CCRC Community College Research Center

TEACHERS COLLEGE, COLUMBIA UNIVERSITY

Get with the Program: Accelerating CC Students' Entry into and Completion of Programs of Study

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Council for the Study of Community Colleges Conference
April 9, 2011, New Orleans

Measuring Rates of Program Entry and Completion by Community College Students

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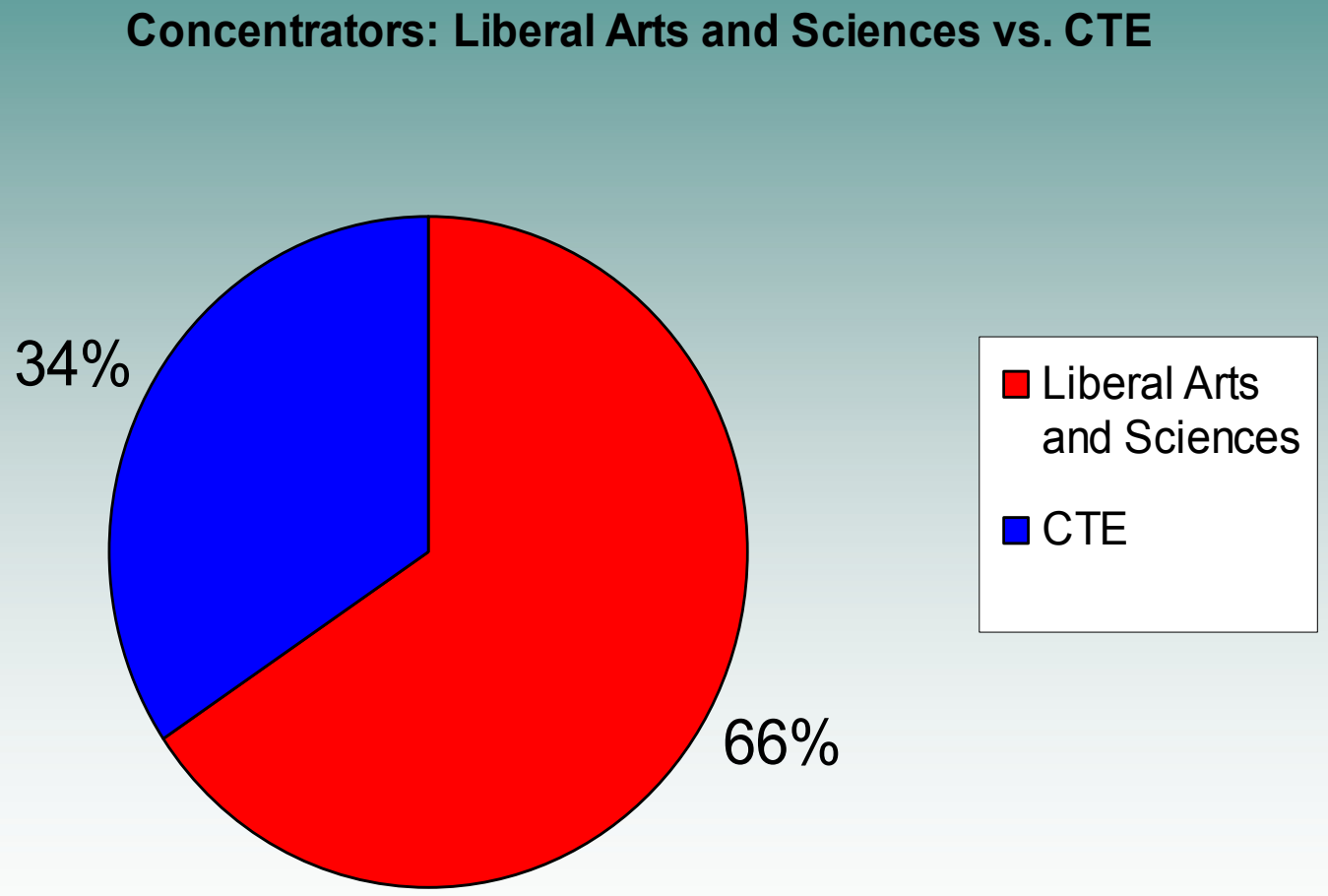
Helping Students Get into A Program of Study

- To earn a credential, students must first enter a program of study
- Many community college students enter without clear goals for completion or careers
- CCs offer many programs, but not enough guidance to help students choose a program

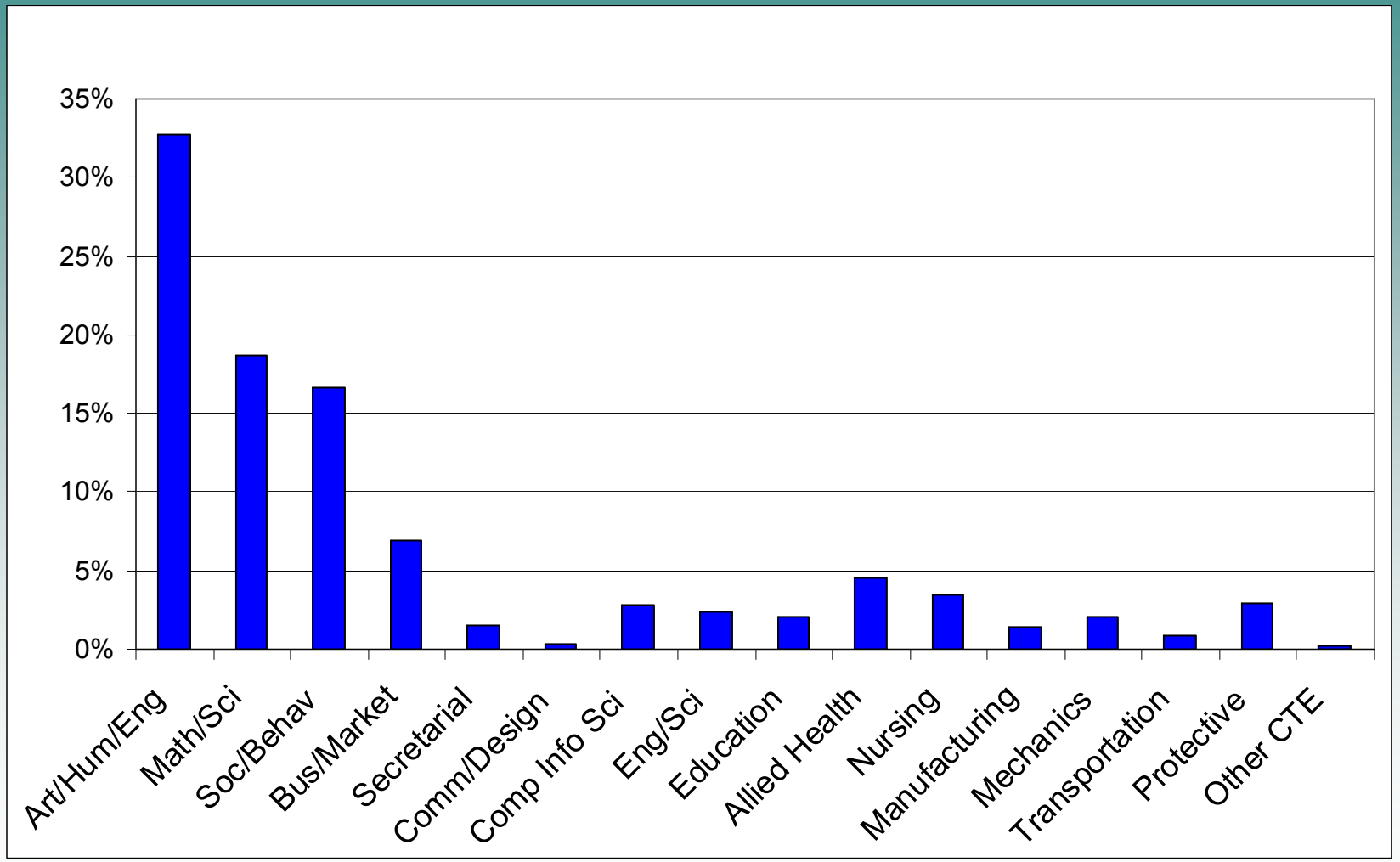
Definitions

- Data from a state system with course- and student-level data, followed from summer 2005 to spring 2010 (5 years)
- We define “concentrators” as those who complete at least nine college-level credits in one program area
  - “Attempters” as those who attempt the same
- One specific CTE program OR one of three liberal arts and sciences programs

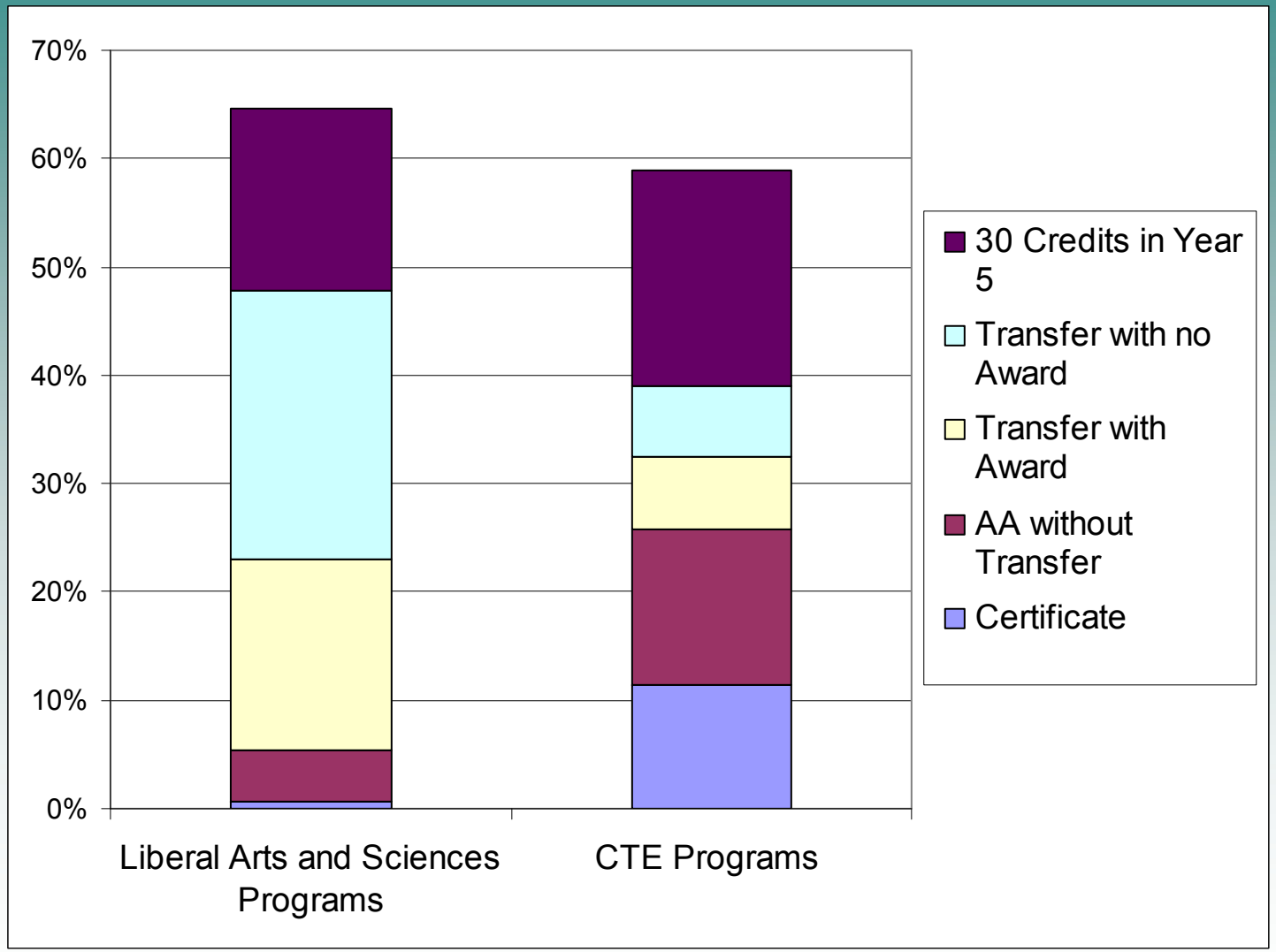
Concentrators by Program Type



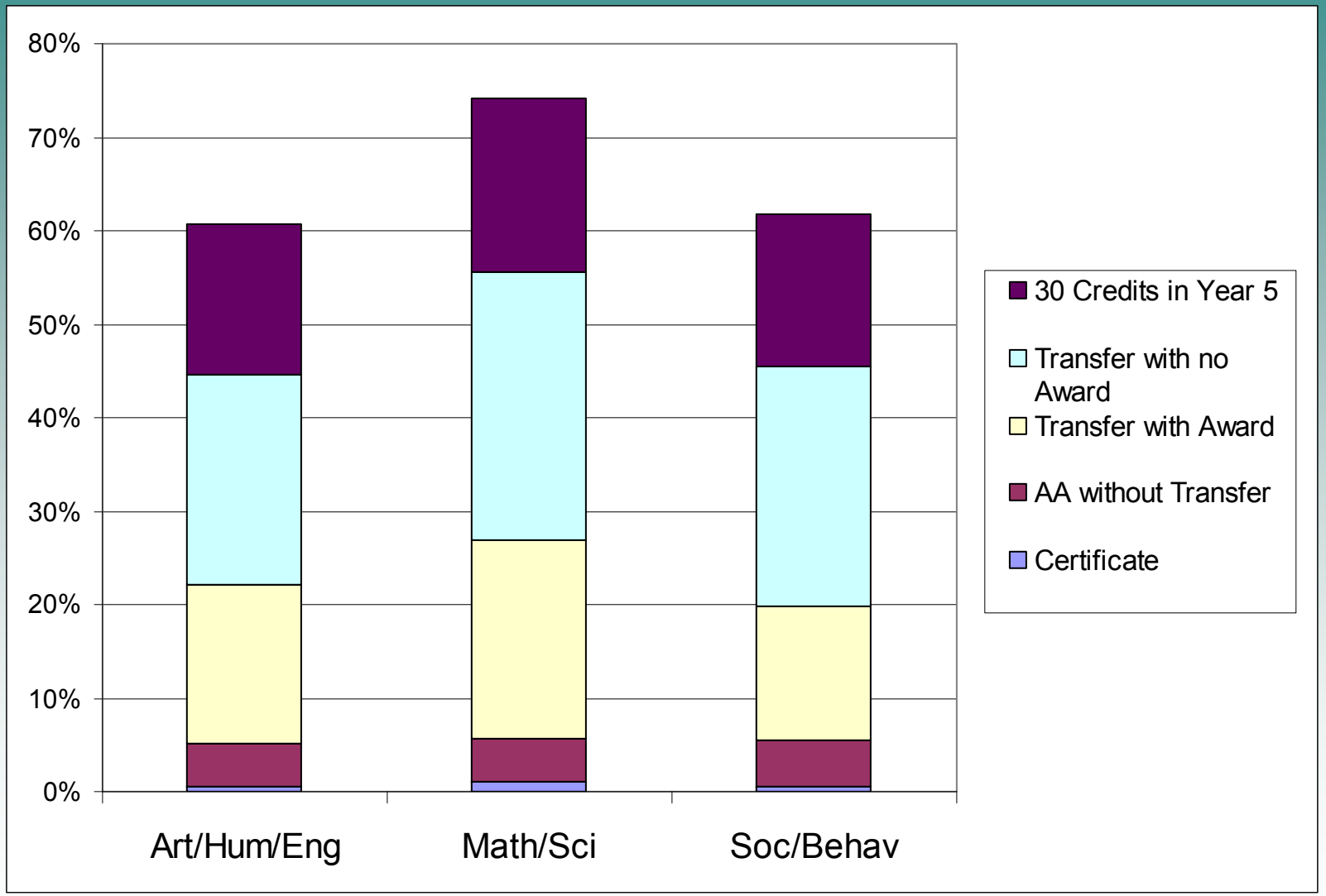
Concentrators by Program Area



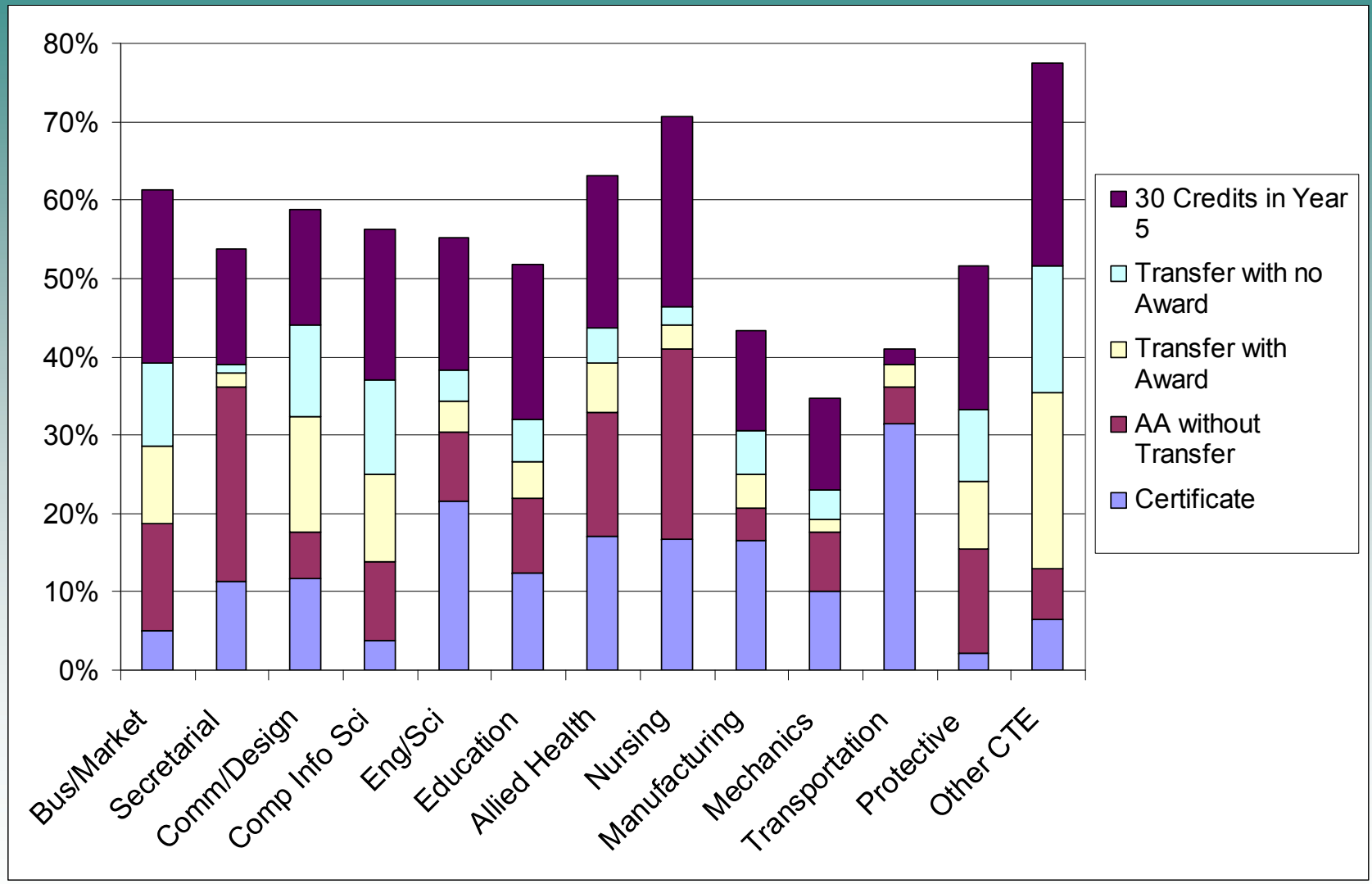
Success Rates



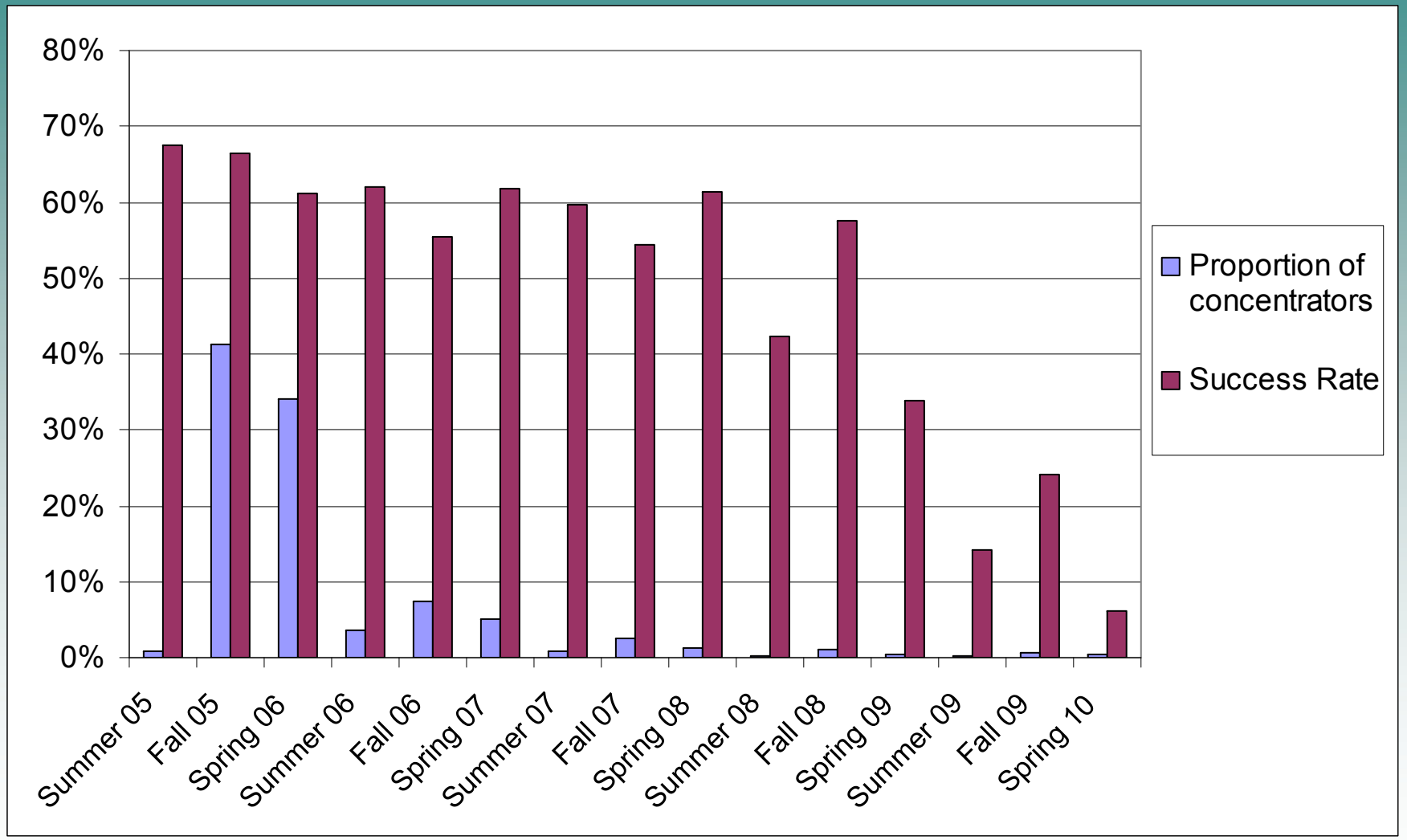
Success Rates by Program Area



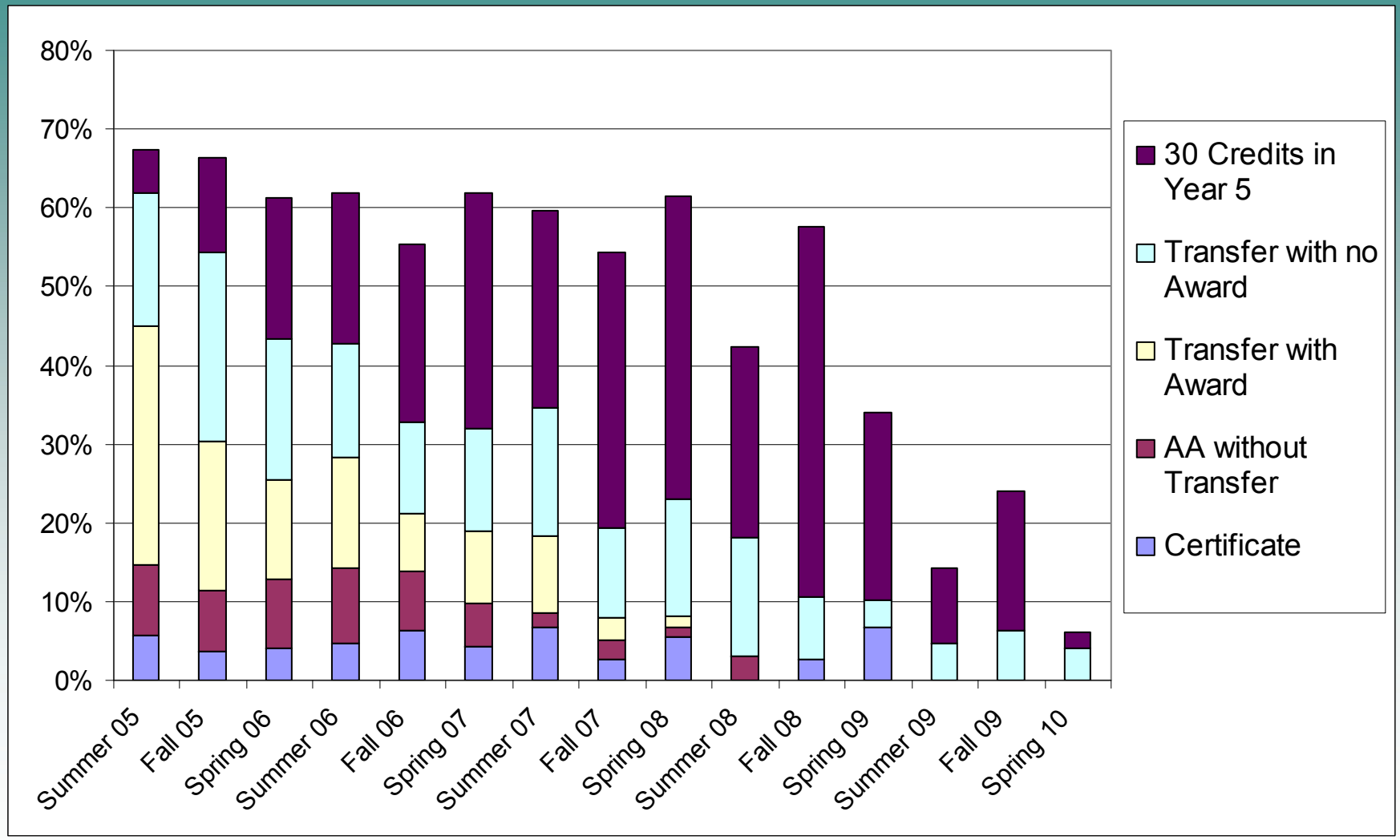
Success Rates by Program Area



Concentrators by Term



Success Rates by Term



Summary

- Most academic concentrators transfer while CTE concentrators earn certificates
  - Most credentials in secretarial, allied health, and transportation
- Three-fourths of all concentrators become one within their first academic year
- It helps to become a concentrator *early*
  - Associated with higher rates of credential attainment and transfer within five years

Charting Pathways to Program Entry and Completion of Low-Income CC Students

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Applying the Methodology

- Concentrator methodology can be used to track a particular population of students
- Policy interest in young, disadvantaged (particularly low-income) students
- Data from Washington State – followed the 2001-2002 FTIC cohort through the end of the 2008-2009 academic year (7 years)

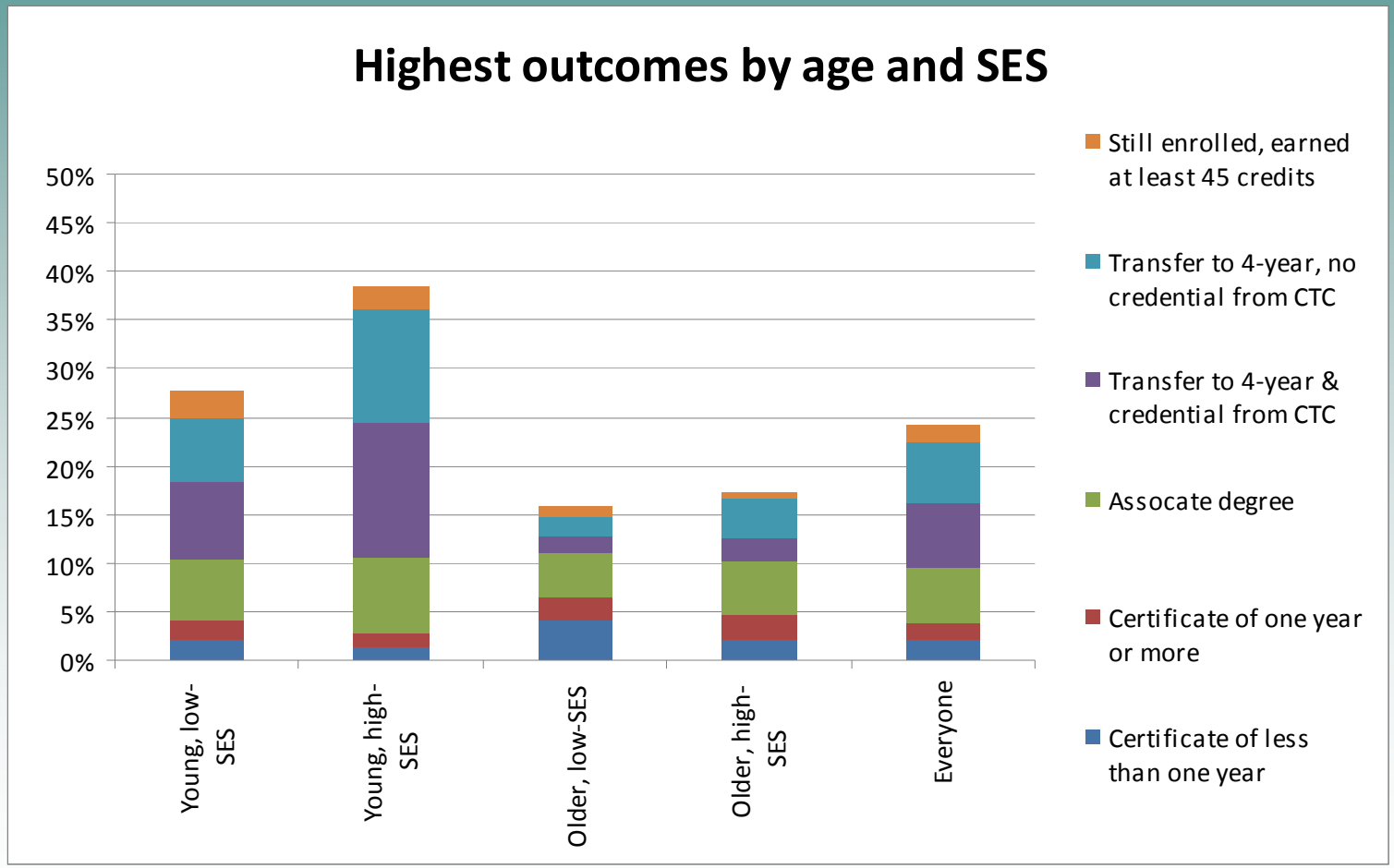
Adapting to a Particular Data System

- Specific challenges will arise
- Examples:
  - WA uses a quarter system; change concentrator definition to 3 classes or 12 quarter credits
  - Some deviations from national CIP taxonomy
  - Missing data (especially data that is missing at different levels across subgroups of interest, or data necessary for classification of students)

Why Young, Low-SES Students?

- Policymakers and funders (ex. Gates, Lumina) interested in improving attainment rates of young, disadvantaged students
- Evidence that low-SES students need more remediation before taking college-level classes
- Theorists have suggested that low-SES students are “tracked” into low-return fields
  - Deil-Amen & DeLuca (2009) described the “Underserved Third” of education pathways
  - Jacobson & Mokher (2010) show that students with low HS GPAs are more likely to go into low-return fields

Variation in Outcomes by Age and SES

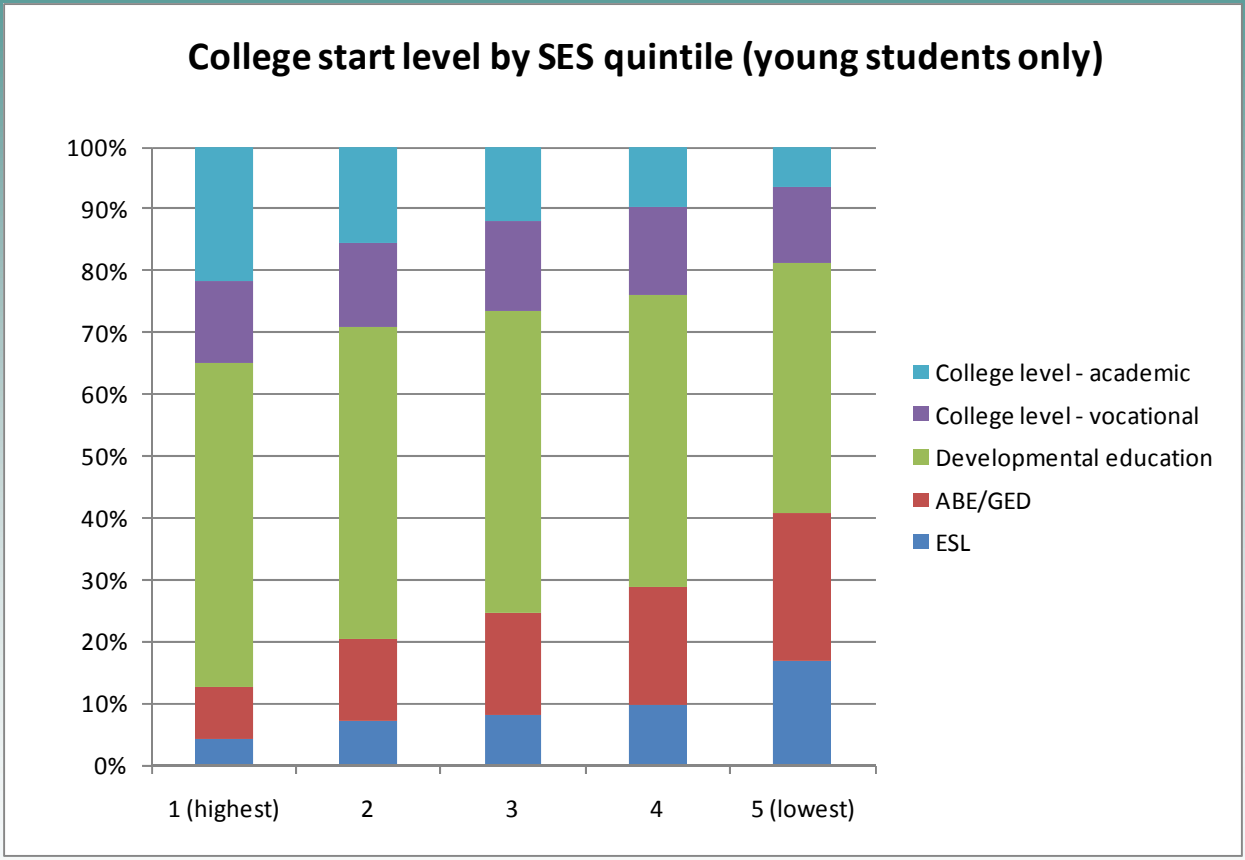


“Stacking” Outcomes

- There is some, but limited, “stacking” of credentials
- For young students:

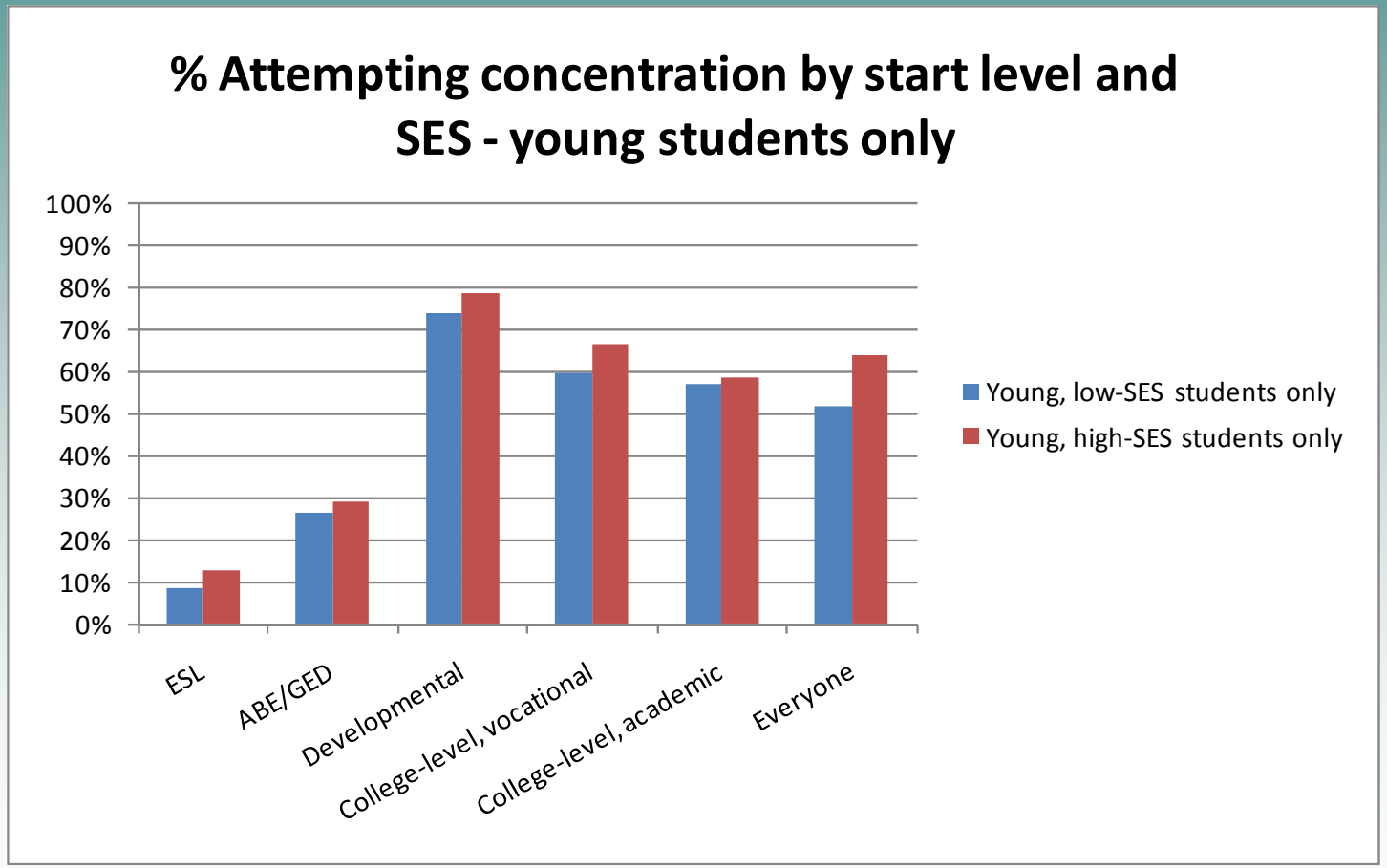
Credential earned:	**Percentage of students who also earned…**			
	Short-term certificate	Long-term certificate	Associate degree	Transfer to 4-year institution
Short-term certificate	N/A	11%	34%	12%
Long-term certificate	10%	N/A	38%	12%
Associate degree	5%	6%	N/A	59%
Transfer to 4-year institution	2%	2%	64%	N/A

Low-SES Students: Starting With Greater Challenges

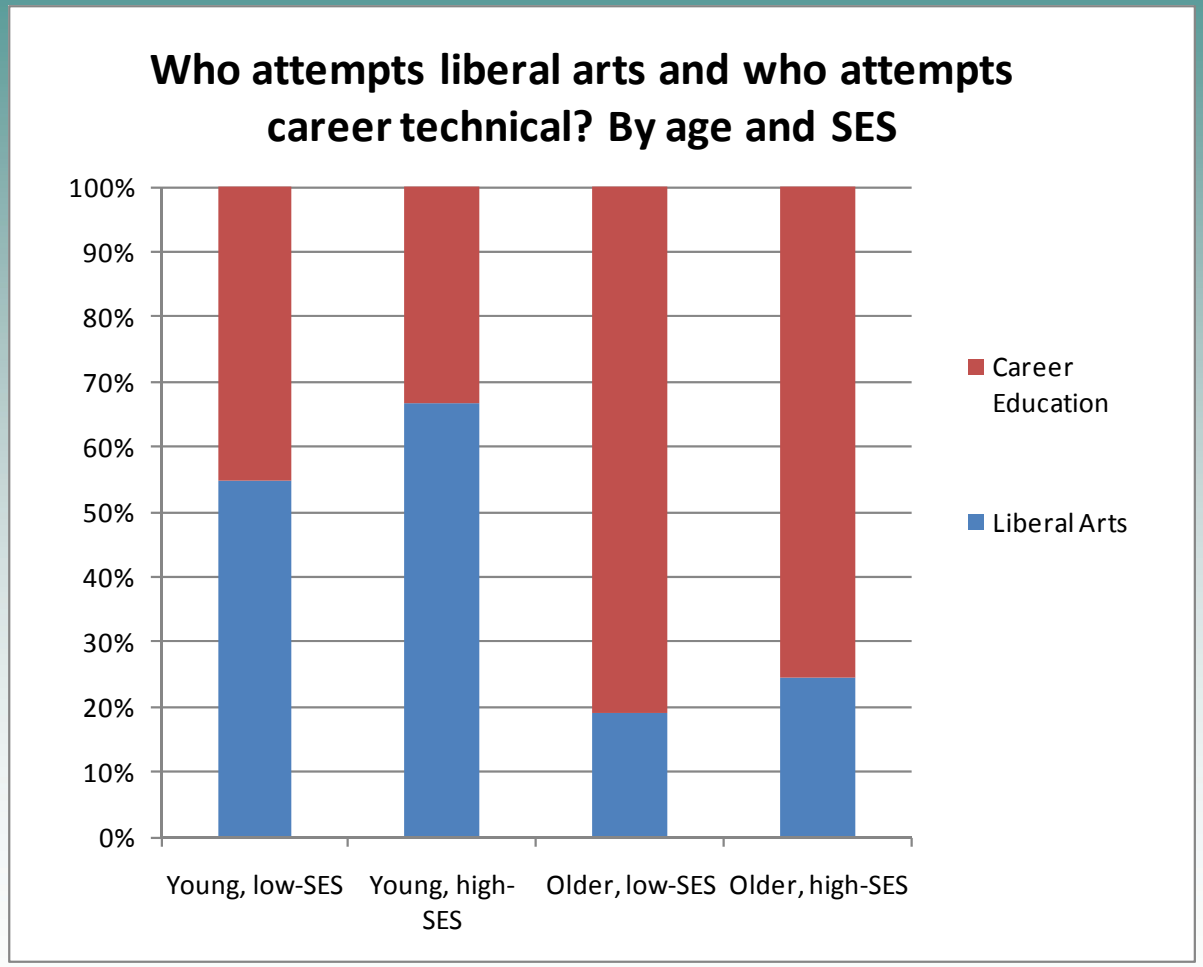


- Even among young students, low-SES students are much more likely to start in remedial coursework, especially ESL and ABE

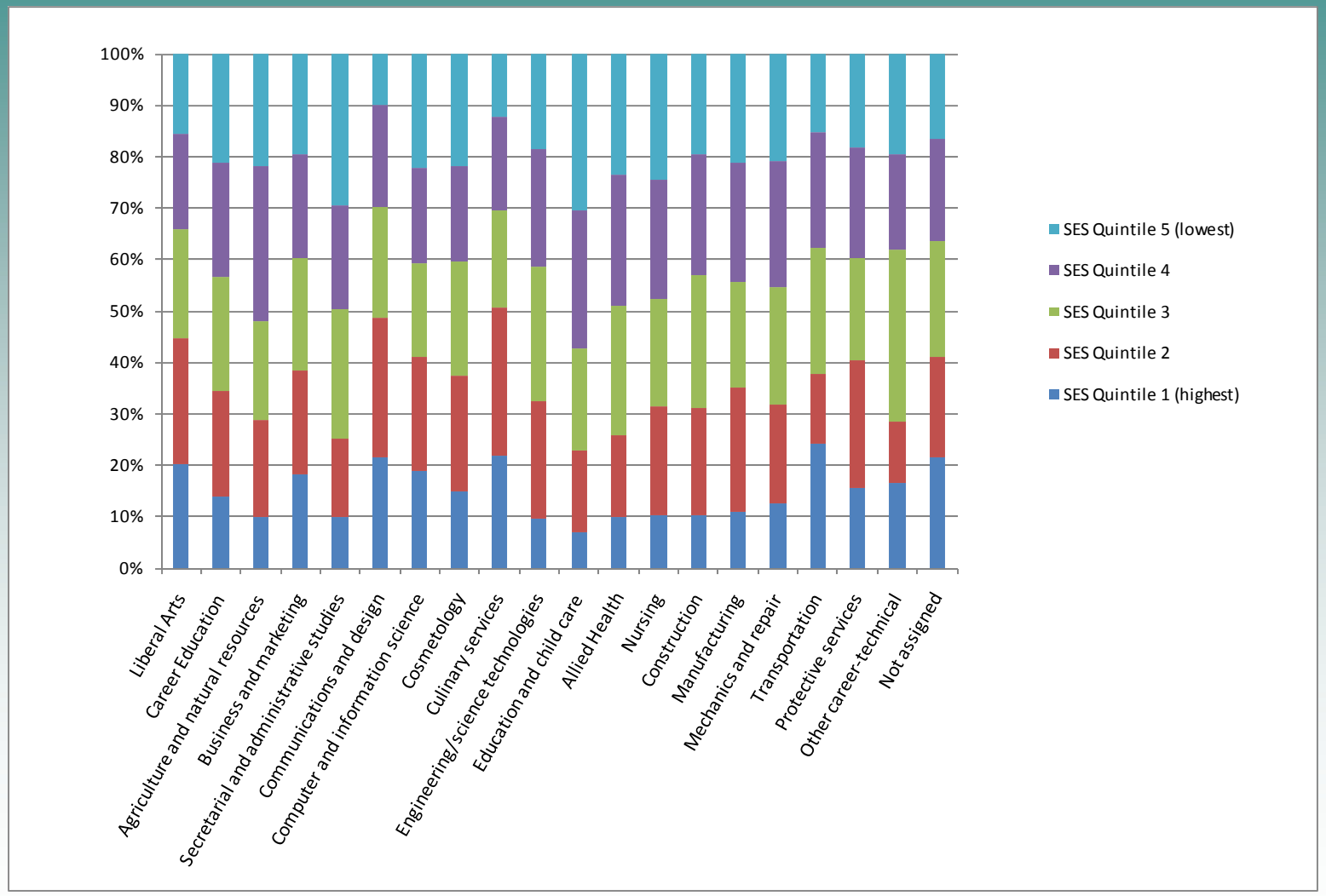
Low-SES Students: Falling Behind at Each Stage of the College Pathway



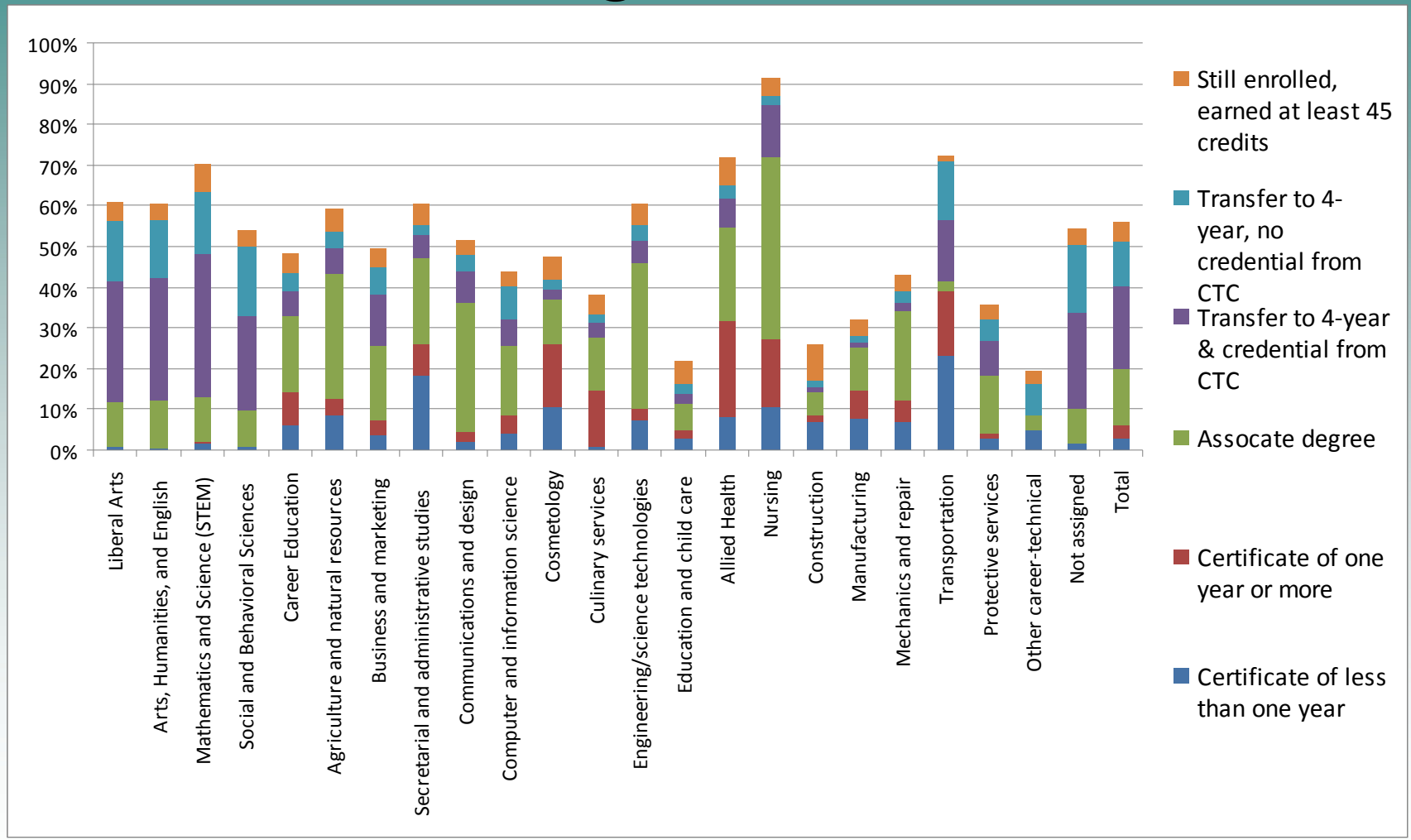
What Type of Concentration Do Students Attempt?



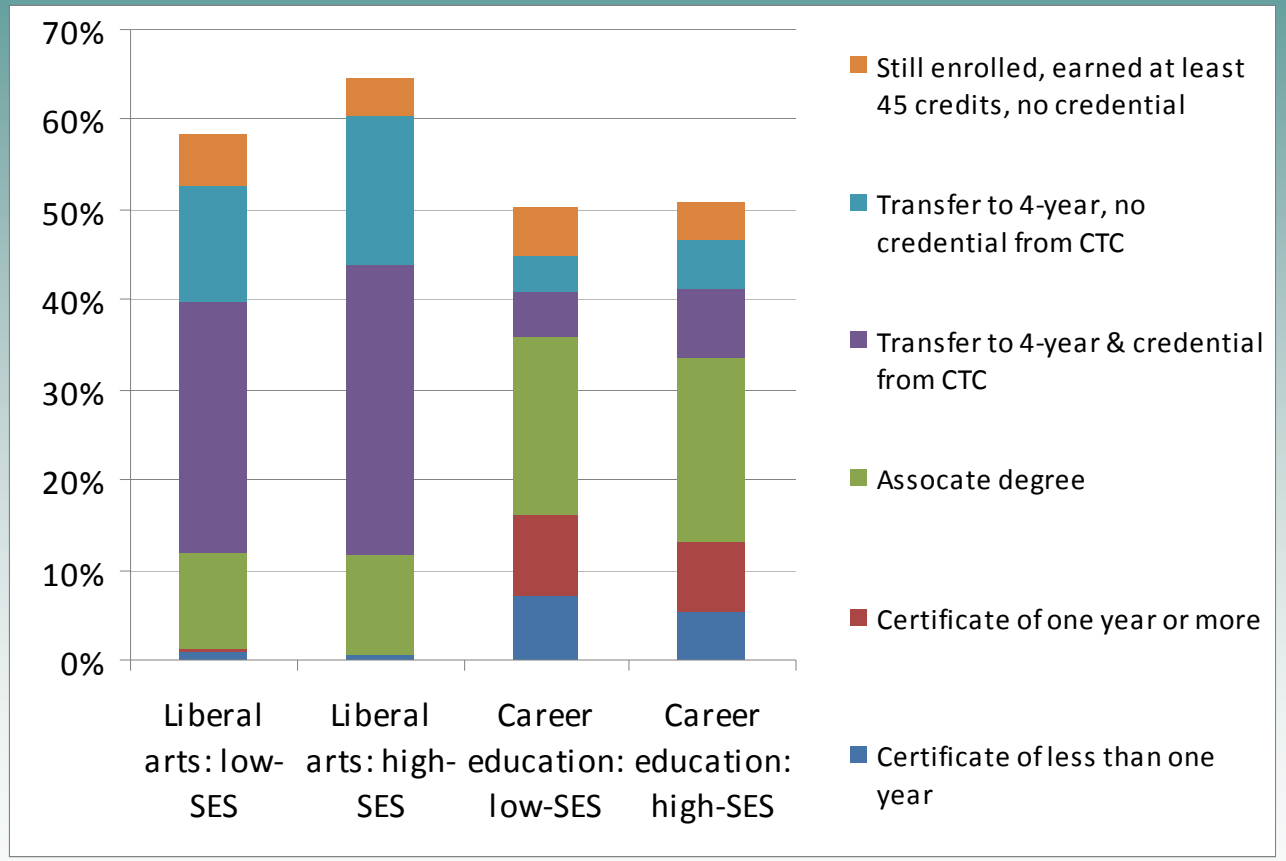
Variation by SES in Field of Concentration Attempted



Outcomes by Concentration for Young Students



Outcomes for Young Students by Age and Type of Concentration



Assessing Theory of the "Underserved Third"

- Deil-Amen & DeLuca 2009 – several claims that we can test with our data
  - *This "underserved third" is likely to enroll college at a remedial level and leave before earning a degree.*
  - *Colleges often fail to help this "underserved third" access preferred occupational pathways, rather than flounder unsuccessfully in general studies areas.*
  - *There are two tiers of occupational education, and the "underserved third" is shunted into the low-prestige, low-return tier.*
  - *"Can society be more purposeful in creating structured, supported routes from high school and subbaccalaureate education into the workforce in ways that do not foreclose options for more advanced levels of schooling? Tighter coupling between academics and career pathways does not have to involve a decoupling from further college opportunities." (pg. 30-31)*

Conclusions

- Low-SES students fall a further behind their higher-SES counterparts at each stage of the educational pathway:
  - They start at a lower level (especially in ESL or ABE/GED classes)
  - They are less likely to attempt a concentration at each level
  - They are less likely to enter a concentration they've attempted
  - As concentrators, they are less likely to earn a credential or transfer to a 4-year institution
- Important to understand why so many students don't make it even to the stage of attempting a concentration

Using Clustering and Coherence Measures to Understand Community College Course-Taking Patterns

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Motivation

- Diverse student goals and diverse college program offerings; only a vague sense of who is doing what
- What are the common pathways through a community college & how *structured* are they?

Motivation (continued)

- Rosenbaum et al. – *After Admission: From College Access to College Success*
  - Found that for-profit institutions are more likely to graduate students
  - Hypothesis is that this is because they offer fewer choices, structured programs, cohort model)

Motivation (continued)

- The structure hypothesis:
  - Students that undertake more structured programs have better outcomes
  - Since we do not have access to program requirements, we evaluate this hypothesis indirectly
  - All things being equal, a student with a more coherent transcript will have a better outcome

Data & Methods

- Data: Washington State community college transcript files, FTC 01-02 & 05-06 cohorts
- Evaluate the overlap between student transcripts
- Form clusters based on similar (overlapping) transcript content
- CIP system: federal Classification of Instructional Programs, used to overcome lack of common course numbering across schools

Similarity Measure

- Compare students pair-wise and count percentage of each students transcript that is found in the other's
- The measure of similarity is the average of the two percentages, which will typically be different unless the students have transcripts of the same length
- E.g. if transcripts are ABDGHQR and BIGQZ, "BGQ" is in common, which is 3/7 of the first transcript and 3/5 of the second; the average of these is about 0.51

Most Frequent Courses

College	Number of courses needed to cover 50% of all course enrollments
Comprehensive CC #1	53
Comprehensive CC #2	73
Comprehensive CC #3	51
Technical College #1	287
Technical College #2	221

- Thus, unclustered, technical colleges appear more heterogeneous; but we will see the situation is more complex after clustering

Clustering Approach

- “Partitioning About Medoids” (PAM)
  - We use it to cluster the transcripts using the above similarity measure
  - Restricted to students that had at least six courses on their transcript
  - Algorithm user specifies number of clusters
  - Algorithm tries many possible clusterings with that number of clusters until it finds one that is optimal

Clustering Results

- There are two types of community colleges in Washington, 29 comprehensive colleges and 5 technical colleges; the latter have an occupational/vocational focus, while the former offer both occupational/vocational courses and liberal arts for transfer to four-year schools
- We hypothesize that technical colleges will be more structured
- We studied three comprehensive colleges and two technical colleges
- We did in fact find that the technical colleges were more structured, in that students in each cluster were more like each other than they were in the clusters for the comprehensive schools.

Clustering Results

- While the technical colleges are more heterogeneous overall, they are more homogeneous within the clusters; in the clusters for the comprehensives, about 20 courses are needed to reach 50% of all courses; at the two comprehensives, it is 10-12.
- Looking just at departments within a cluster, we need about 3-4 departments to cover 50% of courses in a cluster; in the technical colleges, the median is just one, which means that in half the clusters, we need only one department

Clustering Results at a Comprehensive CC

This college had a number of liberal arts clusters

It also had some highly-specialized clusters, like one might see in a technical college; these included a business program, a criminal justice program, a hotel management program, a nursing program, and a program for ophthalmic technicians

Clustering Results
The Technical Colleges

- The technical colleges had fewer subjects represented in each cluster, in part due to a tendency to list required classes under the subject in question: e.g. “veterinary math” or “culinary math”
- Tech College #1 had many distinct programs listed in its 40 clusters: field surveying, nursing, electronics, office automation, auto body, culinary arts, etc.
- Tech College #2 also had focused programs in the clusters, for instance, auto repair, early childhood education, pharmacy technician, cosmetology, nursing. There was also an ESL cluster and an ABE/GED cluster

A System-Wide Clustering

- Washington State lacks common course numbering, so we based a system-wide clustering on the CIP system
- Two transcripts overlap based on the number of four-digit CIP codes they have in common
- Examples of four-digit CIP codes:
  - 11.06: Data Entry/Microcomputer Applications
  - 15.03: Electrical Engineering Technologies/Technicians
  - 23.04: English Composition
  - 43.01 Criminal Justice and Corrections
- For this clustering, we focused, system-wide, on those students that passed at least four college-level courses

A Thirty-Cluster System-Wide Result

- 12 Liberal Arts Clusters, including one Math and Science and one Music
- Design/Fine Arts
- Medical Administration
- Auto Repair
- Nursing
- Computers
- Business Assisting
- Parenting Education
- Real Estate
- Business Management
- Culinary Arts
- Early Childhood Education
- Accounting
- Engineering Technology with Computers
- Precision Metalworking
- Cosmetology
- Allied Health
- Industrial Production

Evaluation of Clustering Results

- Clustering does an excellent job of separating out workforce programs and miscellaneous programs, like real estate
- It creates too many liberal arts clusters, but that is due to the large proportion of transfer students in the system
- Our next step: to cluster liberal arts students and other students separately, where liberal arts students are defined as those that took at least 75% liberal arts classes

Coherence Measures

- A transcript is coherent if it consists of courses that are frequently taken together (by other students)
- So far, we have developed two coherence measures:
  - One based on a table of CIP codes that are frequently found together in a transcript, across all transcripts
  - One based on how much each transcript overlaps with other transcripts placed in the same cluster or category (as used in the clustering method)

Use of Coherence Measures

- Coherence measures can be used to:
  - Help predict student outcomes while controlling for other characteristics
    - We have preliminary indications that one of our measures can do this.
  - Detect the variability in coherence, and therefore perhaps structure, across similar programs in different colleges
    - We have detected such variation using the other one of our metrics

Conclusion

- Clustering is a very useful tool in determining what students in a college are studying, and it can pick up more subtle patterns than simpler methods of identifying a concentration
- It is also less labor intensive than an audit that compares each student's transcript with a predefined program of study
- Transcript coherence measures can be useful in determining the extent to which the institution seems to have sets of students that are following structured programs of study.

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CCRC funders include: Alfred P. Sloan Foundation, Lumina Foundation for Education, The Ford Foundation, National Science Foundation (NSF), Bill & Melinda Gates Foundation and Institute of Education Sciences of the U.S. Department of Education