National Research Center for Career and Technical Education

A New Typology for Career and Technical Education (CTE): Measuring Engagement, Achievement and Transitions of CTE Students

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NRC CTE
National Research Center for Career and Technical Education

Our Vision

- The National Research Center for Career and Technical Education (NRCCTE) is the primary agent for generating scientifically based knowledge, dissemination, professional development, and technical assistance to improve career and technical education (CTE) in the United States.

Our Mission

- The NRCCTE works to improve the engagement, achievement, and transition of high school and postsecondary CTE students through technical assistance to states, professional development for CTE practitioners, and dissemination of knowledge derived from scientifically based research.

Three Foci of the NRCCTE

- ***Engagement*** – Completing high school, completing PS programs
- ***Achievement*** – technical and academic; acquisition of industry credentials
- ***Transition*** – to continued formal learning without the need for remediation; and to the workplace

Defining the CTE student

- Different denominations: concentrator, participant, investor …
- "Traditional" classification in large surveys:
  - Academic track
  - Vocational track
  - Neither and both (dual)—as defined in the NCES sample survey
- NCES: Fulfillment of an occupational area if 3 or more credits are taken in that area ("occupational concentrator")
- Different levels, different goals

Understanding participation in CTE: Common perspective

ACADEMIC CURRICULUM	CTE CURRICULUM: NO	CTE CURRICULUM: YES
NO	General	CTE
YES	Academic	Dual

ACADEMIC COURSE TAKING REQUIREMENTS

Defining curriculum levels

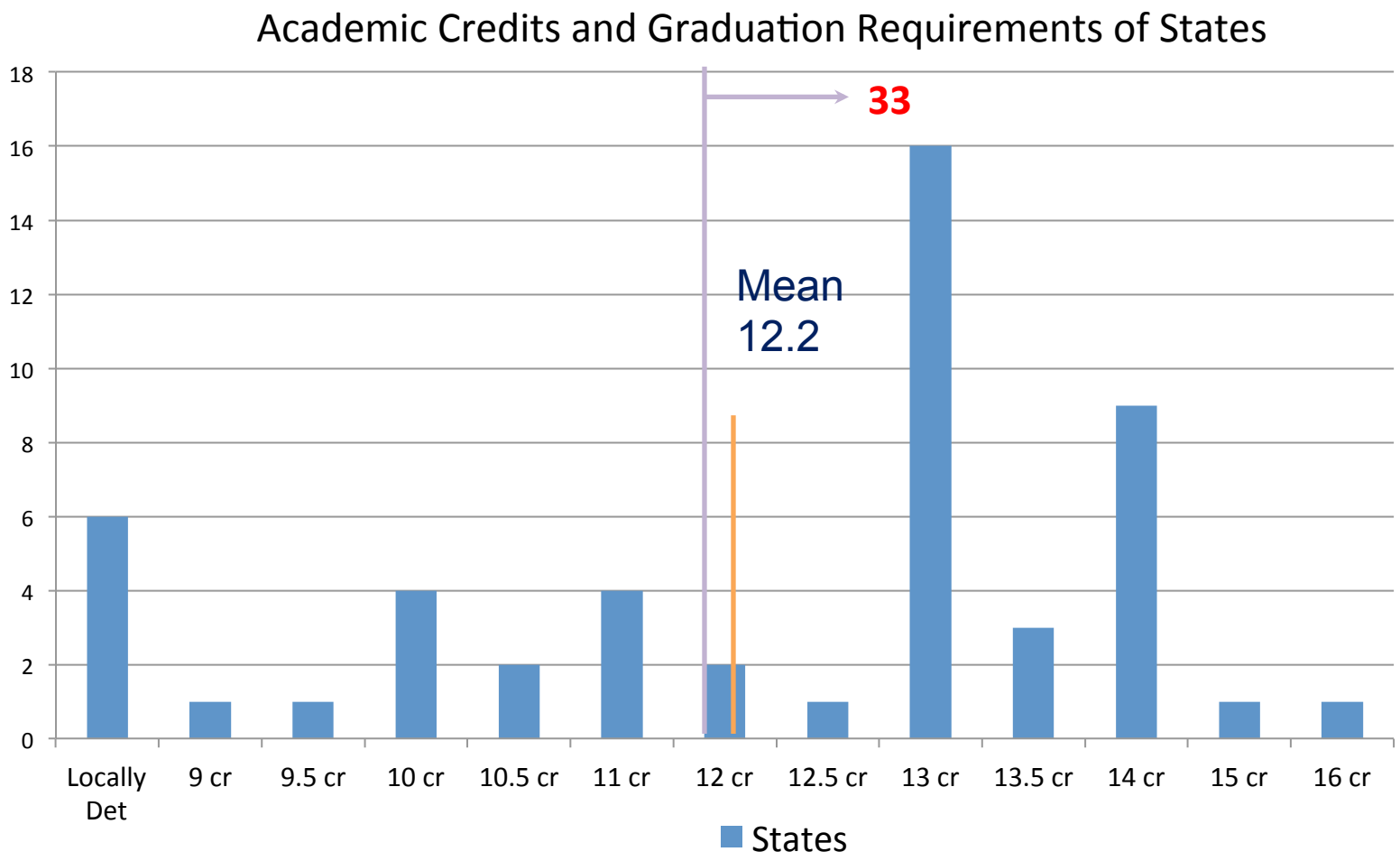
In this report, three curriculum levels are used to report on the coursetaking patterns of graduates: standard, midlevel, and rigorous. The curriculum levels are based on the number of credits and the types of courses graduates completed. For example, a standard curriculum level consists of four credits of English; three credits each of social studies, mathematics, and science; and no foreign language credits. Figure 2 describes the course credits graduates need to complete to be classified at each curriculum level.

FIGURE 2 Course credit requirements to attain specified curriculum levels

	STANDARD	MIDLEVEL	RIGOROUS
ENGLISH	4	4	4
SOCIAL STUDIES	3	3	3
MATHEMATICS	3	3 (including geometry and algebra I or II)	4 (including precalculus or higher)
SCIENCE	3	3 (including at least two of biology, chemistry, and physics)	3 (including biology, chemistry, and physics)
FOREIGN LANGUAGE	0	1	3

NOTE: This is a modified version of curriculum levels used by Laura Horn and Lawrence K. Kojaku (*High School Academic Curriculum and the Persistence Path Through College*, National Center for Education Statistics, NCES 2001–163, U.S. Department of Education, Washington, DC: 2001). The standard curriculum level is equivalent to what Horn and Kojaku refer to as a core curriculum; the nomenclature used in this report is different to avoid confusion with core credits also discussed in this report. One difference between this report and the classification by Horn and Kojaku is that to be considered as having completed a rigorous curriculum, this report does not require graduates to have taken an AP or honors course. This modification was made to ensure that HSTS data for earlier years are consistent with data for 2005.

Current Graduation Requirements and CTE



A High School Experience May Look Like This

STANDARD CREDIT REQUIREMENTS (4E, 3M, 3S, 3SS)
(NCES-HSTS 2011)

HIGH LEVEL MATH AND SCIENCE
(4E, 3M, 3S, 3SS, 1FL; Geom & Alg I or II or higher, 2 Bio, Che, Phys)

CTE COURSE TAKING (UP TO LESS THAN 3 CREDITS) OR HIGH INTENSITY CTE (3 OR MORE CR, NOT FULFILLING OR FULFILLING AN OCCUPATIONAL AREA)

Current Participation Levels in CTE

- 92% of public high school students take one *course* in CTE (class of 2005)
  - Consistent for past 15 years

- 4.01: Average number of CTE credits earned by all public high school graduates (2005)

Reformulating CTE Course Taking

- Traditionally, CTE includes only the total number of CTE credits enrolled and completed either across all areas or within one area to identify the extent of participating or concentrating in CTE. A three-credit threshold is used to divide CTE students into participants and concentrators

- The NRCCTE has begun exploring, examining, and analyzing credits taken within an occupational area, across all occupational areas, and the number of occupational areas in which high school graduates participate and concentrate
- The source of the data is the US Department of Education sample survey data, specifically the 2005 NCES High School Transcript Studies (HSTS) data and the Education Longitudinal Study (ELS) data

Reformulating CTE Course Taking

- The purpose is to understand, the level, mix, and intensity of CTE course-taking within and across different occupational areas.
- The NRCCTE has expanded the participant-concentrator dichotomy by creating a taxonomy that more accurately represents CTE course-taking.
- Using the Classification of Secondary School Courses (CSSC) different parts of the high school graduates' transcripts are analyzed

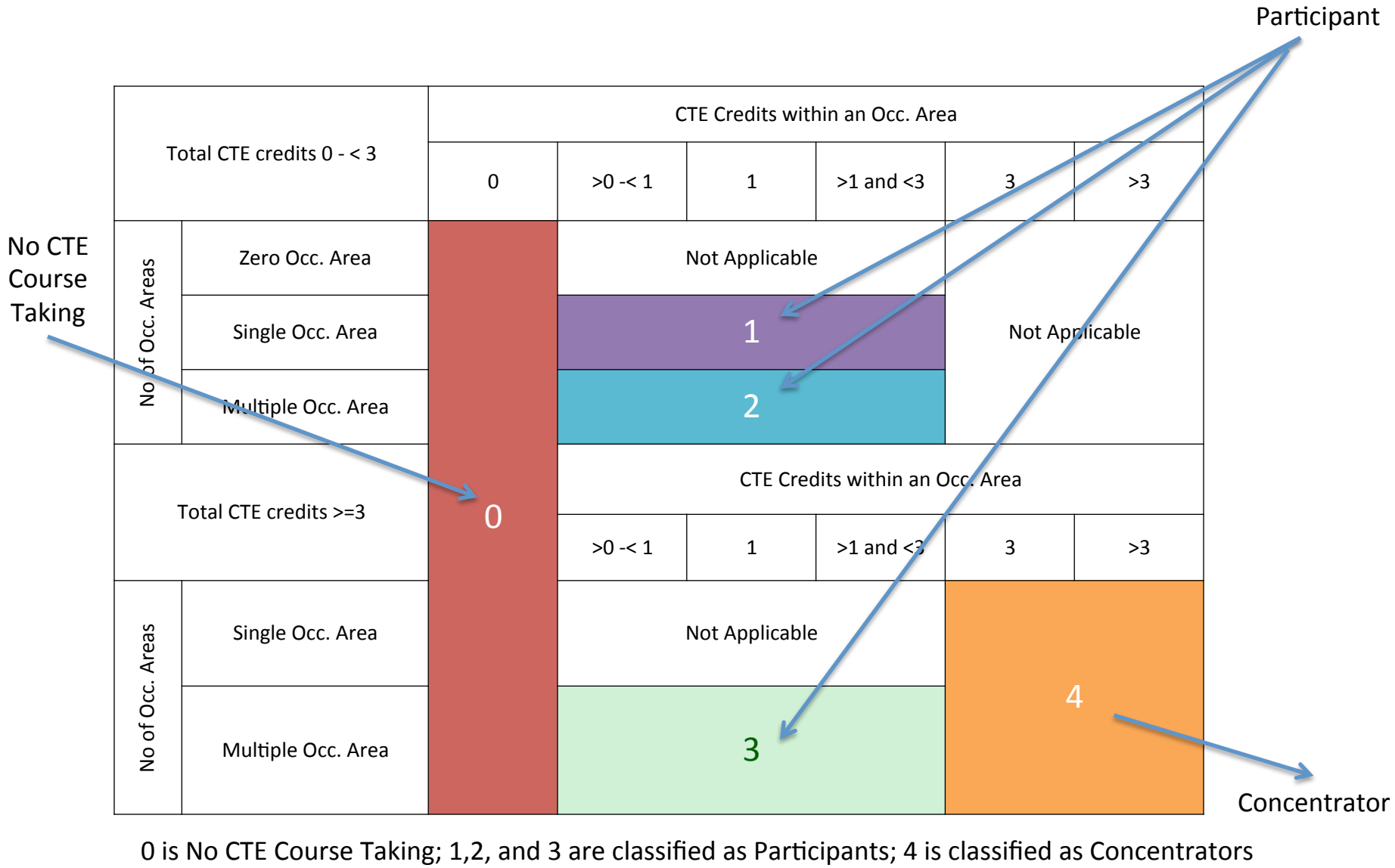
Reformulating CTE Course Taking

- Following along the lines of NCES, the basic steps are as follows:
  - Identify CTE and Academic courses
  - Divided CTE into 13 occupational areas
  - Divided Academic into different subject areas, including Math and Science
  - Categorized Math & Science courses by three levels: Less than Basic, Basic, and Advanced
  - Identified Academic and CTE courses which are in sequence and further divided by No Sequence/ Sequence
  - Determined the last grade year Math & Science course taken

Reformulating CTE Course Taking

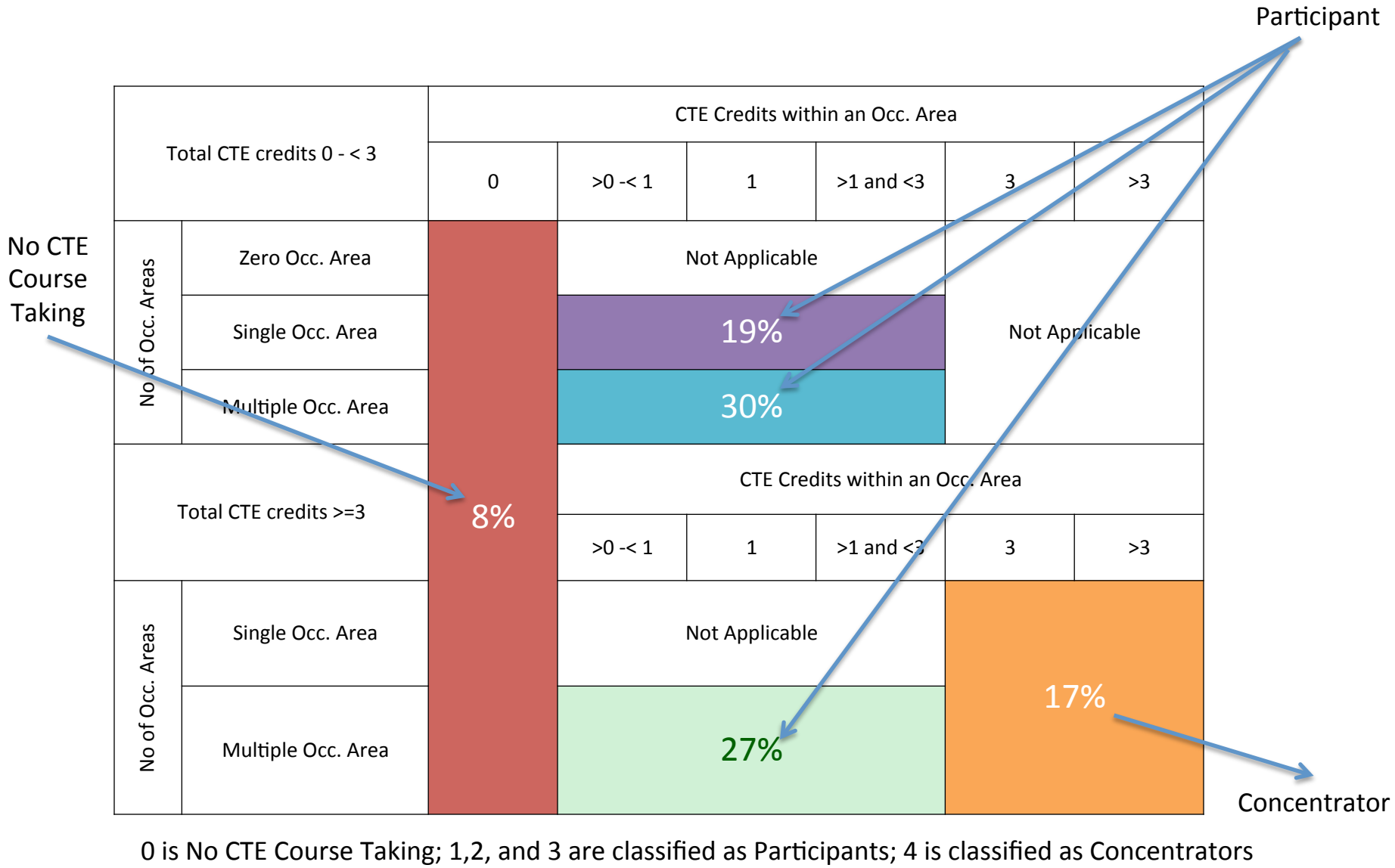
- Dividing CTE course taking patterns of high school graduates (students) into three facets:
  - Identify how many credits high school graduates takes and completes within each occupational area
  - Determine the total number of CTE credits enrolled and completed across all occupational areas
  - Count the number of occupational areas in which each graduate enrolls and completes courses
- A crosstab has been built that relates the above three facets creating the following (shown on the next slide)

Reformulating CTE Course Taking



0 is No CTE Course Taking; 1,2, and 3 are classified as Participants; 4 is classified as Concentrators

Reformulating CTE Course Taking



0 is No CTE Course Taking; 1,2, and 3 are classified as Participants; 4 is classified as Concentrators

Modifying the Foci of the NRCCTE

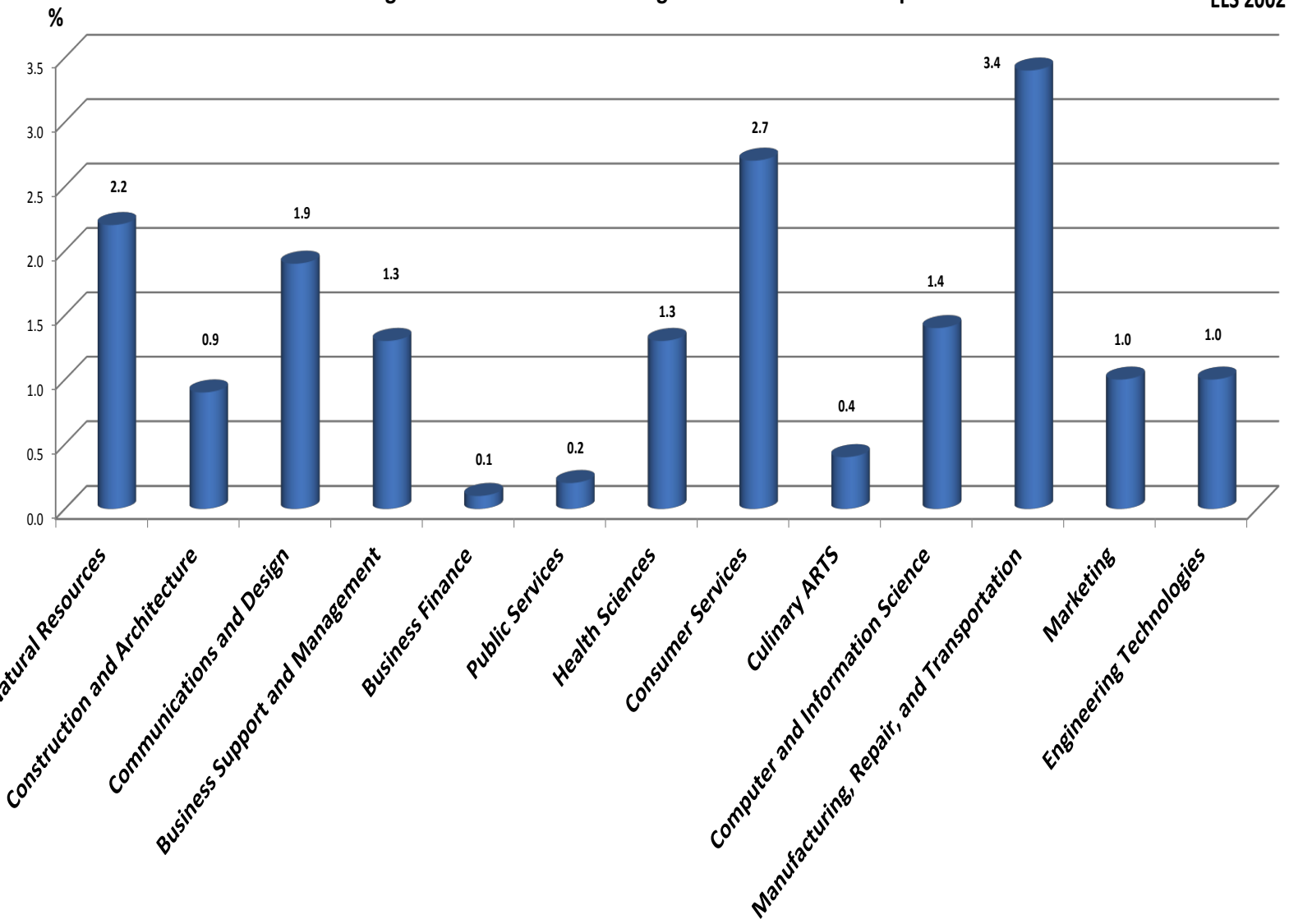
- ***Engagement*** – defined as attending, focusing, and specializing in course work and work-based learning within programmatic career pathways or programs of study;
- ***Achievement*** – defined as academic performance, skill development, and, completing (graduating) school or college; and,
- ***Transition*** – defined either moving on to postsecondary education without the need for remediation; or, as managing the swirl that takes place between education and the workplace.

ENGAGEMENT

Graduates from Public High Schools: CTE Coursetaking and Fulfillment of Occupational Areas

ELS 2002

N=2'698,609



CTE Group	High School CTE AREA	Postsecondary Program
Occupational Area Not Fulfilled (Less than 3 Credits One Occupational Area) {1}	Consumer Services; Business support and management; Computer and information science; Communications and design	Business/management/ marketing/related; Engineering technologies/ technicians: Arts--visual and performing; Health professions/clinical sciences; Education

- High school graduates take CTE courses in "newer" CTE clusters
- Enrolling in postsecondary programs that have some degree of "marketability"
- With CTE credits averaging around one and high school CTE enrollment in only one occupational area, how are secondary and postsecondary programs related and connected?

CTE Group	High School CTE AREA	Postsecondary Program
Occupational Area Not Fulfilled (Less than 3 Credits More than One Occupational Area) {2}	Consumer Services; Computer and information science; Business support and management; Communications and design; Business Finance	Business/management/ marketing/related; Health professions/clinical sciences; Education

- High school graduates take CTE courses in “newer” CTE clusters
- Enrolling in postsecondary programs that have some degree of “marketability” but choices appear to be narrowing
- With CTE credits averaging around 1.80 and CTE enrollment in more than one occupational area, will the case for secondary and postsecondary programs linkages be better defined?

CTE Group	High School CTE AREA	Postsecondary Program
Occupational Area Not Fulfilled (More than 3 Credits and more than one occupational area but not reaching the 3-credit threshold for an occupational area) {3}	Communications and design; Business support and management; Consumer Services; Computer and information science; Business Finance; Marketing	Business/management/ marketing/related; Engineering technologies/technicians: Health professions/ clinical sciences; Education

- High school graduates take CTE courses in "newer" CTE clusters but mix and match occupational areas but not enough to concentrate in any one
- Enrollment in postsecondary programs appear to link back to high school CTE enrollment
- With CTE credits averaging around almost four and CTE enrollment in more than one occupational area, are these CTE students laying a foundation for a program of study?

CTE Group	High School CTE AREA	Postsecondary Program
Occupational Area Fulfilled (at least 3 credits in one occupational area) {4}	Health Sciences (F); Communications and design (F); Computer and information sciences (F); Consumer Services (F); Agriculture and natural resources (F); Business support and management; Engineering technologies	Business/management/ marketing/related; Engineering technologies/technicians: Arts--visual and performing; Health professions/ clinical sciences; Education

- High school graduates take CTE courses in "newer" CTE clusters but mix and match occupational areas but concentrate in at least one occupational area
- Enrollment in postsecondary programs appear to link back to high school CTE enrollment
- With CTE credits averaging over four and a half and graduate fulfills at least one occupational area, are these CTE students making their program of study at the high school level itself?

ACHIEVEMENT

Graduation Rates of Public High School Students and Career and Technical Education Course Taking. Class of 2004. ELS:2002 (Percentages)

CTE Course-taking (credits)	Graduated*	Not Graduated	Weighted n
All students	93.6%	6.4%	2,698,121
0	92.0%	8.0%	215,646
0.01 - 0.99	92.1%	7.9%	201,987
1	94.4%	5.6%	287,940
1.01 - 2.99	91.5%	8.5%	806,182
3.00/No OAF**	95.8%	4.2%	204,943
3.00+/No OAF	95.0%	5.0%	528,060
3.00/OAF	94.2%	5.8%	21,904
3.00+/OAF	95.9%	4.1%	431,459

* Graduated by Summer 2004.
**OAF: Occupational area fulfilled. Student completed at least 3 credits in a single occupational area.
Source: Education Longitudinal Study of 2002 (Second Follow Up of 2006).

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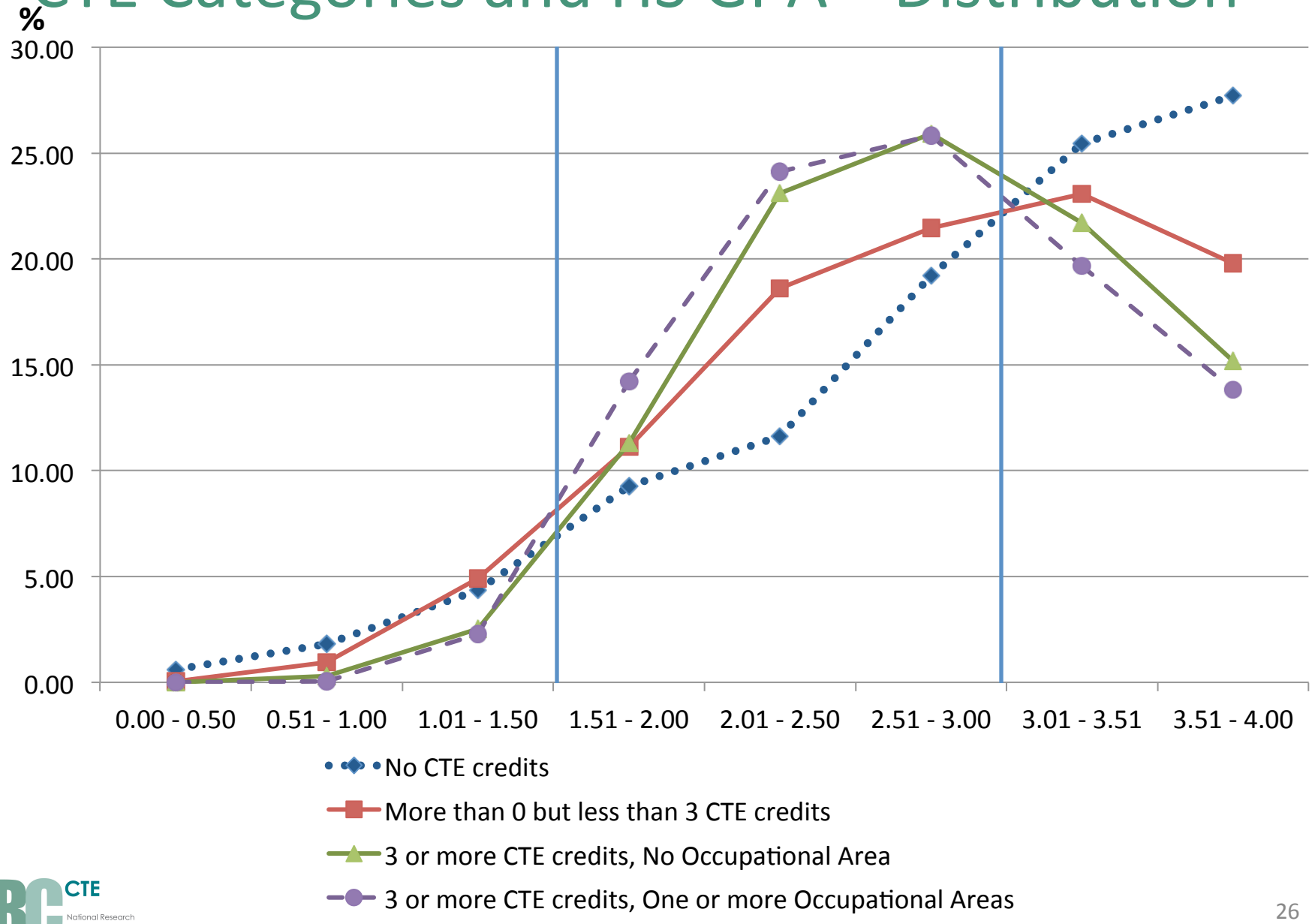
CTE Categories and HS GPA—Distribution



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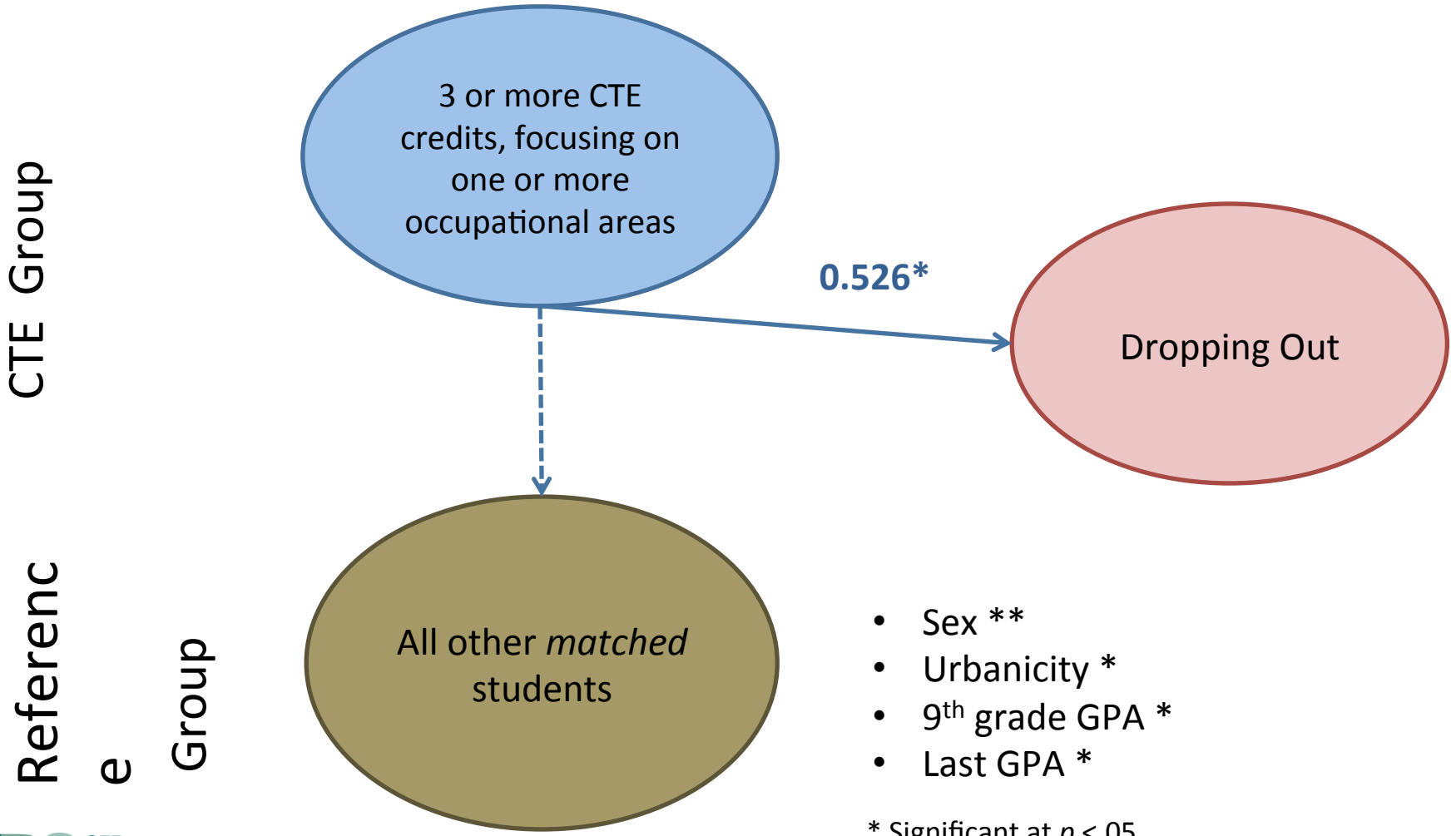
CTE and HS Achievement

	No CTE credits	More than 0 but less than 3 CTE credits	3 or more CTE credits, No Occupational Area	3 or more CTE credits, One or more Occupational Areas
GPA Mean	2.91	2.78	2.74	2.69
Basic Math	3.98%	2.67%	2.28%	5.80%
Algebra 2	36.05	43.44	51.89	58.82
Beyond Algebra 2	59.97	53.90	45.83	35.38
Basic Science	2.60%	1.48%	1.19%	3.50%
Biology	44.78	52.23	59.75	60.46
Biology or higher or equivalent	52.62	46.30	39.06	36.04

Propensity Score Matching



- Sex **
- Urbanicity *
- 9th grade GPA *
- Last GPA *

* Significant at $p < .05$
** Significant at $p < .10$

Discussion

- Ninth-grade GPA is a constant significant predictor
  - Prior academic achievement explains successful outcome
- SES equally important (in two of the models)
- Confirms prior research
- Important effect of CTE on engaging
  - Particularly high-intensity CTE (3 or more CTE credits)
  - High-intensity: importance of articulated, meaningful programs

… Discussion

- CTE inversely related to dropping out
- Not conclusive, but yet important
  - National representative sample
  - Looks at CTE credit-taking spectrum
- Further research
  - HSLS

TRANSITIONS

Graduates from Public High Schools and Highest Education Level Attempted by CTE Coursetaking (Percentage)

ELS 2002

Highest Education Level	CTE Coursetaking (Credits)						
	0.00	0.01 - 1.00	1.00 - 2.99	3.00	3.00 +	3.00 +; OAF	Total
Some High School	0.3	0.5	1.0	0.2	0.4	0.2	2.6
GED	0.1	0.1	0.3	0.0	0.1	0.1	0.7
High School diploma	1.1	3.2	5.8	1.6	4.9	5.4	21.9
Enrolled in less-than-2-year school	0.1	0.3	0.6	0.1	0.3	0.5	1.9
Enrolled in 2-year college	1.7	4.1	8.0	2.2	5.8	5.1	26.9
Enrolled in 4-year college or university	4.8	10.0	14.2	3.5	8.0	5.6	46.0
Total	8.0	18.2	29.9	7.6	19.6	16.8	100.0

***N* =2'692,087**

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NRCCTE Typology

- Looks at the whole spectrum of CTE credit taking
- Based on 0, 1 and 3 credits (8 basic categories)
- Different levels: respond to different intents, interests, and plans

CTE is not what it used to be …

- Graduation requirements
- Participation patterns
- Occupations expansion
  - Variations within each occupation
  - Career pathways and clusters

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