# Five-Year Changes in Instructional Quality and Course Enrollments in the Northeast Tennessee i3 Consortium

**Quarterly Report, May–July 2015**

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**Approved by:** **July 2015**

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# Abstract

Two of the strategies the Northeast Tennessee College and Career Ready Consortium has implemented to expand high school students' access to academically rigorous courses are (1) improving the quality of instruction in math and science and (2) expanding the availability of online learning, distance learning, and college-level Advanced Placement (AP) and dual enrollment courses. This quarterly report examines progress made by the Consortium in these two areas during the grant period. Part 1 of the report looks at changes in instructional quality, using classroom observations conducted near the beginning and end of the grant. Part 2 of the report considers changes in enrollment in online learning, distance learning, AP, and dual enrollment courses, using data from surveys of Consortium schools. We find evidence of broad-based instructional quality gains in Consortium math and science classrooms, as well as enrollment increases, especially for online learning and dual enrollment.

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# Executive Summary

Funded by an Investing in Innovation Fund (i3) grant to the Niswonger Foundation, the Northeast Tennessee College and Career Ready Consortium seeks to improve local high school students' preparedness for college and careers by expanding access to academically rigorous courses. This quarterly report examines progress made by the Consortium over the period of the grant (2010–2015) in changing the following:

(1) Instructional practices and instructional quality in Consortium schools' math and science classrooms

(2) Enrollment numbers for online learning, distance learning, Advanced Placement (AP), and dual enrollment courses

## Changes in instructional quality

Part 1 of this report uses ratings of instructional quality based on a total of 442 classroom observations conducted at two points in time. The first set of observations was taken in 2011, near the beginning of the grant, and the second in 2014, near the end of grant activities. At both points, classroom observations were conducted both in Consortium schools and in similar, comparison schools, in order to examine how the two groups of schools compared on their instructional quality ratings at baseline, and on the change in average ratings between baseline and the end of the grant. Evaluating these comparisons will help determine to what extent the quality of instruction in Consortium schools may have improved over the grant period, and to what extent any such gains can be attributed to grant activities versus other statewide policy changes that may be occurring at the same time (such as Race to the Top).

**Our analysis suggests that Consortium schools did experience broad-based gains in instructional quality over the course of the grant.**

Specifically, for both math and science courses, there were statistically significant increases in the average overall instructional quality rating for Consortium schools. Also, Consortium schools made larger gains in their average overall instructional quality rating than did comparison schools, providing evidence that some of the improvement in overall instructional quality can be attributed to services provided under the i3 grant.

## Enrollment in rigorous courses

Part 2 of this report uses data from the Tennessee Department of Education and from surveys administered by CNA to Consortium and comparison schools from school years 2010/11 to 2014/15 to examine enrollment patterns in online learning, distance learning, AP, and dual enrollment courses. We use the data to investigate changes over time in the proportion of schools offering each course type, enrollment for each course type, and the extent to which the Consortium's enrollment targets for each course type were met by the end of the grant.

**We find that enrollments increased across all four course types.**

In particular, enrollment in online learning courses and dual enrollment increased the most. The rate of enrollment growth in AP courses was lower, in part because it started from a higher baseline enrollment level. Only online learning courses met the 2014/15 enrollment goal.

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# Introduction

Supported by an Investing in Innovation Fund (i3) grant to the Niswonger Foundation, the Northeast Tennessee College and Career Ready Consortium (Consortium) is a network of 15 neighboring Tennessee cities and counties that govern a total of 30 high schools.[1] The Consortium, in partnership with five area colleges, seeks to improve its high school students' preparedness for college and careers by expanding access to academically rigorous courses such as Advanced Placement (AP), dual enrollment, STEM (science, technology, engineering, and mathematics), foreign language, and career and technical education (CTE). Those courses are made available to Consortium students through online learning, distance learning, and dual enrollment modes as well as traditional face-to-face classes.

As we approach the end of the Niswonger Foundation i3 grant, we are examining progress made toward Consortium goals over the period of grant activity, from school year 2010/11 through 2014/15. Two issues that the Consortium is particularly interested in learning more about are its roles in (1) improving instructional quality in math and science courses and (2) increasing access to rigorous courses. This quarterly report examines these issues in two parts:

- **Part 1: Classroom Observations and Instructional Quality Ratings Analysis.** In the first part of the report, we examine whether there has been a change in instructional practices and instructional quality in Consortium schools since the beginning of the grant, using evidence from classroom observations.

- **Part 2: Course Enrollment Counts.** The second part of the report examines the role of the Consortium in increasing students' participation in rigorous courses by looking at changes in course enrollment numbers since the beginning of the grant and the progress made toward annual enrollment targets.

We begin by looking at the results of two sets of classroom observations, one conducted near the start of grant activities, in 2011, and the second conducted near

[1] The Consortium added a 30th high school, University School, in 2013/14. Because both the classroom observations and courses enrollment data of this report go back to the beginning of the grant, the analyses include only the original 29 schools that were observed at baseline.

the end of the grant, in 2014, at both Consortium schools and a matched group of comparison schools. (The comparison schools are 28 non-Consortium Tennessee high schools selected at the beginning of the grant, using propensity score matching, as being most similar to each Consortium school based on a number of criteria including student demographics, baseline academic performance, school resources, community characteristics, and availability of AP and CTE courses.)

These observations measured the level of classroom instructional quality, both overall and along a set of classroom quality characteristics. We examine the numerical ratings from these observations by subject, and where appropriate, by course level, to measure any change in instructional quality in Consortium classrooms over the course of the grant. We supplement the analysis of numerical instructional quality ratings with a qualitative analysis of classroom observers' comments in order to gain insight into the characteristics of classrooms that are rated highly in instructional quality.

We then examine changes over time in course enrollments from a survey administered to Consortium and comparison schools biannually from 2010/11 to 2014/15. These surveys provided data on enrollment numbers in online learning, distance learning, AP, and dual enrollment courses. We use these sources to investigate changes over time in the proportion of schools offering each course type, changes in enrollment numbers for each course type, and the extent to which the Consortium's enrollment targets for each course type were met by the end of the grant.

We conclude by summarizing the findings of both parts.

# Part 1: Classroom Observations and Instructional Quality Ratings Analysis

According to the theory of change underlying Consortium efforts, the instructional quality of the courses students take is an important determinant of students' readiness for college and careers. The Consortium's Learning Resources Team facilitated efforts at improving instructional quality by ensuring that teachers at Consortium schools had access to collaborative professional learning opportunities (including, for example, Summer Academies and AP training through the College Board), and by providing help with implementing innovative new math and science curricula. Part 1 of this report provides information about any changes in instructional quality in math and science in the original 29 Consortium schools that may be attributable to such grant activities.

## Data and methods

To measure and better understand these potential changes in instructional quality, the evaluation team partnered with Briarwood Associates to use its Leadership by Design (LBD) classroom observation instrument. LBD is a comprehensive instrument with which observers measure the quality of a classroom's instructional practices and capture information about the classroom setting. The developer of Leadership by Design, Dr. Stephen Henderson, trains all observers annually to use the LBD instrument and the scoring rubric. For this evaluation, the observers visited math and science classrooms in the 29 Consortium schools and the 28 comparison schools twice each—once in 2011, near the beginning of the grant, and again in 2014, near the end of grant activities.

### An explanation of the ratings

The LBD classroom observation instrument is completed by trained observers with subject matter expertise during classroom observations lasting 45 to 90 minutes. After reflecting on the LBD instrument, the observer completes a rating rubric on which she numerically rates 33 elements of instructional quality, each on a 5-point scale. A score of 5 indicates high quality, and a score of 1 indicates poor quality. Scores below 3 indicate areas that are "in need of improvement."

### Subscale ratings

The observer then combines the ratings on the 33 elements to create scores for nine different dimensions, or "subscales," of instructional quality. Each subscale score is based on an average of ratings on 3–5 of the 33 instructional quality elements. These subscales are defined as follows:

- ***Lesson Overview***—combines ratings of the quality of lesson objectives, use of instructional resources, content delivery, placement in instructional sequence, and seating arrangement for the lesson

- ***Instructional Overview***—includes measures of student focus, instructional strategies, and awareness of student needs

- ***Questioning***—combines quality of questions, depth and breadth of participation in discussion, use of target-centered questions, and feedback to responses

- ***Classroom Atmosphere***—integrates ratings of student involvement, classroom management, and classroom culture

- ***Development of Higher-Order Skills***—combines amount and level of student investigation that takes place with an assessment of the extent to which students' scientific skills are being developed

- ***Teacher Content Knowledge***—combines ratings on quality of communication, connecting content to life experiences, use of strategies appropriate to content, and ability to present lesson content from various perspectives

- ***Positive Learning Climate***—integrates ratings on communicating high expectations, establishing a positive learning environment, valuing and supporting diversity, fostering mutual respect between teacher and students, and providing a safe environment

- ***Effective Classroom Management Leading to Positive Student Outcomes***—includes measures of the extent to which instruction is based on an accurate assessment of student needs; effective use of time, space, and materials; and instruction that facilitates higher-order thinking

- ***Use of Assessment***—combines ratings of alignment of assessment with learning objectives, use of variety of formative and summative assessments, and degree to which the classroom accommodates diverse learning needs

### *Overall rating of instructional quality*

The observer also provides an overall rating of instructional quality on the same 5-point scale. This overall rating is an independent rating of instructional quality, not an average of the nine subscale ratings. The overall rating takes into account the observer's general assessment of classroom instructional quality, including the effectiveness of instruction, the degree of alignment with objectives and standards, the level of student engagement, and the value of instruction in developing students' higher-order thinking skills. Observers are required to write comments corresponding to their overall rating, to provide context for understanding why they selected that rating. Table 1 displays the rubric corresponding to the overall rating.

Table 1. Leadership by Design (LBD) Classroom Observation Rubric for Overall Instructional Quality Rating

| Rating | Description |
|---|---|
| 5 | Instruction was of high quality and effective for all students |
| | Evidence that instruction was based on clearly defined objectives that were fully aligned with standards |
| | All students were engaged in activities requiring high-level thinking skills |
| 4 | Instruction was of high quality and effective for most students |
| | Evidence that instruction was based on clearly defined objectives that were aligned with standards |
| | Most students were engaged in activities requiring high-level thinking skills |
| 3 | Instruction was of good quality and effective for many students |
| | Evidence that instruction was based on student objectives somewhat aligned with standards |
| | Some students had an opportunity for higher-level thinking skills development |
| 2 | Instruction was of mediocre quality and effective for only a small portion of students |
| | Little evidence that instruction was based on clearly defined objectives that were aligned with standards |
| | Instruction had minimal impact on student learning |
| 1 | Instruction was of poor quality and was not effective for any students |
| | No evidence that instruction was based on student objectives |
| | Learning was not based on instruction provided |

A score of 2 ("mediocre") or 1 ("poor") indicates that instructional quality needs improvement. The rubric also has an additional subscale for the classroom's physical setting, collected to provide baseline contextual information, but not used to evaluate the teacher or quality of instruction.

## The classroom observations

All observers were experienced math or science teachers employed by Briarwood Associates who had used the LBD instrument in previous studies. The observers conducted two sets of classroom observations in math and science classrooms in each of the original 29 Consortium schools and in each of the 28 comparison schools. The first set of observations was conducted at baseline, in the spring or fall of 2011, at the beginning of grant activities.

The schools were informed of the visits beforehand and chose the classrooms to be observed. Teachers provided information on the lessons, as well as samples of their student assessments. A mix of math and science courses and regular-level and advanced courses, including Advanced Placement, International Baccalaureate (IB), honors, and other higher-level courses, were chosen for observations. Observers visited two classrooms per subject area in each school.

A second set of classroom observations was conducted at the Consortium and comparison schools in the spring or fall of 2014, near the end of the grant. Whenever possible, the same teachers as at baseline were observed; but if the same teacher was no longer teaching at the school, the principal selected another teacher from the same level course and subject as previously.

Table 2 summarizes the number of classrooms observed by subject, course level, and period for Consortium and comparison schools. There were a total of 442 observations conducted.

Table 2. Number of Classroom Observations, by Course Type and Period

| Group | Course Subject, Level | Baseline | End-of-Grant |
|---|---|---|---|
| Consortium Schools | Math | 56 | 57 |
| | Advanced | 20 | 15 |
| | Regular | 36 | 41 |
| | Unknown | 0 | 1 |
| | Science | 57 | 57 |
| | Advanced | 12 | 17 |
| | Regular | 45 | 39 |
| | Unknown | 0 | 1 |
| | **Total** | **113** | **114** |
| Comparison Schools | Math | 56 | 53 |
| | Advanced | 12 | 10 |
| | Regular | 44 | 43 |
| | Science | 55 | 51 |
| | Advanced | 12 | 17 |

| Group | Course Subject, Level | Baseline | End-of-Grant |
|---|---|---|---|
| | Regular | 43 | 34 |
| | **Total** | **111** | **104** |
| | **Overall Total** | **442** | |

## Research questions and analysis plan

This part of the report uses the classroom observations and associated instructional quality ratings to answer the following questions:

1. **Baseline overall instructional quality ratings.** How do Consortium and comparison schools compare on average overall instructional quality ratings at baseline, before much grant activity had begun? How do the findings vary by course subject or course level?

2. **Change in overall ratings over time.** How do Consortium and comparison schools compare on the change in average overall instructional quality ratings between baseline and the end of the grant? How do the findings vary by course subject and course level?

3. **Change in categories indicating a need for improvement.** For Consortium schools, how does the number of average subscale ratings indicating a need for improvement (i.e., an average score of less than 3 on a 5-point scale) change between baseline and the end of the grant?

4. **Change in subscale ratings.** In which subscales do Consortium schools show larger gains in their average rating relative to comparison schools?

To answer these questions, this report includes data tables and graphics displaying average overall and subscale instructional quality ratings. As appropriate, we break down these ratings according to the time of the observation (baseline vs. end-of-grant), course subject matter (math vs. science), and course level (advanced vs. regular). We use statistical *t*-tests to evaluate whether average ratings differ significantly between Consortium and comparison schools or differ over time. In addition, we supplement the analysis with material from the observers' written comments to shed light on the changes in instructional practices that are behind any changes in ratings.

Insight into the effect that i3 grant activities have on the instructional quality of Consortium classrooms is a key goal of this analysis. Gaining this insight is complicated because other changes may be occurring over time, such as state Race to the Top initiatives, that may affect the quality of instruction at all schools in the state. An important aspect of the analysis, therefore, is to compare ratings between Consortium and comparison schools. Doing this accounts for such statewide changes—that is, the comparison school ratings give us an idea of the pattern we might have observed in the Consortium school ratings in the absence of i3 grant activities. Any difference in the change in ratings over time between Consortium and comparison schools can be attributed to the grant activities.

The remainder of this part of the report is organized as follows. First, we will look at the *overall rating* of instructional quality. We compare differences in the average overall instructional quality ratings at baseline between Consortium schools and comparison schools. We break down these comparisons by subject and, where appropriate, by course level. We then compare differences in the change in average overall ratings from baseline to end-of-grant between Consortium and comparison schools.

Second, to develop a deeper understanding of the overall changes we observed, we compare differences in the *subscale ratings* between Consortium and comparison schools for the various aspects of instructional quality.

# Overall rating of classroom instructional quality

In this section, we consider differences in the average overall instructional quality rating between the 29 Consortium schools and the 28 comparison schools. For each subject, we compare the Consortium and comparison schools at baseline, and then consider differences between the two groups of schools in their change in average ratings between baseline and the end of the grant.

## Math courses

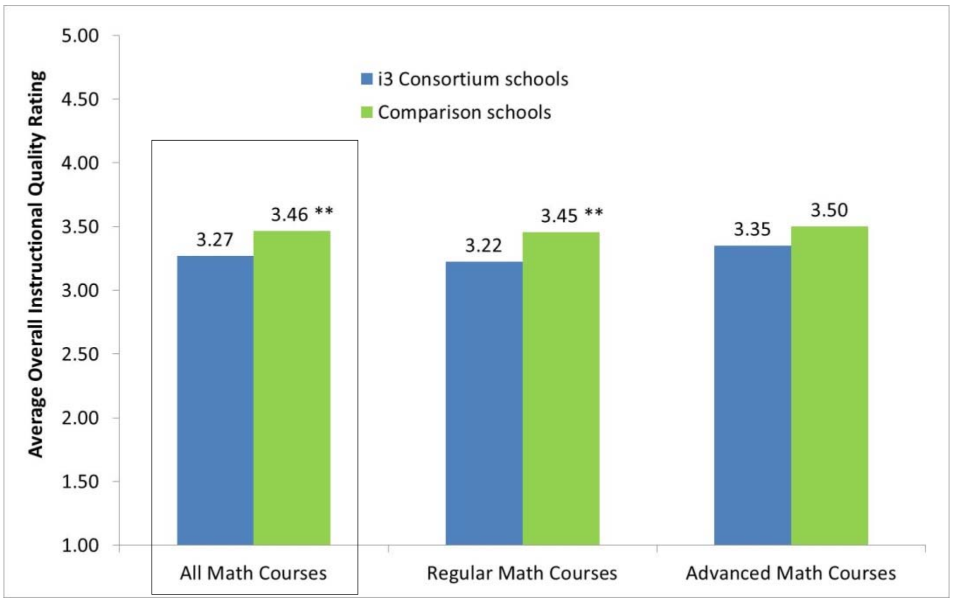
### *Baseline comparisons*

Figure 1 (below) displays average overall instructional quality ratings at baseline for Consortium and comparison schools in math, for all courses and then for regular versus advanced courses.

At baseline, the comparison schools had a higher average rating across all math courses, and for regular math courses in particular, compared with the i3 Consortium schools (both differences statistically significant at the 10 percent level). For advanced math courses, where the sample size is relatively small (N=10 to N=20, depending on the group), we found no statistically significant difference.

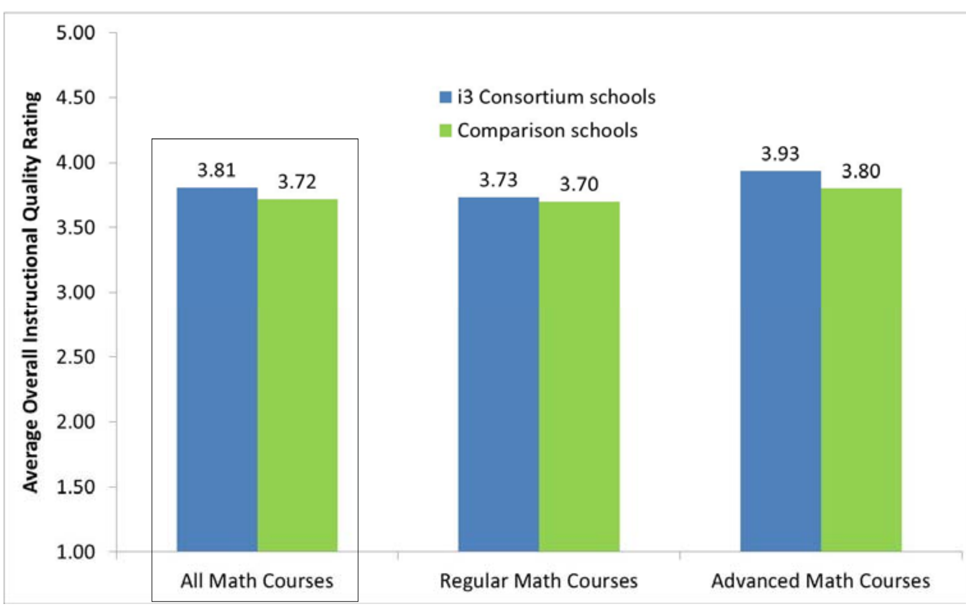
That those differences in math course ratings are statistically significant suggests that there is only a low possibility that the difference between the two sets of observation scores occurred merely by chance. That is, Consortium schools really did have lower math scores at the start of the grant.

Figure 1. Average Overall Ratings at Baseline for Math Courses, 2011




** Difference is statistically significant at the 10 percent level.

Figure 2. Average Overall Ratings at End-of-Grant for Math Courses, 2014



End-of-grant comparisons

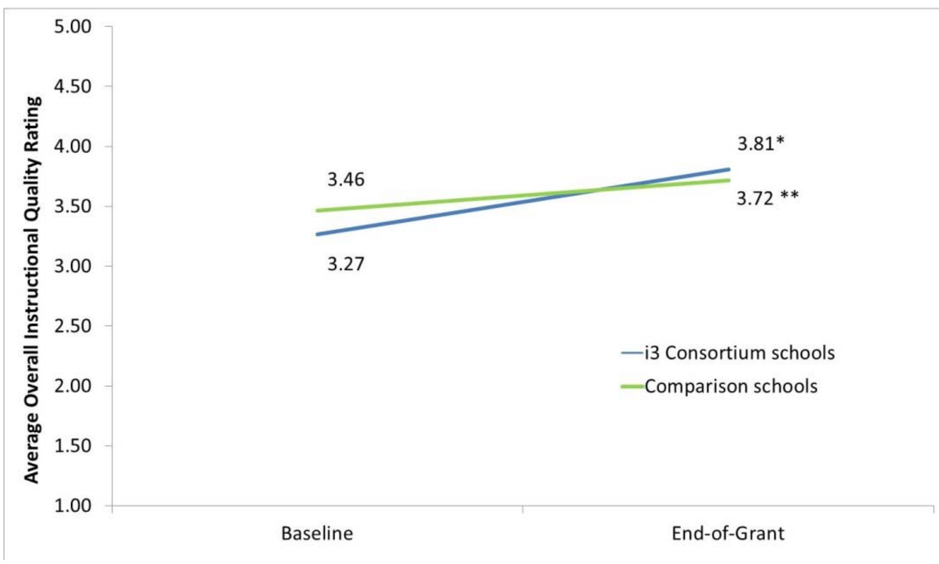
Figure 2 (above) is similar to Figure 1, but shows the average overall ratings in math based on the set of classroom observations taken near the end of the grant.

## *Comparisons of the change in ratings over time*

Comparing Figure 1 and

Figure 2 tells us something more about the gains that Consortium schools made in overall instructional quality for math relative to comparison schools. That is, where the Consortium schools had been significantly behind the comparison schools in math overall at baseline, by the end of the grant they were doing every bit as well. Figure 3 (below) displays the change in average overall instructional quality rating over time across all math courses.

Figure 3. Change in Average Overall Rating, All Math Courses, 2011 vs. 2014




* The difference between the end-of-grant and baseline ratings for Consortium schools is statistically significant at the 5 percent level.

** The difference between the end-of-grant and baseline ratings for comparison schools is statistically significant at the 10 percent level.

Across all math courses, the average overall instructional quality rating increased more over the grant period in Consortium schools than in comparison schools. For Consortium schools, the average overall rating increased from 3.27 to 3.81, a gain of 0.54 ratings point on the 5-point scale. The difference was statistically significant at the 5 percent level. For comparison schools, the average overall rating increased from 3.46 to 3.72, a gain of 0.26 ratings point. That difference was statistically significant at the 10 percent level. (The lower the significance level, the less likely that the change observed happened by chance.)

The "difference-in-difference"—the amount that average ratings growth across all math courses in Consortium schools exceeded that in comparison schools—was 0.28 ratings point. This is an estimate of the amount of change in ratings that is attributable to the grant activities.

This pattern of change in ratings was relatively consistent between regular versus advanced math courses. For regular math courses, the change in the average overall rating between baseline and end-of-grant for Consortium schools was 0.26 point larger than the change for comparison schools. For advanced math courses, the change in rating in Consortium schools was larger by 0.28 rating point.

In general, the ratings provide evidence that Consortium schools started off significantly behind the comparison schools in terms of overall instructional quality across all math courses, but had caught up by the end of the grant. Both Consortium and comparison schools demonstrated gains in instructional quality over time, but the gains were about twice as large in the Consortium schools (0.54 versus 0.26 ratings point).

## Science courses

### *Baseline comparisons*

Figure 4 (below) compares the baseline average overall instructional quality ratings for Consortium and comparison schools in science, across all courses and for regular and advanced courses.

At baseline, the Consortium and comparison schools had about the same average overall instructional quality ratings across all science courses and for regular and advanced science courses. That is, the slight differences evident in Figure 4 were not statistically significant. Thus, we can say that the Consortium schools and comparison schools had roughly equivalent levels of instructional quality in science courses at the beginning of the grant.

Figure 4. Average Overall Ratings at Baseline for Science Courses, 2011

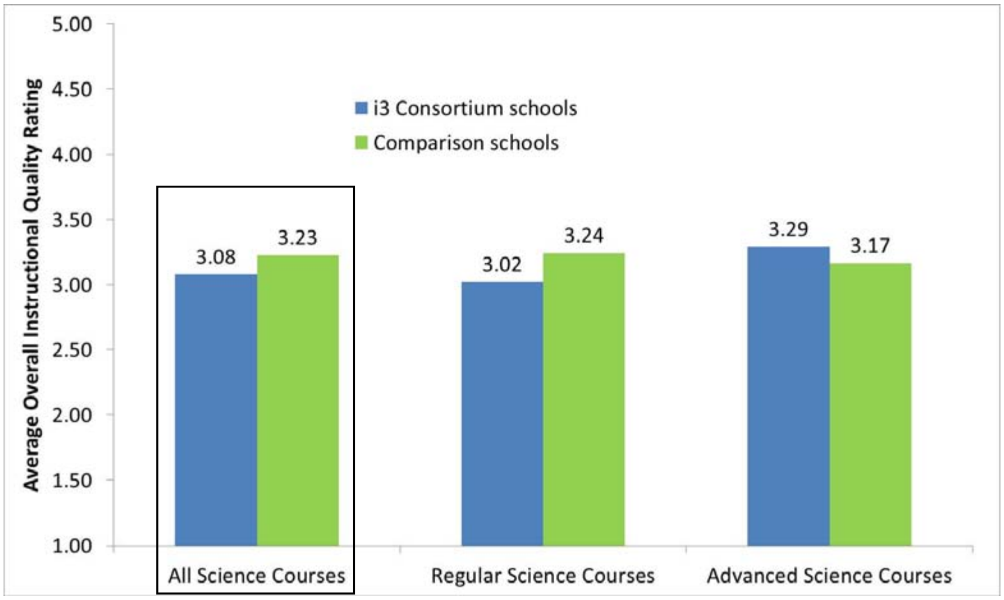
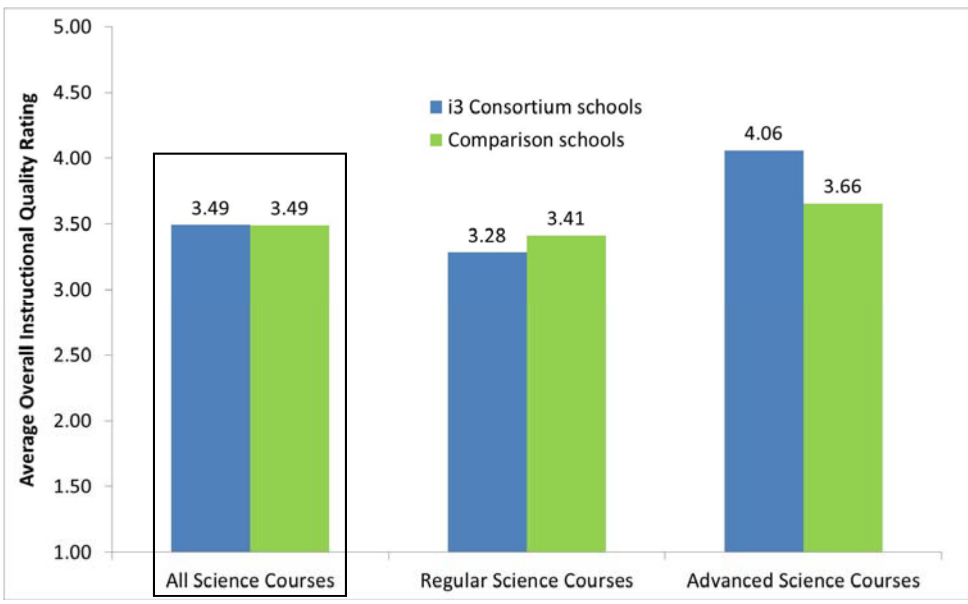



Figure 5. Average Overall Ratings at End-of-Grant for Science Courses, 2014



### *End-of-grant comparisons*

Figure 5 (above) is similar to Figure 4, but shows the average overall ratings in science based on the set of classroom observations taken near the end of the grant.

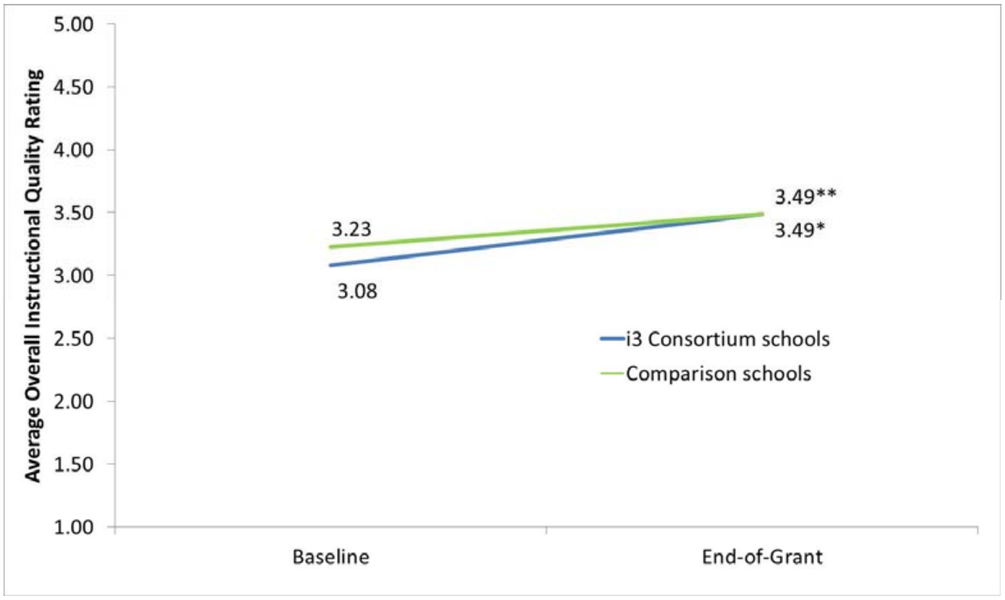
As indicated in Figure 4, at the end of the grant Consortium and comparison schools had the same average overall instructional quality rating across all science courses (3.49). For regular science courses, comparison schools continued to have a higher average overall rating than did Consortium schools, although the gap was a bit smaller than at baseline (0.13 vs. 0.22). For advanced science courses, Consortium schools continued to have a higher average overall rating relative to comparison schools, with a fairly large gap at end-of-grant (0.40 vs. 0.12).

Again, none of these differences for science courses was statistically significant. However, at 4.06, the rating for advanced science courses in Consortium schools broke the threshold at which the LBD rubric describes instructional quality as "high quality and effective for most students," with "most students engaged in activities requiring higher-order thinking skills."

### *Comparisons of the change in ratings over time*

Figure 4 and Figure 5 (above) suggest that in regular science courses, Consortium schools made small gains in overall instructional quality relative to the comparison schools. In advanced science courses, Consortium schools made relatively large gains. Figure 6 (below) shows the change between baseline and end-of-grant, across all science courses in Consortium and comparison schools.

Figure 6. Change in Average Overall Rating, All Science Courses, 2011 and 2014




* The difference between the end-of-grant and baseline ratings for Consortium schools is statistically significant at the 5 percent level.

** The difference between the end-of-grant and baseline ratings for comparison schools is statistically significant at the 10 percent level.

For all science courses, the average overall rating increased more over the course of the grant in the Consortium schools than in comparison schools. For Consortium schools, the average overall rating increased from 3.08 to 3.49, a total of 0.41 ratings point on the 5-point scale. The difference was statistically significant at the 5 percent level. For comparison schools, the average overall rating increased from 3.23 to 3.49, a total of 0.26 ratings point. That difference was statistically significant at the 10 percent level.

The increase across all sciences courses was 0.15 point higher in Consortium schools than in comparison schools. This difference-in-difference value, an estimate of the change in the rating that is attributable to the i3 grant, was about half the size of the relative gain in overall instructional quality of 0.28 rating point for Consortium school math courses. Unlike math, in science courses the pattern of ratings change between regular and advanced courses differed somewhat. For regular science courses, the average overall rating increased more in the Consortium schools than in the comparison schools (0.26 vs. 0.17), for a difference-in-difference change of 0.09 point for the Consortium schools. This is the smallest relative gain in overall instructional quality of any of the comparisons by course/level. For advanced science courses, the average overall rating also increased more in Consortium schools than in comparison schools, by 0.28 point, or more than three times the relative gain for regular science courses.

Evidence from the ratings suggests that gains in overall instructional quality in science courses for Consortium schools were concentrated in advanced science courses (AP, IB, honors, and other higher-level courses), although the Consortium schools did show some smaller relative gains in overall instructional quality for regular science courses, as well. This finding is consistent with the Consortium's emphasis on teacher participation in AP trainings, one avenue for trying to increase instructional quality in advanced courses.

# Instructional quality ratings by subscale

Evidence from the overall ratings shows that over the period of the i3 grant, classrooms in Consortium schools made gains in instructional quality relative to comparison schools, especially in math courses (both regular and advanced) and in advanced science courses. Digging deeper into these changes, in this section we evaluate changes in ratings on LBD's nine subscales over time.

Recall that separate from their overall instructional quality rating, observers complete a rating rubric on which they numerically rate 33 elements of instructional quality. They then combine their ratings on the 33 elements to create scores for LBD's nine subscales of instructional quality. Each subscale score is based on an average of ratings on 3–5 of the 33 instructional quality elements. First for math and then for science courses, we will:

- Compare subscale ratings between Consortium and comparison schools at the beginning and the end of the grant.
- Examine on which instructional quality subscales were schools rated as "in need of improvement" (average rating below 3 on the 5-point scale) at baseline, and on which of those subscales did they show improvement.
- Take a closer look at the subscales on which the Consortium schools made gains relative to comparison schools.

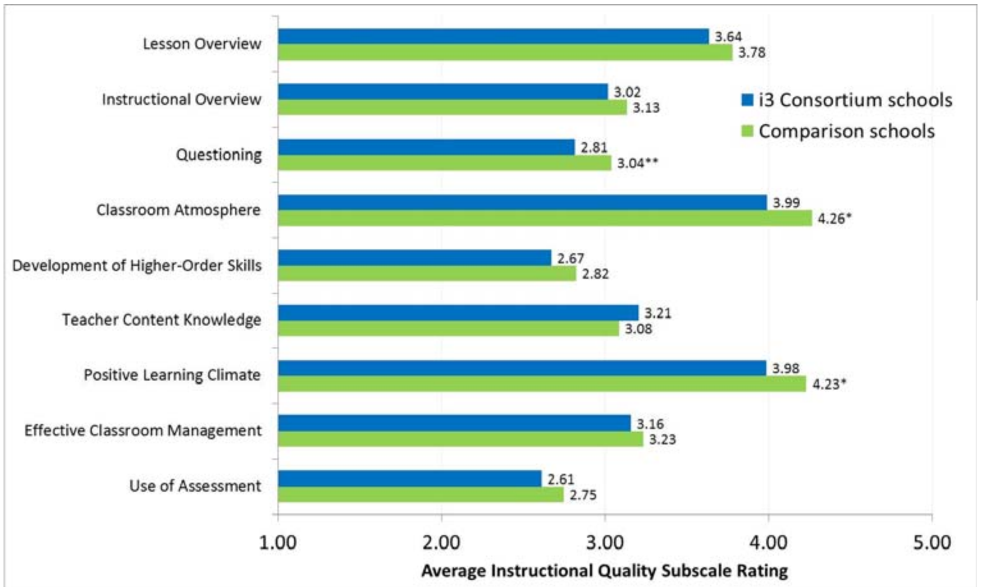
## Math courses

To compare levels of instructional quality between Consortium and comparison math classes on the nine instructional quality subscales, we take two average ratings snapshots. The first is based on the baseline classroom observations conducted near the start of grant activities, in 2011, and the second is based on the observations conducted near the end of the grant, in 2014.

### *Baseline comparisons*

Figure 7 (below) shows a comparison of baseline instructional quality subscale ratings across all math courses between Consortium and comparison schools.

Figure 7. Average Instructional Quality Subscale Ratings at Baseline for Math Courses, 2011




* Statistically significant at the 5 percent level.

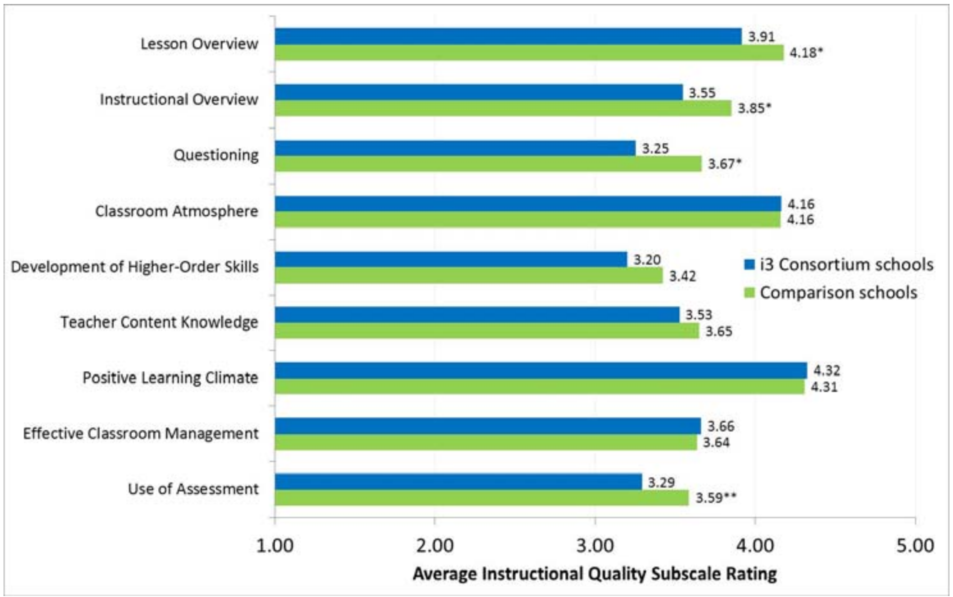
** Statistically significant at the 10 percent level.

Overall, the pattern of subscale ratings looks consistent with the evidence from the overall ratings of classroom instructional quality, where the comparison schools were scored higher than Consortium schools were on average at baseline (see Figure 1).

### *End-of-grant comparisons*

Figure 8 (below) is similar to Figure 7, but shows average math subscale ratings based on the set of classroom observations taken near the end of the grant.

Figure 8. Average Instructional Quality Subscale Ratings at End-of-Grant for Math Courses, 2014




* Statistically significant at the 5 percent level

** Statistically significant at the 10 percent level

By the end of the grant, the Consortium schools had averages similar to those of comparison schools in three of the nine math subscales; but the comparison schools still scored higher average ratings in the other six. For four of those six subscales, the differences between the Consortium and comparison schools' average ratings were statistically significant, at the 5 percent level for Lesson Overview, Instructional Overview, and Questioning, and at the 10 percent level for Use of Assessment.

Figure 9 (below) compares Consortium and comparison schools on the amount by which each subscale average rating changed from baseline to the end of the grant in math.

Figure 9. Change in Average Subscale Ratings from Baseline to End-of-Grant, All Math Courses, 2011 vs. 2014

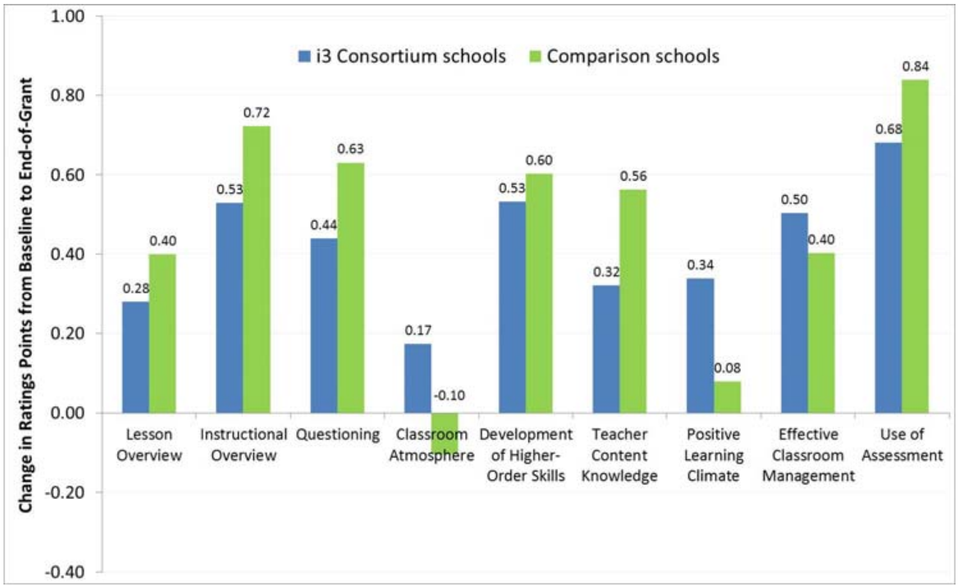



Figure 9 shows that in math courses, Consortium schools improved in their average ratings in each of the nine subscales. Consortium schools saw a larger increase in the average math course rating relative to the comparison schools in three of the subscales (Classroom Atmosphere, Positive Learning Climate, and Effective Classroom Management).

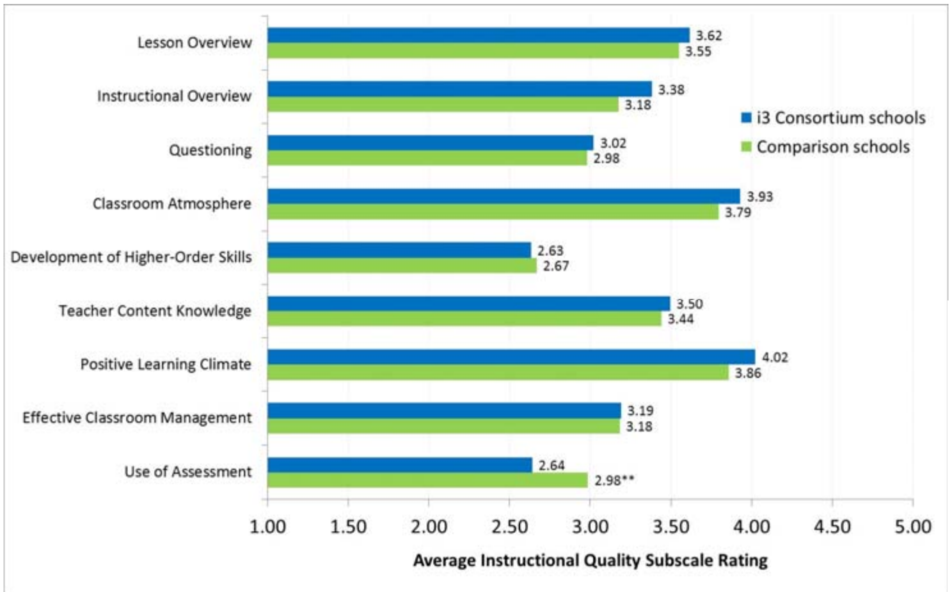
## Science courses

As we did with the math comparison, we take two average ratings snapshots across the nine instructional quality subscales: one near the start of the grant and the other near its end.

### *Baseline comparisons*

Figure 10 (below) shows a comparison between the Consortium and comparison schools on the average subscale ratings across all science courses.

Figure 10. Average Instructional Quality Subscale Ratings at Baseline for Science Courses, 2011



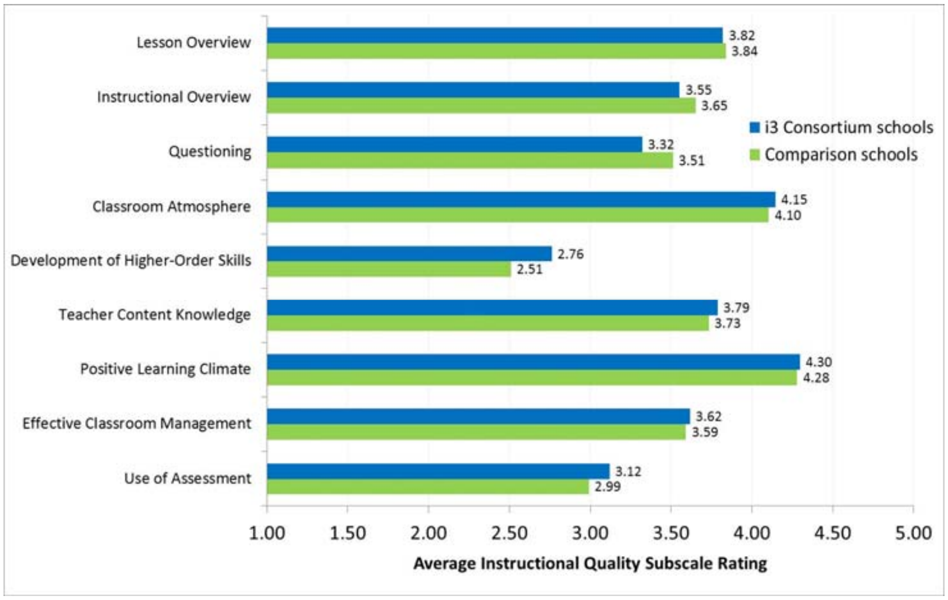

** Statistically significant at the 10 percent level

In science courses, the Consortium and comparison schools at baseline had similar average scores on eight of the nine subscales. Although seven of the Consortium scores were higher, none of those differences was statistically significant. The only subscale where the difference was significant was Use of Assessment, in which the comparison schools had the instructional quality advantage.

### *End-of-grant comparisons*

Figure 11 (below) is similar to Figure 10, but shows the comparison of end-of-grant instructional quality subscale ratings for Consortium and comparison schools in science courses.

Figure 11. Average Instructional Quality Subscale Ratings at End-of-Grant for Science Courses, 2014

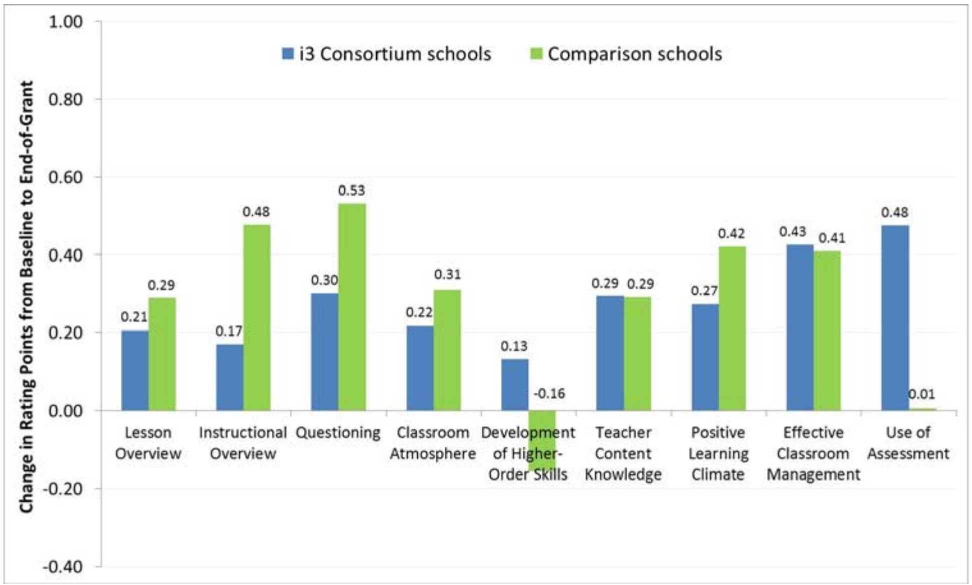



Again, scores were similar for Consortium and comparison schools; none of the end-of-grant differences between them was statistically significant.

For advanced science courses (AP, IB, honors, and other higher-level courses), Consortium schools had higher average ratings at the end of the grant than did the comparison schools in each of the nine subscales (see Appendix A, Table 4 and Table 5). Despite the relatively small number of classroom observations of advanced science courses (N=12), differences in four advanced science subscales were statistically significant (Use of Assessment, at the 5 percent level; Classroom Atmosphere, Positive Learning Climate, and Effective Classroom Management, at the 10 percent level). Gains in the Classroom Atmosphere and Positive Learning Climate subscale ratings may be important, because there is some evidence that gains in such areas are associated with increases in student motivation (Williams, Blythe, & White, 2002).

Figure 12 (below) compares Consortium and comparison schools on the amount by which each subscale average rating changed from baseline to the end of the grant in science courses.

Figure 12. Change in Average Subscale Ratings from Baseline to End-of-Grant, Science Courses, 2011 vs. 2014




In science courses, Consortium schools increased their average rating in all nine instructional quality subscales. In two of the subscales (Development of Higher-Order Skills and Use of Assessment), gains made by Consortium schools exceeded gains made by comparison schools. Increases in scores from baseline to end-of-grant in Questioning, Development of Higher-Order Skills, and Use of Assessment may be particularly important, as research has associated improvements on these domains of instructional quality with improvements in student learning (Williams et al., 2002).

## Subscales in which Consortium schools were "in need of improvement"

Instructional quality ratings below 3.0 indicate a particular need for improvement. Table 3 (below) identifies, by subject, the subscales in which the Consortium schools' average ratings indicated a need for improvement at baseline (2011) and at the end of the grant (2014).

Table 3. Subscales in which Consortium Schools Were "In Need of Improvement" at Baseline and at End-of-Grant, by Subject

| Subscale | Math Baseline | Math End-of-Grant | Science Baseline | Science End-of-Grant |
|---|---|---|---|---|
| Lesson Overview | | | | |
| Instructional Overview | | | | |
| Questioning | ● | | | |
| Classroom Atmosphere | | | | |
| Development of Higher-Order Skills | ● | | ● | ● |
| Teacher Content Knowledge | | | | |
| Positive Learning Climate | | | | |
| Effective Classroom Management | | | | |
| Use of Assessment | ● | | ● | |

At baseline, the average subscale ratings for the Consortium schools showed a need for improvement in Development of Higher-Order Skills and in Use of Assessment in both math and science (see Figure 7 for math courses and Figure 10 for science courses).

By the end of the grant, instructional quality in Consortium school math courses had improved such that none of the nine subscales were "in need of improvement" (see Figure 8). For science courses, the subscale Development of Higher-Order Skills remained "in need of improvement" from baseline to end-of-grant; although Consortium school science courses did see small instructional quality gains in that subscale (2.63 to 2.76), especially relative to comparison schools, where the average rating declined from 2.67 to 2.51 (see Figure 11 and Figure 12).

Breaking down the subscale ratings for regular and advanced courses by subject also produced interesting findings. At baseline, in each group of courses (regular math and science, and advanced math and science), we found two to four subscales with average ratings below 3, indicating a need for improvement. By the end of the grant, only two subscales for regular science courses (Development of Higher-Order Skills and Use of Assessment) remained so.

Appendix A contains a detailed breakdown of average instructional quality ratings, by subject, course level, and subscale.

# Evidence from observers' comments

In order to gain greater understanding of what high-quality instruction looks like in Consortium schools, we considered evidence from observers' written comments made as part of the Learning by Design classroom observation process. After a site visit, the observer reflects on the observation and, using the LBD instrument completed during the observation, fills out the LBD Classroom Observation Rubric. The written comments from these rubrics form the data analyzed in this section.

## Overall instructional quality rating

Observers of highly rated classrooms (those receiving an overall rating of 5) at the end of the grant suggest that Consortium teachers were emphasizing careful planning and coordination of course materials and student engagement in activities requiring higher-order thinking skills:

> Clearly, there was careful planning of the lesson-instructional strategies, questions, assignments, technology use.
>
> All students were engaged throughout class with the varied activities, and were required to use higher level thinking. They seemed to understand the content as the teacher progressed through the lesson and as they began to generalize their findings.
>
> Overall students received instruction from a very capable, experienced teacher who "knew" her students. She asked higher level questions to make students think. Instruction was teacher-directed, but she engaged students very effectively.
>
> Students were involved throughout class and seemed to feel responsible for their own learning. The instruction engaged students in higher order thinking and they indicated through discussion and responses to questions that they understood the content.

## Subscales with gains relative to comparison schools

In math, gains that Consortium schools made from baseline to end-of-grant in instructional quality exceeded gains made by comparison schools in three subscales: Classroom Atmosphere, Positive Learning Climate, and Effective Classroom Management (see Figure 9). In science, Consortium schools made greater gains in two subscales: Development of Higher-Order Skills and Use of Assessment (see Figure 12).

Below we examine observers' comments about Consortium classrooms that were highly rated in these five subscales at the end of the grant. The comments suggest that, by the end of the grant, highly rated Consortium math and science classrooms were displaying high levels of student engagement, instructional practices that encouraged students to use higher-order thinking skills, and a diversity of instructional approaches that effectively responded to the different learning needs of different students.

### *Classroom Atmosphere*

Observers of Consortium classrooms that were highly rated in this subscale noted the level of student enthusiasm and engagement:

> The environment in this class was open and energetic, with excellent rapport between teacher and students. Although the content was difficult and tedious, students remained enthusiastic, demonstrating confidence, persistence, responsibility, and accuracy in their work.
>
> This experienced teacher had good rapport with students and had a very engaging method of talking to them and asking questions. Students were curious about problems and enthusiastic, confident, responsible, and persistent in their work.

### *Development of Higher-Order Skills*

Observers of Consortium classrooms that were highly rated in this subscale commented that students were involved in activities such as applying and testing theories using data collection, analysis, and interpretation strategies:

> Students applied theorems, interpreted data and engaged in productive discussion. The baseball game activity used an inquiry approach to lead students to understand the concept of probability at a higher level than they had learned in previous courses.
>
> Although most of the problems in this lesson required the use of formulas and had specific responses, students had to analyze data, evaluate logical consistency, and interpret the meaning of their responses. The teacher asked "Why" questions and required them to reason through definitions for independent and dependent events.
>
> Although the inventory was clearly an investigative activity, it did not involve the use of traditional laboratory equipment. Data was collected as students used written information to calculate their daily water usage, based on their usual activities. Communication skills were continuously used, and the interpretation of data was essential

> to form conclusions. This process included lively interpretative discussions.

### *Positive Learning Climate*

Observers of Consortium classrooms rated highly here wrote that teachers were taking steps to build student confidence in their ability to learn, and were using alternative teaching methods and presentation modes to address students' different learning needs:

> The teacher communicated confidence in students and they also demonstrated confidence in themselves. ... Although these students were very capable, the teacher tried to reach different learning styles by showing them several methods.

> The lesson objective of modeling exponential growth and decay was very challenging, but from the interaction between students and teacher, it is evident that students felt confident in their abilities to achieve. The teacher used visuals, discussion, real experiences, and authentic problems to try to address their needs.

> The teacher offered encouragement and praise throughout class, e.g., "Probability is hard; you have to think." ... "Math is fun!" ... "Thanks for the hard work today." He provided an alternative method for working the rational exponent problems when he observed that some students were having difficulty.

### *Effective Classroom Management*

Observers of Consortium classrooms that were highly rated in this subscale noted that teachers were efficiently using and coordinating different types of classroom resources and activities:

> Students were involved immediately for the entire time of class. The teacher checked their homework as they did the warm up, made efficient use of the Promethean Board and SmartView, and printed the trig identities on pink paper so students would not misplace them. When they could not figure out how to find the common denominator while manipulating the identities, she showed them a similar problem using common fractions.

> Students were paired at small tables to facilitate discussion and hands-on activity. As they worked in pairs, the teacher circulated, constantly adapting questions or explaining in more detail so that students could understand.

> Questioning strategies really pushed students to use higher level thinking skills and consider concepts from different perspectives.
>
> Few materials were used, but the classroom was efficiently managed to maximize instruction time. After the inventory activity, students transitioned into "jig-saw groups" to read new material, decide the important points within their groups, and then teach the material to other students. This strategy was both effective and highly efficient. Students spent at least half of the instruction time in group processing and self-reflection.

### *Use of Assessment*

With respect to Use of Assessment, observers noted that highly rated Consortium classrooms at the end of the grant were using formative assessment that was integrated into instruction and used to adapt instruction to the different learning needs of students:

> Excellent use of formative assessment to determine student learning and adjust instruction accordingly. Emphasis on all-student involvement and understanding was impressive. Re-taught using new and different examples when it was clear students were not grasping the concept sufficiently.
>
> Formative assessment was during previous lesson review to determine level of student understanding prior to the day's instruction and following the development of the concept being taught. Assessment was integrated throughout the direct instruction and utilized to adjust the instructional flow to insure all student involvement and learning.
>
> Questioning for understanding during the pre-lab and closure was the most obvious strategy used for formative assessment. Incomplete understanding revealed during the pre-lab was addressed with additional instruction. Based on teacher comments, it appeared that student responses to the questions during closure would be considered during the subsequent lesson. Also during closure, the teacher provided additional help with the challenging lab report questions, and students needing additional time were given the opportunity to complete the assignment for homework. Written work, and astute teacher-to-student questioning during the lab provided each student with at least two opportunities to demonstrate learning. Since the lab report was to be assessed, the extra assistance provided for students while completing the report indicated that this teacher

> modifies assessment to meet the learning needs of students, with in-depth student understanding always the primary focus.

## Questioning showed improvement by end-of-grant

One additional subscale, Questioning, is worth noting because the Consortium schools math course average rating in this subscale increased from 2.81, indicating need for improvement, to 3.25 by the end of the grant—a difference statistically significant at the 5 percent level. The Consortium schools science course average ratings also increased, from 3.02 to 3.32—a difference statistically significant at the 10 percent level.

Observers of some of the Consortium school classrooms that were highly rated on the Questioning subscale at the end of the grant noted that teachers were asking questions that stimulated divergent, higher-order thinking among their students:

> The teacher asked several questions that stimulated divergent thinking, e.g., "Why? What do you think would be different?" She tried to get the students to make sense of probability formulas. She provided feedback to engage them more, e.g., "What do you have to have instead?"... Explain to the class; what is he talking about?"... "Because?"... "These are excellent; I would like for you to elaborate more."

> Students were encouraged to ask questions of the teacher and each other. The teacher asked many questions, several requiring higher order responses, e.g., "Why do populations grow exponentially?" She cautioned them often to "put some thought into it" and gave them adequate wait time. Most students had an opportunity to respond, as she addressed questions to individual students. She often answered a response with another question as feedback.

> During the lesson introduction, the teacher posed several significant questions that required student reflection and stimulated higher-levels of thinking. Both divergent and convergent questions were evident throughout the lesson. These precocious students were full of ideas and questions, and students were not only encouraged, but also required to question each other. The purpose of the lesson was to apply newly learned concepts to a real-life problem, and the teacher was consistently alert to misconceptions among students. Students were not corrected, but were questioned so that they could arrive at a better conclusion after reflection. Most students received feedback from the teacher that was appropriate and that also stimulated critical thinking.

> Mix of questions requiring students to consider prior learned content to apply to concept being developed. Lots of real world examples and applications of the content being taught. Excellent feedback and used numerous examples to clarify, reinforce and extend. Excellent use of wait time and inclusion of all students in the discussion.

# Conclusion: Classroom observations analysis

To summarize our findings: Evidence from the instructional quality ratings suggests that Consortium schools' instructional quality improved over the course of the grant, both overall and especially with respect to Classroom Atmosphere, Development of Higher-Order Skills, Positive Learning Climate, Effective Classroom Management, and Use of Assessment. Comparisons showing that Consortium schools' instructional quality ratings increased relative to the ratings for comparison schools in these areas also suggest that at least some of these gains can be attributed to activities and resources provided under the i3 grant.

What kinds of specific changes may have been responsible for these instructional quality gains in Consortium schools? In our October 2014 Quarterly Report, we discussed responses to a set of questions about important changes in Consortium schools over the course of the grant (Geraghty, Holian, & Cunningham, 2014). These free-response questions were posed to teachers and administrators in Consortium schools by the Learning by Design observers as a supplement to the classroom observations taken at the end of the grant. The questions covered changes in professional development and training, curriculum development, instructional practices, new technology, and classroom management.

Administrators were most likely to report important changes in professional development and training, curriculum development, and new technology. Teachers most often mentioned changes in professional development and training and instructional practices. Science teachers also were relatively likely to report the availability of new technology as being a key change. Among specific types of changes, respondents were most likely to mention the following:

- Increased availability of computer labs (especially by administrators and science teachers)
- Increased exposure to, and use of, both Common Core standards and AP training in professional development and training, as an instructional practice, and as part of curriculum development
- Increased availability of dual enrollment and distance or online learning courses in curriculum development

- Formative assessment techniques learned as part of Gray Fossil training sessions (especially by science teachers)

While some of these responses could describe other changes that occurred independent of the grant, there was also significant grant-sponsored activity in these areas, as well.

# Part 2: Course Enrollment Counts

In this part of the report, we examine changes over time in student enrollment in online learning, distance learning, Advanced Placement, and dual enrollment courses.

## Data and methods

Increasing access to rigorous coursework is an important goal of the i3 grant. Below we describe course availability and participation for the original 29 Consortium schools and whether the grant-end enrollment goals for each course type were reached in the 2014/15 school year.

### Sources of data

The primary source of data is a school enrollment survey of Consortium and comparison schools administered biannually from 2010/11 to 2014/15. These surveys, conducted by the evaluation team during each Fall and Spring semesters, collected enrollment data for online learning, distance learning, AP, and dual enrollment courses.[2] Over the course of the grant, the survey evolved to ask for more-specific information; for example, the length of the course for all of the different course types and whether a course fit multiple course types.

Surveys asked respondents to provide the course name, state course code, number of enrollments, and course length (year-long or one semester) for each of these types of courses offered at the Consortium high schools in the Fall, Spring, and Summer semesters.[3]

[2] Small changes were made to the Fall 2014 dual enrollment and distance learning enrollment numbers reported in the April 2015 quarterly report (Mokher et al., 2015), due to our having received additional and clarified information from the Spring 2015 survey. The updated figures are reported in Appendix B (Figures 19 and 21).

[3] Survey data from University School are not included in this report, since it joined the Consortium after the course enrollment goals were established.

- For online courses, additional enrollment data from Summer 2015 were included in this report. The source of data for that semester was the OpenSIS™ course management system for online courses that was used by the Niswonger Foundation Learning Center Online.

- For distance learning courses, additional questions were included about the type of course(s) offered (i.e., regular, AP, or dual enrollment) and whether the school sent or received the course(s).

- For AP courses, we used student-level data on course enrollments from the Tennessee Department of Education (TDOE), except for 2014/15 we used AP enrollment data from the school surveys.[4]

- For dual enrollment courses, additional questions were included about the delivery method (i.e., at the college campus, college instructor at the high school campus, high school teacher at the high school campus, distance learning, or online learning).

We used descriptive statistics to summarize course availability, changes in course enrollment numbers since the beginning of the grant, actual versus target course enrollment numbers for 2014/15, and the sources of enrollments/delivery method for each course type in 2014/15.

## Annual course enrollment targets

The original i3 grant proposal established a set of annual enrollment goals for online, distance learning, AP, and dual enrollment courses. Funding for the Consortium began in Fall 2010, but school year 2010/11 was used primarily for planning and building necessary infrastructure. Thus, the first full year of program implementation was 2011/12.

Given the delay in program implementation, the original enrollment goals had to be distributed over four years instead of five. In May 2012, the Consortium's Advisory Board established a set of revised goals using actual enrollments in 2010/11 as the new baseline and recalibrating goals for the expected growth in each year of the

[4] The school survey from the baseline year did not include questions about AP enrollments, because we expected that TDOE would provide that data. However, after we experienced considerable lag between the end of the academic year and when TDOE was able to provide the student-level data for that year, we added questions about AP enrollments to the survey. In this report, to ensure consistent comparisons across all years of the grant, we used TDOE data for all annual AP enrollment counts except for 2014/15, as those counts were not yet available from TDOE at the time of writing.

grant to reflect the one-year delay in implementation. Annual goal and actual enrollment figures for each course type for each year are available in Appendix B, while the body of the report focuses on enrollment data from the baseline year versus 2014/15.

## Research questions

This part of the report uses the enrollment data to answer the following questions:

1. **Course availability.** How has the proportion of schools offering each course type changed from 2010/11 to 2014/15?
2. **Course participation and source.** How has enrollment size for each course type changed from 2010/11 to 2014/15; and what was the enrollment source/delivery method for these course types in 2014/15?
3. **Actual vs. target enrollment.** How do actual enrollments in each course type compare versus enrollment targets for 2014/15?

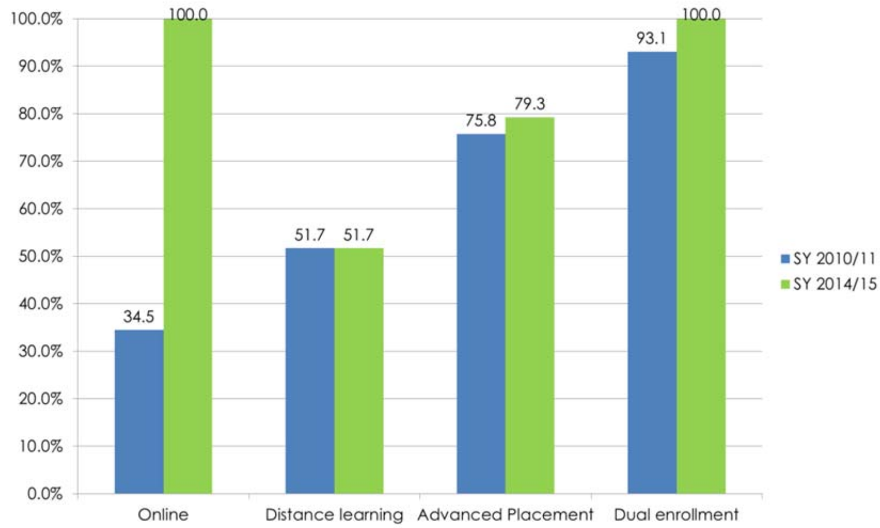
# Changes in course availability by type

Of the four course types, online courses saw the largest increase in availability (proportion of Consortium schools offering one or more such courses) between the baseline year and 2014/15. As Figure 13 (below) shows, availability tripled, from 34.5 percent of Consortium schools (10 out of 29 schools) in the baseline year to 100 percent in 2014/15.

About half of all Consortium schools offered distance learning courses, both at baseline and in 2014/15.

Advanced Placement and dual enrollment courses were already widely available among Consortium schools at the start of the grant. Availability of AP courses increased slightly during the grant period from 76 percent to 79 percent of Consortium schools. About 93 percent of Consortium schools offered a dual enrollment course at baseline, increasing to 100 percent of schools in 2014/15.

Figure 13. Percentage of Consortium Schools Offering Each Course Type




# Changes in course enrollments by type

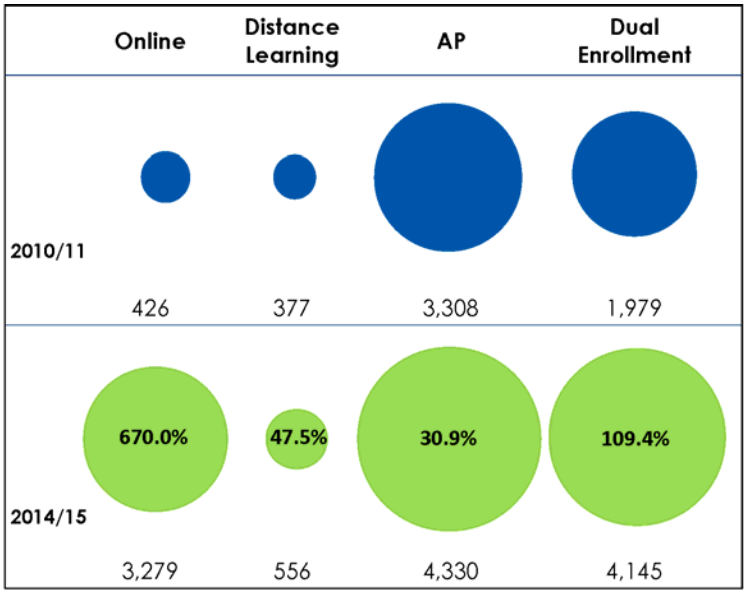
Enrollments increased for all four course types, as shown in Figure 14 (below), which displays changes in enrollment numbers between the baseline year and 2014/15.

In particular, enrollment in online courses increased 670 percent, from 426 to 3,279. By contrast, enrollment in distance learning courses, which was similar to online course enrollment at baseline, increased only 47.5 percent.[5]

Initial enrollments in AP and dual enrollment courses were much higher than in the other two course types. Despite almost 2,000 enrollees in dual enrollment courses at baseline, enrollment still doubled, to 4,145 students in 2014/15. AP enrollment also increased, but more modestly (30.9 percent), from 3,308 at baseline to 4,330 in 2014/15.

[5] For distance learning courses, enrollments at postsecondary institutions that sent courses to high schools were not included in the total enrollment count. In these cases, only enrollments at the high school receiving the courses were counted.

Figure 14. Number and Percentage Change in Enrollment by Course Type, 2010/11 vs. 2014/15




# Sources of enrollments and delivery method by course type

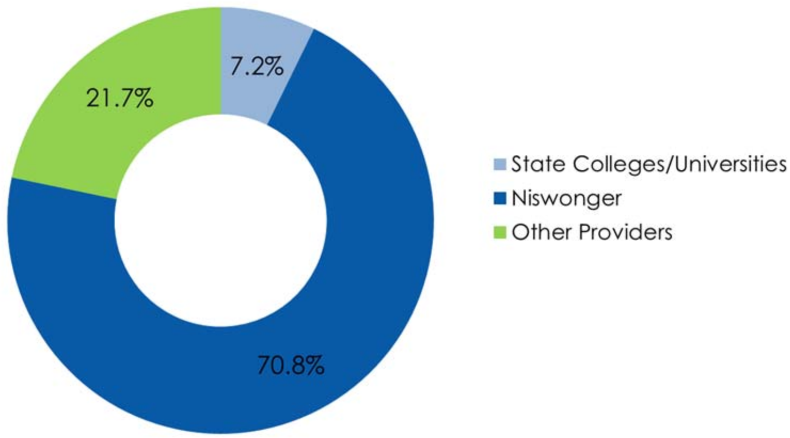
Course instruction for online, distance learning, and to a lesser extent, dual enrollment courses came from a wide variety of sources. The delivery of course instruction also varied for AP and dual enrollment courses. The expansion of course-taking options through distance learning technology is a particularly important goal of the grant. Expanded course-taking opportunities allow Consortium students to complete college-credit–bearing courses and regular courses to ensure the timely completion of graduation requirements. This section reports the various sources of course instruction and delivery methods and the extent of their usage.

## Online courses

A mixture of different sources created the course content delivered in online courses. The Niswonger Foundation provided almost three quarters of the online courses for Consortium schools in 2014/15 (see Figure 15 below). "Other" providers constituted the next largest source of online courses, which covers a variety of sources such as private companies (e.g., A+ Learning Systems, Grade Results, THS eLearn).

The third source was secondary/postsecondary institutions including University School (a high school associated with East Tennessee State University), Brigham Young University, and six Tennessee postsecondary institutions: East Tennessee State University, Milligan College, Northeast State Community College, Tennessee Colleges of Applied Technology (in Elizabethton), Tusculum College, and Walters State Community College.

Figure 15. Online Course Enrollment Sources, SY 2014/15




## Distance learning courses

In 2014/15, there were 49 distance learning courses offered at Consortium high schools, excluding classes from postsecondary institutions sent to high schools as dual enrollment courses.

Since logistical barriers exist when coordinating distance learning courses between school systems, we recorded the number of courses sent between school systems. In these 49 courses, 55.5 percent of students in 2014/15 enrolled in a same-county distance learning course (vs. a course sent from a different county).[6]

Carter County was the most active school system, with 250 enrolled students in 27 distance learning courses (both sent and received).

[6] If a postsecondary institution sent a distance learning course to a Consortium high school, the high school course enrollment was counted as coming from a different county.

## Advanced Placement courses

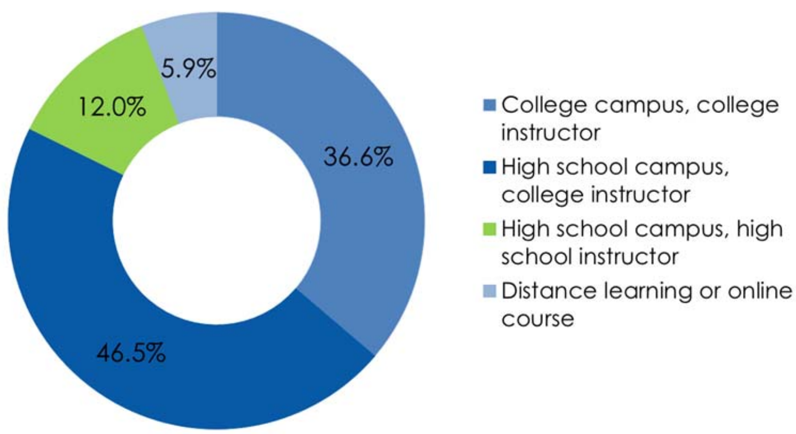
Face-to-face was by far the most common delivery method for AP courses in 2014/15 at 99 percent. Online or distance learning modes accounted for just 1 percent of AP enrollments. While AP enrollment data were not available from the baseline year (see Footnote 4), the delivery mode for AP courses has remained consistent since the baseline year (when delivery methods other than face-to-face were not available).

## Dual enrollment courses

A college instructor holding class at a high school campus was the most common delivery method for dual enrollment courses in 2014/15, accounting for almost half of all enrollments. More than a third of dual enrollment courses were delivered by a college instructor holding class at a college campus (see Figure 16 below).

These findings support the notion that dual enrollment courses are exposing students to college-level instruction and allowing a preview of life on a college campus while still in high school.

Figure 16. Dual Enrollment Delivery Method: 2014/15

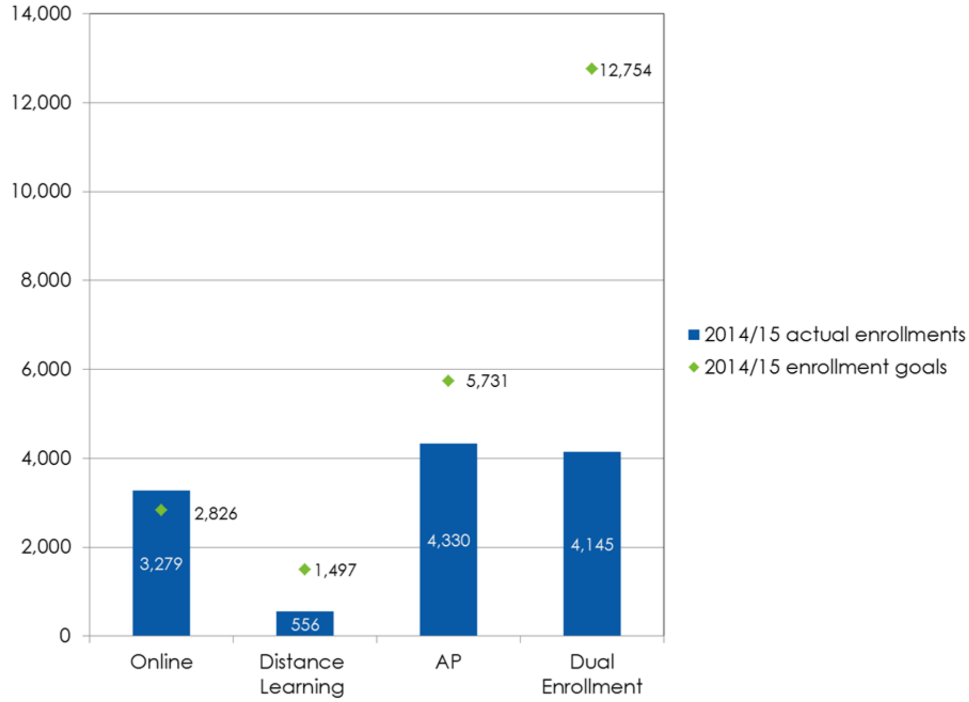



# Actual enrollments versus end-of-grant goals by course type

The April 2015 quarterly report (Mokher et al., 2015) presented Fall 2014 enrollment numbers as percentages of the 2014/15 goals set by the Consortium Advisory Board for each course type.

Our updated analysis shown in Figure 17 (below) found that only online courses met their 2014/15 enrollment goal.

Figure 17. Actual Course Enrollments in 2014/15 vs. 2014/15 Enrollment Goals, by Course Type




It is worth noting, however, that the enrollment goals for each course type were set as purposely ambitious—especially for the final year of the grant, which was assigned the highest enrollment goal, since it assumes annual projected growth in each of the previous years. Even though Consortium schools did not meet the enrollment goals for distance learning, Advanced Placement, and dual enrollment courses, all of these courses grew considerably over the course of the grant (see Figure 14).

# Conclusion

In Part 1 of this report, we analyzed instructional quality ratings based on direct classroom observations conducted in Consortium schools and in a matched set of comparison schools at baseline (SY 2010/11), and again at the end of the grant (SY 2014/15). Our analysis produced the following findings:

- There is evidence of broad-based instructional quality gains in Consortium schools over the grant period. For both math and science courses, there were statistically significant increases in average overall instructional quality ratings for Consortium schools. Consortium schools also saw increases in each of nine subscales of instructional quality from baseline to the end of the grant.

- Relative to the comparison schools, Consortium schools made larger gains in the overall instructional quality rating, especially for advanced science and regular math and science courses. These relative gains for Consortium schools provide additional evidence that some of the improvement in instructional quality can be attributed to services provided under the i3 grant.

- Relative to the comparison schools, Consortium schools also showed larger gains in the Classroom Atmosphere, Positive Learning Climate, and Effective Classroom Management instructional quality subscales in math. Additionally, Consortium schools saw increases in the Questioning, Development of Higher-Order Skills, and Use of Assessment subscales in science. Gains in these dimensions of instructional quality may be particularly important because some research has linked them to gains in student achievement or student motivation.

Part 2 of this report examined changes in course availability and enrollment numbers, as well as progress made toward annual enrollment goals, for online learning, distance learning, Advanced Placement, and dual enrollment courses over the grant period. Our analysis found that:

- Enrollment in online learning courses saw the largest increase between the baseline year and the end of the grant. After starting at 34.5 percent coverage during the baseline year, the availability of online learning courses reached full coverage (100 percent) in 2014/15.

- There were increases in enrollment among all four course types, particularly enrollment in online learning courses and dual enrollment courses. Enrollment growth in distance learning and AP courses was lower in comparison, due to enrollment in those courses starting from a much higher baseline number at the start of the grant. Enrollment in dual enrollment courses more than doubled, while AP enrollment increased by nearly one-third over the course of the grant.

- Only one course type (online learning) met the 2014/15 enrollment target, in part due to overly ambitious goals set for the final year of the grant.

In recent site interviews, school administrators and counselors at Consortium schools expressed concern over future student interest in dual enrollment with the emergence of Tennessee Promise, which offers the opportunity to take state-subsidized college courses, starting in Fall 2015. School administrators and counselors reason that the incentive to take dual enrollment courses in the future could diminish, particularly as the fees associated with dual enrollment courses are no longer covered by the Niswonger Foundation as the i3 grant concludes. Our findings may support their concern:

- Enrollment in dual enrollment courses decreased from 4,617 in 2013/14 to 4,145 in 2014/15, despite the availability of dual enrollment courses at every Consortium school in 2014/15. It's possible that student interest in dual enrollment courses declined as students reasoned that the opportunity to take subsidized college courses would no longer be confined to the current school year. In addition, the Consortium offered fewer dual enrollment gap scholarships in 2014/15 due to budget constraints, which may have played a role, too.

# Appendix A: Detailed Instructional Quality Ratings for Consortium and Comparison Schools

Table 4. Consortium Schools: Detailed Instructional Quality Ratings

| Category | Overall Rating | | Subscales: Lesson Overview | | Instructional Overview | | Questioning | | Classroom Atmosphere | | Development of Higher-Order Skills | | Teacher Content Knowledge | | Positive Learning Climate | | Effective Classroom Management | | Use of Assessment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. |
| **Baseline** | **113** | **3.17** | **113** | **3.63** | **113** | **3.20** | **113** | **2.92** | **113** | **3.96** | **113** | **2.65** | **113** | **3.35** | **113** | **4.00** | **113** | **3.17** | **110** | **2.63** |
| **Math** | **56** | **3.27** | **56** | **3.64** | **56** | **3.02** | **56** | **2.81** | **56** | **3.99** | **56** | **2.67** | **56** | **3.21** | **56** | **3.98** | **56** | **3.16** | **55** | **2.61** |
| Advanced | 20 | 3.35 | 20 | 3.71 | 20 | 3.15 | 20 | 2.83 | 20 | 4.05 | 20 | 2.90 | 20 | 3.20 | 20 | 4.10 | 20 | 3.17 | 20 | 2.73 |
| Regular | 36 | 3.22 | 36 | 3.59 | 36 | 2.94 | 36 | 2.81 | 36 | 3.95 | 36 | 2.54 | 36 | 3.21 | 36 | 3.92 | 36 | 3.15 | 35 | 2.54 |
| **Science** | **57** | **3.08** | **57** | **3.62** | **57** | **3.38** | **57** | **3.02** | **57** | **3.93** | **57** | **2.63** | **57** | **3.50** | **57** | **4.02** | **57** | **3.19** | **55** | **2.64** |
| Advanced | 12 | 3.29 | 12 | 3.80 | 12 | 3.82 | 12 | 3.14 | 12 | 4.31 | 12 | 2.92 | 12 | 3.79 | 12 | 4.35 | 12 | 3.53 | 12 | 2.86 |
| Regular | 45 | 3.02 | 45 | 3.57 | 45 | 3.27 | 45 | 2.99 | 45 | 3.83 | 45 | 2.56 | 45 | 3.42 | 45 | 3.94 | 45 | 3.10 | 43 | 2.58 |
| **End-of-Grant** | **114** | **3.65** | **114** | **3.87** | **114** | **3.55** | **114** | **3.29** | **114** | **4.15** | **114** | **2.98** | **114** | **3.66** | **114** | **4.31** | **113** | **3.64** | **112** | **3.21** |
| **Math** | **57** | **3.81** | **57** | **3.91** | **57** | **3.55** | **57** | **3.25** | **57** | **4.16** | **57** | **3.20** | **57** | **3.53** | **57** | **4.32** | **57** | **3.66** | **57** | **3.29** |
| Advanced | 15 | 3.93 | 15 | 3.88 | 15 | 3.71 | 15 | 3.48 | 15 | 4.30 | 15 | 3.50 | 15 | 3.53 | 15 | 4.40 | 15 | 3.77 | 15 | 3.29 |
| Regular | 41 | 3.73 | 41 | 3.91 | 41 | 3.48 | 41 | 3.16 | 41 | 4.10 | 41 | 3.06 | 41 | 3.50 | 41 | 4.28 | 41 | 3.62 | 41 | 3.28 |
| **Science** | **57** | **3.49** | **57** | **3.82** | **57** | **3.55** | **57** | **3.32** | **57** | **4.15** | **57** | **2.76** | **57** | **3.79** | **57** | **4.30** | **56** | **3.62** | **55** | **3.12** |
| Advanced | 17 | 4.06 | 17 | 4.20 | 17 | 4.18 | 17 | 3.90 | 17 | 4.74 | 17 | 3.29 | 17 | 4.21 | 17 | 4.62 | 16 | 4.11 | 17 | 3.57 |
| Regular | 39 | 3.28 | 39 | 3.68 | 39 | 3.32 | 39 | 3.10 | 39 | 3.94 | 39 | 2.58 | 39 | 3.61 | 39 | 4.19 | 39 | 3.44 | 37 | 2.93 |

Table 5. Comparison Schools: Detailed Instructional Quality Ratings

| Category | Overall Rating | | Subscales: Lesson Overview | | Instructional Overview | | Questioning | | Classroom Atmosphere | | Development of Higher-Order Skills | | Teacher Content Knowledge | | Positive Learning Climate | | Effective Classroom Management | | Use of Assessment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. | N | Avg. |
| **Baseline** | **111** | **3.35** | **111** | **3.66** | **111** | **3.15** | **111** | **3.01** | **111** | **4.03** | **110** | **2.75** | **111** | **3.26** | **111** | **4.05** | **111** | **3.21** | **108** | **2.86** |
| **Math** | **56** | **3.46** | **56** | **3.78** | **56** | **3.13** | **56** | **3.04** | **56** | **4.26** | **56** | **2.82** | **56** | **3.08** | **56** | **4.23** | **56** | **3.23** | **56** | **2.75** |
| Advanced | 12 | 3.50 | 12 | 3.85 | 12 | 3.11 | 12 | 2.96 | 12 | 4.39 | 12 | 2.96 | 12 | 3.33 | 12 | 4.25 | 12 | 3.22 | 12 | 2.28 |
| Regular | 44 | 3.45 | 44 | 3.76 | 44 | 3.14 | 44 | 3.06 | 44 | 4.23 | 44 | 2.78 | 44 | 3.02 | 44 | 4.22 | 44 | 3.23 | 44 | 2.88 |
| **Science** | **55** | **3.23** | **55** | **3.55** | **55** | **3.18** | **55** | **2.98** | **55** | **3.79** | **54** | **2.67** | **55** | **3.44** | **55** | **3.86** | **55** | **3.18** | **52** | **2.98** |
| Advanced | 12 | 3.17 | 12 | 3.63 | 12 | 3.17 | 12 | 2.85 | 12 | 4.00 | 12 | 2.67 | 12 | 3.48 | 12 | 4.11 | 12 | 3.31 | 12 | 2.63 |
| Regular | 43 | 3.24 | 43 | 3.52 | 43 | 3.18 | 43 | 3.02 | 43 | 3.74 | 42 | 2.67 | 43 | 3.43 | 43 | 3.79 | 43 | 3.15 | 40 | 3.09 |
| **End-of-Grant** | **103** | **3.61** | **104** | **4.01** | **103** | **3.76** | **104** | **3.59** | **104** | **4.13** | **103** | **2.98** | **104** | **3.69** | **104** | **4.29** | **104** | **3.61** | **104** | **3.29** |
| **Math** | **53** | **3.72** | **53** | **4.18** | **53** | **3.85** | **53** | **3.67** | **53** | **4.16** | **53** | **3.42** | **53** | **3.65** | **53** | **4.31** | **53** | **3.64** | **53** | **3.59** |
| Advanced | 10 | 3.80 | 10 | 4.24 | 10 | 3.77 | 10 | 3.73 | 10 | 4.17 | 10 | 3.55 | 10 | 3.70 | 10 | 4.42 | 10 | 3.63 | 10 | 3.47 |
| Regular | 43 | 3.70 | 43 | 4.16 | 43 | 3.87 | 43 | 3.65 | 43 | 4.16 | 43 | 3.40 | 43 | 3.64 | 43 | 4.28 | 43 | 3.64 | 43 | 3.61 |
| **Science** | **50** | **3.49** | **51** | **3.84** | **50** | **3.65** | **51** | **3.51** | **51** | **4.10** | **50** | **2.51** | **51** | **3.73** | **51** | **4.28** | **51** | **3.59** | **51** | **2.99** |
| Advanced | 16 | 3.66 | 17 | 4.03 | 17 | 3.84 | 17 | 3.60 | 17 | 4.31 | 17 | 2.85 | 17 | 3.88 | 17 | 4.36 | 17 | 3.65 | 17 | 2.64 |
| Regular | 34 | 3.41 | 34 | 3.74 | 33 | 3.56 | 34 | 3.47 | 34 | 4.00 | 33 | 2.33 | 34 | 3.66 | 34 | 4.24 | 34 | 3.56 | 34 | 3.17 |

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# Appendix B: Actual Course Enrollments vs. Goals, by Course Type, Year, and Semester

Figure 18. Online Learning: Actual Course Enrollments vs. Annual Goals (SYs 2010/11–2014/15)

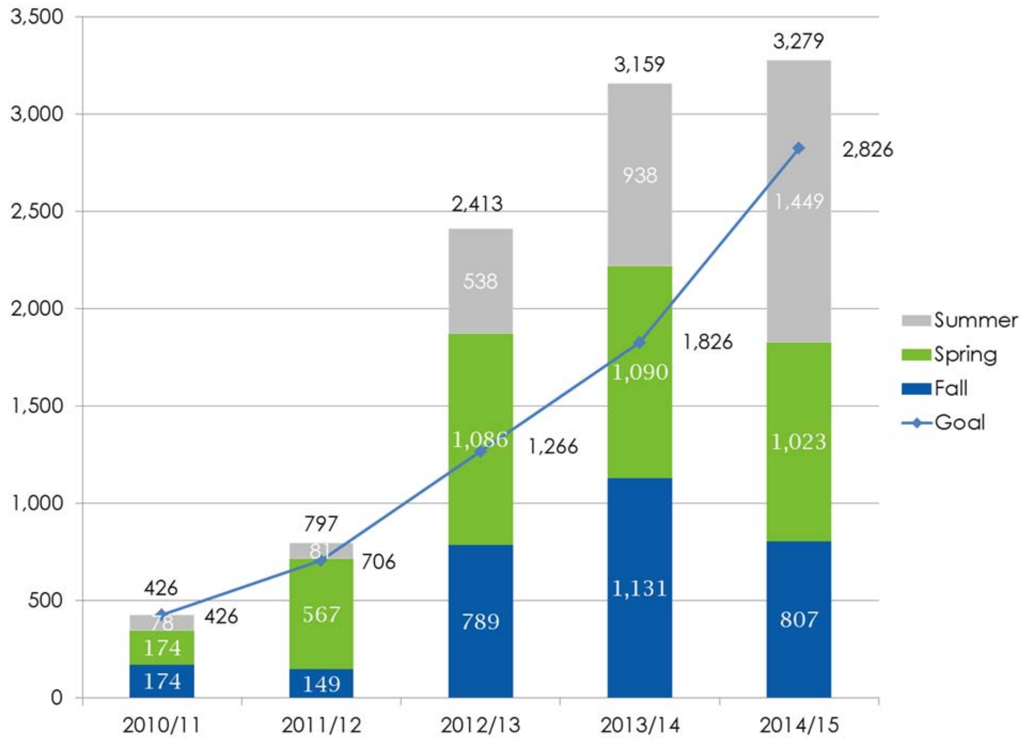


Figure 19. Distance Learning: Actual Course Enrollments vs. Annual Goals (SYs 2010/11–2014/15)

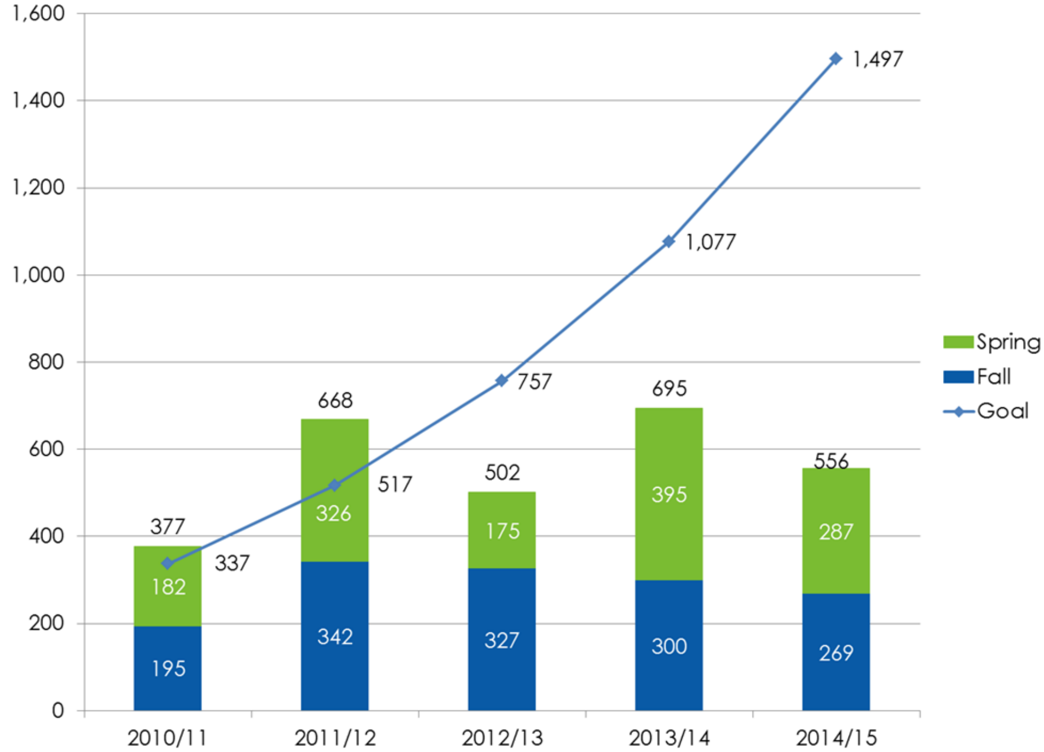


Figure 20. Advanced Placement: Actual Course Enrollments vs. Annual Goals (SYs 2010/11–2014/15)

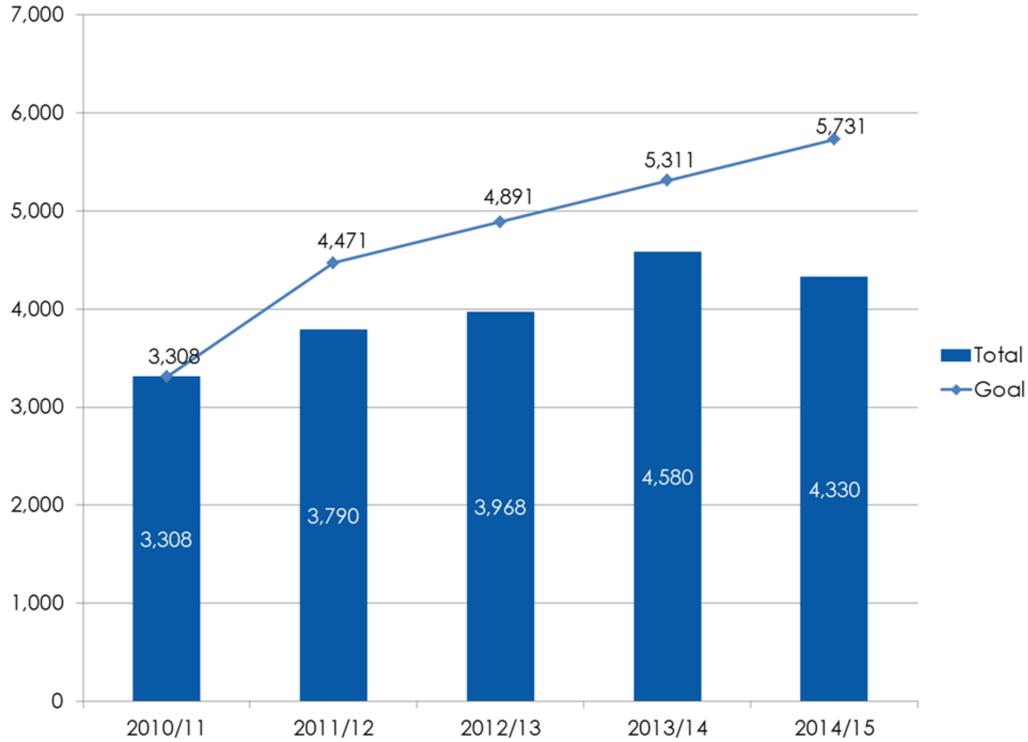
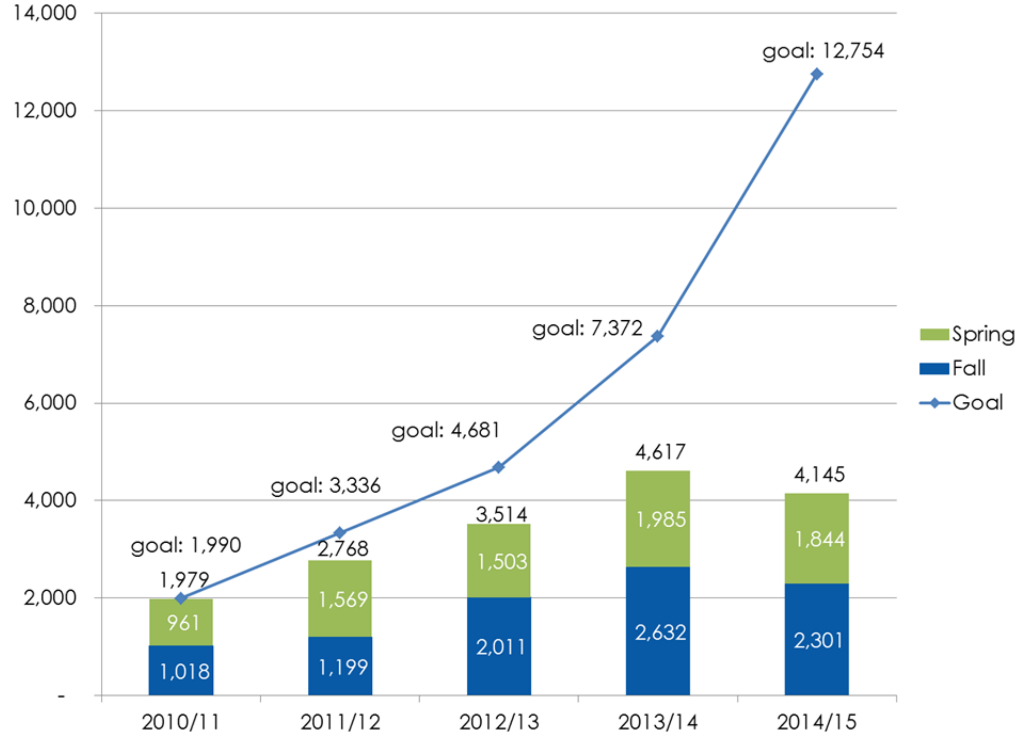


Figure 21. Dual Enrollment: Actual Course Enrollments vs. Annual Goals (SYs 2010/11–2014/15)



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