, I felt much more comfortable going through it a second time, and I think it went really well with my freshmen. My freshmen this year, I don't think will say as many terrible things as my seniors said about Trip Line. That is good.”

Of Year 4's curriculum, she said:

“So this year we started out just reviewing all of the stuff from Algebra II and so that was our first couple of weeks. We really got a good handle on that stuff and then we did the discrete math unit, and then we did series and sequences, which is a continuation of discrete math. Then the second half of the year we did the polynomial calculus and that was interesting. It was obviously my first time through it and so I had lots of questions and we got to a good point and so I think it was good where we ended up and we started making the connection between rate of change and derivative.”

This site used the AP materials the most consistently of any site across the four years.

### Professional development and supports

The Cohort 1 teacher attended the Algebra Project summer institute for two summers and worked with the AP Teacher Resource Materials (TRM) team. She relied on classroom visits from the AP professional developer, and communicated online and shared material with another cohort teacher at a different site.

When the Cohort 2 came on in 2011-2012, the Algebra Project summer institute was designed for third year teachers, so she attended the Secondary Math Lab and worked with Dr. Moses for two weeks. An AP professional developer was also there for the first week when he worked with the Cohort 2 teacher and a small number of other teachers. Yet this experience did not fully prepare her to use the Algebra Project model, and specifically the Trip Line and Road Coloring curricula, with her 9<sup>th</sup> graders. The plan was for a professor from the local university to support her in the classroom but unfortunately the Cohort 1 teacher became very ill, so the professor had to substitute for her and the Cohort 2 teacher was left on her own with only visits from the AP to support her. It was a very rough beginning for her.

Both cohort teachers said that their work with an AP professional developer was the most useful professional development related to the project. He visited every two months or so. The Cohort 2 teacher only participated in the summer professional development in 2012 (not before her first year of teaching). She felt that maybe it was too late and she didn't find it very helpful.

Regarding whether these teachers would volunteer to teach Algebra Project again, knowing what they know now, Cohort 1 teacher said she definitely would but the Cohort 2 teacher was still not sure. She said she worries that she isn't "doing it right."

The teacher's experience working with the first cohort (with YPP) when they were just 8<sup>th</sup> graders really helped develop students' trust, and she is incredibly close with this class. She said:

"I am still absorbing everything that I have gone through over the last 4 ½ to 5 years... Obviously the connection to the kids is phenomenal... but I think for me, I have just grown so much professionally from it and not only with this group of kids, but the way I teach has changed and even my traditional classes have changed and the way I teach them and the way I learn has changed, which is really huge for me because now I have all of these support people. Before, especially in high school, we don't work together very well, and we are kind of an isolated bunch and so for me, I have realized we can really learn a lot from each other and why be afraid to jump into that. And so [a researcher for the

project] and I are going to do a calculus study this summer and just something that you wouldn't do, or would have done before.”

When asked what it takes to do the Algebra Project successfully, one teacher said:

“It takes a lot of collaboration and you definitely have to be willing to do this work. That is the biggest thing, you have to have a desire for it and you have to be really committed to doing what is best for kids... and being willing to learn and change and re-develop who you thought you were as a teacher and that is huge for me.”

Another teacher said of the Algebra Project:

“I think it has some benefits and sometimes I question whether or not I am the right person to work it. Because sometimes I don't feel successful with it and really question, and am I doing what I am supposed to be doing and is this how it is supposed to be working? It is different and it pushes your comfort zone as a teacher and sometimes I am not sure if I have the energy for it and I think ‘wow, this is for a young person.’”

### ***Challenges***

The double-block that is required by the Algebra Project model presents challenges for scheduling and finances. First, for students who play sports, finding time to add a double-block is very difficult. Secondly, having one class with a fewer number of students than average, that meets for twice as long as other classes, is expensive and difficult to schedule.

Finding and supporting teachers to do Algebra Project is also a challenge. At the high school, the majority of the math teaching staff is nearing retirement and they have no desire to change their instruction or take on additional or different work at this time. There is no question that Algebra Project requires more time and energy than teaching a traditional textbook-based curriculum does.

## **Southeast Michigan: A Declining Auto Industry Community**

### ***Community and school selection***

The high school in Southeast Michigan was selected as a cohort demonstration site for a variety of reasons. It is close to a university where Dr. Moses had a history of working. A group of concerned community members called the Math Literacy Group, which began with a visit from Moses in 2006, had already been meeting for two and a half years. Some members of this group, such as the assistant superintendent of the district, became key players in selecting a cohort demonstration school. At the time, the high school was entering its fifth year of not making AYP according to NCLB criteria, and 70% of the students were not passing Algebra 1. The school had included the Algebra Project in its improvement plan. The Young People's Project (YPP) also had an established presence at the university and was serving students in this district.

In April and May 2009, Dr. Moses along with the university point people for the cohort demonstration project held two parent meetings to talk about the importance of the Algebra Project at the high school. Only about six students and their families attended the first meeting, so Moses offered these students an incentive for signing up their friends. A slightly larger group attended the second meeting, including the high school principal and one middle school principal. Following these meetings, the two teachers who had been identified as the cohort teachers, met with groups of students at the two middle schools. The university point people phoned families and spoke with parents and listened to their concerns and questions, asking for their presence at the subsequent parent meetings.

### ***Students and their experience***

The university point people held several meetings with district administrators in Winter 2009 to look at reading and mathematics test score data for 8<sup>th</sup> grade students at the two middle schools to identify a cohort of students. The assistant superintendent identified 130 students who were in the lower quartile based on standardized test scores, and this formed the pool from which the district selected the cohort participants. Middle school principals reviewed the list and selected 95 candidates. A brochure accompanied by a letter about the Algebra Project cohorts was sent to each student's home address, inviting them and their parents to the first parent meeting. They also provided brochures at the two middle schools. Representatives from the Young People's Project met with the 8<sup>th</sup> graders at both schools to demonstrate

math games, and raise the possibility that they could learn math a different way if they agreed to be part of the Algebra Project cohorts.

The assistant superintendent made the final selection of students based on their families' agreement, completed forms, presence at meetings, and phone conversations. The criteria included the students' mathematical performance on the Northwest Education Association (NWEA) assessment, as well as teachers' sense that these students could benefit from the Algebra Project.

Forty high school freshmen began the cohort in two classes in Fall 2009.<sup>27</sup> The teacher of one class left at mid-year, and 24 cohort students continued with two teachers, a new one and the remaining original cohort teacher. The other 16 students, who had been part of the cohort but were not going to continue into Year 2, worked with two different teachers for the second semester to prepare to transition back into Algebra I. In Spring 2011 one of the university point people and her husband, a retired university professor, came into the cohort class regularly to work with small groups of students with a focus on reading, interviewing students about their literate lives, and building a bank of information for designing the summer institute.

By the end of the third year, 2011-12, the student count in the cohort class had dropped to 11 by mid-year. The class period was 130 minutes for the first two years and cut to 90 minutes starting in 2011-12. The school restructured into two academies and the Algebra Project work became part of one academy at this time. With this reconfiguration, all classes met for 90 minutes, but the cohort class met daily whereas other classes met only two to three days a week.

In Spring 2012, students described their experience in the cohort class as different from regular math classes. Some of the features of the class that distinguished it from regular math classes were that there were only twelve students, and they often received one-on-one attention from the teacher. They did not have textbooks and sometimes had to present their work to the class. Some students said they felt like their classmates were family or old friends from childhood; others said they felt close to a few students in the class. Students had difficulty focusing on the math when the teacher was not with them, but when they had to make their work public by presenting it to the class they tended to be more focused. Neither of the

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<sup>27</sup> Thirty-six of these attended the site's summer institute. Three of these students left the cohort between the summer institute and the beginning of school in the Fall 2009, and the assistant superintendent and counselors replaced them with new students before the school year started.

classes we observed was able to realize the learning potential inherent in the planned activities due to low student engagement.

In Year 3, we observed the cohort class with twelve students twice during a site visit. One day we observed a math class facilitated by a visiting AP professional developer and the classroom teacher, and the other day was an enrichment class taught by YPP. The math class was planned to start with a warm-up activity comparing the functions of the motion of two cars followed by a three-part classwork activity comparing the features of monomials and polynomials, using graphing calculators to graph them and making observations in writing about how they relate to each other. However, the class only did the warm-up activity and did not get to the classwork.

The AP professional developer started the class by introducing the warm-up activity. He showed students how to graph and compare the functions using graphing calculators. The students seem to know what to do, and one explained the meaning of a graph: “The straight line means constant speed and the curvy line means it’s changing speed.” Only about half of the students engaged with the math on their own, but other individual students engaged when the two facilitators worked one-on-one with them.

Two YPP College Math Literacy Workers (CMLW) conducted the other class. They did three activities, two of which were math-centered and together lasted about 40 minutes, and the third was role-playing a college admissions team considering student profiles, which lasted about 45 minutes. In one math activity, students were standing in a circle and each student had a stick to hold with two fingers. The challenge was to take it to the floor and back up without dropping it. For the second game, students were standing in facing lines with a cup in the middle that students used to indicate they had the answer. The challenge was to do calculations with composite and prime numbers as quickly as possible to win points for the team. About half of the students were engaged in these activities, one was acting out and strongly resisting participation and others were distracted and engaged with their cell phones or iPods. For the college review board activity, one of the YPP coordinators told students that this activity required no cell phones. The challenge for the activity was to work in teams to identify two out of seven of the students as the best picks, and then the review panel would select one. The students overwhelmingly favored the male upper class, private school, two-parent household candidate over a single mom, an immigrant, a former gang member, and a student who worked to help support his family. This activity had good potential for students to reflect on the implications of their decisions for themselves as college bound students, but the students did not have an opportunity to do this kind of reflection. The activity concluded quickly with the

YPP leaders asking students how many of the applicants they could identify with and pointing out that they have many of the responsibilities in life that they faulted the applicants on.

The school and district disbanded the cohort during Summer 2012. About six to seven students continued to meet on Saturdays to study calculus with a group of four adults: their cohort teacher, the university liaison, and two YPP representatives. Sixteen of the students who had participated in the cohort class graduated at the end of their senior year.

The cohort students at this site were offered a variety of extracurricular opportunities and support in addition to the cohort class at school.

Summer Institutes: Prior to their freshman year in Summer 2009, 36 of the 40 cohort students participated in YPP activities during a summer institute at the partner university. Phone calls and personal contacts helped get students to the summer institute. One of the university liaisons picked up about 15 students at their homes one day when they did not arrive on the bus. Nine of these students also went to the Algebra Project 2009 student summer institute in Chicago.

This site did not offer a student summer institute in 2010 but about three-quarters of the cohort students participated in the Secondary Math Lab offered at the partner university that summer. The 2011 summer program for cohort students provided a mix of literacy, mathematics, creative expression, and ACT preparation led by a minister who is a former math teacher. Students also interviewed people on the university campus about careers the students were interested in. A dance instructor, a music teacher, a former math teacher turned journalist, and YPP comprised the staff offering a student adult ratio of 2:1. Students wrote formal e-mail invitations to interviewees, video- and audio-taped the interviews, transcribed them, and then wrote summaries based on these experiences. Students also choreographed and performed a dance about careers and aspirations and wrote music and performed it. They shared the mathematics competitions, the dance, the music, and the interview results with their families at the final celebration. A subset of this group also went to the Secondary Math Lab to interact with the rising 9<sup>th</sup> grade students who were the students for the lab. We do not have information on student summer activities, which occurred in 2012. Eleven cohort students participated.

Young Peoples Project: In Year 2, two YPP CMLWs started getting to know and working with the cohort students during the first Secondary Math Lab in Summer 2010. The YPP effort continued into the school year when they came into the cohort class two days a week for half of the class to do community building



activities and to figure out how to work with the students during the school year. This same pattern of coming into class twice a week continued into 2011-12, but CMLWs stayed for the entire period. They worked with the students on social justice topics and YPP-created curriculum. YPP typically mentors high school students to be paid Math Literacy Workers doing math games with younger middle and elementary students after school, but YPP at Ypsilanti High altered their schedule and work because students indicated that they would not attend after-school activities. The university liaison said they had to figure out another way for cohort students to develop their “soft skills: “Just recognizing, these kids are not going to come to the after-school [program] and so, what they need in terms of soft skills development is so important because unless they get that, they aren’t actually going to be learning the math.” In Spring 2012 the YPP walked with the cohort students to a nearby middle school during the school day to do math games and social justice work with the middle school students in lieu of paid after-school jobs.

Saturday meetings and special events: Dr. Moses came to this site monthly much of the 2010-11 school year to work with students on Saturdays. A group of parents and a person from the community college also contributed to this effort. The cohort teacher estimated that about five students consistently attended these events. Moses was at the partner university for Martin Luther King Day 2011 and invited the cohort students to join him on stage to recognize them and the work they were doing. At the end of the second year of the cohort in Spring 2011, the cohort class visited a third university to meet counselors, to talk about exams, coursework, to see the campus, and to visit dorm rooms. The CMLWs also met with cohort students on Saturdays at a college to prepare for the ACT, starting in February 2012. In Spring 2013 five of the cohort students visited historically black colleges with a group of cohort students from another site.

### ***Teachers and teacher supports***

In 2009-10, two teachers started teaching the two freshmen cohort classes. By the middle of the first year 2009-10, however, one of the teachers resigned her position. The 40 students participated in the decision of how to winnow down the class, and one cohort class continued second semester. The district hired a replacement teacher in Spring 2010, and the project convinced the district to allow her to co-teach the cohort class with the original teacher even though she had not had any professional development in the curriculum or pedagogy of the Algebra Project. The remaining cohort teacher received a significant level of in-class support during the first year from four people from the local university: a post-doctoral fellow in mathematics, a researcher, a doctoral student from the College of Engineering, and the Director of Outreach. Four to five people were assisting in the class at this time including a parent-teacher liaison, a

special education teacher, and a professional development specialist from the AP who was visiting for about two weeks of every month. He worked with the cohort class teacher daily during the teacher's prep period and sat in on his classes to help facilitate.<sup>28</sup> The cohort students who were transitioning out of the cohort had two teachers and a similar array of individuals supporting them.

The next year, 2010-11 started off with the same co-teaching situation in the cohort class. At mid-year, the new teacher left the school for another position, and another new hire, an alumnus from the partner university in mathematics teaching, replaced her. This new teacher co-taught the cohort class for a semester to finish out 2010-11. In 2011-12 this replacement teacher no longer taught the cohort students. As mentioned above, the district and school dissolved the cohort at the end of Year 3.

Curriculum: The teachers used AP Trip Line and Road Coloring materials during the first semester, which they supplemented with their own versions of worksheets on a range of topics using Algebra Project ideas. In one cohort class, "Career Fridays" involved presentations by an engineering doctoral student in the class on the ways engineering and technology are applied in everyday life, discussions about the colleges students wanted to attend, and opportunities for self-reflection on strengths and careers.

During Year 2 the teacher with help from the AP professional developer adapted curriculum from *Discovering Geometry* with some AP geometry materials and AP pedagogy, which meant that students were given activities to complete in groups and then present to the class. In 2011-12, the cohort teacher continued to create worksheets using a variety of resources with the support of the AP professional developer for planning and teaching.

Professional development and supports: The original two cohort teachers along with eight others from the area went to the AP summer professional development institute in Chicago in Summer 2009 prior to beginning the first year with the cohort students. Then the site decided to offer their own professional development and applied to the National Institute for Diversity, and got an EAGR grant to fund a summer institute 2010-12 called the Secondary Math Lab. The teachers from this site attended in 2010-11 and 2011-12. All AP teachers in the Cohorts project were invited. Bob Moses taught the lab.

In Years 1 and 2, the cohort teachers had a common preparation period for 1.75 hours daily which included lunch, but most of the planning occurred on Sundays between 10:00-2:00 in a coffee shop

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<sup>28</sup> The professional developer also worked with other teachers in the district because 75 percent of the district's math teachers are new.

debriefing the past week, examining the material for the coming week, and sketching out instructional plans in some detail. A team from the local partner university observed classes and participated in the weekend planning meetings, so observations were routinely incorporated into instructional planning. The group also spent time on topics of interest ranging from mathematical issues, opportunities for explanation, how to handle grading, individual learners, the teaching situation, and how to deal with the extra 30 minutes of class time, which is the time period that derailed instruction. In Year 3, the professional developer continued to visit monthly for a week or two each visit. This work focused on helping the cohort teacher learn to read where the students are mathematically and to adapt his teaching accordingly, connecting with individual students and motivating them. The teacher said that his focus was trying to design lessons so the content was accessible to his students: “Something that the students can read and interpret and actually do.” He was relieved that he was able to shift his focus to thinking about the curriculum and how to motivate his cohort students to learn mathematics rather than constantly dealing with behavioral issues. The site applied for E-Math funds to continue to bring the professional developer to work with the cohort teacher and other teachers in the district, but this component did not get funded. Nonetheless, the site continued to manage to bring in this support.

Mathematician materials developers visited the teacher during Fall 2009. Dr. Moses and a materials developer met with the teaching team three times. One other mathematician material developer visited Summer 2011 and worked with the teacher.

### ***Community involvement***

Most of the community involvement at this site occurred through home visits and personal phone calls to cohort students’ families by Dr. Moses and the university liaison. This site held one family night to consider what to do about the loss of one of the teachers in Year 2, but only four or five parents attended. The Algebra Project students in attendance demonstrated an activity from Road Coloring for those who were present.

### ***Challenges and distinctive contributions of this site***

Two major challenges at this site were that the classroom teacher lacked experience, and neither the teacher nor the university liaison was of the community of the cohort students. Additionally, the university liaison’s professional expertise was not in a STEM discipline. These factors and others contributed to the site struggling to get a foothold in the community and to the teacher struggling with

classroom management and AP pedagogy. A key player at the site said, “I think right from the get-go there wasn’t an appropriate plan,” and support from the Algebra Project to the sites was not clearly articulated or sufficient to help them realize all of the necessary components of a successful cohort. This person said that the AP has passion for the work but nothing in writing that shares their learning and experience: “We kept thinking that they had more of a codified plan than just that hypothesis.” In response, this site made a commitment to illuminating one central and very complex piece of the cohort model, which is Dr. Moses’ teaching.

Perhaps the most significant contribution of this site to the cohort project was the Secondary Math Lab where Dr. Moses taught a different group of rising 9<sup>th</sup> grade students for three summers in an fish bowl situation where teachers were able to observe and discuss what they observed without disrupting the class. As the university liaison said the intent of the Lab was to illuminate model cohort teaching and “really trying to name some of what it is that is going on there.” The result was video footage of the classes and detailed scripting of Dr. Moses’ planning, instructional moves and decisions.

## **California: A Large Urban Community**

### ***Partnerships***

Unique to this cohort demonstration site was the four-way partnership between the Algebra Project (AP), the district, the local universities, and a community organizing entity. The organizing group, an affiliate of the national Industrial Areas Foundation (IAF), is the largest and most diverse organizing effort in the county. It was a key partner in the cohort work from the beginning. Meetings designed to bring together all of the AP players at this site—the university liaisons, the cohort teachers, Young People’s Project (YPP), and the community organizers—occurred more or less quarterly. The community organizers scheduled the meetings and offered a meeting space. The agenda was usually decided collectively.

### ***Recruiting for and launching cohorts***

In Spring 2009, an Algebra Project affiliated organizing group began to recruit 8<sup>th</sup> grade students whose middle schools feed into the two high schools, one in a northeastern section of the city and the other in the south, with the goal of forming Algebra Project cohort classes. The organizing group included community organizers, members of the YPP who had been working in the neighborhood at a different school, local university students and professors from partner universities.

One middle school on the south side provided a list of students who were performing “below or far below basic” based on their scores on the state test, and the organizing group did a weekend walk in the neighborhood to visit the 80 students’ homes. They talked to family members about the opportunity to enroll in a class that used the innovative approach of the Algebra Project and the cohort model. After the walk the organizing group plus four potential cohort teachers, Dr. Moses, and an assistant principal held three information sessions at this high school. They explained the project and asked whether students had an interest in participating in the AP Cohort project starting in Fall 2009. These efforts yielded 15 students and recruiting continued with parents from the school community calling the homes of target students who were likely to attend this high school. As school started, 35 students were identified to make two cohorts with two teachers. The cohort teachers themselves recruited eight additional students from their standard Algebra I classes bringing the total to 43. The university professor liaison and his student mentors worked with the teachers and new students to help integrate them into the classes.

The project effort ran into the first of many challenges when a change in administration occurred at this high school during summer before the cohort was slated to start. Right before the beginning of the school year, the organizing group met with the new principal to describe the Algebra Project work and to explain what had taken place prior to her selection. She agreed that the high school would host the Algebra Project, as a model intervention program.

The launch effort for a second high school unfolded in a similar manner. An organizing team formed in northeastern neighborhoods and conducted activities to engage students and parents. They held a Saturday visitation of 92 students' homes, met with parents to encourage their interest in their children, visited middle school classrooms, organized Saturday YPP activities for students, and organized a group of AP leaders to attend a community organizing action in July 2009. Some cohort students from another AP site presented some of their AP mathematics work at the July action. At this event the organizing group secured the commitment of the district superintendent and the director of instruction to the cohort demonstration project. Following the event, the organizing group learned that the district, making good on its commitment, had found funds to reduce class size to 20-25 students for the cohort classes.

In September 2009 four cohort classes started, two at each of the two high schools, and all cohort teachers plus another interested teacher attended the AP cohort professional development institute during the summer.

### ***Students and their experiences***

By Year 2, the two original cohort classes at one school had lost 12 students, so the total student count was down to 31, and these two Cohort 1 classes combined into one junior class of approximately 19 students in Year 3. One of the cohort teachers at this school decided not to continue with the Algebra Project, so the students in her class who were interested in continuing in the project joined the remaining classes. The total count for Cohort 1 students at this school was 23 in Year 2 and 16 in Year 3.

In Year 1, the cohort teachers at both schools planned student summer programs for the incoming freshmen cohorts. However, due to the change in principal at the site mentioned above, the plan was modified and delayed until right before school began for the students at this school. At the other high school, the entering Cohort 1 students attended a three-week summer institute taught by YPP College Math Literacy Workers (CMLW) and the two classroom teachers. The next summer before Year 2, a cohort teacher, with assistance from YPP, offered a new group of entering 9<sup>th</sup> graders a two-week summer

institute to prepare them for starting high school and participating in a cohort. The other school did not offer a student summer program in Year 2. This site's student summer programs differed from other demonstration sites' program in that the cohort teachers rather than the university professor liaisons organized and delivered them, and they occurred at the high schools rather than on a university campus.

Both of the cohort classes, which Inverness Research observed in Year 3, focused on preparing for the state test. Group work and teacher facilitation, which are hallmarks of AP pedagogy, were more evident in one class than the other, which was rapid paced and conducted in a traditional style of teacher delivery. Students in the former class listened to their group members, helped each other, explained their work in front of the class and discussed it. This class had a group identity, which was missing in the other. Students in the other class were listening, taking notes, and solving problems individually on worksheets, and occasionally working together.

By Year 4, the cohort classes had 11 students at one school and approximately 15 at the other school. A significant change for students in their last year of the cohort was that they were not required to take a math class their senior year for graduation, so the cohort classes were considered an elective. As a result the content of the classes included college preparation as well as mathematics. First semester of senior year, the cohort classes at both schools spent time on college preparation, completing applications, FAFSA, and preparing for and taking the SAT. The math topics for one class the first semester were discrete math and polynomial calculus, both written by Algebra Project mathematician material developers, and statistics (Rossman text) the second semester. The other class studied statistics the second semester.

Twenty-six of the original 86 students graduated at the end of Cohort 1 Year 4, and estimates were that 19 were attending college.

### ***Teachers' experiences and supports***

Five teachers from this site attended Algebra Project professional development in Chicago during Summer 2009 along with other interested teachers in the district and teachers from other AP cohort demonstration sites. At both cohort schools, teachers also received support during the year from a variety of people. One of the AP mathematician materials developers visited three times during the first year for a week each time. He met with teachers from both schools on the weekends and spent the weekdays in classrooms. Two university professors from two different local universities were liaisons with the

teachers. They visited the cohort classrooms periodically and worked with the teachers on planning, math content and pedagogy. Both professors had connections with the schools from previous work, which was useful in initially identifying the cohort teachers and establishing relationships.

In the second year of the project, both teachers at the second school continued to teach their cohort classes, and one of these teachers started a second cohort of twenty-five 9<sup>th</sup> graders.<sup>29</sup> At the end of Year 2, one of the cohort teachers changed schools. The rising Cohort 1 11<sup>th</sup> graders, who wanted to stay with the project, were integrated into the cohort class of the remaining teacher, and the Cohort 2 class, which he had started, disbanded. With the class being behaviorally challenging, the AP collective decided to integrate the Cohort 2 students back into regular math classes.

The two remaining cohort teachers from the two schools attended the Algebra Project cohort summer professional development in Summer 2010 held at the university affiliate for another demonstration site. In Fall 2010 the AP collective offered a classroom management workshop jointly for the cohort teachers and teachers at two other district schools.<sup>30</sup> Classroom management presented a major challenge to teachers in most of the cohort classes, and teachers were eager to have support for improving student behavior. Local professional development and support occurred at a lower level during Year 2 compared to Year 1. At one school the university professor liaison visited less this second year, and the mathematician materials developer who had come the previous year was not able to come. However, one of the AP professional development specialists came for a few days in January 2011. In response to the reduced support from the AP project, the cohort teachers met every two weeks with teachers at two other schools that were working with the AP in Fall 2010. Two of the local university liaisons also attended these meetings. Teacher attendance at the meetings was uneven so the group decided to meet once a month beginning in January 2011.

One cohort teacher said that the most helpful support in Year 2 was meeting with the other AP cohort teacher at his school on Saturdays to go over materials and figure out how to present it. During the third year of the project, the university liaison changed at one school to an associate math professor who was familiar with the Algebra Project work.

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<sup>29</sup> The class decreased to 18 students by mid-year.

<sup>30</sup> Two other schools in the district were working with AP but were not part of the cohort demonstration site. They were included in this professional development workshop.



During the final year of Cohort 1, one cohort teacher had in-class support from two local university mathematicians and university students. The other teacher worked periodically with the associate math professor on statistics concepts and planning. This teacher had had only one undergraduate statistics course, so her university support person thought she needed a fairly high level of support. However, because of last-minute changes in the class schedule at the high school, the university person said that she was only able to observe about 50 percent of the time, and she met with the teacher for planning and content support about 30 percent of the time.

Teaching the cohorts was challenging for both teachers and both invested extra time, energy and thought to their work with the cohort students. One teacher, who was a more experienced teacher and of the community of her students, was more successful in teaching the materials and creating a positive academic culture in the cohort. However, neither of the teachers remains in the classroom. One teacher left the school to attend graduate school at the end of Year 4, and the other remains at the other school, but in an administrative position. A new school, which embraces AP pedagogy across all math classes, is receiving support from the AP collective.

### *Distinctive site features and challenges*

This very large urban district brought many challenges as a context for serving the target student population in four-year cohorts in high school mathematics. The four-way partnership was unique to this site and provided logistical and advocacy support of a different nature than the other three demonstration sites experienced. Other sites could have benefited from similar partnerships. At the front end, the community-organizing group had ready strategies for assisting in reaching out to the parents and families of the students to provide support and encouragement to join and stay in the program. Throughout the four years it ran interference on the political decisions that threatened the continuity of the project and built relationships with the district from the superintendent to principals to the teachers to students. One of the early challenges the community-organizing group worked with was that the timing for the launch of the project coincided with the district facing an \$800 million deficit, and 7000 teachers had received pink slips for dismissal. At this time of upheaval, the project was asking for a district commitment to smaller cohort classes when average class size was increasing up to 45 students due to budget cuts. The request from the AP was significant in this district climate because implementation of the cohort model essentially calls for half of the average class size, with 1.5 teacher time. And similar to the cohort schools at other sites, these two high schools were under pressure to meet AYP, so principals were coming and going frequently. When principals changed, the community organizers got to know the new ones and took

responsibility for communicating and promoting the cohort project to them. The first summer of the project, they helped secure teacher permissions to go to the project's professional development in Chicago when the district had a moratorium on teachers attending professional development out of the immediate area. Additionally, one of the university project partners changed after the first year, which also changed the fiscal agent for the project. The new university entered the picture wanting to involve the AP in a family of schools not included in the project. The logistics of negotiating these relationships required attention from the community organizers as well as others in the project. The community organizers also tasked themselves with reaching out into the schools to help with individual students who lost motivation to stay in the program and to work to maintain connections between the teachers and the university partners.

This district faced a fiscal crisis at the time of the launch of the cohort demonstration sites, which was amplified by the threat of teacher layoffs, schools feeling pressured to meet their AYP, frequent change of principals, and change in one of the university partners and fiscal agent for the grant. Without the participation of the community organizing entity, it is doubtful that the effort here would have been able to survive for four years.