



## **Skills Builders in Michigan Community Colleges**

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## **Skills Builders in Michigan Community Colleges**

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### **SUMMARY OF FINDINGS**

Skills builder students — CTE-focused students who attend community college for a short time, succeed in their courses at a very high rate, but rarely complete a credential or transfer to a four-year institution — are a meaningful segment of the Michigan community college student population. They account for more than one-quarter (27%) of new CTE-focused students in the five community colleges engaged in this study, and about one in fourteen (7%) students in the broader population of new students.

Skills builders in Michigan are disproportionately male and older, with an average age of 35. They are especially likely to be found in the fields of engineering technologies, construction trades, precision production, computer and information sciences, and security and protective services. One in nine (11%) attended a postsecondary institution at some point in time prior to enrolling in a Michigan community college.

Few skill builders complete community college credentials, although about one in seven (15%) eventually transfers to a four-year institution. Just as in California, skills builders in Michigan realize meaningful earnings gains from their investment in college education. They experience declining average earnings prior to enrolling in college, followed by a marked reversal and rising average earnings after enrolling college.

To support further research on skills builders, community college institutional research offices can use the combination of five key behavioral parameters (discussed at the end of this report) to identify skills builders with reasonable accuracy. Colleges can use this information to pinpoint programs that serve skills builders; customize supports for skills builders; review program requirements, particularly short-term certificate programs, to better meet the needs of skills builders and employers; and target resources efficiently across the population of student served by the colleges.

### **BACKGROUND**

#### **Community College Skills Builder Students**

Community colleges play a fundamental role in the economy, providing many avenues for students to prepare, maintain, or advance their education and capacity to engage productively. Among these, community colleges provide transfer pathways to four-year institutions to earn a baccalaureate degree, whether with or without an intermediate postsecondary credential awarded by the community college. Community colleges also provide many postsecondary credential programs intended to prepare students to enter the workforce directly without further education, including both associate degrees and certificates.

In addition to these, research indicates that even very short-term engagement in community college education can provide, under some circumstances, significant economic gains to students (Bahr, 2016). Much of the research on this aspect of community colleges' contributions to the

economy has focused on *skills builder* students (Bahr & Booth, 2012; Booth & Bahr, 2013). Skills builders are CTE-focused students who attend community college for a short time, succeed in their courses at a very high rate but rarely complete a credential or transfer to a four-year institution, and yet they realize significant earnings gains.

Research on skills builders has been very important to advance understanding of the full scope of community colleges' economic contributions. However, to date, this research has focused almost exclusively on California, and research in other states is needed to determine how generalizable are the prior findings.

### **Value to Michigan's Community Colleges**

With support from the Michigan Center for Student Success, Michigan's community colleges have focused on increasing student success, especially the rate at which students earn certificates or degrees, or transfer to complete a degree at a four-year institution. While colleges have consistently improved student outcomes over the last five years, there are still too many students who enroll but never earn a certificate or degree. The identification of skills builders will contribute to a more comprehensive understanding of community college student population in Michigan. With an eye on continuing to increase rates of completion, the results of the study can help community colleges understand the enrollment patterns of non-completing students and identify opportunities to target completion efforts toward the students who have the potential to benefit from them.

### **DATA**

Data for this study were collected from five Michigan community colleges — Alpena Community College, Jackson College, Macomb Community College, Oakland Community College, and Washtenaw Community College, collectively referred to as the partner colleges. The focal sample includes students who were new to Michigan community colleges (i.e., had not previously attended a Michigan community college, whether a partner college or another community college in Michigan), who first enrolled in for-credit coursework in a partner college between Fall 2002 and Summer 2008, and who reported a valid social security number. Importantly, this sample of 166,301 students is not confined to first-time college students. Rather, one-quarter of the students in the sample previously attended an institution of higher education, though not a Michigan community college.

Student course-taking and outcomes in the partner colleges were observed for different lengths of time, depending on when the partner college extracted the data. All students were observed beginning when they first entered a partner college, between Fall 2002 and Summer 2008, as noted above. Students at Oakland Community College ( $n = 63,781$ ) were observed from the term of first entry through the Spring semester of 2011. Students at Jackson College ( $n = 14,013$ ) were observed through the Summer term of 2011. Students at Macomb Community College ( $n = 46,387$ ) and Washtenaw Community College ( $n = 36,875$ ) were observed through the Fall semester of 2011. Students at Alpena Community College ( $n = 5,245$ ) were observed through the Summer term of 2012. Students' quarterly earnings, as reported in the state Unemployment Insurance (UI) database, were observed through the second quarter of 2011.

## METHOD

### Identifying Short-Duration, Highly Successful Students

To identify skills builder students in the five partner community colleges, I drew on the method described by Bahr and Booth (n.d.) in their study of skills builders in California's community colleges. In particular, I used cluster analysis (Bahr, Bielby & House, 2011) to differentiate a group of short-duration highly successful (SDHS) students from other groups of students, focusing on three key variables: total number of credits attempted by a student in the partner community colleges, (2) overall course credit success rate (the ratio of credits completed successfully to credits attempted), and (3) the number of semesters in which a student enrolled in any for-credit coursework in the partner community colleges.

Drawing on these variables, I calculated 15,000 cluster solutions, encompassing 15 different presumptions about the number of meaningful groups of students ( $k$ ) in the larger analytical sample, from  $k = 4$  through  $k = 18$ , and 1,000 different random partitionings ( $p$ ) of the observations in the analytical sample. The result of this effort was the creation of 15,000 additional student-level variables, one for each cluster solution, indicating a potential group (cluster) assignment of each student in the sample.

Based on these assignments, I calculated within-cluster means and within-cluster standard deviations of the three focal variables, creating a dataset containing 165,000 rows and six variables. I then added a seventh variable addressing the number of students identified as belonging to each of the 165,000 groups. Just as in Bahr and Booth's study, a single cluster of SDHS students was readily evident in each of the 15,000 cluster solutions, though the precise characteristics of this cluster varied both within and across values of  $k$ .

Focusing just on the SDHS clusters, I compared the variability of the within-group means (the standard deviation of the group means) and the average within-cluster variability (the mean of the within-group standard deviations) of each the variables at each value of  $k$ . The objective was to select the value of  $k$  that minimized variability in the group of SDHS students across random partitionings of the sample (i.e., a relatively consistent group of SDHS students), while also minimizing variability in the students identified as SDHS (i.e., SDHS students who are relatively homogenous in terms of their behavior). I found that  $k = 8$  and  $k = 13$  tended to minimize variability on both dimensions, relative to other values of  $k$ . Of the two,  $k = 8$  had the lower variability in the size of the SDHS cluster and the smaller number of students who were identified as SDHS in *some* of the 1,000 random partitionings but not *all* of the partitionings. Hence, it was selected as the preferred value of  $k$  for identifying SDHS students.

Students who were identified as SDHS in all 1,000 random partitionings of  $k = 8$  were deemed to be SDHS students for the purposes of this study. In all, 96% of all students either were classified as SDHS students in all 1,000 random partitionings ( $n = 46,467$ ; 28% of the analytical cohort) or were *not* classified as SDHS students in *any* of the 1,000 random partitionings ( $n = 113,284$ ; 68% of the larger analytical cohort). Thus, only 4% of students ( $n = 6,550$ ) were inconsistently classified as SDHS students.

## Identifying Skills Builder Students

I subdivided the 46,467 students who were consistently classified as SDHS into three groups. The first group ( $n = 17,079$ ) was confined to reverse transfer students, defined as students who attended a four-year institution within one year prior to enrolling in a Michigan community college. Bahr and Booth (n.d.) demonstrate that reverse transfer students frequently exhibit a skills builder-like behavioral profile but clearly attend community college for different reasons, as most quickly return to a four-year institution. In this case, 92% of the SDHS reverse transfer students subsequently returned or transferred to a four-year institution after attending a partner community college.

The second group ( $n = 11,253$ ) is the skills builder students, defined as SDHS students who did not reverse transfer and whose course-taking profile included at 50% of credits from CTE fields. The remaining group ( $n = 18,135$ ) includes all other SDHS students. The remainder of this report focuses on the second group — the skills builder segment of the student population.

## ANALYSIS

### Prevalence of Skills Builders

Table 1 describes the prevalence of skills builder students as a percentage of all new community college students (the analytical cohort in this study) and as a percentage of all new career and technical education (CTE) students. As noted, the analytical cohort includes all students who entered one of the five partner community colleges between Fall 2002 and Summer 2008, who had not previously attended a Michigan community college, and who reported a valid social security number. CTE students are the subset of the analytical cohort who attempted at least half of their credits in CTE fields. Here, we see that skills builders about 1 in 14 new students in the partner colleges (7%) but more than 1 in 4 new CTE students (27%).

Table 1: Prevalence of skills builders

Analytical Sample	Size
All students	166,301
Subset of CTE students	41,921
Subset of skills builders	11,253
Skills builders as percentage of all students	7%
Skills builders as percentage of CTE students	27%

Notes: CTE stands for career and technical education. The subset of CTE students are those who took at least 50% of their credits in CTE fields.

## Demographic Profiles of Skills Builders

Table 2 presents information about the age, gender, and race/ethnicity of skills builders as compared with all new students and all new CTE students. On average, skills builders are considerably older at 35 years of age than are new students generally (25 years) or CTE students generally (29 years). However, skills builders are similar to all CTE students in being disproportionately male (61% and 59% male, respectively), as compared with all new students (47% male). Skills builders also are similar to CTE students generally in the distribution of race/ethnicity, being somewhat more likely to be White and somewhat less likely to be Black than are new students generally.

Table 2: Demographic characteristics

	All Students	All CTE Students	Skills Builders
Average Age at CC Entry (years)	25	29	35
Female	53%	41%	39%
White	78%	81%	81%
Black	14%	11%	9%
Hispanic	2%	2%	2%
Asian/Hawaiian/Pacific Islander	5%	5%	6%
American Indian/Alaskan Native	1%	1%	1%
Multiracial/Other	1%	1%	1%

Notes: CC stands for community college. Cases with missing data on a particular measure (age, gender, or race/ethnicity) were excluded from the calculations for that measure.

## Enrollment Behavior of Skills Builders

In Table 3, I provide information about the enrollment behavior of skills builders, as well as all CTE students and all new students. By definition, skills builders enroll in college for a short time and are highly successful in their coursework. Here, we see that Michigan skills builders enroll in an average of 2.1 courses amounting to 6.1 credits (94% in CTE fields) over an average of 1.4 semesters. Their rate of success in those courses is 100%, and they achieve an average GPA of 3.4. About 1 in 9 (11%) had attended college previously, which is a substantially smaller fraction than the larger group of CTE students or the all students generally.

Table 3: Enrollment behavior

	All Students	All CTE Students	Skills Builders
Number of courses attempted	10.2	10.2	2.1
Number of credits attempted	33.3	31.4	6.1
Percentage of attempted credits in CTE fields	29%	80%	94%
Number of semesters enrolled	4.1	4.2	1.4
Proportion of courses completed successfully (passing grade)	73%	79%	100%
Proportion of credits completed successfully (passing grade)	73%	79%	100%
Average GPA	2.3	2.6	3.4
Attended college prior to enrolling in Michigan CC	25%	21%	11%

Notes: CC stands for community college. Cases with missing data on GPA were excluded from the calculation of average GPA. The analytical sample includes students whose first enrollment in a Michigan community college was in one of the five partner colleges. Therefore, the calculation of the percentage of students who attended college prior to enrolling in a Michigan community college concerns postsecondary education in institutions *other than* Michigan community colleges.

### Course-Taking Behavior of Skills Builders

To help illuminate the fields of study in which skills builders are found, Table 4 provides the percentage of all credits attempted in each of the fields defined by the two-digit Classification of Instructional Programs (CIP). The figures in each *column* sum to 100%, indicating that all credits attempted for each segment of the analytical sample are accounted for. The fields are sorted by the percentage of credits attempted by the skills builder segment.

The most noteworthy differences in Table 4 are between skills builders and the broader group of CTE students. In particular, the share all credits attempted in the five fields of engineering technologies, construction trades, precision production, computer and information sciences, and security and protective services is considerably greater among skills builders (46%) than it is among CTE students generally (24%).

A reasonable question to ask, however, is whether the difference in the distribution of credits between skills builders and the broader group of CTE students is due to the fact that the latter simply attempt more credits in non-CTE fields. To investigate this possibility, I examined the distribution of attempted credits in CTE fields *only* (not shown). The results confirmed the initial observation that skills builders disproportionately concentrate their course-taking in these five fields, with 52% of CTE credits attempted by skills builders falling into these fields versus 35% of CTE credits attempted by CTE students generally. In contrast, the broader group of CTE students is comparatively more likely to take coursework in health fields, business, management, and marketing, personal and culinary services, and mechanic and repair technologies (58% of CTE credits attempted by CTE students generally versus 43% of CTE credits attempted by skills builders).

Table 4: Distribution of all credits attempted

	All New Students	All CTE Students	Skills Builders
Business, management, marketing, and related support services.	8%	16%	17%
Computer and information sciences and support services.	5%	10%	13%
Construction trades.	1%	3%	13%
Health professions and related clinical sciences.	6%	15%	12%
Engineering technologies/technicians.	2%	5%	10%
Mechanic and repair technologies/technicians.	2%	6%	6%
Security and protective services.	2%	4%	6%
Precision production.	< 1%	2%	4%
Personal and culinary services.	1%	3%	2%
Parks, recreation, leisure, and fitness studies.	2%	3%	2%
Mathematics and statistics.	13%	6%	2%
English language and literature/letters.	12%	6%	2%
Social sciences.	8%	4%	1%
Family and consumer sciences/human sciences.	< 1%	< 1%	1%
Psychology.	6%	3%	1%
Visual and performing arts.	4%	1%	1%
Biological and biomedical sciences.	6%	3%	1%
Transportation and materials moving.	< 1%	< 1%	< 1%
Communication, journalism, and related programs.	3%	1%	< 1%
Architecture and related services.	< 1%	1%	< 1%
Liberal arts and sciences, general studies and humanities.	2%	1%	< 1%
Public administration and social service professions.	< 1%	< 1%	< 1%
Basic skills.	2%	1%	< 1%
Foreign languages, literatures, and linguistics.	3%	1%	< 1%
History	3%	1%	< 1%
Physical sciences.	4%	1%	< 1%
Legal professions and studies.	< 1%	1%	< 1%
Philosophy and religious studies.	2%	1%	< 1%
Engineering.	< 1%	< 1%	< 1%
Education.	1%	< 1%	< 1%
Library science.	< 1%	< 1%	< 1%
Multi/interdisciplinary studies.	1%	< 1%	< 1%
Natural resources and conservation.	< 1%	< 1%	< 1%
Communications technologies/technicians and support services.	< 1%	< 1%	< 1%
Agriculture, agriculture operations, and related sciences.	0%	0%	0%
Area, ethnic, cultural, and gender studies.	0%	0%	0%
Citizenship activities.	0%	0%	0%
Health-related knowledge and skills.	0%	0%	0%
High school/secondary diplomas and certificates.	0%	0%	0%
Interpersonal and social skills.	0%	0%	0%



Leisure and recreational activities.	0%	0%	0%
Military technologies.	0%	0%	0%
Personal awareness and self-improvement.	0%	0%	0%
Reserve officer training corps (jrotc, rote).	< 1%	< 1%	0%
Residency programs	0%	0%	0%
Science technologies/technicians.	< 1%	< 1%	0%
Technology education/industrial arts.	0%	0%	0%
Theology and religious vocations.	0%	0%	0%
<b>TOTAL</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

NOTES: Fields with non-zero percentage of credits that round to zero are marked "< 1%". Fields that have zero percentage of credits are marked "0%".

### Academic Outcomes of Skills Builders

Table 5 summarizes the academic outcomes of skills builders. Less than one in twenty skills builders (4%) were awarded a postsecondary credential by a partner community college in this study, as compared with more than one in four CTE students (27%) and one in seven new students generally (15%). More skills builders eventually transferred to a four-year institution (15%), but still their rate of transfer is considerably lower than the two broader segments (25% of CTE students and 41% of new students generally).

Table 5: Academic outcomes

	<b>All Students</b>	<b>All CTE Students</b>	<b>Skills Builders</b>
Awarded a postsecondary certificate from partner CC	4%	10%	4%
Awarded an associate's degree from partner CC	11%	17%	< 1%
Awarded any postsecondary credential from partner CC	14%	23%	5%
Transferred to a four-year postsecondary institution	41%	25%	15%
Any completion	49%	42%	19%

Notes: CC stands for community college. Completion includes a postsecondary certificate or associate's degree awarded by a partner community college or transfer to a four-year postsecondary institution.

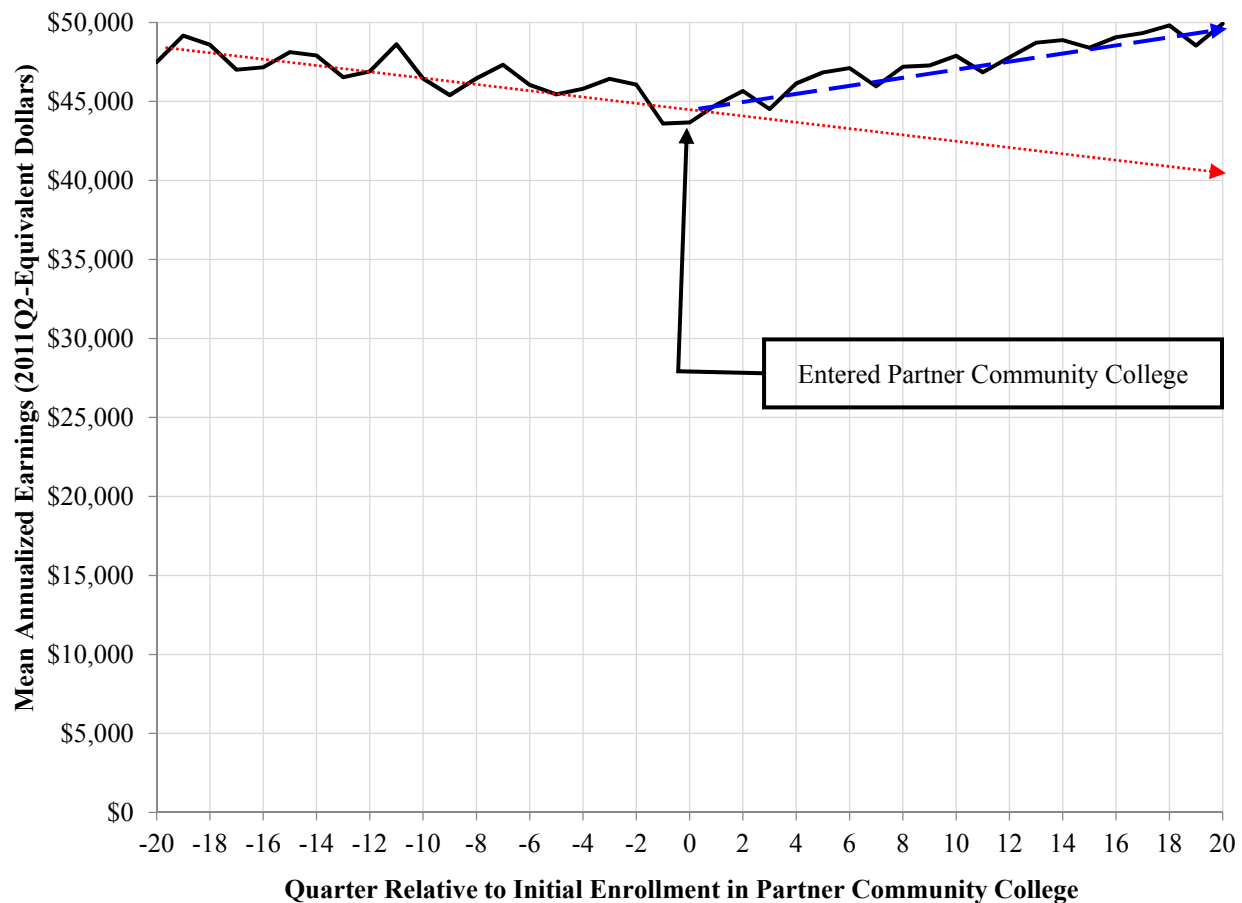
### Earnings of Skills Builders

Figure 1 draws on unemployment insurance (UI) data and illustrates the mean annualized earnings of skills builder students before and after entering a partner community college. The  $x$ -axis in Figure 1 is the quarter relative to a student's first quarter of enrollment in a partner college. The first quarter of enrollment is denoted by 0. Recall that students may have entered a partner college anytime between Fall 2002 and Summer 2008. Hence, values on the  $x$ -axis are not fixed points in time but, rather, points in time relative to each student's first enrollment in a Michigan community college. Negative values (to the left of 0) on the  $x$ -axis indicate time

before a student's first enrollment in a Michigan community college, while positive values (to the right of 0) indicate time after a student's first enrollment.

Earnings are adjusted for inflation to 2011Q2-equivalent dollars. Importantly, as is common in analysis of earnings using UI data, individuals who were missing earnings records in any given quarter were excluded from the calculation of mean earnings in that quarter. Missing records most often indicate zero earnings but also can indicate employment in a sector not covered by the UI system (e.g., self-employment, military employment) or employment in another state. Hence, Figure 1 provides information about employed individuals only, and specifically individuals employed in a UI-covered sector in Michigan.

Figure 1: Mean annualized earnings of employed skills builder students in the period of time before and after first enrolling in a Michigan community college



One will note a marked downward trend in earnings up to and including quarter 0, which is the quarter that the students entered the partner community college. One also will note a clear reversal of this trend beginning in quarter 1, the quarter after students first term of enrollment. The downward trend is highlighted by the red dotted line. Ordinary least squares (OLS) regression analysis indicates that students' earnings were falling at an average rate of \$170 per year (inflation adjusted) in the twenty quarters prior to and including the quarter of college entry. The upward trend is highlighted by the blue dashed line, and OLS regression analysis indicates that

students' earnings climbed at an average rate of \$272 per year (inflation adjusted) in the twenty quarters following college entry.

### **Institutional Research on Skills Builders**

The method used to identify skills builders in this study was very elaborate and time consuming, making it generally not amenable to translation to college institutional research offices. An alternative method would use the range of behaviors evident among skills builders identified in this study to define a set of behavioral parameters. In future studies of the student populations in individual colleges, students whose behavior fits these parameters reasonably could be deemed skills builders for analytical purposes.

A careful examination of these data revealed that the following criteria, applied simultaneously, correctly identify 99.1% of skills builders in the population of students who were new to Michigan community colleges and who enrolled in one of the partner colleges. Further, these criteria correctly exclude 99.9% of students who are not skills builders:

- Number of terms enrolled in community college  $\leq 3$
- Percentage of community college course credits completed successfully = 100%
- Total number of community college credits attempted  $< 27$
- Percentage of attempted community college credits in CTE fields  $\geq 50\%$
- Did not attend a four-year institution in the one year prior to enrolling in community college

An important consideration, however, is the span of time over which these measures are calculated. This study drew on data addressing student behavior over an exceptionally long period of time, but shorter observation periods would be required for colleges to apply the identification criteria provided here. The question that must be answered is how short may the observation period be and still result in reasonably accurate identification of skills builders. For example, measuring attempted credits over just one year following initial enrollment in college and applying the attempted credit criterion ( $< 27$  credits) would result in a larger number of students than would measuring attempted credits over three years and applying the same criterion.

Here, I find that using a three-year window of observation (observing student behavior for three years following initial enrollment) ensures that 99.1% of skills builders are correctly identified, and that the rate of correct exclusion of students who are not skills builders falls from 99.9% to 99.1%. That said, a three-year window of observation increases the number of students identified as skills builders by a meaningful 12.5%. Therefore, though a three-year observation period likely is acceptable, a longer period of observation (e.g., four years, five years) would be preferred.

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