What's Happening

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Dual enrollment courses in Kentucky: High school students' participation and completion rates

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Key findings

- Approximately one in five Kentucky students in grades 11 and 12 participated in dual enrollment courses between 2009/10 and 2012/13.
- Participation rates were higher for female students, White students, students not eligible for the school lunch program, and students attending high school in Appalachian counties and rural areas.
- Students completed 83–86 percent of dual enrollment courses attempted each year between 2009/10 and 2012/13.
- Completion rates were lower in courses that were attempted by Black students, students eligible for the school lunch program, and students attending school in Appalachian counties.
- About 22 percent of students who completed dual enrollment courses earned at least the equivalent of a full semester's worth of college coursework.

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Summary

This study describes annual rates of participation and completion for Kentucky public high school students in grades 11 and 12 who attempted dual enrollment courses offered by public two-year and four-year colleges. High school students can take dual enrollment courses on a college campus, on a high school campus, or online. To be considered dually enrolled, students must be enrolled in a preK–12 school district and a college in the same academic term, in accordance with Kentucky's statutory definition for dual enrollment courses (Kentucky Revised Statute § 158.007). The study used data from the Kentucky Center for Education & Workforce Statistics for 2009/10–2012/13, the most recently available data at the time of the study, to address research questions on the percentage of students participating in dual enrollment courses, the most common types of dual enrollment courses attempted, course completion rates, and the number of college credits earned through these courses.

Members of the Kentucky College and Career Readiness Alliance of Regional Educational Laboratory Appalachia requested a descriptive study to provide baseline information on students' participation and completion rates in dual enrollment courses. The findings presented here can inform both programmatic decisions and policy development for stakeholders in the Kentucky education system. The report also may be of use to practitioners and policymakers outside of Kentucky who are interested in state-based strategies to improve high school students' college and career readiness. A complementary Regional Educational Laboratory Appalachia study examined implementation practices for dual credit programs in nonurban districts (Piontek, Kannapel, Flory, & Stewart, 2016). Dual credit programs are a subset of dual enrollment programs for which students receive credit at both the high school and postsecondary institution.

Findings on participation rates:

- About one-fifth of Kentucky students in grades 11 and 12 participated in dual enrollment courses during the four years 2009/10–2012/13; participation rates rose in 2011/12 and then fell in 2012/13.
- Participation in dual enrollment courses varied by student characteristics, with higher participation rates for students in grade 12, female students, White students, students who were not English learners, students who were not eligible for the school lunch program (a proxy for low-income status), and students with the highest grade point averages and ACT scores.
- Participation rates varied by school characteristics, with higher rates for students attending schools in Appalachian counties and in rural, less populated areas. Participation also was higher among students in schools with fewer than 1,000 students and in schools with the lowest percentages of racial/ethnic minority students. In 2009/10 and 2011/12 participation rates were higher for students attending schools serving the largest percentages of students eligible for the school lunch program, but those rates subsequently declined about 12 percentage points.

Findings on the most common types of dual enrollment courses taken each year:

- Most dual enrollment courses attempted by students in grades 11 and 12 were offered by two-year colleges, used standard letter grades, and were delivered through face-to-face instruction on college campuses.

- Students in grades 11 and 12 attempted increasing numbers of academically focused courses and decreasing numbers of career and technical education courses across the four years. About 61 percent of dual enrollment courses taken in 2012/13 had an academic focus.

Findings on course completion rates:

- About 85 percent of the dual enrollment courses attempted by students in grades 11 and 12 were completed.
- Completion rates were lower in courses that were attempted by Black students, students eligible for the school lunch program, students with C grade point averages or below, and students with low ACT scores.
- Completion rates were lower in courses that were attempted by students attending schools in Appalachian counties in 2011/12 and 2012/13.
- Completion rates were lower in courses attempted through four-year colleges in 2011/12 and 2012/13 and in courses delivered through face-to-face instruction on high school campuses.

Findings on college credits earned:

- Students who participated in dual enrollment courses earned an average of 7.8 college credits from those courses before their high school graduation.
- About 22 percent of Kentucky's high school students who completed dual enrollment courses earned at least an entire semester's worth of college credits (12 or more) before their high school graduation.

Contents

Why this study?

Dual enrollment provides high school students with the opportunity to complete college courses and earn college credit before graduating from high school. States established dual enrollment courses in the 1970s as an accelerated learning option for high-achieving students who needed more challenging high school curricula (Klopfenstein & Lively, 2012). Over time, however, a broader range of students began taking dual enrollment courses, including economically disadvantaged high school students who take them as a way to lower the cost of college education, accelerate degree completion, and smooth the transition from high school to college (Barnett & Stamm, 2010; High School Leadership Summit, 2004; Hofmann, 2012; Karp & Jeong, 2008).

This expanded participation in dual enrollment courses reflects increasing efforts to improve the likelihood that high school students will be ready for college and careers (Carrell & Sacerdote, 2013; Dougherty & Fleming, 2012; Pretlow & Wathington, 2013; Zinth, 2014). As of the 2011/12 academic year 47 states plus the District of Columbia had statewide policies governing dual enrollment, and 82 percent of U.S. public high schools offered dual enrollment programs (Zinth, 2014; see also Thomas, Marken, Gray, & Lewis, 2013). Approximately 1.4 million students nationwide took dual enrollment courses in 2010/11 (Thomas et al., 2013).

Dual enrollment provides high school students with the opportunity to complete college courses and earn college credit before graduating from high school

As do other states, Kentucky uses dual enrollment as one strategy to improve access to college education for its high school students, particularly after passage of Kentucky Senate Bill 1 in 2009, which focuses on improving college and career readiness. In response to this legislation the Kentucky Department of Education developed the College and Career Readiness Delivery Plan in 2013 to increase the number of students who are college and career ready. One strategy for reaching this goal is to provide opportunities for high school students to earn college credit. Furthermore, a statewide dual credit[1] task force submitted recommendations in December 2014 that called for increasing access to dual credit courses (Kentucky Council on Postsecondary Education & Kentucky Department of Education, 2014).

In a 2009 study the Kentucky Council on Postsecondary Education, which oversees the state's two-year and four-year colleges, reported that participation in dual enrollment programs increased steadily between 2001/02 and 2008/09, from 9,321 high school students to 19,045. That study predated Kentucky Senate Bill 1 and other recent policy developments designed to increase access to dual enrollment opportunities. Members of the Kentucky College and Career Readiness Alliance (KyCCRA) reported in 2013 that the new emphasis on college and career readiness promoted by Senate Bill 1 was boosting interest in dual enrollment courses. Members of KyCCRA noted a lack of recent information about participation and completion patterns in dual enrollment programs that could inform policy aimed at meeting the college and career readiness needs of high school students, especially those in traditionally underserved regions of Kentucky. A complementary Regional Educational Laboratory (REL) Appalachia study examined implementation practices for dual credit programs in nonurban districts (Piontek et al., 2016).

What the study examined

REL Appalachia[2] undertook a descriptive study of Kentucky public high school students' participation and completion rates in dual enrollment courses in Kentucky's two- and

four-year colleges from 2009/10 through 2012/13, the most recent dataset available when this study was conducted. This study focuses on students in grades 11 and 12, as these students had the highest participation rates.

The study addressed the following research questions for academic years 2009/10 through 2012/13:

1. What percentage of students in grades 11 and 12 participated in dual enrollment courses, and how did participation rates vary by student and school characteristics and over time?

2. What were the most common characteristics of dual enrollment courses (two-year or four-year college enrollment, grading and delivery format, and course content area) taken each year?

3. What were course completion rates for students in grades 11 and 12, and how did completion rates vary by student, school, and course characteristics and over time?

4. How many college credits did high school students earn through dual enrollment courses before their high school graduation?

Kentucky uses dual enrollment as one strategy to improve access to college education for its high school students

Dual enrollment has not been defined consistently across states. This report uses Kentucky's statutory definition of dual enrollment[3] as a program in which a student who is enrolled in high school is taking one or more college courses from a two-year or four-year college in Kentucky during the same academic term. This and other key terms are defined in box 1. The study's research methods are summarized in box 2 and described in more detail in appendix A.

Box 1. Key terms

Appalachian counties. The 54 counties in the eastern part of Kentucky, as defined by the Appalachian Regional Commission. This area has high levels of poverty and low levels of educational attainment.

College, four-year. A college or university that offers dual enrollment courses to high school students. The institution typically confers bachelor's, master's, doctoral, and professional degrees.

College, two-year. A community or technical college that offers dual enrollment courses to high school students. The institution typically confers associate's degrees and technical certificates.

Completion rate. A percentage derived from the number of dual enrollment courses completed by a student divided by the total number of dual enrollment courses attempted. Students are considered to have completed a course if they earned a D or higher under a standard grading method or received a credit, pass, satisfactory, or complete under a nonstandard grading method.

Courses. College courses taken by high school students as part of a dual enrollment program.

- *Academic courses* refers to college courses focused primarily on English, math, social studies, science, foreign language, or fine arts.
- *Career and technical education courses* refers to college courses focused on specific professions, careers, or trades, such as agriculture, business, construction, and nursing.

(continued)

Box 1. Key terms *(continued)*

Delivery format. The way a dual enrollment course is delivered:

- *Online* refers to a course delivered using the Internet that does not require students to attend the class on a high school or college campus or at another off-site location.
- *Face-to-face* refers to a course delivered on a high school or college campus that requires students to attend the class at a given campus location.
- *Other off-site* refers to a face-to-face course delivered at an alternative location such as an educational service center or a regional education cooperative.

Dual enrollment. A program in which a high school student is enrolled in a preK–12 school district and a two- or four-year college during the same academic term. This definition is consistent with the statutory definition used by the state of Kentucky.

Dual enrollment course. A college course taken by a high school student before graduation.

Grading method. Typically one of two grading methods is used in dual enrollment courses:

- *Standard letter grades* refers to an A through F grading scale.
- *Nonstandard grades* refers to any other scale, such as pass/fail, satisfactory/unsatisfactory, or complete/incomplete.

High school graduate. A high school student who has completed the necessary requirements to earn a high school diploma in Kentucky.

High school student. A student who has not graduated from a Kentucky high school (within the analytic year) and is enrolled full-time in grades 9–12.

Participation rate. A percentage derived from the number of high school students who enrolled in dual enrollment courses divided by the total number of high school students in an academic year.

Box 2. Data and methods

This descriptive study used data from the Kentucky Center for Education & Workforce Statistics, which maintains a statewide longitudinal data system of information on students enrolled in Kentucky's preK–12 public school system and public two-year and four-year colleges.[1] Data were obtained for every high school student in grades 11 and 12 enrolled in the Kentucky public school system in academic years 2009/10, 2010/11, 2011/12, and 2012/13. This period was selected because it captures the most recent data available when the study was conducted. Data for private high schools and private colleges were not provided. Data on characteristics of Kentucky's high schools and colleges were obtained from the National Center for Education Statistics Common Core of Data and Integrated Postsecondary Education Data System (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2015a, 2015b).

Data for each year were analyzed independently, so findings in this report describe what happened in 2009/10 independent of 2010/11, and so on. With the exception of the cumulative number of credits each student earned through dual enrollment courses, data were not aggregated across years.

In comparisons between groups of students or across academic years, differences of less than 3 percentage points within and across academic years are not highlighted unless doing

(continued)

Box 2. Data and methods *(continued)*

so provides some context. This threshold is somewhat arbitrary but was selected as a convenient marker for highlighting policy-relevant findings. Smaller differences are still reported in figures and tables.

The research questions required different units of analysis to yield the information requested by the members of the Kentucky College and Career Readiness Alliance. In answering research questions 1 and 4, students were used as the unit of analysis to identify participation rates in dual enrollment and number of college credits earned. In answering research questions 2 and 3, courses were used as the unit of analysis to identify the types of courses taken and course completion rates.

Both unduplicated and duplicated counts were used to address different research questions. Unduplicated counts were used for research questions 1 and 4, when students were the unit of analysis and when the focus was on a single occurrence, such as whether a student participated in a course in a particular year. Duplicated counts were used for research questions 2 and 3, when courses were the unit of analysis and entailed counting an observation more than once, such as when the same student took more than one course. Students could, for example, take several dual enrollment courses in a given year, and each enrollment had to be considered when answering research questions on the number of college credits earned prior to graduation.

See appendix A for a more detailed description of the study's research methods.

Note

1. Missing data and other forms of error can influence the accuracy of any dataset, but such errors have relatively small effects on analyses of large datasets such as the Kentucky Longitudinal Data System. The study team worked with Kentucky Center for Education & Workforce Statistics staff to confirm the accuracy of analyses shared in this report.

What the study found

This report provides findings on annual dual enrollment participation and completion rates for Kentucky's students in grades 11 and 12, as well as on differences in participation and completion rates by student, school, and course characteristics. These findings are further disaggregated over time, from 2009/10 through 2012/13. This report also provides findings on the types of dual enrollment courses taken and credits earned.

Participation rates in dual enrollment courses varied by student characteristics, including grade level, gender, race/ethnicity, English learner status, eligibility for the school lunch program, grade point average, and ACT scores

About a fifth of students in grades 11 and 12 participated in dual enrollment courses

About a fifth of students in grades 11 and 12 participated in dual enrollment courses between 2009/10 and 2012/13 (table 1; an average of 19.5 percent across the four years). Participation rates rose from around 19 percent in the first two years to 22.6 percent in 2011/12 and then fell to 17.0 percent in 2012/13. The reason for the 5.6 percentage point decline is unclear and may be worth exploring in future research studies.

Participation rates varied by student characteristics

Participation rates in dual enrollment courses varied by student characteristics, including grade level, gender, race/ethnicity, English learner status, eligibility for the school lunch program, grade point average, and ACT scores (see table 1).

Table 1. Participation rates in dual enrollment courses for Kentucky public high school students in grades 11 and 12, by student characteristics, 2009/10–2012/13

	2009/10		2010/11		2011/12		2012/13	
Variable	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total students in grades 11 and 12	84,503	100.0	84,927	100.0	85,607	100.0	81,701	100.0
Students in grades 11 and 12 who took dual enrollment courses[a]	16,049	19.0	16,463	19.4	19,335	22.6	13,860	17.0
Grade level								
11	5,668	12.7	5,976	13.5	7,004	15.7	3,869	9.4
12	10,381	26.1	10,487	25.8	12,331	30.2	9,991	24.6
Gender								
Male	7,958	18.8	8,058	18.9	9,367	21.7	5,826	14.1
Female	8,090	19.2	8,404	19.9	9,967	23.5	8,034	19.8
Race/ethnicity[b]								
American Indian	32	19.0	27	16.0	30	18.9	28	19.6
Asian/Pacific Islander	93	10.5	123	11.2	163	13.7	161	12.9
Black	927	10.2	982	10.8	1,117	12.2	709	7.8
Hispanic	254	12.2	243	10.6	329	12.9	281	11.0
White	14,392	20.6	14,738	21.0	17,253	24.4	12,170	18.2
More than one race	119	14.5	207	16.6	251	19.7	218	18.5
Race/ethnicity unknown	232	15.6	143	17.7	192	30.4	293	55.8
English learner status								
English learner student	13	4.0	14	4.7	35	5.7	19	3.2
Not English learner student	16,036	19.1	16,449	19.4	19,300	22.7	13,841	17.1
Eligibility for school lunch program								
Eligible	6,837	17.8	7,089	18.3	8,595	21.1	5,240	12.9
Not eligible	9,212	19.9	9,176	20.7	10,707	24.0	8,620	21.0
High school grade point average								
A (4.00–3.70)	3,082	28.1	3,211	28.9	3,939	33.7	3,946	34.1
B (3.69–2.70)	7,641	20.8	8,012	21.4	9,639	25.2	7,428	20.8
C (2.69–1.70)	4,633	15.3	4,648	15.5	5,233	17.5	2,313	8.2
D (1.69–1.00)	654	11.1	560	9.9	509	9.9	173	3.1
F (less than 1.00)	24	6.3	27	7.1	10	3.0	0	0.0
ACT score[c]								
28–36	961	22.6	1,079	23.2	1,337	26.1	1,424	28.0
19–27	7,128	22.4	7,799	23.2	9,686	27.6	8,536	25.0
10–18	7,559	17.4	7,218	17.3	7,825	19.6	3,603	9.8
Lower than 10	[d]	[d]	[d]	[d]	[d]	[d]	[d]	[d]

Note: Students are the unit of analysis, and the numbers of students reported are based on an unduplicated count of students in grades 11 and 12 who participated in one or more dual enrollment courses. Percentages reflect participation rates for students with specific characteristics. Participation rates were calculated relative to the share of students with each characteristic among all students in grades 11 and 12.

a. Includes only Kentucky public high school students who attempted dual enrollment courses at two-year or four-year public colleges in Kentucky during the academic year.

b. Some racial/ethnic groups were aggregated because of their small sample size. "American Indian" includes Alaska Native; "Asian/Pacific Islander" includes Hawaiian. "More than one race" was listed in the dataset provided by the Kentucky Center for Education & Workforce Statistics.

c. The range of possible ACT scores was divided into four groups with equal ranges.

d. Five or fewer students in the dataset scored below 10 on the ACT; these data are not presented in the table because of their small numbers.

Source: Authors' calculations based on student data provided by the Kentucky Center for Education & Workforce Statistics in 2014.

More than a quarter of students in grade 12 participated in dual enrollment courses (26.7 percent average across the four years). Participation rates for students in grade 12 were about double the rates for students in grade 11 during the first three years studied and almost triple the rate in 2012/13 (24.6 percent of students in grade 12 and 9.4 percent of students in grade 11; see table 1).

From 2009/10 through 2011/12 female and male students participated at similar rates (meaning that there was less than a 3 percentage point difference). However, in 2012/13 female students participated at higher rates (19.8 percent) than male students (14.1 percent). Similar to the overall participation patterns noted previously, participation rates for both male and female students rose in 2011/12 and then fell in 2012/13.

White students participated in dual enrollment courses at higher rates than racial/ethnic minority students, with the exception of American Indian students (less than a 3 percentage point difference).[4] Differences in participation rates were largest between White students (21.1 percent average across the four years) and Black (10.3 percent), Hispanic (11.7 percent), and Asian/Pacific Islander students (12.1 percent). Differences between racial/ethnic groups remained consistent across years with one exception: the 6.1 percentage point gap between White and multiracial students in 2009/10 disappeared in 2012/13, when both groups had similar participation rates (18.2 percent and 18.5 percent).

Participation rates for students in grade 12 were about double the rates for students in grade 11 during the first three years studied and almost triple the rate in 2012/13

Participation rates were higher for students who were not English learners or were not eligible for the school lunch program. English learner students participated at much lower rates in dual enrollment courses than students who were not English learners (see table 1). Across the four years an average of 4.4 percent of English learner students (an average of 20 students each year) participated in dual enrollment courses compared with an average of 19.6 percent of students who were not English learners. Participation rates for English learner students were similar across the four years, with the highest rate (5.7 percent) in 2011/12.[5]

From 2009/10 through 2011/12 participation rates were similar between students eligible and students not eligible for the school lunch program. However, in 2012/13 eligible students participated at lower rates (12.9 percent) than non-eligible students (21.0 percent). An average of about 19.1 percent of students eligible for the school lunch program participated in dual enrollment courses from 2009/10 through 2011/12, but rates dropped 8.2 percentage points in 2012/13, to 12.9 percent.

Participation rates were also higher for students who had the highest grade point averages and ACT scores. Students with a higher grade point average had higher participation rates in dual enrollment courses than students with a lower grade point average (see table 1). Across all four years an average of 31 percent of students with an A grade point average and 22 percent of students with a B grade point average participated in dual enrollment courses compared with about 14 percent of students with a C average, about 9 percent of students with a D average, and about 4 percent of students with an F average. Participation rates across all grade point averages generally rose between 2009/10 and 2011/12 before dropping in 2012/13. Participation rates dropped the most for students with a grade point average of C (9.3 percentage points), D (6.8 percentage points), or B (4.4 percentage points).

Students with low ACT college admission test scores (scores of 10–18) had lower participation rates than those with higher ACT scores (19–36). Participation rates for students with low ACT scores fell by almost 10 percentage points between 2011/12 and 2012/13. Students with higher scores participated at steadily increasing rates. Students who scored highest had the most consistent and largest increase from 2009/10 through 2012/13, at 5.4 percentage points.

Participation rates varied by school characteristics

Participation in dual enrollment courses varied by the location of the participating student's high school, including whether the school was in an Appalachian county and whether it was in a rural, urban, town, or suburban locale. Participation rates also varied by general characteristics of the school, including school size (student enrollment), percentage of racial/ethnic minority students, and percentage of students eligible for the school lunch program, as well as by institution type, grading method, and delivery format.

Participation rates in dual enrollment courses were higher for students attending schools in Appalachian counties and in rural, less populated areas

Participation rates were higher for students in Appalachian counties and in rural areas. Participation rates in dual enrollment courses were higher for students attending schools in Appalachian counties and in rural, less populated areas (table 2). Students in high schools in Appalachian counties participated in dual enrollment courses at higher rates than students in high schools in non-Appalachian counties. Across the four years about 26 percent of students attending high schools in Appalachian counties participated in dual enrollment courses compared with about 17 percent of students in non-Appalachian counties. This is an important finding, considering that the Appalachian region has historically had lower levels of educational attainment and higher rates of poverty (Appalachian Regional Commission, 2010). Similar to other observed trends, participation rates for both groups rose in 2011/12 and fell in 2012/13.

Students who attended high schools in rural areas participated in dual enrollment courses at higher rates (25.3 percent average across the four years) than students attending schools in towns (20.2 percent), suburbs (14.3 percent), or urban areas (11.4 percent). Across all four years students who attended rural schools participated at more than double the rates of students who attended urban schools. Participation rates for students attending rural, town, and suburban schools followed trends similar to those for other variables studied. Participation rates rose between 2009/10 and 2011/12 and then fell in 2012/13. Participation rates for students attending urban schools were consistently the lowest among all locales.

Participation rates were higher for students attending schools enrolling fewer than 1,000 students and for schools with the lowest percentages of racial/ethnic minority students. Students attending high schools with fewer than 1,000 students participated in dual enrollment courses at higher rates than students attending high schools with 1,000 or more students (see table 2). Across the four years about 23 percent of students attending schools with fewer than 1,000 students participated in dual enrollment courses compared with about 19 percent of students in schools serving 1,000–1,499 students and 11 percent of students attending the largest high schools (serving 1,500 or more students). Since high school size and school locale are related (schools tend to be smaller in rural areas and Appalachian counties, which are mostly rural), these findings are consistent with the higher participation rates reported for rural high schools and schools in Appalachian

Table 2. Participation rates in dual enrollment courses for Kentucky public high school students in grades 11 and 12, by school characteristics, 2009/10–2012/13

	2009/10		2010/11		2011/12		2012/13	
Variable	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total students in grades 11 and 12	84,503	100.0	84,927	100.0	85,607	100.0	81,701	100.0
Students in grades 11 and 12 enrolled in at least one dual enrollment course[a]	16,049	19.0	16,463	19.4	19,335	22.6	13,860	17.0
Region[b]								
Appalachian counties	5,931	24.3	6,177	25.2	7,857	31.8	5,053	23.0
Non-Appalachian counties	10,118	16.8	10,286	17.0	11,478	18.9	8,807	14.7
School locale								
Rural	8,253	24.4	8,414	25.3	10,286	29.5	7,085	22.2
Town	3,887	18.7	4,063	19.7	4,887	24.6	3,403	17.7
Suburban	1,840	14.8	1,713	13.4	2,275	16.6	1,605	12.3
Urban	2,069	11.9	2,273	12.4	1,887	11.0	1,767	10.1
School size (number of students)								
499 or fewer	2,231	22.0	2,558	22.6	2,780	27.0	1,951	20.3
500–999	6,876	22.6	7,330	24.1	8,558	27.4	5,921	20.8
1,000–1,499	4,696	18.7	4,938	18.6	6,195	22.5	4,421	16.1
1,500 or more	2,246	11.9	1,637	9.9	1,802	10.9	1,567	9.7
Percentage racial/ethnic minority[c]								
0–3.7 percent	5,774	25.2	6,092	26.6	6,950	34.7	4,196	23.2
3.8–8.9 percent	5,047	22.3	4,362	22.2	5,655	24.8	4,021	19.3
9.0–29.6 percent	3,205	17.0	4,010	17.8	4,274	19.8	3,800	17.7
29.7–100 percent	2,023	10.0	1,998	10.1	2,450	11.6	1,842	8.7
Percentage eligible for school lunch program[c]								
0–36.3 percent	3,144	14.6	3,219	14.8	3,724	17.1	3,381	15.7
36.4–48.1 percent	4,578	21.5	3,467	18.0	5,013	22.1	3,997	18.9
48.2–60.4 percent	3,188	15.5	4,118	21.6	5,221	23.9	3,636	17.1
60.5–100 percent	5,139	24.3	5,658	22.7	5,371	27.9	2,845	16.0

Note: Students are the unit of analysis, and the numbers of students are based on an unduplicated count of students in grades 11 and 12 who participated in one or more dual enrollment courses. Percentages reflect participation rates for students attending schools with specific characteristics. Participation rates were calculated relative to the share of students attending schools with each characteristic among all students in grades 11 and 12.

a. Includes only Kentucky public high school students who attempted dual enrollment courses at two-year or four-year public colleges in Kentucky during the academic year.

b. *Appalachian region* refers to the eastern part of the state of Kentucky, an area with high levels of poverty and low levels of educational attainment that includes 54 of the state's 120 counties, as defined by the Appalachian Regional Commission.

c. These groupings are quartiles based on the percentage of students in a school who are of a racial/ethnic minority group or eligible for the school lunch program. The quartile sets are based on the state's total student population (not just those who attempted a dual enrollment course) in grades 9–12 for a given year. School composition data from the National Center for Education Statistics were converted to quartiles by the study team and linked to each student record. All students with linked information were then placed into one of the four groups, so that approximately 25 percent of the total student population in Kentucky attended schools within each category. Participation rates were calculated by dividing the number of students who participated in a dual enrollment course by the total number of grade 11 and 12 students in a quartile.

Source: Authors' calculations based on student data provided by the Kentucky Center for Education & Workforce Statistics in 2014 and school data obtained from the National Center for Education Statistics Common Core of Data (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2015a).

counties. Except for the largest schools (1,500 or more students), participation rates across the four years are similar to other observed trends, rising between 2009/10 and 2011/12 before falling in 2012/13.

Students attending the least racially/ethnically diverse high schools (less than 3.8 percent racial/ethnic minority students) participated in dual enrollment courses at the highest rates (27.4 percent average across the four years). Students attending the most racially/ethnically diverse high schools (more than 29.6 percent racial/ethnic minority students) participated in dual enrollment courses at the lowest rates (10.1 percent average across the four years). Similar to patterns observed for other variables, participation rates for students attending all school types increased over the first three years, then fell in 2012/13.

Participation rates for students attending schools serving the largest percentage of students eligible for the school lunch program were higher in 2009/10 and 2011/12 than those for schools serving smaller percentages but were similar in 2012/13. From 2009/10 through 2011/12 students attending high schools serving the largest percentage of students eligible for the school lunch program (more than 60.4 percent; see table 2) participated in dual enrollment courses at higher rates (25.0 percent average across the three years) than students attending high schools serving less than 36.3 percent of eligible students (15.5 percent). However, between 2011/12 and 2012/13 participation rates for schools serving the largest percentage of eligible students fell about 12 percentage points, resulting in participation rates similar to those for schools with smaller percentages of eligible students.

In 2009/10 almost four times as many courses were taken at two-year institutions as at four-year institutions, but by 2012/13 only about 1.7 times more courses were taken at two-year institutions than at four-year institutions

Most dual enrollment courses attempted by students were offered by two-year colleges, used standard letter grades, and were delivered through face-to-face instruction on college campuses. Nearly three-quarters of dual enrollment courses were offered by two-year colleges (73.0 percent average across the four years) rather than by four-year colleges (table 3), a finding consistent with national research (Marken, Gray, & Lewis, 2013). However, the percentage of courses taken at four-year colleges rose over the four years studied. In 2009/10 almost four times as many courses were taken at two-year institutions (79.5 percent) as at four-year institutions (20.5 percent). By 2012/13 only about 1.7 times more courses were taken at two-year institutions (63.6 percent) than at four-year institutions (36.4 percent).

Most dual enrollment courses attempted by students used standard letter grades (an A through F grading scale) and were delivered using face-to-face instruction. More face-to-face instruction courses were delivered on college campuses than on high school campuses. However, the percentage of dual enrollment courses held on high school campuses rose from 12.4 percent of face-to-face courses in 2009/10 to 36.5 percent in 2012/13. Though less prevalent than face-to-face courses, the share of online courses more than doubled from 4 percent in 2009/10 to almost 10 percent in 2012/13.

The percentage of academically focused courses attempted rose while the percentage of career and technical education courses attempted fell. Across the four years students in grades 11 and 12 took an increasing proportion of academically focused dual enrollment courses (such as English, math, science, social studies, foreign language, and art) and a declining proportion of courses focused on career and technical education areas (such as agriculture, business, construction, and nursing; figure 1). The percentage of dual enrollment courses taken by students that focused on academic subjects rose from 37.6 percent

Table 3. Participation rates in dual enrollment courses for Kentucky public high school students in grades 11 and 12, by institution type, grading method, and delivery format, 2009/10–2012/13

	2009/10		2010/11		2011/12		2012/13	
Variable	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total dual enrollment courses attempted[a]	34,975	100.0	36,651	100.0	42,847	100.0	34,087	100.0
Institution type								
Two-year	27,793	79.5	28,786	78.5	30,171	70.4	21,665	63.6
Four-year	7,182	20.5	7,865	21.5	12,676	29.6	12,422	36.4
Grading method								
Standard letter grades	31,300	89.5	33,322	90.9	38,759	90.5	31,622	92.8
Nonstandard grades[b]	2,396	6.9	2,599	7.1	3,301	7.7	1,549	4.5
Unknown[c]	1,279	3.7	730	2.0	787	1.8	916	2.7
Delivery format								
Online	1,404	4.0	1,620	4.4	2,132	5.0	3,374	9.9
Face-to-face	21,653	61.9	22,842	62.3	27,561	64.3	21,272	62.4
High school campus	2,679	12.4	3,336	14.6	7,132	25.9	7,763	36.5
College campus	18,974	87.6	19,506	85.4	20,429	74.1	13,509	63.5
Other off-site[d]	11,918	34.1	12,189	33.3	12,954	30.2	9,441	27.7

Note: Courses are the unit of analysis, and individual students may be counted multiple times if they attempted multiple dual enrollment courses. Percentages and values may not sum to 100 percent because of rounding or missing data.

a. Includes only dual enrollment courses offered by public colleges in Kentucky and taken by Kentucky public high school students in grades 11 and 12.

b. Includes courses with final grades designated as credit/no credit, pass/fail, satisfactory/unsatisfactory, or complete/incomplete.

c. Includes courses that had final grades designated as audit, multi-semester, or still in progress or that had multiple grading methods assigned (students earned both standard and nonstandard grades for the same course).

d. Includes courses delivered at non–high school locations such as educational service centers and regional education cooperatives.

Source: Authors' calculations based on student and college course data provided by the Kentucky Center for Education & Workforce Statistics in 2014.

in 2009/10 to 61.0 percent in 2012/13 (see table B1 in appendix B). During the same period participation in courses focused on career and technical education declined from 52.2 percent to 23.4 percent.

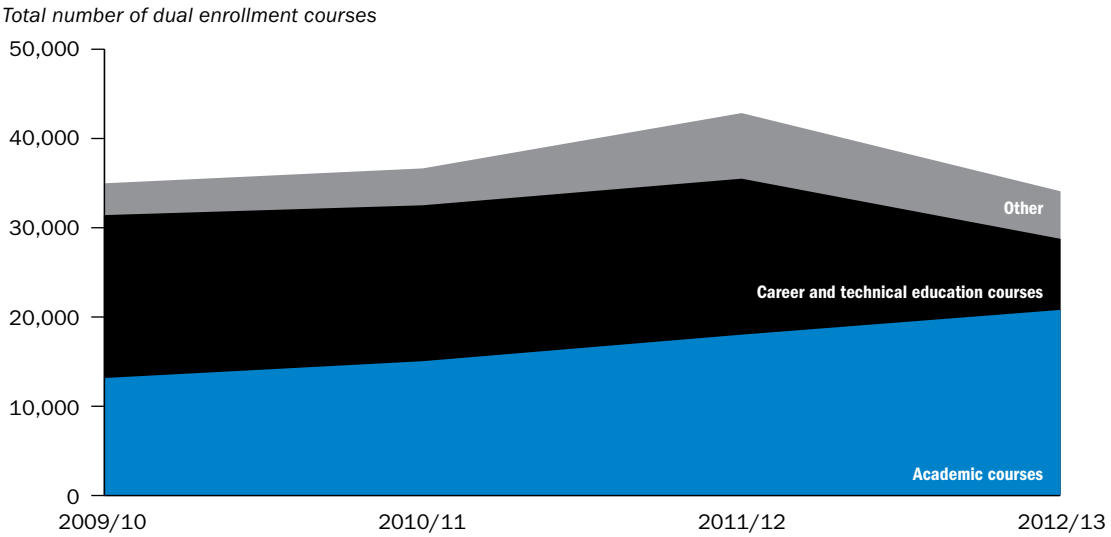
About 85 percent of dual enrollment courses attempted were completed

Across the four years approximately 85 percent of the courses attempted by students in grades 11 and 12 were completed (table 4). Students withdrew prior to completion in about 5 percent of dual enrollment courses attempted and did not complete about 2 percent of dual enrollment courses attempted. Across the four years studied, the percentage of dual enrollment courses audited declined.

Course completion rates varied by student characteristics

Course completion rates were similar across all four years studied (less than a 3 percentage point difference; table 5). Course completion rates also were similar for male and female students, with the exception of 2009/10, when completion rates were 3.8 percentage points higher for female students. However, course completion rates differed for other student characteristics, including race/ethnicity, eligibility for the school lunch program, high school grade point average, and ACT scores.

Figure 1. Kentucky public high school students in grades 11 and 12 attempted an increasing share of academically focused courses over 2009/10–2012/13



Note: Courses are the unit of analyses, and individual students may be counted multiple times if they attempted multiple dual enrollment courses. The figure shows the number of dual enrollment courses taken at public colleges in Kentucky by public high school students in grades 11 and 12. Content area was determined based on the Certified Instructional Program code for each course. Documentation about these codes is available from the Kentucky Council on Postsecondary Education (http://cpe.ky.gov/info/institutionalusers). Academic courses include college-level art, English, foreign language, social studies, math, and science. Career and technical education courses include courses focused on agriculture, business, computer science, construction, nursing, and other profession-related courses. Other courses include remedial education courses or specialized courses that were not classified as either academic or career and technical education.

Source: Authors' analysis of student and college course data provided by the Kentucky Center for Education & Workforce Statistics in 2014.

Table 4. Completion rates in dual enrollment courses for Kentucky public high school students in grades 11 and 12, 2009/10–2012/13

	2009/10		2010/11		2011/12		2012/13	
Variable	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Average number of courses attempted per student[a]	2.2		2.2		2.2		2.5	
Completed course	29,083	83.2	31,717	86.5	36,096	84.2	29,259	85.8
Attempted but did not complete[b]	600	1.7	590	1.6	822	1.9	862	2.5
Withdrew from course	1,843	5.3	1,759	4.8	2,404	5.6	1,162	3.4
Incomplete or in-progress	801	2.3	946	2.6	1,988	4.6	1,095	3.2
Audited course	1,054	3.0	954	2.6	716	1.7	110	0.3
Missing or not reported	1,594	4.6	685	1.9	821	1.9	1,599	4.7
Total	34,975	100.0	36,651	100.0	42,847	100.0	34,087	100.0

Note: Except for average number of courses attempted per student, courses are the unit of analysis, and individual students may be counted multiple times if they attempted multiple dual enrollment courses. Percentages and values may not sum to 100 percent because of rounding or missing data.

a. Includes only dual enrollment courses offered by public colleges in Kentucky and taken by Kentucky public high school students in grades 11 and 12. Average number of courses attempted per student uses students as the unit of analysis and is based on unduplicated student counts. Average number of courses attempted per student was calculated by dividing the total number of dual enrollment courses attempted by students in grades 11 and 12 in any given year by the total number of students in grades 11 and 12 enrolled in at least one dual enrollment course in that year.

b. Includes students who failed the course.

Source: Authors' calculations based on course data from the Kentucky Center for Education & Workforce Statistics in 2014.

Table 5. Completion rates in dual enrollment courses for Kentucky public high school students in grades 11 and 12, by student characteristics, 2009/10–2012/13

	2009/10		2010/11		2011/12		2012/13	
Variable	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total dual enrollment courses completed[a]	29,083	83.2	31,717	86.5	36,096	84.2	29,259	85.8
Grade level								
11	9,532	81.6	10,515	85.8	11,941	85.3	7,318	86.0
12	19,551	83.9	21,202	86.9	24,155	83.8	21,941	85.8
Gender								
Male	14,386	81.3	15,604	85.5	17,439	83.4	12,139	84.5
Female	14,697	85.1	16,112	87.5	18,656	85.1	17,120	86.8
Race/ethnicity[b]								
American Indian	41	75.9	45	81.8	57	89.1	41	64.1
Asian/Pacific Islander	205	88.4	276	89.9	378	88.1	443	91.7
Black	1,233	74.5	1,410	77.2	1,570	79.0	1,262	79.7
Hispanic	416	81.9	418	83.9	555	83.5	539	82.9
White	26,512	83.6	28,865	87.1	32,655	84.4	25,981	86.3
More than one race	218	84.8	367	85.7	497	87.2	489	87.3
Race/ethnicity unknown	458	84.3	336	89.1	384	89.1	504	78.3
English learner status								
English learner student	16	76.2	23	85.2	34	73.9	23	85.2
Not English learner student	29,067	83.2	31,694	86.5	36,062	84.3	29,236	85.8
Eligible for school lunch program								
Eligible	10,998	77.6	11,996	81.9	13,954	79.8	9,617	80.8
Not eligible	18,085	87.0	19,373	89.9	22,080	87.3	19,642	88.5
High school grade point average								
A (4.00–3.70)	7,066	93.9	7,683	94.6	9,506	91.3	10,174	92.0
B (3.69–2.70)	14,181	86.5	15,661	89.3	18,101	85.7	15,284	86.0
C (2.69–1.70)	7,043	72.8	7,625	78.3	7,859	76.5	3,574	72.9
D (1.69–1.00)	742	57.3	710	60.9	617	61.7	227	63.6
F (less than 1.00)	38	61.3	29	47.5	7	31.8	0	0.0
ACT score[c]								
28–36	2,810	92.7	3,136	93.7	3,720	91.9	3,992	91.8
19–27	13,408	87.8	15,754	89.7	19,270	86.5	18,684	87.5
10–18	12,353	77.8	12,291	82.0	12,371	79.7	5,927	78.4
Lower than 10	[d]	[d]	[d]	[d]	[d]	[d]	[d]	[d]

Note: Courses are the unit of analysis, and individual students may be counted multiple times if they attempted multiple dual enrollment courses.

a. Includes only Kentucky public high school students who attempted dual enrollment courses at two-year or four-year public colleges in Kentucky during the academic year. To be considered to have completed a course, a student must have earned a final course grade greater than or equal to a D, pass, satisfactory, or complete based on the data provided.

b. Some racial/ethnic groups were aggregated because of their small sample sizes. "American Indian" includes Alaska Native; "Asian/Pacific Islander" includes Hawaiian. "More than one race" was listed in the dataset provided by the Kentucky Center for Education & Workforce Statistics.

c. The range of possible ACT scores was divided into four groups with equal ranges.

d. Five or fewer students in the dataset scored below 10 on the ACT; these data are not presented in the table because of their small numbers.

Source: Authors' calculations based on data from the Kentucky Center for Education & Workforce Statistics in 2014.

Completion rates were lower for Black students and students eligible for the school lunch program. Completion rates for dual enrollment courses were lower for Black students than for all other racial/ethnic groups except American Indian students.[6] The average completion rate for courses attempted by Black students across the four years was 77.6 percent compared with 89.5 percent for Asian/Pacific Islander students, 86.3 percent for multiracial students, 85.3 percent for White students, and 83.1 percent for Hispanic students. Completion rates for courses attempted by Asian/Pacific Islander students were consistently highest across all four years studied, with about a 92 percent completion rate in 2012/13 (see table 5).

Very few English learner students participated in dual enrollment courses (between 3.2 and 5.7 percent, depending on the year; see table 1). For example, only 19 English learner students participated in dual enrollment courses in 2012/13, completing a total of 23 dual enrollment courses. These small participation numbers make course completion comparisons with other groups tenuous. With that caveat in mind, completion rates were lower for English learner students than for students who were not English learners in 2009/10 (7.0 percentage points lower) and in 2011/12 (10.4 percentage points lower). Completion rates were similar for both groups in the remaining years.

Very few English learner students participated in dual enrollment courses

Across the four years completion rates were lower for students eligible for the school lunch program (80.0 percent) than for students who were not eligible (88.2 percent).

Completion rates were lower for students with a C grade point average or below and students with a low ACT score. Completion rates for dual enrollment courses were lower for students with a lower grade point average than for students with a higher grade point average (see table 5). Average completion rates across the four years were 93.0 percent for students with an A grade point average and 86.9 percent for students with a B grade point average compared with 75.1 percent for students with a C grade point average and 60.9 percent for students with a D grade point average.

Similarly, completion rates for dual enrollment courses were higher for students with high ACT scores (28–36) than for students with lower ACT scores (10–18). Average completion rates across the four years were 92.5 percent for students with ACT scores of 28–36, 87.9 percent for students with ACT scores of 19–27, and 79.5 percent for students with ACT scores of 10–18.

Course completion rates varied by school locale and course characteristics

Completion rates for dual enrollment courses varied by whether participating students' high schools were in an Appalachian county or not and in a rural, urban, town, or suburban locale (table 6). Completion rates also varied by general characteristics of the course, including the college enrollment type and the delivery format (table 7).

Course completion rates were lower for students attending schools in Appalachian counties in 2011/12 and 2012/13 and for students attending urban schools in 2012/13. In 2009/10 and 2010/11 course completion rates for students attending schools in Appalachian counties were similar to those for students attending schools in non-Appalachian counties (see table 6). However, completion rates were 7.3 percentage points lower in 2011/12 and 5.6 percentage points lower in 2012/13 for students attending schools in Appalachian counties than for students in non-Appalachian counties.

Table 6. Completion rates in dual enrollment courses for Kentucky public high school students in grades 11 and 12, by school characteristics, 2009/10–2012/13

	2009/10		2010/11		2011/12		2012/13	
Variable	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total dual enrollment courses completed[a]	29,083	83.2	31,717	86.5	36,096	84.2	29,259	85.8
Region[b]								
Appalachian counties	10,457	81.4	11,153	85.3	13,866	79.9	10,359	82.3
Non-Appalachian counties	18,626	84.1	20,564	87.2	22,230	87.2	18,900	87.9
School locale								
Rural	15,356	83.1	16,270	87.0	19,532	83.4	15,873	86.9
Town	6,651	81.2	7,681	86.0	9,087	86.3	6,837	85.8
Suburban	3,729	86.9	3,383	87.4	4,171	83.2	3,341	84.3
Urban	3,347	83.3	4,383	85.0	3,306	85.1	3,208	82.5

Note: Courses are the unit of analysis, and individual students may be counted multiple times if they attempted multiple dual enrollment courses.

a. Includes only Kentucky public high school students who attempted dual enrollment courses at two-year or four-year public colleges in Kentucky during the academic year. To be considered to have completed a course, a student must have earned a final course grade greater than or equal to a D, pass, satisfactory, or complete, based on the data provided.

b. *Appalachian region* refers to the eastern part of the state of Kentucky, an area with high levels of poverty and low levels of educational attainment that includes 54 of the state's 120 counties, as defined by the Appalachian Regional Commission.

Source: Authors' calculations based on data from the Kentucky Center for Education & Workforce Statistics in 2014.

Table 7. Completion rates in dual enrollment courses for Kentucky public high school students in grades 11 and 12, by course characteristics, 2009/10–2012/13

	2009/10		2010/11		2011/12		2012/13	
Variable	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total dual enrollment courses completed[a]	29,083	83.2	31,717	86.5	36,096	84.2	29,259	85.8
Institution type								
Two-year	22,710	81.7	24,847	86.3	26,289	87.1	19,505	90.0
Four-year	6,373	88.7	6,870	87.3	9,807	77.4	9,754	78.5
Delivery format								
Online	998	71.1	1,329	82.0	1,618	75.9	2,727	80.8
Face-to-face	18,035	83.3	19,674	86.1	22,996	83.4	18,334	86.2
High school campus	2,144	80.0	2,631	78.9	4,979	69.8	6,075	78.3
College campus	15,891	83.8	17,043	87.4	18,017	88.2	12,259	90.7
Other off-site[b]	10,050	84.3	10,714	87.9	11,320	87.4	8,198	86.8

Note: Courses are the unit of analyses, and individual students may be counted multiple times if they attempted multiple dual enrollment courses.

a. Includes only Kentucky public high school students who attempted dual enrollment courses at two-year or four-year public colleges in Kentucky during the academic year. To be considered to have completed a course, a student must have earned a final course grade greater than or equal to a D, pass, satisfactory, or complete, based on the data provided.

b. Includes courses delivered at non–high school locations such as educational service centers and regional education cooperatives.

Source: Authors' calculations based on data from the Kentucky Center for Education & Workforce Statistics in 2014.

Average completion rates across the four years were similar for students attending high schools in all locales. Although completion rates were lower in 2012/13 for students attending urban schools than for students attending rural and town schools, these differences were not consistent across the four years studied.

Completion rates were lower for courses delivered at four-year colleges in 2011/12 and 2012/13 and for courses delivered through face-to-face instruction on the high school campus. Course completion rates differed depending on whether courses were delivered at two-year or four-year colleges. Completion rates also differed over time (see table 7). In 2009/10 completion rates were higher for courses taken through four-year colleges (88.7 percent) than through two-year colleges (81.7 percent). However, between 2009/10 and 2012/13 the completion rate for courses taken through four-year colleges declined to 78.5 percent, while the completion rate for courses taken through two-year colleges rose to 90.0 percent. As a result, completion rates were higher for courses taken through two-year institutions than through four-year institutions: 9.7 percentage points higher in 2011/12 and 11.5 percentage points higher in 2012/13.

Course completion rates varied depending on whether the courses used an online or a face-to-face delivery format and, for face-to-face instruction, on whether students took the dual enrollment course on a college campus or a high school campus. Course completion rates were lowest for courses completed through face-to-face instruction on high school campuses (76.8 percent average across the four years) and highest for courses completed through face-to-face instruction on college campuses (87.5 percent).

Completion rates were higher for courses taken through two-year institutions than through four-year institutions

Students earned an average of 7.8 college credits before high school graduation

The dataset for this study included information on the credits each Kentucky high school student earned in dual enrollment courses each academic year but not the cumulative number of credits earned over the four years of the study. Furthermore, because the dataset included only four years of data, it could be used to calculate the cumulative credits earned by students over their high school careers only for the cohort of high school students who enrolled in grade 9 in 2009/10 and persisted to grade 12 in 2012/13. Thus, the analysis reported in this section is for total college credits earned through dual enrollment over a high school career derived by adding the credits completed by each student in a single cohort in each academic year. The results may not be the same as the number of credits accepted by a college when a student is officially admitted.

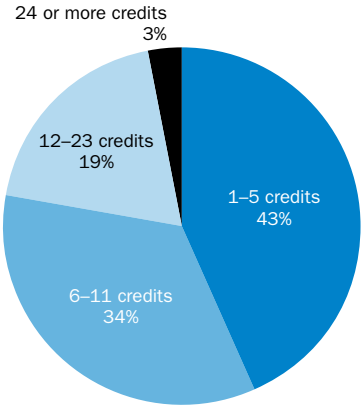
About 3 percent of students who completed dual enrollment courses earned at least a full year's worth of college credits (24 or more) before their high school graduation, about 22 percent earned at least a semester's worth of college credits (12 or more), and about 19 percent earned 12–23 credits (figure 2). On average, students earned 7.8 college credits by taking dual enrollment courses before their high school graduation.

Implications of the study findings

Many Kentucky public high school students participate in dual enrollment courses at public colleges to complete college-level coursework and earn college credit before their high school graduation. An average of 20 percent of high school students in grades 11 and 12 pursued this opportunity over 2009/10–2012/13. Participation rose in 2011/12 and then fell 5.6 percentage points in 2012/13. Why participation declined is unclear, and the causes for the decline may be worth exploring in future research studies.[7]

The findings raise important questions about variations in course participation rates for students of different race/ethnicity, gender, and family income. Participation rates were

Figure 2. About 22 percent of Kentucky public high school students who completed dual enrollment courses earned at least a full semester's worth of college credit (12 or more credits) before graduation, 2009/10–2012/13



Note: Percentages do not sum to 100 because of rounding. Students are the unit of analysis. Figure shows the number of college credits earned by public high school students in Kentucky who completed dual enrollment courses over four academic years and is based on an unduplicated count of 12,022 students who earned a final course grade of D or better, pass, satisfactory, or complete. The total number of credits was determined by adding the number of credits for completed courses in each academic year. To be included, students had to be enrolled as a grade 9 student in a Kentucky high school in 2009/10 and as a grade 12 student in 2012/13. Students for whom courses were identified as audit, incomplete, or withdraw in the dataset were excluded from the percentages.

Source: Authors' analysis based on data from the Kentucky Center for Education & Workforce Statistics in 2014.

lowest for racial/ethnic minority students, male students, and students eligible for the school lunch program. Course completion rates were lower for Black students and students eligible for the school lunch program. Future studies might explore whether specific factors are impeding racial/ethnic minority students, male students, and students from low-income families from participating in and completing dual enrollment courses and explore how these barriers might be removed or overcome. The study also found higher participation rates—but lower completion rates—for students in Appalachian counties. Future studies might examine the nature and quality of dual enrollment courses in various regions and locales, as well as supports that may be needed to facilitate successful course completion for students in rural and high-poverty schools, such as academic assistance, guidance counseling, language support, and special education services.

The types of dual enrollment courses in which high school students participated changed during the four years studied. The proportion of academically focused dual enrollment courses rose over the period, while the proportion of career and technical education courses fell. This shift may be related to increased participation rates of students with higher grade point averages and ACT scores and decreased participation rates of students with lower grade point averages and ACT scores. Indeed, consistent with previous research on dual enrollment programs, academic courses appear to appeal to students seeking more rigorous, college-focused curricula (Barnett & Stamm, 2010; Hofman, 2012; Karp & Jeong, 2008). As Kentucky seeks to expand access to dual enrollment opportunities, this finding raises questions about whether students with lower grade point averages and ACT scores need additional encouragement and support to pursue academic dual enrollment courses.

The percentage of online and face-to-face dual enrollment courses attempted by students rose over the four years. That increase has important implications as staff consider how best to provide access to dual enrollment courses in rural and remote locations, where students may have limited access to online services. Further, this finding raises questions about how the state and its colleges can provide education supports to students enrolled in dual enrollment courses.

Limitations of the study

The analysis is limited in two important respects. First, the dataset provided by the Kentucky Center for Education & Workforce Statistics did not include information for students enrolled in dual enrollment courses at private colleges or colleges outside Kentucky. While these students likely constitute a minority of participants in dual enrollment courses, it bears repeating that this report includes results only for students attending public high schools who completed dual enrollment courses at public colleges in Kentucky.

Second, the dataset did not include the cumulative number of college credits earned by high school students through dual enrollment courses. Although cumulative credits were calculated for this study, the four-year period covered by the data limited such calculations to the cohort of high school students who enrolled in grade 9 in 2009/10 and persisted to grade 12 in 2012/13. The results do not provide a longitudinal understanding of the potential changes in the numbers of credits that students may earn across multiple years.

Appendix A. Study methodology

This appendix details the data sources and study methodology.

Data

This study used student- and course-level data from the Kentucky Center for Education & Workforce Statistics (KCEWS) to determine participation and completion rates of Kentucky public high school students in dual enrollment courses in academic years 2009/10 through 2012/13. Data for schools and colleges were not available from KCEWS, so data from the U.S. Department of Education's National Center for Education Statistics (NCES) were used. The two separate data files were linked using a unique student identification number. A complete list of variables and sources used in this study are shown in table A1.

Student-level data. KCEWS provided data for every high school student in Kentucky who was enrolled between 2009/10 and 2012/13. The data included a student identification number unique to each student. The numbers were used to isolate individual students for analysis and to link student-level information with information on courses, schools, districts, and colleges. All student-level characteristics used in the study were assigned as of the initial baseline year. These included gender, race/ethnicity, eligibility for the school lunch program, and English learner status.

Student-level variables related to a specific academic year were assigned as of the relevant academic year. These variables included grade level, high school grade point average, graduation status, official graduation date, and ACT score. In addition, the data included information about the high school that the student attended (school ID and district ID).

KCEWS also provided an indicator to identify whether the student was enrolled in both a public preK–12 school and a public college during the same academic term. This indicator was used to determine whether the student was dually enrolled.

Course-level data. KCEWS provided data for each college course taken by a public high school student in Kentucky through a public college in Kentucky during academic years 2009/10 through 2012/13. Students were matched to the college courses they took using their unique student identification numbers. Their participation as dual enrollment students was verified by matching the dual enrollment indicator provided by KCEWS to the dual enrollment indicator found in the college course data. In addition, course-level variables included audit status, certified instructional program code, credit hours attempted, credit hours earned, department offering the course, course number, delivery format, delivery location, grading method, term, and course grade.

The course file also included a college ID (an Office of Postsecondary Education identification assigned by the U.S. Department of Education) denoting the institution at which the dual enrollment course was taken.

College-level variables. These data were obtained from the NCES Integrated Postsecondary Education Data System (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2015b). Specifically, data included information about the college sector (two- or four-year) and whether the college was private or public.

Table A1. Variables used in the analysis of participation and completion rates in dual enrollment courses for Kentucky public high school students, 2009/10–2012/13

Variable	Description	Source	File type
Student variables			
Student ID	Student ID number	Kentucky Center for Education & Workforce Statistics (KCEWS)	Person file
Academic year	Student academic year	KCEWS	Person file
ACT score	Student composite ACT score	KCEWS	Person file
Eligibility for the school lunch program	Student eligibility for the school lunch program in given year (proxy for low-income status)	KCEWS	Person file
Gender	Student gender	KCEWS	Person file
High school grade point average	Student grade point average in given academic year	KCEWS	Person file
Grade level	Student grade level in a given academic year	KCEWS	Person file
Graduation status	Student graduation flag in a given academic year	KCEWS	Person file
Race/ethnicity	Student race/ethnicity	KCEWS	Person file
Appalachian	Whether student was in Appalachian region	KCEWS	Person file
KCEWS DE	KCEWS-generated flag to indicate dual enrollment	KCEWS	Person file
Course variables			
Audit status	Course audit flag	KCEWS	Course file
Certified instructional program code	Course Certified Instructional Program code (for subject area)	KCEWS	Course file
Credit hours attempted	Course credit hours (number of credit hours attempted)	KCEWS	Course file
Credit hours earned	Course credit hours (number of credit hours earned)	KCEWS	Course file
Department	Department offering course	KCEWS	Course file
Course number	Course number (use with department and institution for identifying course)	KCEWS	Course file
Delivery format	Distance learning flag (whether online or face-to-face)	KCEWS	Course file
Delivery location	Course on-campus flag (whether on or off campus)	KCEWS	Course file
Grade method	Course grade	KCEWS	Course file
Term	Semester/term that course offered	KCEWS	Course file
Course grade	Final course grade	KCEWS	Course file
Dual enrollment flag	Indicator denoting a dually enrolled student	KCEWS	Course file
College variables			
College ID	College ID number (based on OPEID[a] number)	KCEWS	College file
College type	Two-year or four-year college type	National Center for Education Statistics (NCES)	Integrated Postsecondary Education Data System
School/district variables			
District ID	District ID number	KCEWS	Person file
School ID	School ID number	KCEWS	Person file
Student enrollment	School enrollment count	NCES	Common Core of Data
Percent English learners	Percentage of students English learners	NCES	Common Core of Data
Percent eligible for the school lunch program	Percentage of students eligible for the school lunch program	NCES	Common Core of Data
Percent minority	Percentage of students who are racial/ethnic minority	NCES	Common Core of Data
Locale code	Urban-centric locale code	NCES	Common Core of Data

a. Office of Postsecondary Education ID.

Sources: Kentucky Center for Education & Workforce Statistics, National Center for Education Statistics Common Core of Data (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2015a), and National Center for Education Statistics Integrated Postsecondary Education Data System (U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics, 2015b).

School- and district-level variables. These data were obtained from the NCES Common Core of Data (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2015a). School- and district-level variables included total student enrollment, percentage of students who are English learners, percentage of students eligible for the school lunch program, percentage of students who are a racial/ethnic minority, and an urban-centric locale code for each high school (for example, city, suburban, town, or rural) based on the most recent U.S. Census.

Description of the study population. The study included public Kentucky high school students taking dual enrollment courses at public colleges in Kentucky. The study population included all high school students taking dual enrollment courses who were enrolled in a Kentucky public high school in the 2009/10, 2010/11, 2011/12, or 2012/13 academic year, representing more than 183,000 students enrolled in 234 high schools in 174 school districts. Specific attention was given to students in the dataset who were enrolled in grades 11 and 12. The number of students in grades 11 and 12 in a given academic year ranged from 81,701 to 85,607.

Methods used for descriptive analyses

Before the analysis began, the quality of the data received from KCEWS and the extent of missing or invalid values were assessed. Microsoft Excel and SPSS were used to create frequency counts of values for each key variable in the dataset provided by KCEWS. The frequencies included the numbers of non-missing values, the numbers of values outside the valid range, and the numbers and percentages of missing values. This information on missing data was used to identify incomplete records for removal. Less than 5 percent of values were missing within and across all variables.

Next, an unduplicated count of high school students in grades 11 and 12 in each academic year who participated in dual enrollment courses was calculated. The unduplicated count of students in grades 11 and 12 taking dual enrollment courses was divided by the total number of high school students enrolled in grades 11 and 12 in the state that year to determine the annual participation rates. A similar approach was used to determine participation rates based on specific student characteristics (grade level, gender, race/ethnicity, and so on) and school characteristics (region, locale, enrollment, percentage eligible for the school lunch program, percentage minority, percentage English learner, and so on). The results of these calculations are shown in tables 1 and 2 in the main report.

To determine the course completion rates for dual enrollment courses, the total number of courses completed was divided by the total number of courses attempted. Course completion rates include duplicate student counts (students may be counted multiple times depending on the number of courses they enroll in). A course was considered completed if the student received a D or higher, a credit, a pass, a satisfactory, or a complete. A similar approach was used to determine completion rates based on specific characteristics of students (grade level, gender, race/ethnicity, and so on), courses (delivery location, delivery format, and so on), and colleges (for example, two- or four-year). The data provided by KCEWS indicated that students who successfully completed their dual enrollment courses also earned college credit. Thus, a separate calculation to determine the number of credits students earned after completing a dual enrollment course was not necessary. The results of these calculations are shown in tables 4, 5, 6, and 7 in the main report.

To calculate the number of college credits students earned before their high school graduation, students within the dataset who were enrolled as grade 9 students in the 2009/10 academic year were identified. For these students, the total number of college credits earned in each year (2009/10, 2010/11, 2011/12, and 2012/13) were added together. This addition was necessary, as the data provided by KCEWS did not include the number of college credits on a cumulative basis. This student cohort was considered to be typical of total credits earned across a four-year high school career.

Appendix B. Dual enrollment course participation rates by course content area

This appendix describes dual enrollment course participation rates by course content area over the four years of the study. This information may be of interest to people who wish to know how the proportion of dual enrollment course participation changed during the study period.

Table B1. Participation rates in dual enrollment courses for Kentucky public high school students in grades 11 and 12, by course content area and year, 2009/10–2012/13

	2009/10		2010/11		2011/12		2012/13	
Course content area	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total dual enrollment courses attempted[a]	34,975	100.0	36,651	100.0	42,847	100.0	34,087	100.0
Academic courses[b]	13,161	37.6	15,050	41.1	18,023	42.1	20,798	61.0
Math	2,569	7.3	2,567	7.0	3,906	9.1	4,250	12.5
English/language arts	3,541	10.1	4,526	12.3	5,185	12.1	6,590	19.3
Science	1,820	5.2	1,780	4.9	2,353	5.5	2,497	7.3
Social studies	4,257	12.2	4,868	13.3	5,114	11.9	5,829	17.1
Foreign languages	347	1.0	409	1.1	582	1.4	654	1.9
Art	627	1.8	900	2.5	883	2.1	978	2.9
Career and technical education courses[b]	18,254	52.2	17,467	47.7	17,475	40.8	7,960	23.4
Engineering/computer science/ technology	4,702	13.4	4,262	11.6	3,901	9.1	1,784	5.2
Agricultural sciences	147	0.4	287	0.8	576	1.3	503	1.5
Business/communication	2,150	6.1	2,131	5.8	2,409	5.6	1,823	5.3
Health sciences	3,496	10.0	3,409	9.3	3,569	8.3	1,899	5.6
Trades	7,759	22.2	7,378	20.1	7,020	16.4	1,951	5.7
Other	3,560	10.2	4,134	11.3	7,349	17.2	5,329	15.6
Other content area	3,539	10.1	3,931	10.7	5,956	13.9	4,018	11.8
Missing	21	0.1	203	0.6	1,393	3.3	1,311	3.8

Note: Courses are the unit of analysis, and individual students may be counted multiple times if they attempted multiple dual enrollment courses. Percentages and values may not sum to 100 percent because of rounding or missing data.

a. Includes only dual enrollment courses attempted by Kentucky public high school students in grades 11 and 12 in public colleges in Kentucky.

b. Content area was determined based on the Certified Instructional Program code for each course. Documentation about these codes is available from the Kentucky Council on Postsecondary Education (http://cpe.ky.gov/info/institutionalusers).

Source: Authors' calculations based on course data from the Kentucky Center for Education & Workforce Statistics in 2014.

Notes

1. This study does not account for dual credit courses, which are similar to dual enrollment but not the same, because the dataset provided by the Kentucky Center for Education & Workforce Statistics did not include information on dual credit course participation. A dual credit program allows high school students to receive credit for the same course from the high school and a college simultaneously. Advanced placement courses are not considered dual enrollment, since they are not taken through a higher education institution. In conjunction with this study, REL Appalachia conducted a qualitative study that provides information on dual credit programs and practices in six nonurban districts in Kentucky (Piontek et al., 2016).
2. REL Appalachia serves the four states of Kentucky, Tennessee, Virginia, and West Virginia. REL Appalachia differs from the region of Kentucky that is referred to as Appalachia.
3. See Kentucky Revised Statute § 157.008 for a complete definition of dual enrollment courses and program requirements; available at http://www.lrc.ky.gov/statutes/statute.aspx?id=3417.
4. American Indian students participated at a rate similar (18.4 percent average across the four years) to White students (21.1 percent); however, the number of American Indian students enrolled in Kentucky's public schools is very small, and minor changes in enrollment may have a disproportionate impact on participation rates.
5. Compared with other student populations, however, the number of English learner students in the Kentucky public school system is quite small, and minor changes in enrollment may have a disproportionate impact on participation rates.
6. Completion rates for courses attempted by American Indian students were similar to those of Black students in 2009/10, higher in 2010/11 and 2011/12, and lower in 2012/13. However, the number of American Indian students enrolled in Kentucky's public schools is very small, and minor changes may have a disproportionate impact on course completion rates.
7. This decline may be related to the introduction of a $50 administrative fee for dual enrollment courses in 2012/13 for courses offered by two-year colleges on their campuses. The fee's effect has not been systematically studied; however, other, unexplored factors could be associated with this trend.

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