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ABSTRACT

The Virginia Community College System (VCCS) operates 23 colleges on 40 campuses throughout Virginia. VCCS educated 63% of all Virginians enrolled as undergraduates in any public college or university in the Commonwealth in fall 2002. VCCS is the major provider of higher education services in economically struggling regions of the state, and educated 75% of all undergraduate students 25 or older and 55% of all undergraduate ethnic minorities. The traditional rationale for public subsidization of education is that education generates externalities, or spillover effects, including increased economic productivity. This report aims to measure the effect VCCS' educational services have on economic productivity. The paper uses the Black and Lynch (1997) model for determining the empirical relationship between educational attainment and productivity. The study suggests that the present value of a VCCS Associate's degree is $106,487 for males, and $85,512 for females. For those who attend community college to enhance skills, the increase in average annual income for a single credit hour at VCCS is calculated at $137 for males and $119 for females. The paper also analyzes VCCS' benefits for economically struggling regions, and state savings in general fund dollars for education. Perkins Core Performance Measures for 2001-02 are appended. (NB)

How Virginia's Community Colleges Contribute to Virginia's Economic Future

January, 2003

A Study Commissioned by the Virginia Community College System

A. FLETCHER MANGUM CONSULTING

Executive Summary

The mission of the Virginia Community College System (VCCS) is to provide higher education and workforce programs that are geographically and financially accessible, and that meet the needs of students, businesses, and communities. In achieving this mission, VCCS has grown to be the largest provider of higher education services in the Commonwealth.

- In fall 2002, VCCS educated 63 percent of all Virginians enrolled as undergraduates in any public college or university in the Commonwealth.

- VCCS also is the largest provider of higher education services to those Virginians most at risk of being left behind as the Commonwealth transitions from the industrial base of the "old economy" to the knowledge base of the "new economy."

For these reasons, VCCS plays a significant role in ensuring Virginia's economic future. Specifically:

- VCCS enhances the productivity of Virginia's workforce. The dollar value of the increased workforce productivity generated by VCCS' 2000-2001 educational services was approximately $395 million per year. The present value of the future stream of benefits generated by that increase is approximately $3.7 billion. A comparison of benefits and costs indicates that the benefit-cost ratio for VCCS' services is 2.2 – the benefits to Virginia's economy are more than twice as great as the costs required to generate those benefits.

- VCCS' students experience significantly increased incomes. The average annual increase in income for VCCS students who graduate with an Associate's degree is $8,190 for males and $7,164 for females. The average annual increase in income associated with a "typical" year at VCCS is $1,518 for males and $1,337 for females.

- VCCS is the largest provider of higher education services to "economically at risk" Virginians. VCCS is the major provider of higher education services in economically struggling regions such as the Southern Piedmont and the Southwest. VCCS educated 75 percent of all Virginians, 25 years of age or older, who sought to upgrade their skills through higher education in fall 2002. VCCS also educated 55 percent of all Virginians of African, Asian, Hispanic, or Native-American decent enrolled as undergraduates in

any public or private non-profit college or university in the Commonwealth in fall 2002.

- VCCS provides an efficient, low-cost alternative for delivering quality educational programs. Compared to public four-year colleges and universities, VCCS saved the Commonwealth $4,732 in tax dollars per FTE student in 2001-2002.

Introduction

The mission of the Virginia Community College System (VCCS) is to provide higher education and workforce programs that are geographically and financially accessible, and that meet the needs of students, businesses, and communities. In achieving this mission, VCCS has grown to be the largest provider of higher education services in the Commonwealth.

- VCCS operates 23 colleges on 40 campuses throughout Virginia. Because of this broad geographical coverage, only a handful of Virginia localities are more than a 30-minute drive from a VCCS college.[1]
- VCCS educated 63 percent of all Virginians enrolled as undergraduates in any public college or university in the Commonwealth in fall 2002 (the most recent year for which data are available). By comparison, in combination Virginia's three largest universities (George Mason University, Virginia Commonwealth University, and Virginia Tech) educated only 16 percent.[2]

Importantly, VCCS is also the largest provider of higher education services to those Virginians most at risk of being left behind as the Commonwealth transitions from the industrial base of the "old economy" to the knowledge base of the "new economy."

- VCCS is the major provider of higher education services in economically struggling regions of the Commonwealth such as the Southern Piedmont and Southwest Virginia.[3]
- VCCS educated 75 percent of all Virginians, 25 years of age or older, enrolled as undergraduates in any public or private non-profit college or university in the Commonwealth in fall 2002.[4]
- VCCS educated 55 percent of all Virginians of African, Asian, Hispanic, or Native-American decent enrolled as undergraduates in any public or private non-profit college or university in the Commonwealth in fall 2002.[5]

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[1] *See*: A. Fletcher Mangum, "System-Wide Needs Assessment for Virginia Education: 2001," Chapter 4 – Access, State Council of Higher Education for Virginia, March 28, 2002, p.90 (http://www.schev.edu/Reportstats/SystemwideNeedsAssessment032802.pdf).
[2] *Source*: State Council of Higher Education for Virginia, unduplicated headcounts for 2001-02 for Virginia public institutions.
[3] *Ibid.*
[4] *Ibid.*
[5] *Ibid.*

To gain a better understanding of the contribution that these services make to Virginia's economic future, the Virginia Community College System commissioned this study of the economic benefits generated by VCCS.

Economic Impact

As with any *economic* enterprise, one contribution the Community Colleges make to Virginia's economy comes through their expenditures on salaries, supplies, equipment, and construction. As with any *educational* enterprise, however, by far the most significant contribution the Community Colleges make to Virginia's economy comes through the human capital they produce – their students. It is that contribution which will be the primary focus of this study.

Increased Productivity

The traditional rational for public subsidization of education is that education generates externalities, or spillover effects, that exceed the private benefits to individuals. As a result, it is in the interest of the community at large to encourage higher levels of educational attainment. Some of these spillover effects take the form of greater civic responsibility, improved health, and reduced crime. From a purely economic perspective though, the largest spillover effect has to do with increased economic productivity.

As individuals increase their human capital through higher levels of educational attainment, not only do they become more productive, they also increase the productivity of the resources around them. A good example of this would be the difference between what can be accomplished by placing a computer in the hands of an experienced user, and what can be accomplished when the computer is placed in the hands of an inexperienced user – same resource, very different result.

Moreover, this difference in results has significant economic implications in the aggregate. Greater productivity translates into increased economic activity and higher incomes. In addition, whereas the old economy favored locations with abundant industrial resources (raw materials, transportation infrastructure, cheap and readily available power), the new economy favors locations with abundant knowledge resources (a skilled workforce and R&D). Put simply, regional

differences in educational attainment have a big effect on regional differences in economic prosperity.[6]

To measure the effect that VCCS' educational services have on economic productivity and, therefore, on Virginia's economy, we must first know the empirical relationship between educational attainment and productivity. Fortunately, a recent and widely cited study by Sandra Black and Lisa Lynch provides that information.[7] Black and Lynch use new data from the National Center on the Educational Quality of the Workforce to estimate the impact of human-capital investments – education – on productivity. What they find is that a 10 percent increase in educational attainment level leads to a 4.9 to 8.5 percent increase in the dollar value of manufacturing output, and a 5.9 to 12.7 percent increase in the dollar value of non-manufacturing output. Using these empirical estimates, along with other data, it is possible to estimate the impact VCCS' educational services have on Virginia's economy.[8]

The first step in this process is to estimate a baseline level of educational attainment for Virginia's workforce. Tables 1A through 1C detail that calculation. Using 2000 Census data, Tables 1A and 1B show the number of years of education embodied in the male and female components of Virginia's workforce. In each of these tables, the second column from the left (A) denotes Virginia population, by educational attainment.[9] The third column from the left (B) denotes labor force participation, by educational attainment.[10] The fifth column from the left is average years of education.[11] By multiplying these three columns, we see, as shown in Table 1C, that in 2000 the human capital "stock" embodied in Virginia's workforce consisted of 47,452,436 years of education.

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[6] For an excellent empirical demonstration of the importance of education as a determinant of regional economic growth *see* R. DeVol, America's High-Tech Economy: Growth, Development, and Risks for Metropolitan Areas," Milken Institute, 1999.

[7] Sandra E. Black and Lisa M. Lynch, "Human-Capital Investments and Productivity," *AEA Papers and Proceedings*, vol.86, no.2, May 1996, pp.263-67.

[8] The method used here to assess the value of the enhanced workforce productivity generated by VCCS' educational services is similar to an one recently employed by the state of Texas to measure the impact of higher education on its economy. *See* "The Impact of the State Higher Education System on the Texas Economy," Texas Comptroller of Public Accounts, December 2000.

[9] *Source*: "Sex by Age by Educational Attainment for the Population 18 and Over," *Census 2000*, Summary File 3, Table PCT25, U.S. Census Bureau.

[10] *Source*: "Sex by Age by Employment Status for the Population 16 Years and Over," *Census 2000*, Summary File 3, Table PCT35, U.S. Census Bureau.

[11] Years of education for the less than 9th grade, 9th to 12th grade, and graduate or professional categories were derived as weighted averages, using national data from the *Current Population Survey*, P20 Series, U.S. Census Bureau, 1998.

Table 1A: Virginia's 2000 Human Capital Stock – Males

	VA population (A)	Labor Force Participation Rate (B)	Active in Labor Force (A x B)	Avg. Years of Education (C)	Total Education Years (A x B x C)
Male:	2,579,825				
18 to 24 years:	349,383				
Less than 9th grade	11,145	66.2%	7,372	5.6	41,286
9th to 12th grade	71,077	66.2%	47,017	10.6	498,385
High school graduate	114,442	66.2%	75,703	12.0	908,441
Some college	114,887	66.2%	75,998	13.0	987,971
Associate degree	8,985	66.2%	5,944	14.0	83,210
Bachelor's degree	26,974	66.2%	17,843	16.0	285,493
Graduate or professional degree	1,873	66.2%	1,239	18.5	22,921
25 to 34 years:	514,891				
Less than 9th grade	20,454	87.2%	17,840	5.3	94,552
9th to 12th grade	56,397	87.2%	49,189	10.3	506,651
High school graduate	140,461	87.2%	122,510	12.0	1,470,121
Some college	111,677	87.2%	97,405	13.0	1,266,261
Associate degree	27,365	87.2%	23,868	14.0	334,149
Bachelor's degree	111,311	87.2%	97,085	16.0	1,553,367
Graduate or professional degree	47,226	87.2%	41,191	18.5	762,025
35 to 44 years:	602,953				
Less than 9th grade	21,909	87.9%	19,262	5.2	100,164
9th to 12th grade	68,340	87.9%	60,085	10.4	624,879
High school graduate	165,795	87.9%	145,767	12.0	1,749,204
Some college	122,907	87.9%	108,060	13.0	1,404,778
Associate degree	36,860	87.9%	32,407	14.0	453,702
Bachelor's degree	110,427	87.9%	97,087	16.0	1,553,399
Graduate or professional degree	76,715	87.9%	67,448	18.7	1,261,274

Table 1A: Virginia's 2000 Human Capital Stock – Males (cont.)

	VA population (A)	Labor Force Participation Rate (B)	Active in Labor Force (A x B)	Avg. Years of Education (C)	Total Education Years (A x B x C)
45 to 64 years:	790,505				
Less than 9th grade	59,157	79.2%	46,852	5.4	253,003
9th to 12th grade	83,872	79.2%	66,427	10.2	677,552
High school graduate	179,312	79.2%	142,015	12.0	1,704,181
Some college	147,970	79.2%	117,192	13.0	1,523,499
Associate degree	41,278	79.2%	32,692	14.0	457,690
Bachelor's degree	136,718	79.2%	108,281	16.0	1,732,490
Graduate or professional degree	142,198	79.2%	112,621	18.8	2,117,271
65 years and over:	322,093				
Less than 9th grade	70,708	20.1%	14,226	6.0	85,359
9th to 12th grade	48,279	20.1%	9,714	10.0	97,137
High school graduate	71,471	20.1%	14,380	12.0	172,560
Some college	45,838	20.1%	9,223	13.0	119,894
Associate degree	6,766	20.1%	1,361	14.0	19,058
Bachelor's degree	40,489	20.1%	8,146	16.0	130,342
Graduate or professional degree	38,542	20.1%	7,755	18.9	146,563
TOTAL					**25,198,832**

Table 1B: Virginia's 2000 Human Capital Stock – Females

	VA population (A)	Labor Force Participation Rate (B)	Active in Labor Force (A x B)	Avg. Years of Education (C)	Total Education Years (A x B x C)
Female:	2,762,866				
18 to 24 years:	326,734				
Less than 9th grade	6,667	63.1%	4,206	6.0	25,233
9th to 12th grade	50,618	63.1%	31,930	10.6	338,456
High school graduate	88,861	63.1%	56,054	12.0	672,642
Some college	129,055	63.1%	81,408	13.0	1,058,303
Associate degree	11,870	63.1%	7,488	14.0	104,826
Bachelor's degree	36,802	63.1%	23,215	16.0	371,435
Graduate or professional degree	2,861	63.1%	1,805	18.1	32,665
25 to 34 years:	513,143				
Less than 9th grade	12,937	76.5%	9,898	5.6	55,429
9th to 12th grade	40,560	76.5%	31,032	10.3	319,634
High school graduate	120,646	76.5%	92,306	12.0	1,107,675
Some college	120,488	76.5%	92,185	13.0	1,198,410
Associate degree	36,379	76.5%	27,834	14.0	389,670
Bachelor's degree	128,745	76.5%	98,503	16.0	1,576,045
Graduate or professional degree	53,388	76.5%	40,847	18.4	751,588
35 to 44 years:	618,262				
Less than 9th grade	14,975	76.1%	11,397	5.4	61,546
9th to 12th grade	51,637	76.1%	39,301	10.3	404,799
High school graduate	158,328	76.1%	120,503	12.0	1,446,041
Some college	147,499	76.1%	112,261	13.0	1,459,399
Associate degree	51,554	76.1%	39,238	14.0	549,328
Bachelor's degree	130,803	76.1%	99,554	16.0	1,592,867
Graduate or professional degree	63,466	76.1%	48,304	18.4	888,793

Table 1B: Virginia's 2000 Human Capital Stock – Females (cont.)

	VA population (A)	Labor Force Participation Rate (B)	Active in Labor Force (A x B)	Avg. Years of Education (C)	Total Education Years (A x B x C)
45 to 64 years:	836,253				
Less than 9th grade	45,919	66.4%	30,504	5.4	164,722
9th to 12th grade	93,554	66.4%	62,148	10.2	633,909
High school graduate	232,631	66.4%	154,537	12.0	1,854,441
Some college	181,675	66.4%	120,687	13.0	1,568,927
Associate degree	51,017	66.4%	33,891	14.0	474,468
Bachelor's degree	135,460	66.4%	89,986	16.0	1,439,777
Graduate or professional degree	95,997	66.4%	63,771	18.4	1,173,383
65 years and over:	468,474				
Less than 9th grade	92,125	10.2%	9,351	6.0	56,104
9th to 12th grade	83,787	10.2%	8,504	10.1	85,894
High school graduate	143,819	10.2%	14,598	12.0	175,172
Some college	73,646	10.2%	7,475	13.0	97,176
Associate degree	11,594	10.2%	1,177	14.0	16,475
Bachelor's degree	41,058	10.2%	4,167	16.0	66,678
Graduate or professional degree	22,445	10.2%	2,278	18.3	41,690
TOTAL					**22,253,604**

Table 1C: Virginia's 2000 Human Capital Stock – Total

	Male	Female	Total
Total Education	**25,198,832**	**22,253,604**	**47,452,436**

The next step in the process is to ascertain the contribution VCCS made to the total educational attainment of Virginia's workforce in 2000 and, using Black and Lynch's empirical estimation, calculate the likely effect that contribution had on the Commonwealth's economy. Table 2 provides these calculations. As shown in Table 2, VCCS enrolled 31,388 male and 46,147 female in-state full-time-equivalent (FTE) students during the 2000-2001 academic year.[12] FTEs are a mathematical construct that identifies the number of full annual course loads, or "person years" of education, VCCS delivered in 2000-2001. In row three these numbers are depicted as a proportion of the total human capital "stock" embodied in Virginia's workforce in 2000 as determined in Table 1. The remainder of Table 3 details the upper bound, lower bound, and mid-point estimates of the value of the enhanced workforce productivity generated by VCCS' 2000-2001 educational services.

The first and fourth rows in each of the upper bound, lower bound, and mid-point estimate sections show the elasticity of response for Virginia's manufacturing and non-manufacturing sectors, as derived from Black and Lynch's empirical estimates of the relationship between education and productivity. The elasticity of response identifies the expected percentage increase in the dollar value of production in Virginia's economy associated with a one percent increase in the educational attainment level of the workforce. For example, the 0.85 elasticity of response measure for manufacturing in the upper bound section indicates that a 1.00 percent increase in aggregate educational attainment is projected to generate a 0.85 percent increase in the dollar value of manufacturing output.

The second and fifth rows in each of these sections detail Virginia's Gross State Product in manufacturing ($32.7 in 2001 dollars) and non-manufacturing ($236.1 billion in 2001 dollars) for 2000.[13] The third and sixth rows detail the dollar value of the increased workforce productivity generated by VCCS' 2000-2001 educational services. These dollar values are simply the product of the in-state FTEs as a proportion of the aggregate educational attainment of the workforce, the elasticity, and the Gross State Product. As these figures demonstrate, the dollar value of the increased workforce productivity generated by VCCS' 2000-2001 educational services is between $254 million and $535 million per year, with a mid-point estimate of $395 million per year (in 2001 dollars).

[12] *Source*: Virginia Community College System, Office of Research.
[13] *Source*: Bureau of Economic Analysis, U.S. Department of Commerce (www.bea.doc.gov/bea/regional/gsp/action.cfm). Adjusted to 2001 dollars based on the Bureau of Labor Statistics' most recent estimates of the Consumer Price Index.

Table 2: Economic Benefit – Value of Productivity Increase (2001 dollars)

	Males	Females	Total
VCCS FTE 2000-2001	31,388	46,147	
as % of total educational attainment of workforce	0.066%	0.097%	
Upper bound estimates			
Elasticity – manufacturing	0.85	0.85	
VA GSP 2000 – manufacturing	$32,696,650,407	$32,696,650,407	
Productivity Gain – manufacturing	$18,383,463	$27,027,580	**$45,411,043**
Elasticity – non-manufacturing	1.27	1.27	
VA GSP 2000 – non-manufacturing	$236,095,280,488	$236,095,280,488	
Productivity Gain – non-manufacturing	$198,333,539	$291,592,260	**$489,925,799**
Total	**$216,717,002**	**$318,619,839**	**$535,336,841**
Lower bound estimates			
Elasticity – manufacturing	0.49	0.49	
VA GSP 2000 – manufacturing	$32,696,650,407	$32,696,650,407	
Productivity Gain – manufacturing	$10,597,526	$15,580,605	**$26,178,130**
Elasticity – non-manufacturing	0.59	0.59	
VA GSP 2000 – non-manufacturing	$236,095,280,488	$236,095,280,488	
Productivity Gain – non-manufacturing	$92,139,203	$135,464,121	**$227,603,324**
Total	**$102,736,729**	**$151,044,725**	**$253,781,454**

Table 2: Economic Benefit – Value of Productivity Increase (2001 dollars) (cont.)

	Males	Females	Total
Mid-point estimates			
Elasticity – manufacturing	0.67	0.67	
VA GSP 2000 – manufacturing	$32,696,650,407	$32,696,650,407	
Productivity Gain – manufacturing	$14,490,494	$21,304,092	**$35,794,586**
Elasticity – non-manufacturing	0.93	0.93	
VA GSP 2000 – non-manufacturing	$236,095,280,488	$236,095,280,488	
Productivity Gain – non-manufacturing	$145,236,371	$213,528,190	**$358,764,561**
Total	**$159,726,866**	**$234,832,282**	**$394,559,148**

It is important to realize that these estimates of the dollar value of increased workforce productivity are not one-time benefits. Rather, they are part of a stream of economic benefits that continue over the entire time that VCCS' students enrolled in 2000-2001 are active in the Virginia workforce. Given that the average age of a male VCCS student in 2000-2001 was 27 and a female student 29,[14] and based on recent analysis of the typical "work-life" of American men and women,[15] we know that on average male VCCS students would be active in the workforce for 32 years and female students 25 years.

In order to determine the cumulative value of the increased productivity that these students contribute to *Virginia's* economy, however, we need to know not only how long students are likely to remain in the workforce, but also how many of them are likely to remain in the Commonwealth. These data are available from the U.S. Census Bureau's 1998 *Current Population Report*, which shows that regionally about three percent of individuals over the age of 25 with some college or an Associate's degree leave the state each year.[16]

[14] *Source*: Virginia Community College System, Office of Research.
[15] *See* James Ciecka, Seth Epstein, and Jerry Goldman, "Work Life Estimates at Millennium's End: Changes Over the Last Eighteen Years," Illinois Labor Market Review, vol.6, no.2, Summer, 2000.
[16] "Geographic Mobility: March 1997 to March 1998," *Current Population Report*, Series P20-520, U.S. Census Bureau, 1998.

Using these data on expected work-life and out-migration, along with the productivity driven annual increases in output calculated in Table 2, we can determine the present value, or value in today's dollars, of the stream of economic benefits generated by VCCS' 2000-2001 educational services.[17] Based on the lower bound, upper bound, and mid-point annual estimates from Table 2, that present value is between $2.4 billion and $5.0 billion, with a mid-point estimate of $3.7 billion (in 2001 dollars).

Having determined the economic benefit derived from the educational services VCCS provides, the next step in the process is to look at the economic cost of those services. Those economic costs take three forms: 1) the state general fund dollars expended to support VCCS' educational and general services, 2) the tuition and fees that students paid for those services, and 3) the opportunity cost of attending college – the income that individuals would have otherwise made if they had not been enrolled as students.

As shown in Table 3, in 2000-2001 VCCS received $306 million in state general fund support to deliver educational and general services.[18] Also during that year, in-state students attending VCCS paid $87 million in total tuition and fees.[19] By far the largest component of total economic costs, however, is the opportunity cost of students attending college – $1.3 billion in forgone income. As detailed in Table 3, this estimate of forgone income is based on the product of the number of male and female students who were enrolled in VCCS during the 2000-2001 academic year,[20] the proportion of those students who were not employed during the school year,[21] their expected labor force participation rate,[22] and their anticipated annual income.[23] Summing all three components of economic cost

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[17] Mathematically, this calculation is:

$$(\Sigma_{1 \text{ to } n}((\alpha)(1-\alpha)^{n-1}(V_{male}))/(1-r)^n) + (\Sigma_{1 \text{ to } n}((\alpha)(1-\alpha)^{n-1}(V_{female}))/(1-r)^n).$$

Where,

n = 32 work-life years for males and 25 work-life years for females,

α = 0.03 probability of out-migration,

V_{male} = the total annual increase in productivity attributable to male students,

V_{female} = the total annual increase in productivity attributable to female students, and

r = 0.06736, the 1991-2000 ten-year average of the 30-year Treasury bond constant maturity rate.

[18] *Source*: Virginia Community College System, Office of Fiscal Services.

[19] *Ibid.*

[20] *Source*: Virginia Community College System, Office of Research.

[21] *Ibid.*

[22] *Source*: "Sex by Age by Employment Status for the Population 16 Years and Over," *Census 2000*, Summary File 3, Table PCT35, U.S. Census Bureau. This figure controls for the fact that, because of unemployment and for other reasons, not all of the students who were not employed during the 2000-2001 academic year would have been employed even if they were not students.

[23] Data on forgone income are taken from Jennifer Cheeseman Day and Eric C. Newburger, "The Big Payoff: Educational Attainment and Synthetic Estimates of Work-Life Earnings," *Table 2: Synthetic Estimates of Work-Life Earnings by Educational Attainment, Sex, Work Experience, and Age, Based on 1997-1999 Work Experience*, U.S. Census Bureau, July 2002, p.11, for *All Workers* (men and women) - *25 to 29 years – High School Graduate*. These figures have been adjusted to reflect the fact that the median

reveals that the total economic costs associated with VCCS' 2000-2001 educational services are $1.7 billion (in 2001 dollars).

Table 3: Economic Cost – E&G Appropriation, Tuition and Fees, and Forgone Income (2001 dollars)

	Males	Females	Total
VCCS E&G General Fund Appropriation (FY 2001)			**$305,803,594**
Tuition and Fees (FY 2001)			**$87,298,323**
Forgone Income	$687,198,969	$579,201,846	**$1,266,400,815**
2000-2001 Unduplicated Headcount	84,673	123,630	
% not working	32%	32%	
Labor Force Participation	0.8660	0.7757	
Forgone Annual Income	$29,288	$18,874	
TOTAL ECONOMIC COST			**$1,659,502,732**

As shown in Table 4, a comparison of the discounted present value of the stream of economic benefits generated by VCCS' 2000-2001 educational services, and the total economic costs associated with those services, reveals that the benefit/cost ratio is 2.2 – the benefits to Virginia's economy are more than twice as great as the costs required to generate those benefits.

Table 4: Benefit/Cost Ratio (2001 dollars)

Present Value of Increased Productivity (mid-point estimate)	Total Economic Costs	Benefit/Cost Ratio
$3.7 billion	**$1.7 billion**	**2.2**

household income in Virginia exceeds the national average according to 2000 Census data ($46,677 in Virginia vs. $41,994 nationally, *see* http://quickfacts.census.gov/qfd/states/51000.html) and inflation adjusted to 2001 dollars based on the Bureau of Labor Statistics' most recent estimates of the Consumer Price Index.

Increased Income

Another way to look at the benefits generated by the educational services VCCS provides is to look at the portion of the economic value created through increased productivity that flows back to students in the form of increased income. Table 5 shows the average annual income of males and females over 25 who graduated from high school, and who have an Associate's degree, as reported by the U.S. Census Bureau.[24] The difference between these two figures, or the apparent additional annual income derived from earning an Associate's degree, is $10,367 for males and $9,069 for females.

There is a substantial body of literature, however, that indicates not all of this difference in annual income is attributable to educational attainment alone. The reason for this has to do with what is called selectivity bias – the tendency for those with greater innate abilities to go on to pursue higher levels of educational attainment. In other words, what you come out of the educational process with is partly attributable to what you had when you went into it. Although estimates differ, one often cited study found that approximately 79 percent of the difference in income between high school graduates and individuals with an undergraduate education is attributable to education alone.[25]

Using the 79 percent figure to adjust the raw income differences shown in Table 5, we find that the adjusted difference in average annual income between those with a high school degree and those with an Associate's degree is $8,190 for males and $7,164 for females. Discounting these income differences over the anticipated 32 year work-life used in the previous section for males, and the 25 year work-life used for females, shows that the present value of the lifetime earnings differential associated with a community college degree is $106,487 for males and $85,512 for females.

It is important to note, however, that an Associate's degree is not the educational goal of the majority of students who attend community college. Instead, the majority of community college students attend classes to enhance specific skills or to prepare for admission to a four-year college or university. As a result, one should also look at the economic benefits associated with incremental educational achievements that are below a full Associate's degree.

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[24] Day and Newburger, p.11. These figures have been adjusted to reflect the fact that the median household income in Virginia exceeds the national average according to 2000 Census data and to adjust for inflation.
[25] Larry L. Leslie and Paul Brinkman, *The Economic Value of Higher Education* (Phoenix: American Council of Education and the Oryx Press), 1993, pp.43-44.

To derive a proxy for these benefits, we also compute the annual income differential associated with a single credit hour of instruction based on the number of credit hours required for an Associate's degree and the adjusted difference in average annual income determined above. According to this calculation, the increase in average annual income associated with a single credit hour of VCCS instruction is $137 for males and $119 for females. Multiplying these figures by the typical annual course loads for males and females in 2000-2001 shows that the average annual increase in income associated with a "typical" year at VCCS is $1,518 for males and $1,337 for females. Discounting these figures according to the work-life estimates used earlier, reveals that the present value of the lifetime earnings differential associated with a "typical" year of VCCS instruction is $19,737 for males and $15,959 for females.

Table 5: Increased Student Income (2001 dollars)

	Males	Females
Average Lifetime Earnings– High School Graduate	$41,244	$28,486
Average Lifetime Earnings– Associate's Degree.	$51,611	$37,555
Difference	$10,367	$9,069
Difference Adjusted for Selectivity Bias	$8,190	$7,164
Present Value of Associate's Degree	**$106,487**	**$85,512**
Adjusted Difference by Credit Hour	$137	$119
Average Annual Course Load	11.1 hours	11.2 hours
Average Annual Increase in Income	$1,518	$1,337
Present Value of Typical Year at VCCS	**$19,737**	**$15,959**

Enhanced Access for Economically at Risk Populations

As discussed in the introduction to this study, VCCS is also the largest provider of higher education services to those Virginians most at risk of being left behind as the Commonwealth transitions from the industrial base of the "old economy" to the knowledge base of the "new economy." Although it is beyond the scope of

this study to *quantify* the economic impact that this aspect of VCCS' mission has on Virginia, it is nonetheless important to *identify* it.

Service to Economically Struggling Regions

Table 6 that follows lists the 30 Virginia localities where VCCS was by far the largest provider of higher education services in fall 2001 – enrolling more than 60 percent of all individuals from each locality who were new public college or university students that year.[26] The majority of these localities are within the Southern Piedmont and Southwest regions of Virginia where local higher education options are few. In addition, these are regions of the Commonwealth that in recent years have seen significant declines in their core industries – textiles, furniture, and tobacco. In 2001, the average unemployment rate in these 30 localities was 5.4 percent.[27] This compares to an average unemployment rate of 3.9 percent across all other Virginia localities. Figure 1 graphically depicts these numbers.

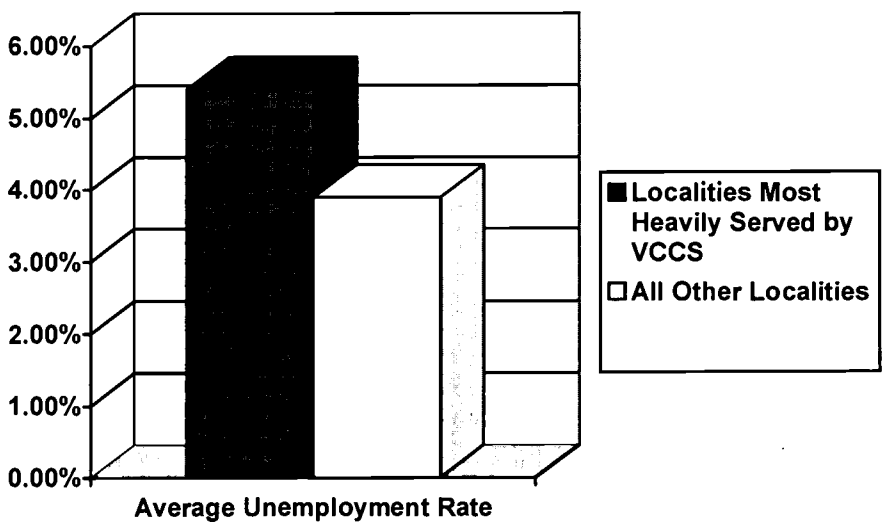

Figure 1: Unemployment in Localities Heavily Dependent on VCCS relative to all other Virginia Localities – 2001

[26] *Source*: "SCHEV Research Report E12 – New Undergraduate Enrollment by Domicile, Fall 2001," State Council of Higher Education for Virginia (http://research.schev.edu/enrollment/E12_Report.asp). Fall 2001 is the most recent year for which these data are available.

[27] *Source*: "Labor Force Data by County, 2001 Annual Averages," Bureau of Labor Statistics, U.S. Department of Commerce (ftp://146.142.4.23/pub/special.requests/la/laucounty.txt).

Table 6: Localities in which VCCS Enrolled over Sixty Percent of all new public College or University Students in Fall 2001

Locality	Unemployment Rate	New Students		
		4 Yr. Publics	VCCS	% VCCS
Lee County	5.5	25	87	77.7%
Russell County	7.3	64	171	72.8%
Craig County	3.3	6	16	72.7%
Washington County	5.9	85	208	71.0%
Alleghany County	3.8	18	40	69.0%
Warren County	2.8	55	119	68.4%
Page County	3.3	26	56	68.3%
Smyth County	8.8	65	136	67.7%
Bland County	5.9	11	23	67.6%
Tazewell County	4.4	96	197	67.2%
Highland County	2.3	4	8	66.7%
Carroll County	10.9	38	75	66.4%
Campbell County	5.0	88	163	64.9%
Henry County	8.6	90	166	64.8%
Pittsylvania County	8.4	90	165	64.7%
Buena Vista City	3.3	8	14	63.6%
Pulaski County	10.1	69	120	63.5%
Frederick County	2.6	134	231	63.3%
Franklin County	4.7	80	136	63.0%
Bristol City	4.0	28	47	62.7%
Roanoke City	3.6	191	320	62.6%
Greensville County	3.6	13	21	61.8%
Halifax County	9.3	85	135	61.4%
Norton City	5.1	12	19	61.3%
Alexandria City	2.8	463	719	60.8%
Rockbridge County	2.7	40	62	60.8%
Bath County	4.6	11	17	60.7%
Patrick County	8.5	41	63	60.6%
Buckingham County	2.6	15	23	60.5%
Buchanan County	7.7	74	112	60.2%

As demonstrated earlier in this study, higher education has a significant effect on economic activity generally. In areas where workers are driven by circumstances to "retool" their skills, or local leaders are desperately seeking to attract new industry, such services are that much more critical however. Although it is difficult to precisely quantify the contribution VCCS makes to the current and future economic health of these 30 localities, it is abundantly clear that, absent VCCS, these localities would be that much more at risk economically.

Service to "Non-Traditional" Students

As Virginia makes the transition from the "old economy" to the "new economy," many workers, not just those in areas that are losing their traditional economic base, will have to upgrade their skills. As opposed to the traditional eighteen year-old first-time student, these "non-traditional" students typically have special needs. They are more often employed full time, married, or have children. As a result, they tend to be place-bound and must attend classes locally. Also, they often need classes that are offered at "non-traditional" times, such as evenings. In addition, they are not usually "degree seeking." Instead, their educational goal is to enhance specific skills by taking a limited number of specific classes.

Given the high correlation between the mission of the community colleges and these special needs – both with respect to geographic access and providing courses that meet local educational and workforce demand – it is not surprising that VCCS is far and away Virginia's largest provider of educational services to "non-traditional" students. In fall 2002, VCCS educated 75 percent of all Virginias 25 years of age or older enrolled in any public or private non-profit college or university in the Commonwealth. Figure 2 below graphically depicts the distribution of "non-traditional" students between community colleges, public four-year colleges and universities, and private non-profit colleges and universities in fall 2002.[28]

[28] *Source*: "SCHEV Research Report E2 – Fall Headcount Enrollments," State Council of Higher Education for Virginia (http://research.schev.edu/enrollment/E2_Report.asp).

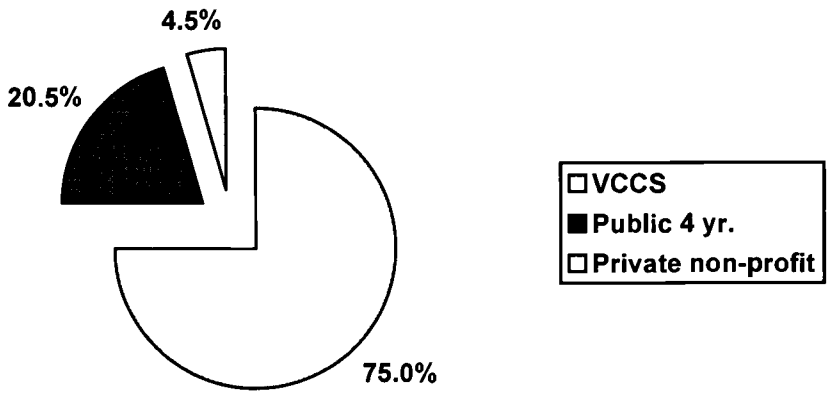

Figure 2: In-State "Non-Traditional" Students Enrolled in any Public or Private non-profit College or University in Virginia – 2002

Here again, although it is difficult to precisely quantify the economic impact of VCCS' role in upgrading the skills of Virginia's labor force to meet the demands of a rapidly evolving economy, it is easy to see that that contribution is critical to Virginia's economic future.

Service to Minorities

Not only is it important to make sure that no region of the Commonwealth is left behind as we move into the new economy, it is also important to make sure that no group of citizens is left behind. In this regard, another significant contribution that VCCS makes to Virginia's economy is that of being the largest provider of higher education services to minorities. In fall 2002, VCCS educated 55 percent of all Virginians of African, Asian, Hispanic, or Native-American decent enrolled as undergraduates in any public or private non-profit college or university in the Commonwealth. Figure 3 below depicts this number, as well as the proportion of in-state minority students enrolled in public four-year and private non-profit colleges and universities in Virginia in fall 2002.[29]

[29] *Ibid.*

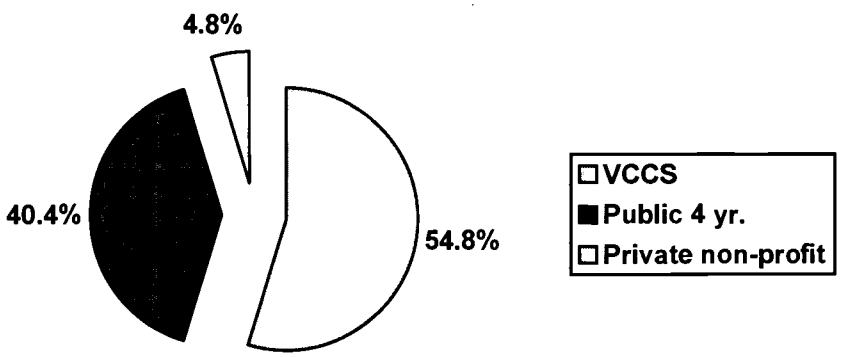

Figure 3: In-State Minority Students Enrolled in any Public or Private non-profit College or University in Virginia – 2002

Systemic Efficiencies

The final economic impact we investigate in this study has to do with VCCS' mission of providing an efficient, low-cost alternative for delivering quality education programs. During the 2001-2002 academic year, VCCS enrolled 83,769 in-state full-time-equivalent (FTE) students. The average cost of educating those students, in state general fund dollars, was $3,568 per FTE.[30] This compares to an average cost to the state of $8,300 per FTE in Virginia's 15 public four-year colleges and universities.[31] The difference between these two state-borne costs – $4,732 per FTE – is depicted graphically in Figure 4.

[30] *Source*: Virginia Community College System, Office of Fiscal Services.
[31] *Ibid.*

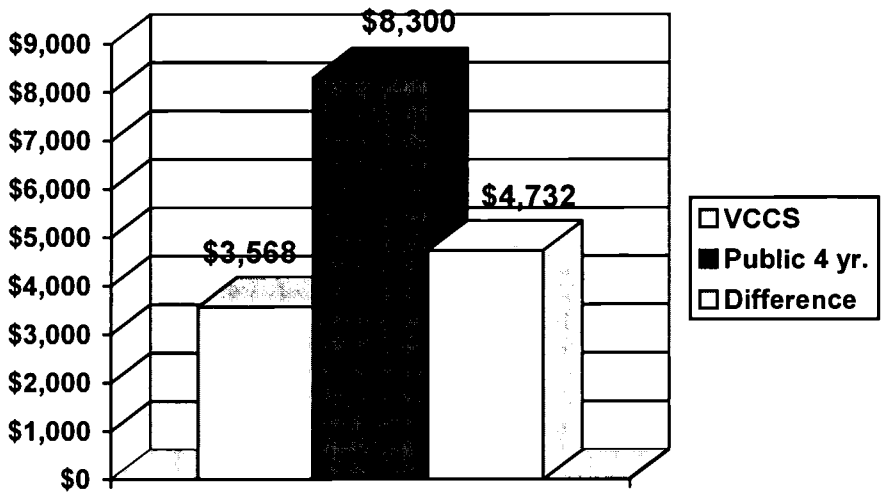

Figure 4: Cost of Education in State General Fund Dollars per FTE – 2001-2002

The most obvious savings attributable to this cost differential have to do with students who follow a "2 plus 2" program – students who spend a portion of their undergraduate careers in a community college before transferring to a four-year institution to complete their baccalaureate degree. According to data provided by VCCS, starting in 1995 there were 3,097 students who had earned 12 or more credits at a community college within four years and then transferred to a Virginia four-year college or university within four years.[32] As shown in Table 7, based on the most recent cost data, this "2 plus 2" approach saved the Commonwealth at least $5.9 million in state general fund support (the additional state funding that would have been required to accommodate those students for 12 credit hours at a public four-year college or university).

[32] *Source*: Virginia Community College System, Office of Research.

Table 7: Savings in State Funding Attributable to VCCS Transfers

Students with at least 12 Credit Hours Who Transfer from VCCS to Virginia 4 yr. Colleges and Universities (A)	Savings in State General Fund Support per FTE (30 credit hours) (B)	Total General Fund Savings (A x B x 12/30)
3,097	$4,732	$5,862,535

Less obvious, but perhaps more important, is the opportunity cost associated with *not* having a Virginia Community College System. Suppose for a moment that the Commonwealth were to maintain its commitment to provide educational services to economically struggling regions of the state, "non-traditional" students seeking to upgrade their skills to meet the demands of the new economy, and minorities, in the *absence* of a Community College System. In all likelihood, that would mean accommodating those students at public four-year colleges and universities. In this scenario, the additional general fund support required to maintain the Commonwealth's commitment in 2001-2002 alone would have been over $396 million in state tax dollars (*see* Table 8 below).

Table 8: Savings in State Funding Attributable to VCCS – 2001-2002

FTE Students Enrolled in VCCS in 2001-2002	Savings in State General Fund Support per FTE	Total General Fund Savings
83,769	$4,732	$396,430,999

Summary

As the largest provider of higher education services in the Commonwealth generally, and by far the largest provider of higher education services to those Virginians most at risk of being left behind as the Commonwealth transitions from the industrial base of the "old economy" to the knowledge base of the "new economy," VCCS makes a significant contribution to Virginia's economic future. This study has assessed four specific areas of that contribution: 1) the dollar value of increased workforce productivity attributable to VCCS' educational services, 2) the portion of that value that flows back to students in the form of increased income, 3) VCCS' service to Virginia's economically at risk populations, and 4)

the tax dollars that VCCS saves the Commonwealth by providing an efficient, low-cost alternative for the delivery of quality education programs.

The findings from that assessment are:

1. The dollar value of the increased workforce productivity generated by VCCS' 2000-2001 educational services was approximately $395 million per year. The present value of the stream of benefits generated by that increase in productivity is approximately $3.7 billion. Comparing this present value benefit to the $1.7 billion in total economic costs associated with it shows that the benefit cost ratio for VCCS' services is 2.2 – the benefits to Virginia's economy are more than twice as great as the costs required to generate those benefits.

2. The average annual increase in income for VCCS students who graduate with an Associate's degree is $8,190 for males and $7,164 for females. For those students who do not obtain an Associate's degree, the average annual increase in income associated with a "typical" year at VCCS is $1,518 for males and $1,337 for females.

3. VCCS is by far the largest provider of higher education services to the Southern Piedmont and Southwest regions of the Commonwealth. These areas are struggling to transition away from a local economy that has traditionally been dependent on textiles, furniture manufacturing, and tobacco – industries that are now declining. VCCS is also the largest provider of higher education services to "non-traditional" students seeking to upgrade their skills to stay current in a rapidly changing economy and to Virginians of African, Asian, Hispanic, and Native-American decent.

4. VCCS provides an efficient, low-cost alternative for delivering quality educational programs. Relative to Virginia's public four-year colleges and universities, this alternative saved the Commonwealth $4,732 in tax dollars per FTE student in 2001-2002.

Perkins Core Performance Measures
Results and Targets
2001-2002

Earl R. McHewitt
Garry Taylor
Academic Services & Research

January 2003

PERKINS III
CORE PERFORMANCE STANDARDS AND MEASURES
VCCS INDICATORS

- For the 2001-02 cycle, the VCCS exceeded performance targets for 4 of the 7 broadly defined measures (not counting the Placement submeasures). Remarkable increases occurred for nontraditional students in nontraditional programs.

- Perkins performance measure definitions for the System were finalized with the Virginia and federal departments of education in Fall 2000(see TABLE 1).

- System level performance measures for the most recent data cycle, 2000-01, are arrayed in TABLE 2.

- Federally approved VCCS or System-level targets for the 2000-01 reporting cycle were established and reviewed through Spring 2001(see TABLE 2). The latest VCCS performance targets, 2001-02 through 2003-04were approved in Fall 2001 and are in Table 2.

- College performance data are for college and Workforce Development Services staff planning and evaluation activities (see Table 3). Only System-level data are compared to System-level targets in the annual report submitted to DOE.

Copies available at: http://www.so.cc.va.us/vccsasr/Research/index.html

TABLE 1

PERKINS III DEFINITIONS
CORE PERFORMANCE STANDARDS AND MEASURES
VCCS INDICATORS

Core Indicator 1: Student Attainment

1P1 Academic Skills

This measure is the percentage of technical majors in certificate, diploma, and degree programs successfully completing an academic skills course. Specifically, for a fall term all registrations for occupational-technical students in math, English, biology, chemistry, geology, physics, and natural science at the 100 level or higher are subset and unduplicated. This forms the denominator. An unduplicated count of students with grades of "C" or above is the numerator.

1P2 Technical Skills

Percentage of technical majors in certificate, diploma, and degree programs successfully completing a technical skills course is the basic measure. Specifically, for a fall term all registrations for occupational-technical students in occupational-technical courses (HEGIS codes greater than 5000) are subset and unduplicated. This forms the denominator. An unduplicated count of students with grades of "C" or above is the numerator.

Core Indicator 2: Completion

2P2 Graduation Rate

A subset of the federal student right-to-know measure is used which is the number of first-time, full-time, occupational-technical freshmen completing a program within 150% of the program length (numerator) as a percentage of the occupational-technical cohort beginning the same fall semester (denominator).

TABLE 1 (cont.)

Core Indicator 3: Placement and Persistence

3P1 Placement, Employment and Further Study
Virginia employment information is obtained for technical graduates within 6-12 months following graduation. Specifically, graduates of an academic year are tracked using UI files to determine their employment status in Virginia in the 4th quarter of that calendar year. For the same graduates, State Council staff determines the number enrolled at a 4-year institution during the corresponding fall semester. The measure is the unduplicated count of those working or studying as a percentage of the total graduates.

3P2 Retention, Employment
Retention is defined as the percentage of those graduates found to be working, as defined in the placement measure,3P1, who continue working for a period of at least one quarter. For example, graduates identified as working in 4th qtr. 1999 would be matched against UI employment information for 1st qtr. 2000. No baseline information has been produced. Not required in 2000-01.

Core Indicator 4: Equity: Program Enrollment and Completion

4P1 Representation, Enrollment
The enrollment measure is the combined minority gender enrollments for each program as a percentage of the total enrollment for all "under-represented" programs. "Under-represented" programs are those related to occupations with gender under-representation (less than 25% minority employment, U.S. Census Household Survey). The minority gender for 4P1 and 4P2 is defined according to national gender splits for the occupations, not the gender with the lowest enrollments or graduates in VCCS programs.

4P2 Representation, Graduates
Similarly for the same "under-represented" programs, the representation measure for graduates is defined as the combined number of minority gender graduates from each of these programs as a percentage of the total graduates for all "under-represented" programs

Table 2

November 2001 Update

VIRGINIA-Postsecondary

Final Agreed Upon Performance Levels for 2000-01 and Years 3, 4 and 5

These are the final baselines and adjusted performance levels agreed upon by the State and the U.S. Department of Education for Years 3, 4, and 5. These baselines and adjusted performance levels are incorporated into the State plan as a condition of approval pursuant to section 113(b)(3)(A)(v) of the Carl D. Perkins Vocational and Technical Education Act of 1998, 20 U.S.C. 2301 et seq., as amended by Public Law 105-332.

Column 1	Column 2	Column 3	Column 4	Column 4A	Column 5	Column 6	Column 7	Column 8
Core Sub-Indicator	Measurement Definition	Measurement Approach DOE Codes	Final Agreed Upon Baseline	Actual Levels 2000-01	Agreed Upon Level 2000-01	Performance Levels for Years 3, 4, & 5 7/1/01-6/30/02	 7/1/02-6/30/03	 7/1/03-6/30/04
1P1 Academic Attainment	**Numerator**: Number of occupational-technical students enrolled in math, English, biology, chemistry, geology, physics, and/or natural sciences at the 100 level or higher who have a "C" or better in the academic course. **Denominator**: Number of occupational-technical students enrolled in math, English, biology, chemistry, geology, physics, and/or natural sciences at the 100 level or higher.	2	69.65%	67.97%	70.08%	70.13%	70.18%	70.23%
1P2 Skill Proficiencies	**Numerator**: Number of occupational-technical students enrolled in occupational-technical courses with HEGIS codes greater than 5000 who have a "C" or better in the occupational-technical course. **Denominator**: Number of occupational-technical students enrolled in occupational-technical courses with HEGIS des greater than 5000.	4	82.55%	81.26%	83.00%	83.05%	83.10%	83.15%
2P1 Completion	**Numerator**: Number who earn an award/degree within 150 percent of the program length. **Denominator**: Number of new	1	17.76%	17.53%	18.00%	18.05%	18.10%	18.15%

	freshmen entering occupational-technical programs as full-time students in a fall semester.							
3P1 Placement	**Numerator**: Number of graduates identified as employed within 6-12 following graduation plus the number of graduates identified as attending a 4-year institution in the term immediately following graduation. **Denominator**: Number of occupational-technical graduates.	**3**	**73.69%**	**70.57%**	**74.69%**	**74.74%**	**74.79%**	**74.84%**
3P2 Retention	**Numerator**: Number of graduates who successfully transitioned into employment, and who have continued employment for a period of at least one quarter. **Denominator**: Number of graduates who successfully transitioned into employment, as defined in 3P1.	**3**	**89.63%**	**88.67%**	**89.63%**	**89.68%**	**89.73%**	**89.78%**
4P1 Participation Non-Trad	**Numerator**: Number of students of the under-represented gender enrolled in non-traditional programs. **Denominator**: Number of students enrolled in non-traditional programs.	**1**	**18.35%**	**20.76%**	**18.85%**	**18.90%**	**18.95%**	**19.00%**
4P2 Completion Non-Trad	**Numerator**: Number of graduates of the under-represented gender who complete non-traditional programs. **Denominator**: Number of graduates who complete non-traditional programs.	**1**	**22.14%**	**28.07%**	**22.50%**	**22.55%**	**22.60%**	**22.65%**

Table 3

College Results
Perkins Performance Indicators: 2001-02 Data Cycle

The measures are based on Fall 2001 enrollments and grades (1P1,1P2, and 4P1), 2000-01 graduates (3P1, 3P2, 4P2), and a fall 1999 (mid-term) entering cohort (2P1). College level data by measure for the Perkins-defined special populations are available, but not presented.

Denominators and numerators are defined in Table 2. All tabled values are percentages.

	1P1	1P2	2P1	3P1	3P2	4P1	4P2
BRCC	78.6	88.8	39.5	84.0	84.1	8.5	27.6
CVCC	74.7	84.6	25.3	82.6	88.2	22.9	33.3
DSLCC	64.0	87.2	33.3	80.0	88.1	13.9	9.5
DCC	68.9	85.4	32.5	74.7	87.3	12.4	7.3
ESCC	69.4	83.6	22.7	68.1	84.8	16.8	21.1
GCC	75.5	85.8	15.8	81.5	90.9	19.4	17.7
JSRCC	66.9	80.2	13.3	84.1	86.6	21.4	18.4
JTCC	74.2	85.7	11.7	84.9	91.5	18.8	33.9
LFCC	75.9	85.6	27.9	77.0	92.2	10.2	30.1
MECC	61.1	80.7	28.2	55.5	85.5	14.8	15.9
NRCC	69.1	83.1	19.7	75.9	92.2	11.8	14.5
NVCC	64.0	77.5	9.8	63.1	92.1	27.8	29.5
PHCC	77.9	85.7	35.3	74.3	93.5	33.9	37.2
PDCCC	61.3	79.1	26.7	75.0	100.0	23.3	40.4
PVCC	72.5	84.1	17.4	89.0	87.2	26.2	32.3
RCC	73.0	79.5	18.4	77.4	92.5	16.7	24.7
SVCC	68.9	81.6	18.4	77.1	91.2	11.0	39.5
SWCC	67.9	77.7	17.0	59.0	87.5	29.5	57.7
TNCC	68.3	81.6	10.9	59.7	91.4	18.6	25.8
TCC	65.3	83.8	11.3	65.0	93.4	20.4	42.7
VHCC	63.7	79.2	25.3	57.0	90.1	17.0	31.3
VWCC	65.0	77.7	15.3	81.2	93.2	27.6	34.6
WCC	76.1	88.6	44.9	77.1	93.6	13.1	11.4
VCCS	67.8	81.5	18.7	71.5	90.6	21.1	30.2
Target	70.13	83.05	18.05	74.74	89.68	18.90	22.55

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