THE RELATIONSHIP BETWEEN INSTITUTIONAL EXPENDITURES AND STUDENT COMPLETION OF MOMENTUM POINTS: A COMMUNITY COLLEGE PERSPECTIVE

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Purpose

O Problem
- O Community colleges serve diverse student populations while budgets continue to shrink.
- O Over 60% of entering community college students are not college ready in math, reading, or writing.

O Purpose
- O Develop a model of institutional effectiveness for community colleges by measuring the impact of institutional expenditures on student milestones and momentum points.

Conceptual Framework

O Astin's (1993) I-E-O Model for assessment

O Persistence and success is complex

O Limited studies on two-year colleges

O Accountability

  O milestones and momentum points

O Longitudinal cohort analysis

O Contextualization

Achievement Points

O Milestone events – "measurable educational achievements that include both conventional terminal completions, such as completing developmental education or adult basic skills requirements."

O Momentum points – "measureable educational attainments, such completing a college-level math course, that are empirically correlated with the completion of a milestone."

Leinbach, D. T. & Jenkins, D. (2008). *Using longitudinal data to increase community college student success: A guide to measuring milestone and momentum point attainment.* CCRC Research Tools No. 2., Community College Research Center, New York: Columbia University, Teachers College.

Research Questions

O Do institutional expenditures influence student attainment of momentum points at Texas community colleges?

O Which institutional expenditures have the most influence on student attainment of momentum points at Texas community colleges?

Methodology

O Population – large multi-college community college district in Texas.

O Fall 2006, Fall 2007 and Fall 2008 entering student cohorts (first-time-in-college) tracked for three years.

O Input Variables

   O Students

Student Cohort Demographics

	Cohorts					
	Fall 2006 (N = 10,072)		Fall 2007 (N = 10,155)		Fall 2008 (N = 10,336)	
Categorical	n	%	N	%	n	%
Gender						
Female	5,225	51.88	5,342	52.60	5,446	52.69
Male	4,847	48.12	4,813	47.40	4,891	47.32
Enrollment Status						
Full Time	4,540	45.08	4,594	45.24	4,812	46.55
Part Time	5,532	54.92	5,561	54.76	5,525	53.45
Race/Ethnicity						
White	3,295	32.71	2,994	29.48	2,657	25.70
Black	2,274	22.58	2,359	23.23	2,344	22.68
Hispanic	3,092	30.70	3,303	32.53	3,806	36.82
Other	1,411	14.01	1,499	14.76	1,530	14.8
Continuous	M	SD	M	SD	M	SD
Age	22.91	9.92	22.77	9.508	22.33	11.893

Note: The source was the host institution's data set.

Methodology

O Institution input variables - for each cohort
  O Size
  O Location
  O Percent remediation
  O Percent minority
  O Percent part time faculty
  O Revenues
  O Total operating expenses/student FTE
  O Percent FTIC receiving any form of financial aid
O Averaged over three years for each cohort

Methodology

O Predictor Variables - Institutional Expenditures

   O Averaged over the three years of tracking for each cohort.

      O Divide expenditure categories by total operating expenditures X 100

      O Sum of percentages / 3

Profile of Institutions by Cohort Years

	Cohorts					
	Fall 2006		Fall 2007		Fall 2008	
	M	SD	M	SD	M	SD
Contextual						
% Entering Students Needing Remediation	63	0.06	59	0.06	57	0.06
% Minority Enrollment	58	0.09	61	0.09	63	0.08
% PT Faculty	79	0.03	78	0.03	77	0.03
Total Revenues	50M	12M	56M	14M	62M	15M
Total Expenditures per FTE	7,712	1,499	8,126	1,581	8,432	1,578
% FTIC Receiving any form of Financial Aid	41	0.10	44	0.09	49	0.10
Predictors						
% Instruction	50	.04	51	.04	50	.05
% Public Service	3	.04	3	.04	3	.04
% Academic Support	7	.02	7	.02	6	.01
% Student Services	11	.01	11	.02	11	.01
% Institutional Support	14	.01	14	.02	14	.02
% Operations & Maintenance	11	.01	13	.01	13	.01
% Scholarships & Fellowships	9	.02	11	.02	14	.03
% Auxilliary Enterprises	3	.00	3	.00	3	.00

Note: Data adapted from THECB (2011) and IPEDS (2011).

Methodology

O Student Success Variables
   O Tracked within each institution
   O No cumulative variable

Cohort Comparison of Successful Completion of Milestones and Momentum Points

	Cohort					
	2006FA		2007FA		2008FA	
Milestones	n	%	n	%	n	%
Reading Readiness	1,338	13.28	1,679	16.53	1,738	16.81
Writing Readiness	1,022	10.15	1,162	11.44	1,282	12.40
Math Readiness	1,521	15.10	1538	15.15	1,557	15.06
Momentum Points						
Completed Gateway English	3,732	37.05	3765	37.08	4,137	40.02
Completed Gateway Math	1,677	16.65	1665	16.40	1,852	17.92
Completed 15 Credits	4,094	40.65	4,193	41.29	4,468	43.22
Completed 30 Credits	2,449	24.31	2,593	25.53	2,749	26.59
Enrolled Second Fall	4,509	44.77	4,523	44.54	5,014	48.51

Note: The source was the host institution's data set.

Conceptual Model

Inputs		Environment		Outputs
Students		***Institutional Expenditures***		***Milestones***
Gender		Academic Support		Math Readiness
Ethnicity		Auxiliary Enterprises		Reading Readiness
Enrollment Status		Institutional Support		Writing Readiness
During First		Instruction		***Momentum Points***
Semester		Operation Maintenance		Completion of Gateway
Age		Public Service		Math Course
		Scholarships and		Completion of Gateway
Institutions		Fellowships		English Course
Size		Student Services		Completion of 15
% Remediation				college-level credits
% PT Faculty				Completion of 30
Location				college-level credits
Revenues				Re-enrollment in
Total Operating				second fall semester
Expenses				
% FTIC receiving				
any form of				
Financial Aid				

Astin's I-E-O Model

Academic Support
Institutional Support
Operation Maintenance
Scholarships and Fellowships

Auxiliary Enterprises
Instruction
Public Service
Student Services

Gender	Size
Ethnicity	%Remediation
FT/PT	% PT Faculty
Age	Location

Total Operating Expenses
% FTIC receiving any form of Financial Aid

Math Readiness
Reading Readiness
Writing Readiness
Completion of Gateway Math
Completion of Gateway English
Completion of 15 college level credits
Completion of 30 college level credits
Re-enrollment in second fall semester

Methodology

O Logistic regression

  O Block method

    O Student variables

    O Institutional categorical variables

    O Institutional continuous variables

    O Institutional expenditures

O Procedure repeated for each milestone and momentum point.

Categorical Variable Descriptions

Variable	Description
Gender	Dummy variable (female = 0; male = 1)
Race/Ethnicity	Ethnicity includes African American/Black, Caucasian/White, Hispanic, and Other (includes American Indian/Alaskan Native, Asian/Pacific Islander, Foreign, and Unknown). Variable is coded using White (non-Hispanic) as the base group (White = 0; Black = 1; Hispanic = 2; Other = 3)
Enrollment Status	Dummy variable (part time = 0; full time = 1)
Location	Location includes suburban large, rural fringe, large city, and midsize city. Variable is coded using suburban large as the base group (suburban large = 0; rural fringe = 1; large city = 2; midsize city = 3)
Size	Dummy variable (medium 2 year = 0; large 2 year = 1)

Dependent Variable Descriptions

Variable	Description
Reading Readiness	0 = no; 1 = yes
Writing Readiness	0 = no; 1 = yes
Math Readiness	0 = no; 1 = yes
Completed Gateway English	0 = no; 1 = yes
Completed Gateway Math	0 = no; 1 = yes
Completed 15 credits	0 = no; 1 = yes
Completed 30 credits	0 = no; 1 = yes
Retained to 2nd Fall Semester	0 = no; 1 = yes

Methodology

O Test for multicollinearity

O Variables removed if Pearson r greater than .700 or less than -.700

O Institutional variables remaining in analysis

    O Location and Size

    O Revenues

    O % Instruction, % Academic Support, % Student Services, % Operations & Maintenance, % Scholarships & Fellowships, and % Auxiliary Enterprises

Sample Size

O Random sample (25%) was drawn from the combined cohorts.

- O Reading Readiness = 3,495
- O Writing Readiness = 3,149
- O Math Readiness = 4,960
- O Successful Completion of Gateway English = 7,634
- O Successful Completion of Gateway Math = 7,634
- O Completion of 15 College-Level Credits = 7,634
- O Completion of 30 College-Level Credits = 7,634
- O Retention to 2nd Fall Semester = 7,634

O p-value of <.01 indicated significance.

Results

O Student characteristics – primary influence

O Institutional characteristics – no influence

O Institutional expenditures

- O % Student Services – gateway English, gateway math, 30 credits and re-enrollment

- O % Instruction and % Operations & Maintenance – re-enrollment

Results

O Institutional expenditures improved the model for

  O Reading Readiness

  O Writing Readiness

  O Completion of Gateway English

  O Completion of 30 credits

  O Re-enrollment

O Did not improve model for Math Readiness, Completion of Gateway Math, Completion of 15 credits; bad model fit (Hosmer and Lemeshow)

Results Research Question 2

O The influence from the financial variables varied with each analysis.

O Student Services exhibited influence on all five of the momentum points.

O Instruction exhibited influence on two milestones and two momentum points.

O Academic Support and Scholarships & Fellowships were the only financial variables not to demonstrate an influence on any milestone or momentum point.

Table 1

Logistic Regression Results for Reading Readiness

Predictor	B	SE	p	Odds Ratio
Constant	-9.137	1.856	<.001	.000
RACE			<.001	
RACE(1)	.031	.117	.789	1.032
RACE(2)	.387	.111	<.001	1.472
RACE(3)	.611	.124	<.001	1.842
SEX(1)	-.246	.076	<.001	.782
AGE	-.035	.005	<.001	.965
TIME(1)	.734	.086	<.001	2.083
LOCALE			.315	
LOCALE(1)	-2.020	2.545	.427	.133
LOCALE(2)	-1.115	1.740	.522	.328
LOCALE(3)	-2.485	2.529	.326	.083
ccsizset(1)	-2.112	1.952	.279	.121
Avg_Total_Rev_3yr	.000	.000	.073	1.000
Pct_Instruction_3YR	17.201	8.530	.044	2.95E+07
Pct_AcadSupport_3YR	11.236	37.637	.765	75787.076
Pct_StudentServ_3YR	31.485	16.444	.056	4.72E+13
Pct_OperationMaint_3YR	-10.655	14.441	.461	.000
Pct_Scholarships_3YR	.511	5.867	.931	1.668
Pct_AuxEnterprise_3YR	-85.655	134.580	.524	.000

Note: p-value <.01 is considered significant for the model (NCES, 2012).

Table 2

Logistic Regression Results for Writing Readiness

Predictors	*B*	*SE*	*p*	Odds Ratio
Constant	-7.517	2.095	<.001	.001
RACE			<.001	
RACE(1)	.245	.128	.057	1.277
RACE(2)	.284	.118	.016	1.328
RACE(3)	.690	.131	<.001	1.994
SEX(1)	-.482	.085	<.001	.618
AGE	-.046	.006	<.001	.955
TIME(1)	.647	.095	<.001	1.910
LOCALE			.504	
LOCALE(1)	-4.198	2.842	.140	.015
LOCALE(2)	-2.688	1.980	.175	.068
LOCALE(3)	-3.754	2.884	.193	.023
ccsizset(1)	-3.159	2.227	.156	.042
Avg_Total_Rev_3yr	.000	.000	.211	1.000
Pct_Instruction_3YR	22.513	9.441	.017	5.99E+09
Pct_AcadSupport_3YR	48.300	42.630	.257	9.47E+20
Pct_StudentServ_3YR	18.209	19.404	.348	8.09E+07
Pct_OperationMaint_3YR	-23.802	16.204	.142	.000
Pct_Scholarships_3YR	6.620	6.461	.306	749.789
Pct_AuxEnterprise_3YR	-172.131	146.397	.240	.000

Note: p-value <.01 is considered significant for the model (NCES, 2012).

Table 3

Logistic Regression Results for Math Readiness

Predictors	B	SE	p	Odds Ratio
Constant	-5.259	1.700	.002	.005
RACE			<.001	
RACE(1)	-.252	.105	.017	.777
RACE(2)	.376	.093	<.001	1.457
RACE(3)	.738	.116	<.001	2.092
SEX(1)	-.428	.071	<.001	.652
AGE	-.041	.005	<.001	.959
TIME(1)	.664	.075	<.001	1.942
LOCALE			.168	
LOCALE(1)	-2.003	2.329	.390	.135
LOCALE(2)	-1.034	1.592	.516	.355
LOCALE(3)	-2.491	2.342	.288	.083
ccsizset(1)	-2.002	1.803	.267	.135
Avg_Total_Rev_3yr	.000	.000	.268	1.000
Pct_Instruction_3YR	12.299	7.926	.121	2.19E+05
Pct_AcadSupport_3YR	15.510	35.000	.658	5.44E+06
Pct_StudentServ_3YR	14.593	15.176	.336	2.18E+06
Pct_OperationMaint_3YR	-12.513	13.346	.348	.000
Pct_Scholarships_3YR	-.974	5.508	.860	.378
Pct_AuxEnterprise_3YR	-49.573	120.743	.681	.000

Note: p-value <.01 is considered significant for the model (NCES, 2012).

Table 4

Logistic Regression Results for Successful Completion of Gateway English

Predictors	B	SE	p	Odds Ratio
Constant	-6.098	1.259	<.001	.002
RACE			<.001	
RACE(1)	-.388	.073	<.001	.679
RACE(2)	-.085	.065	.194	.918
RACE(3)	-.017	.082	.834	.983
SEX(1)	-.478	.051	<.001	.620
AGE	-.047	.004	<.001	.954
TIME(1)	.975	.054	<.001	2.650
LOCALE			.306	
LOCALE(1)	-.886	1.694	.601	.412
LOCALE(2)	-.179	1.165	.878	.836
LOCALE(3)	.159	1.708	.926	1.173
ccsizset(1)	-.444	1.324	.737	.641
Avg_Total_Rev_3yr	.000	.000	.288	1.000
Pct_Instruction_3YR	12.526	5.790	.031	2.75E+05
Pct_AcadSupport_3YR	-10.581	25.540	.679	.000
Pct_StudentServ_3YR	33.815	11.078	.002	4.85E+14
Pct_OperationMaint_3YR	-13.416	9.780	.170	.000
Pct_Scholarships_3YR	1.505	4.018	.708	4.506
Pct_AuxEnterprise_3YR	-64.136	87.098	.462	.000

Note: p-value <.01 is considered significant for the model (NCES, 2012).

Table 5
Logistic Regression Results for Successful Completion of Gateway Math

Predictors	B	SE	p	Odds Ratio
Constant	-4.652	1.550	.003	.010
RACE			<.001	
RACE(1)	-.456	.101	<.001	.634
RACE(2)	.018	.083	.833	1.018
RACE(3)	.957	.095	<.001	2.605
SEX(1)	-.248	.064	<.001	.780
AGE	-.052	.007	<.001	.949
TIME(1)	.942	.070	<.001	2.565
LOCALE			.122	
LOCALE(1)	.928	2.212	.675	2.528
LOCALE(2)	1.356	1.523	.373	3.881
LOCALE(3)	2.354	2.200	.285	10.523
ccsizset(1)	.790	1.715	.645	2.204
Avg_Total_Rev_3yr	.000	.000	.774	1.000
Pct_Instruction_3YR	7.900	7.513	.293	2698.271
Pct_AcadSupport_3YR	-58.291	32.737	.075	.000
Pct_StudentServ_3YR	43.104	13.985	.002	5.24E+18
Pct_OperationMaint_3YR	-8.199	12.933	.526	.000
Pct_Scholarships_3YR	-3.944	5.210	.449	.019
Pct_AuxEnterprise_3YR	-55.326	115.350	.631	.000

Note: p-value <.01 is considered significant for the model (NCES, 2012).

Table 6

Logistic Regression Results for Completion of 15 College-Level Credits

Predictors	B	SE	p	Odds Ratio
Constant	-2.554	1.220	.036	.078
RACE			<.001	
RACE(1)	-.379	.071	<.001	.685
RACE(2)	-.003	.064	.962	.997
RACE(3)	.172	.079	.031	1.187
SEX(1)	-.128	.050	.010	.880
AGE	-.015	.003	<.001	.985
TIME(1)	1.189	.052	<.001	3.284
LOCALE			.101	
LOCALE(1)	-1.232	1.629	.449	.292
LOCALE(2)	-1.109	1.117	.321	.330
LOCALE(3)	-.754	1.642	.646	.470
ccsizset(1)	-.981	1.271	.440	.375
Avg_Total_Rev_3yr	.000	.000	.039	1.000
Pct_Instruction_3YR	5.725	5.586	.305	306.498
Pct_AcadSupport_3YR	2.922	24.615	.906	18.580
Pct_StudentServ_3YR	24.567	10.883	.024	4.67E+10
Pct_OperationMaint_3YR	-14.898	9.372	.112	.000
Pct_Scholarships_3YR	-.478	3.888	.902	.620
Pct_AuxEnterprise_3YR	-73.235	84.110	.384	.000

Note: p-value <.01 is considered significant for the model (NCES, 2012).

Table 7

Logistic Regression Results for Completion of 30 College-Level Credits

Predictors	B	SE	p	Odds Ratio
Constant	-3.643	1.386	.009	.026
RACE			<.001	
RACE(1)	-.405	.083	<.001	.667
RACE(2)	.070	.072	.333	1.072
RACE(3)	.494	.088	<.001	1.639
SEX(1)	-.261	.056	<.001	.770
AGE	-.036	.005	<.001	.965
TIME(1)	1.274	.061	<.001	3.573
LOCALE			.366	
LOCALE(1)	-.898	1.876	.632	.407
LOCALE(2)	-.572	1.290	.658	.565
LOCALE(3)	.042	1.885	.982	1.043
ccsizset(1)	-.527	1.464	.719	.590
Avg_Total_Rev_3yr	.000	.000	.128	1.000
Pct_Instruction_3YR	7.202	6.428	.262	1,342.773
Pct_AcadSupport_3YR	-14.832	28.129	.598	.000
Pct_StudentServ_3YR	34.227	12.277	.005	7.32×10^{14}
Pct_OperationMaint_3YR	-17.011	10.894	.118	.000
Pct_Scholarships_3YR	-1.166	4.463	.794	.311
Pct_AuxEnterprise_3YR	-76.793	96.920	.428	.000

Note: p-value <.01 is considered significant for the model (NCES, 2012).

Table 8
Logistic Regression Results for Re-enrollment in Second Fall Semester

Predictors	B	SE	p	Odds Ratio
Constant	-3.901	1.171	.001	.020
RACE			<.001	
RACE(1)	-.079	.068	.247	.924
RACE(2)	.352	.062	<.001	1.421
RACE(3)	.366	.077	<.001	1.442
SEX(1)	-.166	.048	<.001	.847
AGE	-.013	.003	<.001	.987
TIME(1)	.616	.051	<.001	1.851
LOCALE			.026	
LOCALE(1)	-2.346	1.575	.136	.096
LOCALE(2)	-1.274	1.082	.239	.280
LOCALE(3)	-.765	1.593	.631	.465
ccsizset(1)	-1.426	1.231	.247	.240
Avg_Total_Rev_3yr	.000	.000	.117	1.000
Pct_Instruction_3YR	14.709	5.383	.006	2.44×10^{06}
Pct_AcadSupport_3YR	2.148	23.864	.928	8.570
Pct_StudentServ_3YR	35.006	10.442	.001	1.60×10^{15}
Pct_OperationMaint_3YR	-25.237	9.046	.005	.000
Pct_Scholarships_3YR	5.389	3.735	.149	219.026
Pct_AuxEnterprise_3YR	-172.343	80.897	.033	.000

Note: p-value <.01 is considered significant for the model (NCES, 2012).

Summary of Results for Research Questions

Outcome Variable	Revenues	Instruction	Academic Support	Student Services	Operations & Maintenance	Scholar-ships	Auxiliary
Milestone							
Reading Readiness		X					
Writing Readiness		X					
Math Readiness							
Momentum Point							
Successful Completion of College-level English		X		X			
Successful Completion of College-level Math				X			
Completion of 15 Credit Hours	X			X			
Completion of 30 Credit Hours				X			
Re-enrollment 2nd Fall Semester		X		X	X		X

Summary of Variable Significance on Milestones and Momentum Points

Predictors	Outcomes							
	Milestones			Momentum Points				
	Reading Readiness	Writing Readiness	Math Readiness	Completion of Gateway English	Completion of Gateway Math	Completion of 15 Credits	Completion of 30 Credits	Re-enrollment 2nd Fall Semester
(Race/Ethnicity) White	X	X	X	X	X	X	X	X
(Race/Ethnicity) Black				X	X	X	X	
(Race/Ethnicity) Hispanic	X		X					X
(Race/Ethnicity) Other	X	X	X		X		X	X
(Gender) Male (-)	X	X	X	X	X		X	X
Age (-)	X	X	X	X	X	X	X	X
(Enrollment Status) Full Time	X	X	X	X	X	X	X	X

Summary of Variable Significance on Milestones and Momentum Points

Predictors	Outcomes							
	Milestones			Momentum Points				
	Reading Readiness	Writing Readiness	Math Readiness	Completion of Gateway English	Completion of Gateway Math	Completion of 15 Credits	Completion of 30 Credits	Re-enrollment 2nd Fall Semester
Location								
Size								
Total Revenues								
% Instruction								X
% Academic Support								
% Student Services				X	X		X	X
% Operations & Maintenance								X
% Scholarships & Fellowships								
% Auxiliary Enterprises								

Limitations

O Data was from only seven Texas institutions

  O Not all multicollinearity between the predictor variables could be reduced.

O Expenditures reported within the primary IPEDS expenditure categories may be different at other Texas two-year institutions.

Implications and Significance

O Student characteristics have the greatest influence student success.

   O Full time status has the most influence.

   O Age was a negative influence

   O Gender as Male was a negative influence

   O Influence of race/ethnicity varied

O Institutional characteristics of location and size did not influence student success.

Implications and Significance

O % Student Services was significant for Completion of Gateway English, Completion of Gateway Math, Completion of 30 Credits, and Re-Enrollment in the Second Fall Semester.

O % Instruction and % Operations & Maintenance were significant for Re-Enrollment in the Second Fall Semester.

O Addition of institutional expenditures improved overall model results for Reading Readiness, Writing, Readiness, Completion of Gateway English, Completion of 30 Credit , and Re-Enrollment in the Second Fall Semester.

O Addition of institution expenditures did improve the results for Math Readiness, Completion of Gateway Math, and Completion of 15 Credits.

Conclusions

O Astin's I-E-O model provides an appropriate framework for identifying institutional influences related to student success.

O The ability to track students over time provides a robust method for providing data on student success.

O IPEDS data provides minimally useful institutional-level data to perform analyses using institutional characteristics as predictors of student success.

Conclusions

O A different approach such as program level evaluation may be required to determine institutional effectiveness on Reading Readiness, Writing Readiness, and Math Readiness

O No institutional expenditures demonstrated influence on Completion of 15 Credits. Usefulness as a momentum point questioned.

O Influence of expenditures on momentum points can be used by community colleges during the budgeting process

Conclusions

O Institutions should focus resources and support services to assist and encourage full-time enrollment of students.

Implications for Practice

O Making the college environment more positive toward student success.

O Finding new ways to look at student data to improve student success.

O Identifying activities that support student success allow college administrators to support these activities during lean times

O Benchmarking with internal data

Recommendations for Future Research

O Use of a more robust method of analysis like hierarchical linear modeling or structural equation modeling.

O Use of a larger number of community colleges within a state.

O Use of more refined college expenditures

  O Help focus on promising practices.

  O Provide more contextual information on college spending practices.

O Use of a cumulative variable

  O to explore interactions between momentum points.

  O Impact of completion of multiple momentum points on graduation and transfer.