Perkins Final Evaluation Report

Gwinnett County Public Schools

Perkins Innovation & Modernization Grant

2019-2022

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**Introduction**

The primary focus of the grant was building the capacity of teachers in Gwinnett County Public Schools (GCPS) to deliver high-quality instruction related to computer science principles. The resulting activities of the grant are expected to result in increased enrollment in computer science (CS) coursework, including closing existing gender gaps in course enrollment, and increased integration of math and science content within CS coursework to promote STEM achievement. The main project goals on which the external evaluation focused were (1) the districtwide preparation course intended to assist teachers in successful completion of computer science certification; and (2) the delivery of professional learning (PL) and coaching to a team of 6th through 12th grade STEM and CTE teachers at three schools in the Norcross cluster – Pinckneyville Middle, Summerour Middle, and Paul Duke STEM Magnet High School. For Goal 1, the evaluation included course enrollment data, disaggregated enrollment data by student gender, and data on new teacher certifications in computer science throughout the district. For Goal 2, the evaluation focused on the delivery of professional learning support to a subset of teachers and a descriptive analysis of data from student assessments in math and science, where available. Goal 2 also included tracking enrollment growth in Work-Based Learning and internship programs at Paul Duke STEM High School. The evaluation design was created based on the following logic model submitted for the grant (Figure 1).
### Evaluation Outcomes

The evaluation was conducted with cooperative input and assistance from the school district. Summative data from teacher certification exams, student course enrollment patterns, and student performance on standardized tests is reported to determine the extent to which the goals of the grant were met. The external evaluation questions are centered around the two primary goals intended to be influenced by the implementation of the grant, both of which are focused on developing teacher capacity in computer science instruction. These goals and questions associated with implementation and impact of the grant are presented below. Over the course of the grant period, the COVID-19 pandemic and policy changes within the district resulted in some modifications to the originally planned evaluation. The following sections summarize the outcomes associated with each of the four evaluation questions connected to each goal.
**Goal 1:** Increase access to high school CTE courses by increasing the supply of teachers certified to teach high-quality Computer Science and Engineering courses.

This project intended to increase the supply of teachers meeting state certification requirements in computer science and use that human capital knowledge to better integrate STEM and CTE content across GCPS middle and high school classrooms. As illustrated by recent research conducted by a grant partner, Georgia Tech, exposing middle school students to Engineering and CS concepts can increase their STEM engagement and achievement (Alemdar, et al. 2018). The grant was designed, in part, to increase the availability of computer-science focused courses in middle and high schools across the district, as well as increase the enrollment of underrepresented groups in computer science and engineering courses. Each of the performance measure outcomes related to Goal 1 are presented below.

**(1.1)** To what extent are teachers completing the full preparation course, as intended, and completing the associated exam to add the Computer Science field to their teaching certificate? (Implementation)

This performance measure was initially impacted by the pandemic, which prevented teachers who completed the computer science preparation course from participating in the associated certification exam. A large gap between the end of the first prep course (March 2020) and the next available opportunity to complete the exam (October 2020) occurred due to the pandemic and some teachers no longer felt prepared to be successful on the exam. This resulted in lower participation rates than expected in the October 2020 exam, while first year prep course participants joined in a refresher course with a new cohort of teachers in 2021. During the initial two years of the grant, 53 teachers completed the course – 21 in the first year and 32 in the second year. After the second year of implementation, recruitment into the prep course become more difficult as teachers targeted for recruitment reported inadequate background knowledge of computer science principles. To accommodate this concern the prep course was modified in year three to provide more depth and extended in length, which provided more support to teachers with limited CS backgrounds.
GCPS implemented a year-long prep course beginning in the summer of 2021, which added three days of release time during the 2021-22 school year providing participants an opportunity to complete more assignments during typical working hours. These programmatic changes extended the timeline for participation, supported completion the preparation course, and promoted successful passage of the associated certification exam. In year three, the program trained 19 additional teachers in the revised preparation course. A total of 72 teachers, to date, participated the course over the first three years of the program. In 2022-23, facilitated by the no-cost extension of the grant, GCPS has enrolled 33 additional teachers who are scheduled to complete the course by March 2023. This is expected to result in a final total of 105 teachers trained over the full course of the grant.

(1.2) **What proportion of teachers who complete the prep course also pass the certification exam and become certified Computer Science teachers? (Impact)**

Over the grants first two years, fewer teachers participated in the certification exam administration due to delays in testing introduced by the COVID-19 pandemic and concerns regarding the gap between preparation course participation and administration of the exam in fall 2020. By the middle of year three, participation in the exam had recovered and the pass rate had increased from 42 percent of participating teachers in the first time period to 76 percent of all participants through year three of the program with 55 of 72 participants successfully completing Computer Science certification. Additionally, changes to the design of the computer science certification course and alterations in the certification requirements enacted this year are expected to increase the certification rate among participations. Recent changes in certification requirements replaced the exam format with demonstrated content mastery and a prepared portfolio task to successfully add the Computer Science credential to teaching certificates. Assuming all currently enrolled participants (33) successfully complete the course and portfolio task during the no-cost extension period and add the Computer Science certification to their credentials, the resulting final certification rate of participants would be about 84 percent (88 out of 105 total participants). This would surpass the targeted rate of 80 percent. GCPS will report final certification rates at the end of the no-cost extension period in 2023.
(1.3) Did the increase in the supply of certified Computer Science teachers result in increased course offerings and an increased number of students enrolled in CS courses in grades 8-12 throughout the district? (Impact)

GCPS has experienced a substantial increase in the total number of course offerings in CS and engineering courses and in the total student enrollment in CS and engineering courses during the grant period. The baseline enrollment figures in the 2019-20 academic year included 14,704 student enrollments in CS and engineering courses. The grant’s performance target of a 20 percent increase in enrollment set a goal of 2,941 additional student enrollments over the grant period. In the first year of grant implementation, 18,221 students were enrolled in CS and engineering courses, representing a 24 percent increase over baseline. In Fall 2021 (end of Year two), enrollment in these courses continued its upward trajectory increasing an additional 6.6 percent between Fall 2020 to Fall 2021, climbing to a total of 19,430 students. Finally, between years 2 and 3 of the grant (Fall 2021 to Fall 2022), GCPS experienced a further increase in enrollment of about 9.7 percent. Since the beginning of the grant period, enrollment in CS and Engineering courses has increased 45 percent relative to baseline, far exceeding the original goal of 20 percent. Thus far, the grant enabled GCPS to certify 55 additional Computer Science teachers, increasing the number of courses offered. The growth in student enrollment also reflects the diversity of the district overall. Of the 21,307 student enrollments in 2022-23 CS and engineering courses across all of GCPS’ middle and high schools, 56.4 percent of the CS and engineering students are economically disadvantaged, 31.6 percent are Black, and 29.7 percent are Latino/a. These proportions are closely aligned with the overall demographic characteristics of the district.

(1.4) Does the enrollment of students in upper-level Computer Science focused CTE courses, such as AP Computer Science and/or Engineering, vary by gender in grades 8-12? (Impact)

The gender gap in student enrollment in Computer Science and Engineering courses in GCPS has narrowed over the time period of the grant. At baseline, in Spring 2020, about 30.8 percent (4,538) of students enrolled in Computer Science and Engineering courses were female. The performance target for this measure proposed to increase female enrollment in these courses by 30 percent (increasing to 5,899 female students) over the full time period of the grant. By the
end of the three-year funding period, female enrollment in Computer Science and Engineering courses had increased to 7,201 students representing a 58 percent increase over the baseline enrollment count. These increases outpaced recruitment of male students as the total share of female students rose to 33.8 percent scheduled to participate in all Computer Science and Engineering courses during the 2022-23 school year.

**Figure 2**

**Goal 2 - Develop interdisciplinary teams at three schools who will lead efforts to integrate STEM and CTE content, while providing authentic, engaging work-based learning experiences and STEM-focused internships for students.**

The original grant application designated additional services be provided in Qualified Opportunity Zones located within GCPS. These Qualified Opportunity Zones are areas of the district with substantial proportions of economically disadvantaged students. Three secondary schools (two middle, one high) serving students in these zones were recruited to participate in additional professional development through a grant partner, Georgia Tech Research Institute (GTRI). Additionally, grant funding supported the purchase additional equipment for Computer Science and Engineering courses at these schools, providing students with up-to-date technology tools and the opportunity to build skills in the areas of coding and robotics using this equipment. The additional equipment also supported increased Computer Science enrollment in the courses,
particularly in the middle schools, as students became more interested in learning how to use these CS-related tools.

Though the pandemic interfered with efforts to provide professional development to a subset of STEM teachers, GTRI was able to provide limited virtual and in-person development sessions and assisted with the development of CS-integrated lesson plans. Also, in year three, grant funding provided an additional work-based learning (WBL) position at Paul Duke High School to facilitate students' enrollment in work-based learning and STEM-focused internships.

(2.1) *To what extent are interdisciplinary teams at Paul Duke HS, Pinckneyville MS and Summerour MS participating in professional development experiences focused on integrating math and science content into CS-focused CTE courses? (Implementation)*

In year one of the grant period, GTRI offered professional development virtually, during the summer months. The program documented strong attendance with members of the Computer Science Integration Team (CSTI) participating in an average of 90 percent of the professional development hours offered. CSTI members also attended an online conference, over a three-day period in mid-June, called “Constellations Virtual Computer Science PD Summit”. In year two, during the 2020-21 school year, development experiences were focused on providing job-embedded support to CSIT members within their schools. Covid pandemic restrictions prevented the delivery of in-person professional development from GTRI. This interfered with scheduled PD provision, but later in year two, GTRI provided 12 hours of professional development and CSIT members also participated in collaborative planning with district CTE staff. These experiences were included asynchronous learning via online resources. GTRI delivered face-to-face professional development in the summer of 2021. Additional PD activities occurred in the fall of year three which focused on this content.

(2.2) *How many lessons per year that integrate core math/science content with Computer Science or Engineering content, are piloted by members of the interdisciplinary teacher teams at these three schools? (Implementation)*
The performance target for the grant included the implementation of 5 CS-integrated lessons during years two and three of the grant period. The virtual nature of professional development and the shift to virtual instruction for teachers during this time period limited the creation and implementation of lessons with integrated CS content. Parents had discretion over whether to participate in a full-time virtual learning school experience or in-person learning with masking and social distancing requirements. Teachers were tasked with providing instruction for both groups of students throughout the 2020-21 school year. This shift to simultaneously providing instruction in two modes presented numerous challenges for teachers and students, including efforts to ensure a comparable experience for the in-person and virtual students. These challenges shifted focus away from the development of CS-integrated lessons with an expected format of experiential small-group learning and limited collaboration between teachers to support CS integrations across courses. In addition, during 2021-22, Paul Duke STEM High School was in the process of earning Georgia DOE’s STEAM certification which also included professional development similar to that provided by GTRI during the grant.

In the second half of year two and continuing into the 2021-22 school year, larger proportions of students returned to in-person instruction. Collaboration with GTRI subject matter experts and researchers in engineering and computer science over the time period did lead to the development and use of CS-integrated lessons. To date, 20 lessons have been developed, with an additional 12 expected to be developed by the end of the performance period for the subcontract. Through the workshops, teachers and leaders have shared feedback on the developed lessons as part of the discussions and dialogue. Program implementers in the district have integrated this feedback into revised lesson plan development.

(2.3) *Is there a relationship between teachers’ implementation of CS-integrated lessons and students’ math or science achievement at these three schools? (Impact)*

Disruptions related to student end-of-grade and end-of-course assessments and teacher turnover encountered during the pandemic made comparisons of matched teacher samples of student testing outcomes unreliable indicators of student achievement. Assessing impact on this question requires both detailed data collection on CS-integrated lesson utilization and a comparable group of teachers and students to serve as a comparison group. The district resumed
typical end-of-year and end-of-course assessments of student achievement in spring 2022. A coarse comparison of outcomes for students enrolled math and science coursework in a matched comparison group of schools is presented below.

*Table 1 - School Outcomes Comparison – End-of-Course and End-of-Grade Testing*

<table>
<thead>
<tr>
<th>Participating Schools</th>
<th>Algebra I</th>
<th>Mathematics (8&lt;sup&gt;th&lt;/sup&gt; Grade)</th>
<th>HS Physical Science (8&lt;sup&gt;th&lt;/sup&gt; Grade)&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinckneyville Middle School</td>
<td>51.3</td>
<td>34.8</td>
<td>35.1</td>
</tr>
<tr>
<td>Summerour Middle School</td>
<td>44.0</td>
<td>25.5</td>
<td>24.2</td>
</tr>
<tr>
<td>Paul Duke High School</td>
<td>48.9</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Comparison Schools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snellville Middle School</td>
<td>33.3</td>
<td>19.2</td>
<td>31.2</td>
</tr>
<tr>
<td>McClure High School</td>
<td>30.8</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

**2.4) To what extent does the employment of a work-based learning (WBL) coordinator at Paul Duke HS (in years 3-5) influence student enrollment in WBL courses? (Impact)**

The original application anticipated the opportunity to extend the grant into a five-year intervention, however, this opportunity did not materialize during the course of the grant. The additional WBL support position at Paul Duke High School was implemented as scheduled in year three. There has been limited time for the addition of the position funded for WBL support to impact students, but with the flexibility provided by the no-cost extension period, GCPS increased the 0.50 FTE position in 2021-22 to 1.0 FTE in 2022-23. The district reports that this

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<sup>1</sup> In the treated and matched schools, 8<sup>th</sup> grade students are enrolling in HS Physical Science in large numbers and few, if any, participate in end-of-course testing in 8<sup>th</sup> grade science.
transition to a 1.0 FTE position is expected to make a substantial difference in time allocation as the position focuses on networking with area employers build relationships and increase the number of opportunities for students to participate in work-based learning.

Based on data from Fall 2021, baseline enrollment in work-based learning programs at Paul Duke STEM High School (PDHS) numbered 29 students as measured by course enrollment data which included learning components in either in-person or virtual workplace settings. The grant specified performance target for the position was five percent growth per year, which would require an increase of two students by fall 2022. As of October 2022, there are 42 students enrolled in work-based learning or internship courses according to course enrollment data, a 45 percent increase over participation in the 2021-22 academic year. This is a substantial increase in participation in this type of learning experience for students. The grant-funded WBL coordinator at Paul Duke High School is currently working with students on an Advisory Board to promote enrollment in work-based learning opportunities. This advanced enrollment decision timeline is expected to both increase participation and reduce scheduling conflicts, which limited student enrollment in prior time periods. PDHS is engaged with Siemens, a technology company focused on industry, infrastructure, transportation and healthcare to develop a five-year strategic plan. Siemens nearby location and partnership development is expected to lead to a network of internship opportunities throughout the company.

**Limitations**

The evaluation was conducted with cooperative assistance of GCPS and relies on administrative data collected in the normal course of operations of the district and specific grant activities. Historic events (the COVID-19 pandemic) and significant changes in district leadership (the departure of the district’s longtime superintendent) impacted implementation of planned student survey data collection and resulted in modifications to the originally proposed external evaluation. High rates of teacher turnover among STEM teachers in high-need schools targeted by the intervention (Goal 2) limited the effectiveness of a planned propensity score matching design to identify teachers that were observably similar to those participating in grant-funded professional development activities. As an alternative, comparisons are made to student performance in schools with similar observable demographic characteristics (evaluation question
2.3). A lack of statewide assessments for students in Algebra II, Pre-Calculus or Physics courses also limits outcome comparisons for students in advanced grades. While still potentially limited due to selection-bias, students served by teachers participating in the professional development funded by the grant would have been compared to students served by similar teachers who did not participate. Because the teachers and schools chosen to participate in the activities funded by the grant were largely able to self-select into participation, it is appropriate to temper any differences observed between treated teachers and comparison teacher’s students as they may be due to systematic differences in the characteristics of participants and non-participants.

**Conclusion**

Assessed in terms of performance targets proposed in the grant application, the funding has successfully resulted in achievement of its proposed goals, despite significant historical events that delayed or limited the implementation of some planned activities over the time period of the grant. The data suggests a positive outcome of activities supported by the grant funds, but the non-causal design of the evaluation and substantial influence of historical events over the time period limit confidence in directly attributing the observed outcomes to the support provided by the grant. Causal evaluation designs are resource intensive, not appropriate for every setting or evaluation purpose, and were beyond the scope of this evaluation. Despite the unanticipated events that occurred over the course of the grant period, GCPS successfully pivoted implementation to enable engagement in the planned activities of the grant and there is evidence to suggest that the two primary goals of grant (1) increasing access and enrollment in Computer Science and Engineering courses and (2) developing interdisciplinary teams at three schools to engage in the development of Computer Science-integrated lessons were successful.