Comparing Developmental Education and Success across Age Groups in Minnesota

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Introduction: Some Big Questions that I Failed to Answer

How do older students experience postsecondary education differently than students entering fresh from high school?

Does developmental education improve students' prospects for earning a degree, does it hurt, or is it a wash? How much does the answer to that question vary with different student characteristics?

Should we value some measures of student progress/success more than others for different groups of students?

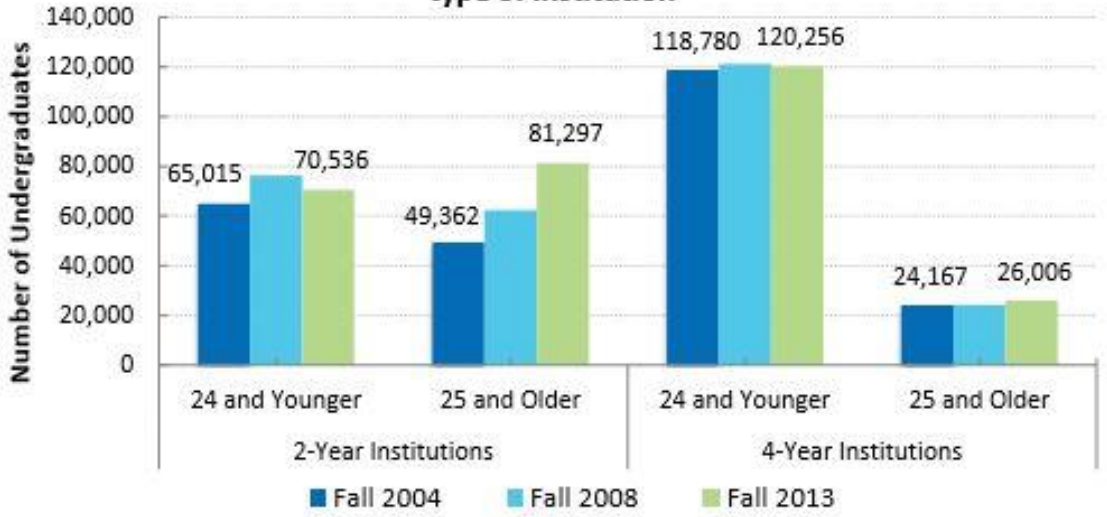
What we knew going in: Post-traditional Students in Higher Ed Nationally

- Students age 25 and older make up around 40 percent of enrolled students (up from below 30 percent in the 1970s).
- Students 25 and older are “nontraditional” by some definitions of the word, but often fit the definition through other factors (financial independence, part-time enrollment, has non-spouse dependents, works full-time, etc.).
- Post-traditional students are more likely to transfer on the path to their credential (“student swirl”).
- Work and family are cited as bigger priorities for older learners and these obligations can represent non-cognitive barriers to completion (“life gets in the way”).

What we knew going in: Post-traditional Students in MN

- Disaggregated descriptives on age of enrolled students - now available on SLEDS!

Figure 1: Undergraduate enrollment in Minnesota by age and type of institution



2-year institutions include state colleges and private career schools. 4-year institutions include state universities, University of Minnesota campuses and private colleges.

Source: Minnesota Office of Higher Education

What we knew going in: DevEd in MN

- *Getting Prepared* report series- A wide variety of disaggregated metrics for recent high school graduates (within two years of graduation). In Minnesota:

- Students of color are disproportionally represented among developmental course-takers.

- Annual costs of developmental education had calculated annual costs ranging between $10 million and $13 million (2007-2014).

- These reports encompass less than half of developmental activity as measured by credits taken (40 percent of the 119,000 credits in fall 2014 were taken by recent high school grads).

What we knew going in: the “impact” of DevEd

- Attempts to quantify effects of DevEd confront selection bias.
- “Considerably nuanced. The courses appear to help or hinder students differently by state, institution, background, and academic preparedness” - Bettinger et al. (2013).
- “Considerable uncertainty” - Martorell and McFarlin (2011) who found “no effect” in Texas. More likely to persist but not to complete in Florida (Calcagno & Long, 2008). Scott-Clayton (2015) describes a “diversionary effect” and makes claims that many remediating students would succeed in college-level courses. **All major peer-reviewed studies have focused on first-time students. None have disaggregated by age or addressed age as a variable.**

Data + Sample

Tracked cohorts for students entering institutions fall terms 2007-2014.

“Entering students” = fall-to-fall continuing students omitted.

The pilot project for OHE’s new SIMON data warehouse. Links three databases: Student Enrollment Records, Awards Conferred, and State Grant Applicant Databases.

Fall term data only for developmental course-taking.

682,682 students across the seven fall terms, 161,534 in the 2007 and 2008 cohorts used for regressions.

Key Definitions

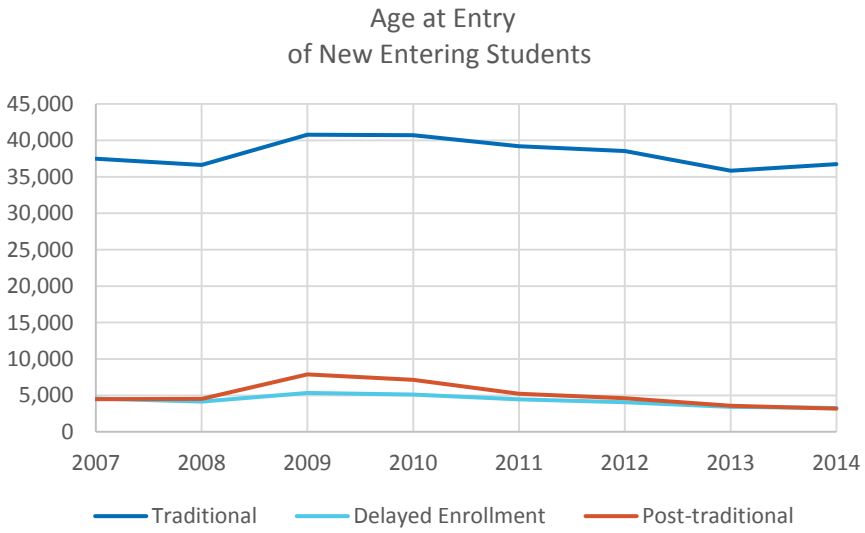
“New Entering” if categorized as such by reporting institution *and* no prior non-PSEO postsecondary enrollment record. I use “transferring” as a larger umbrella than the term typically denotes for ease of discussion. “Returning” would be more accurate but quickly gets muddled.

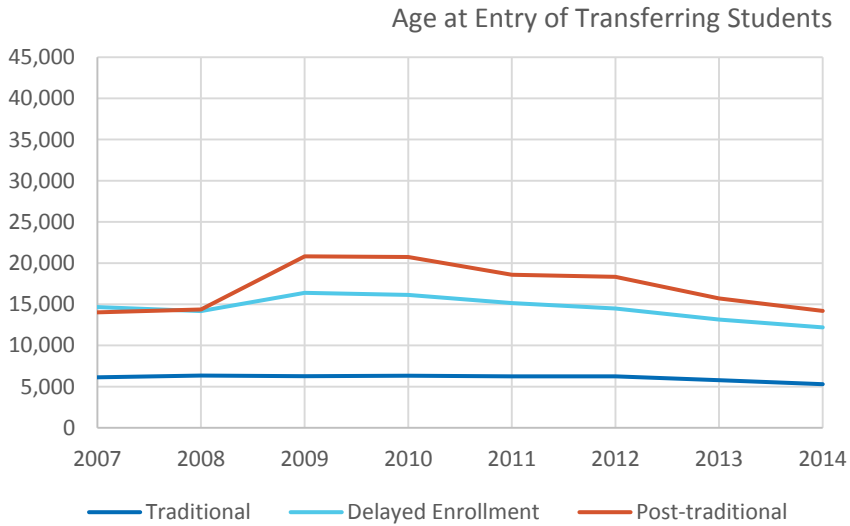
Three age categories, coded at entry:

- “Traditional-age” 17-19
- “Delayed Enrollment” 20-24
- “Post-traditional” 25+

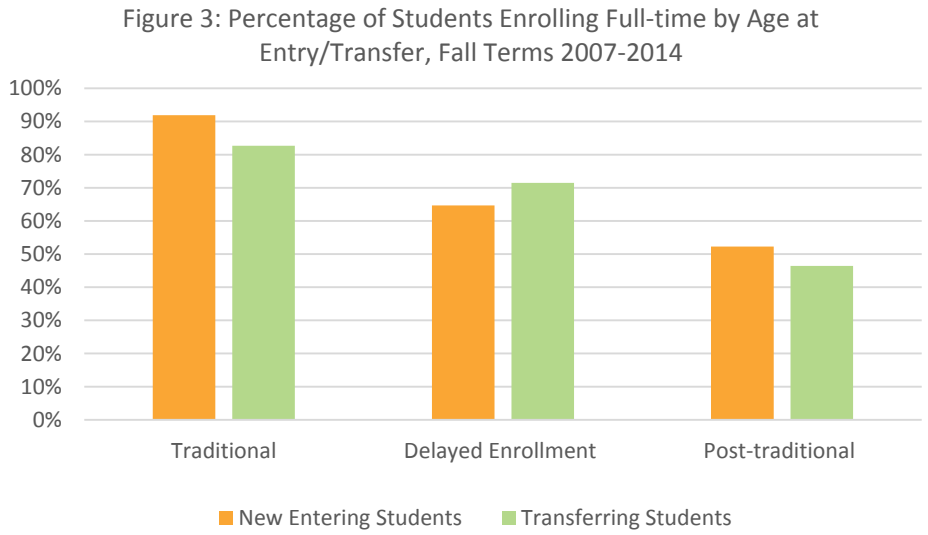
Observed Trends

Enrollment

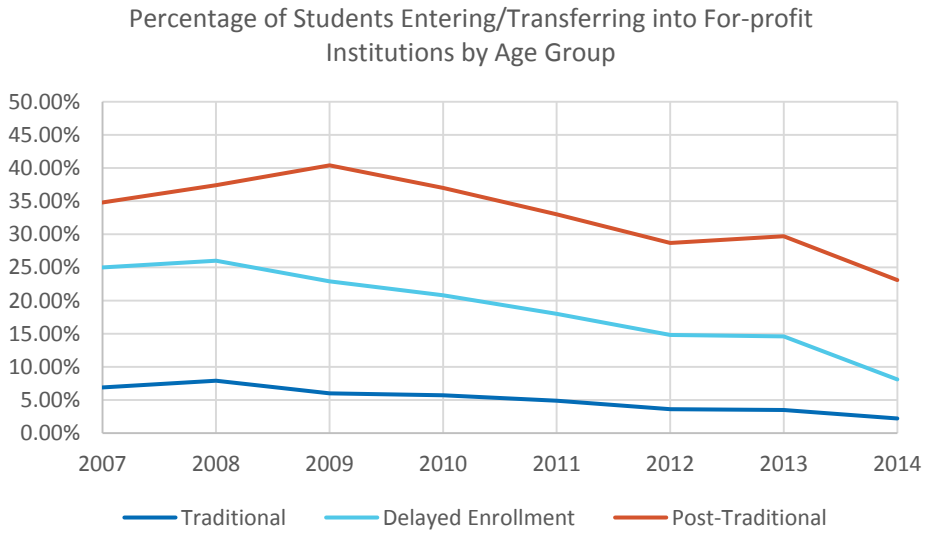

Age at Entry
of New Entering Students
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2007
2008
2009
2010
2011
2012
2013
2014
Traditional
Delayed Enrollment
Post-traditional


Age at Entry of Transferring Students
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2007
2008
2009
2010
2011
2012
2013
2014
Traditional
Delayed Enrollment
Post-traditional

Enrollment (cont'd)



Enrollment (cont'd)



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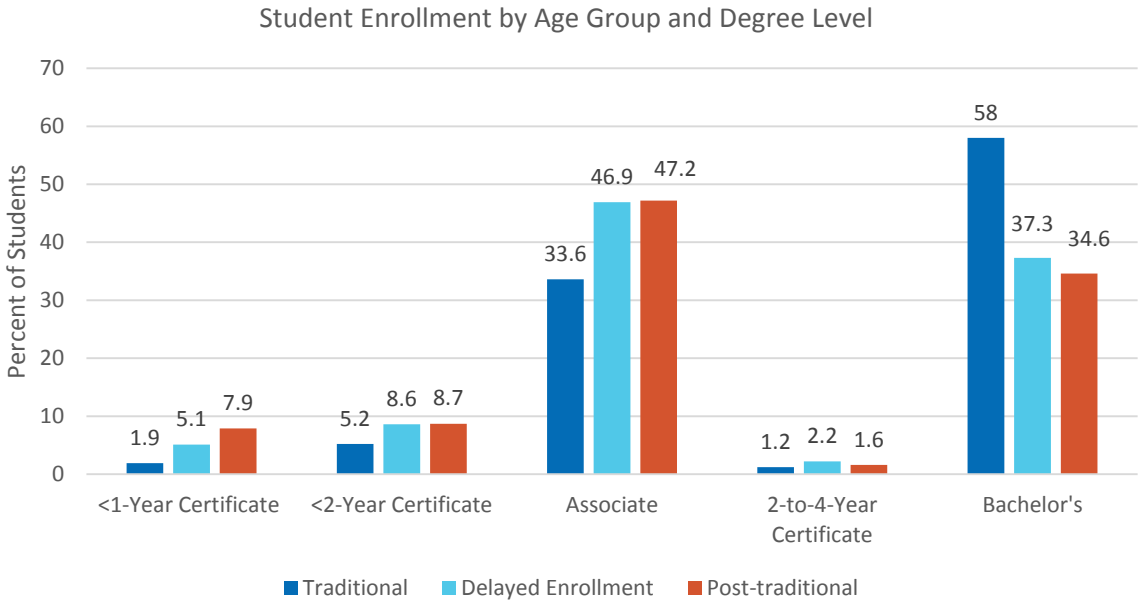
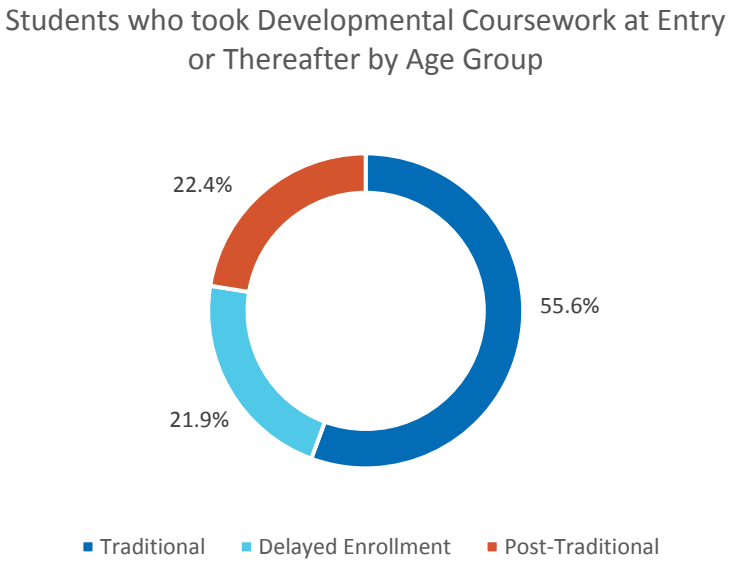
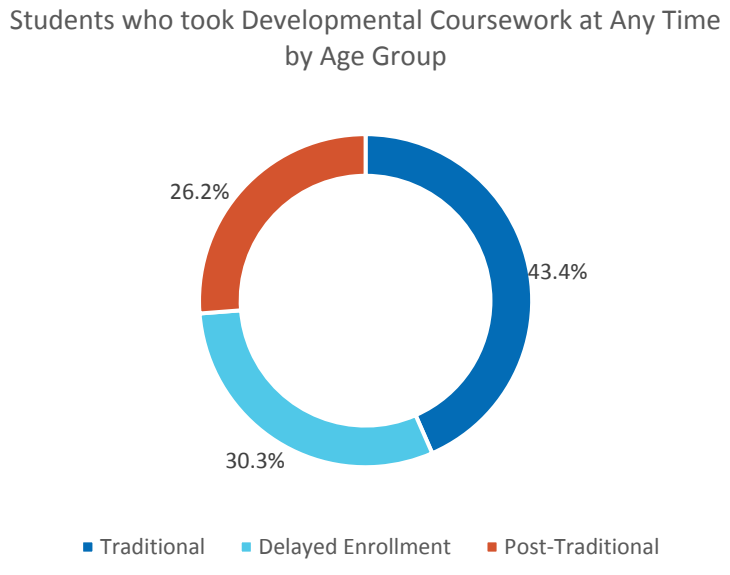
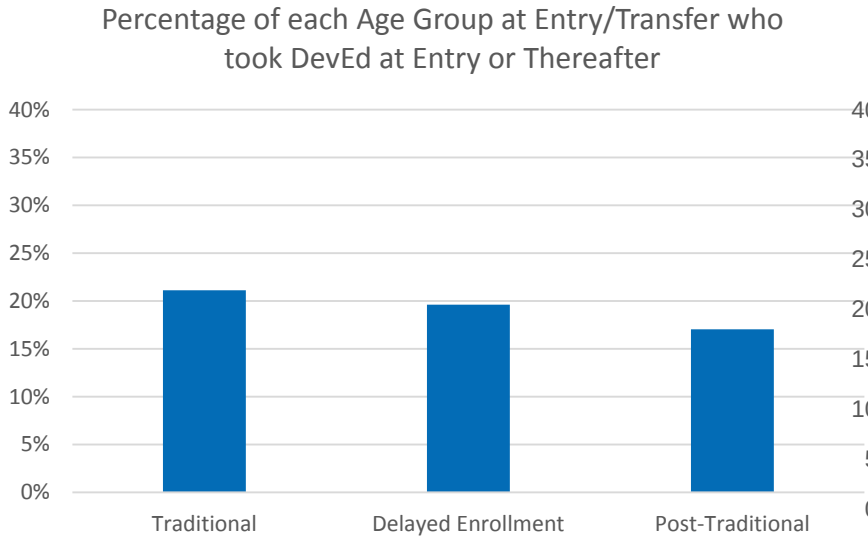


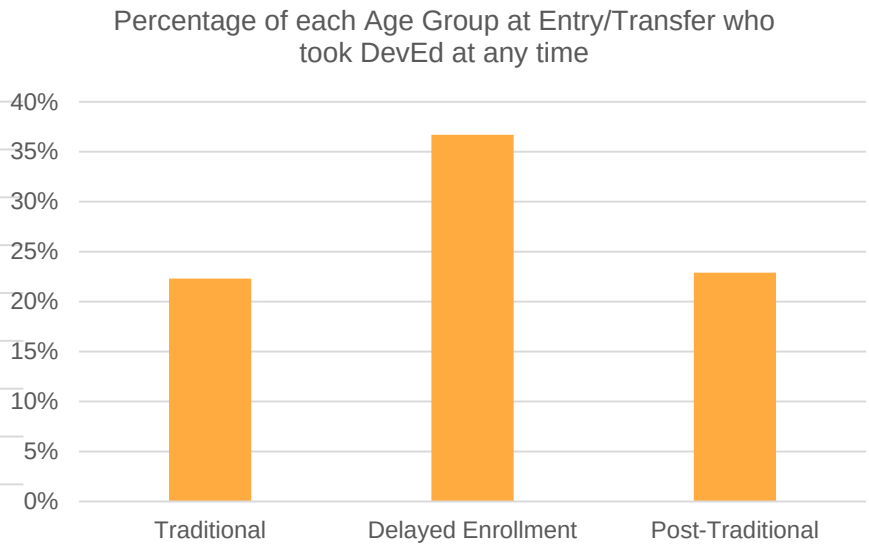
DevEd and Transfer Pathways



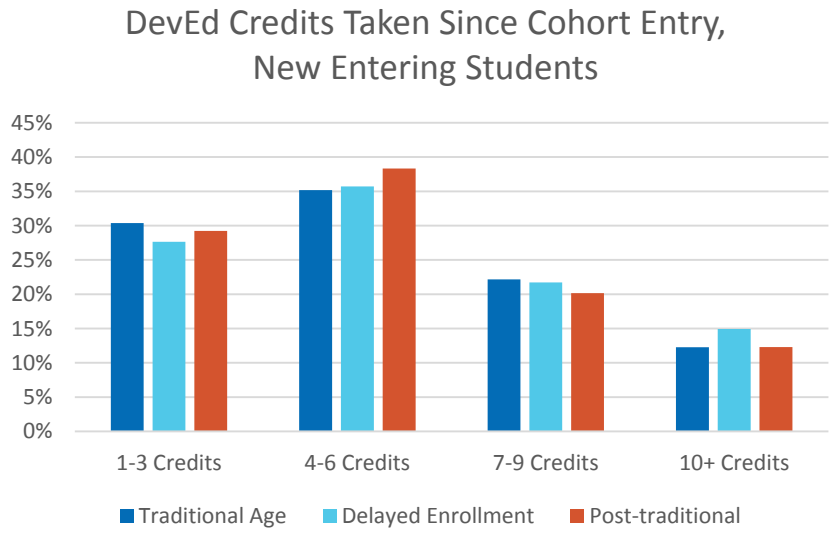


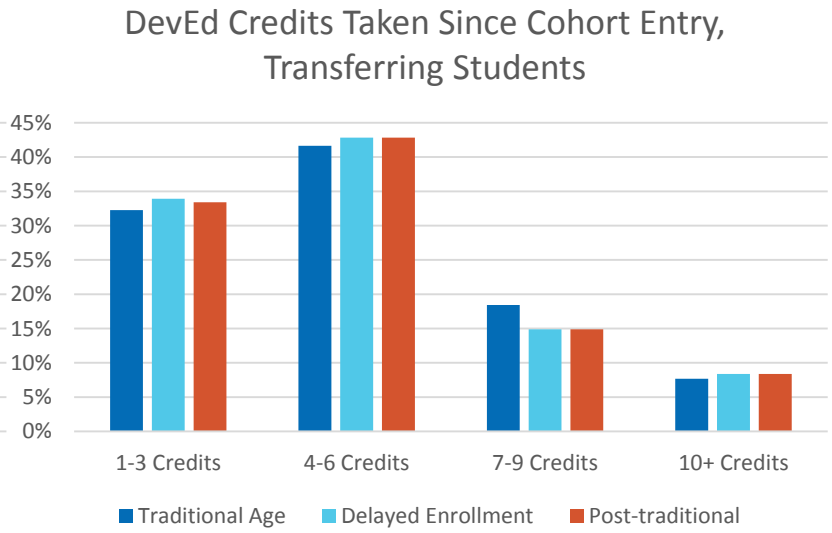
DevEd and Transfer Pathways



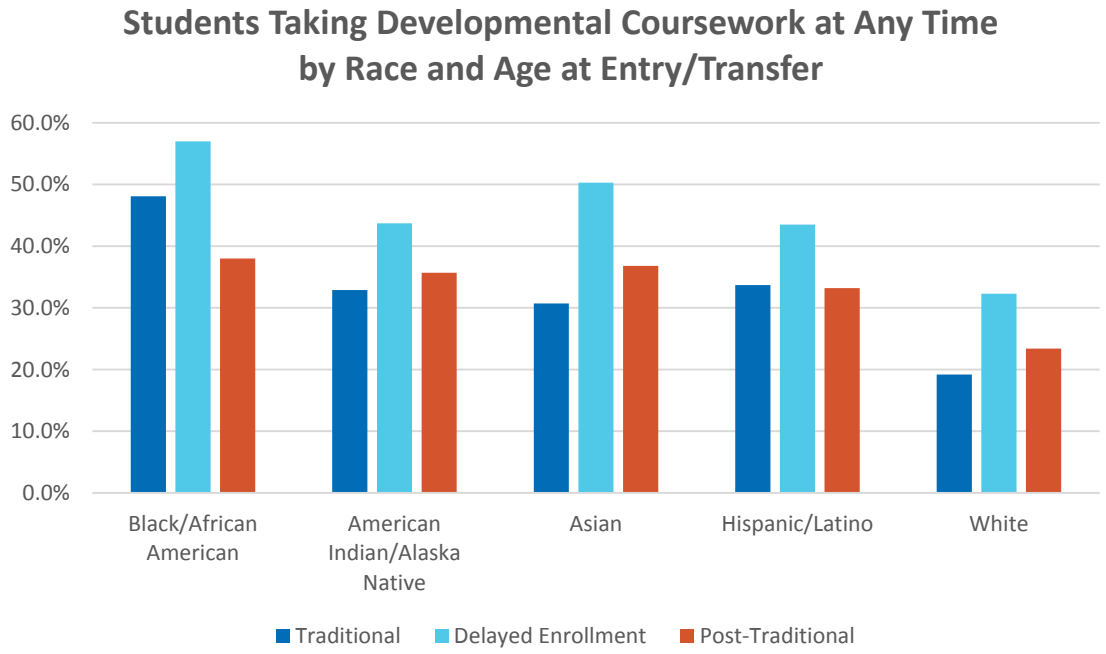


Level of DevEd Participation

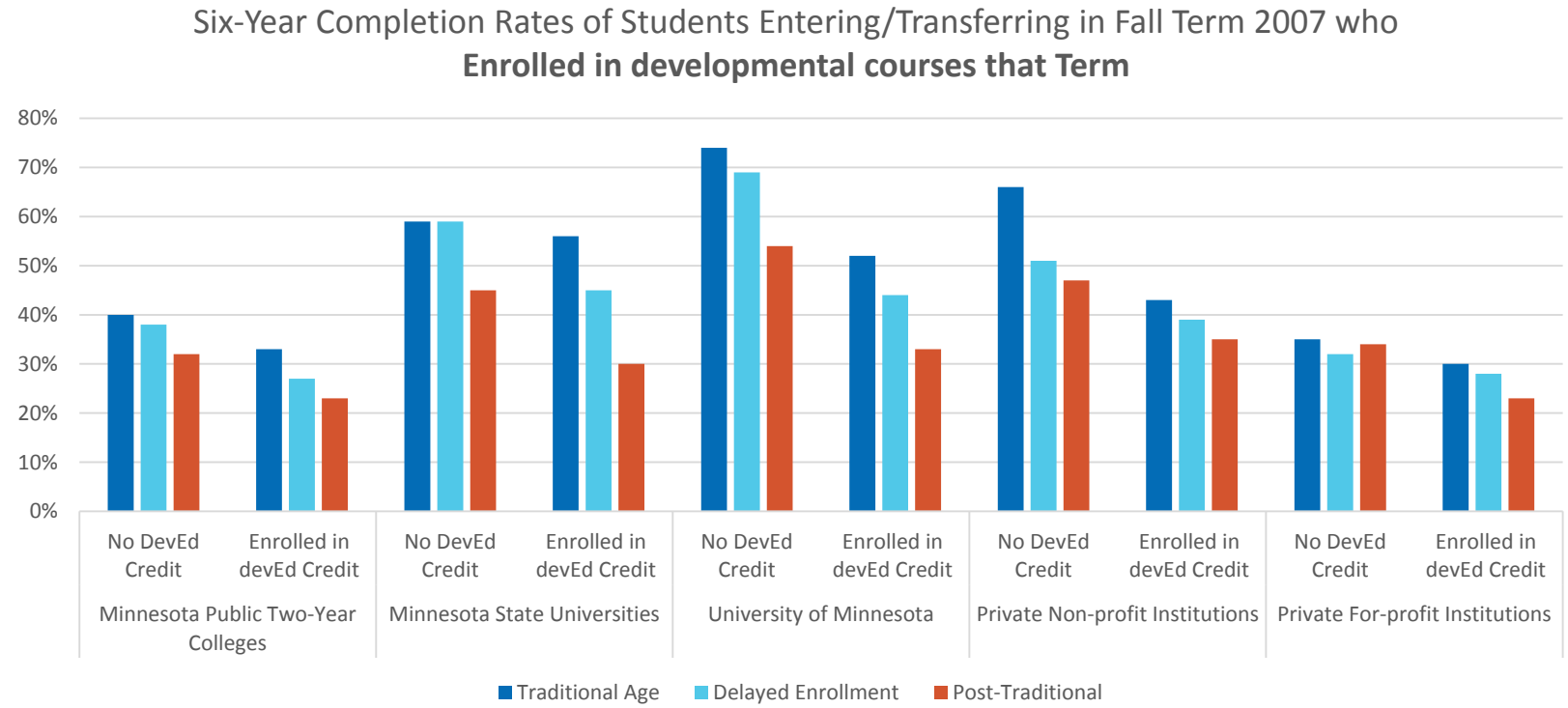




DevEd and Race/Ethnicity



DevEd, Race/Ethnicity, and Program Completion



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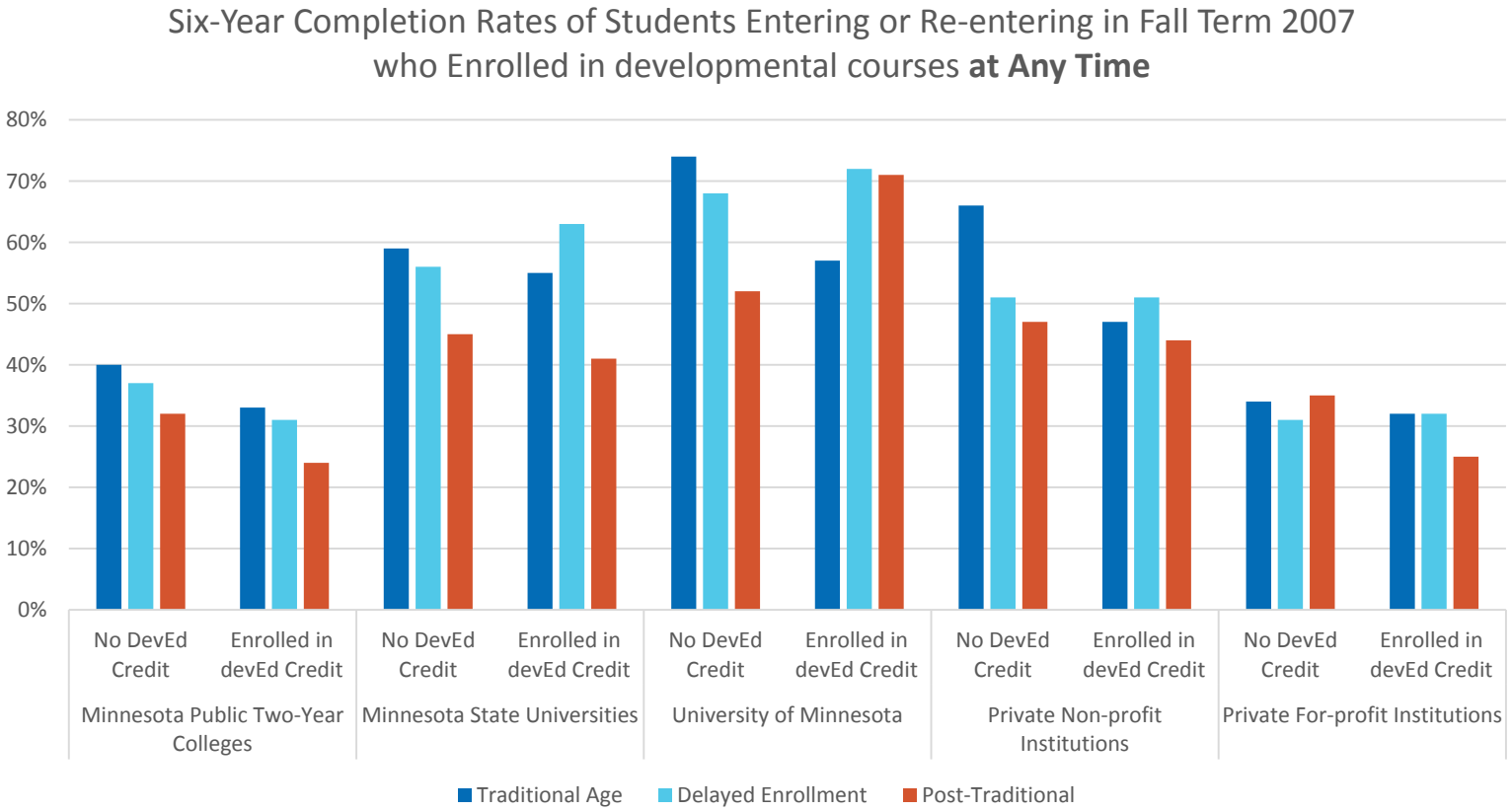
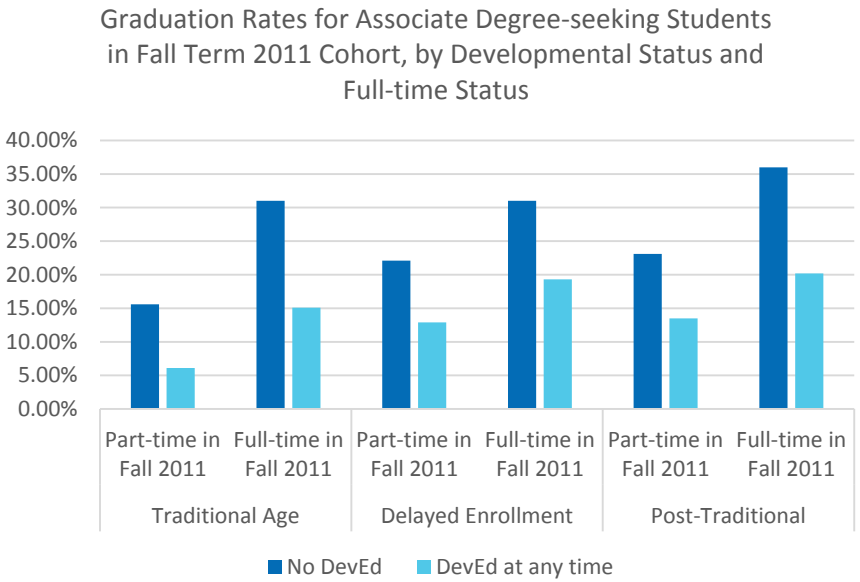


Age, Full-time Status, and Completion



Regressions

Techniques

- Linear probability models with robust standard errors.
- LPM was chosen for ease of use and interpretation and a “common sense” test which suits the exploratory nature of these models.
- Two main sets of regressions, each testing two different measures of DevEd participation, and measuring two different outcomes. This project’s primary demand, from the data pull to this stage, was grappling with permutations.
- Set 1: Interactions of age and DevEd participation, disaggregated by entry status
- Set 2: Effects of different levels of DevEd participation (# of credits taken), disaggregated by age and entry status.

Controls

Enrollment controls: a binary variable for not being full-time at entry; binary variables for institutional sector (base group: public); binary variables for degree level (base group: bachelor's degree); and a fall term year time trend.

Demographic controls: binary variables for gender (base group: male) and race/ethnicity (base group: White).

High School controls: binary variables for students graduating from out-of-state high schools; for students receiving their General Education Development (GED) certificate; for students who did not graduate high school; for students for whom high school graduation data was missing; for homeschooled students; and for students who did not recently graduate (within two years of entry) from a Minnesota high school.

Household controls: binary variable for not being a listed dependent; size of household (or of parent's household if a dependent); adjusted gross income (or that of parents if a dependent); and binary variables for being married and for having children.

Institution dummy controls create a series of binary variables (~140) for the institution a student enrolled into in their cohort year. These variables are not reported individually, in keeping with the parameters of this paper's Data Access Agreement.

Regressions of Age, Developmental Course-taking (any time), and Controls on Likelihood of Graduating: New Entering Students

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	No Controls	Enrollment Controls	Enrollment and Demographic Controls	Enrollment, Demographic, and High School Controls	Enrollment, Demographic, High School, and Household Controls	Enrollment, Demographic, High School, and Household Controls with Inst. Dummies
Enrolled in DevEd Credit	-0.256***	-0.114***	-0.108***	-0.108***	-0.107***	-0.0825***
	(0.00419)	(0.00489)	(0.00492)	(0.00491)	(0.00591)	(0.00627)
Age: Delayed Enrollment	-0.344***	-0.140***	-0.113***	-0.0506***	-0.0513***	-0.0404***
	(0.00628)	(0.00694)	(0.00718)	(0.00774)	(0.0106)	(0.0105)
Enrolled in DevEd Credit x Age: Delayed Enrollment	0.211***	0.0626***	0.0630***	0.0621***	0.0396***	0.0119
	(0.0100)	(0.0103)	(0.0105)	(0.0105)	(0.0132)	(0.0131)
Age: Post-traditional	-0.349***	-0.117***	-0.0914***	-0.0241***	-0.0189	0.00504
	(0.00579)	(0.00680)	(0.00708)	(0.00775)	(0.0134)	(0.0134)
Enrolled in DevEd Credit x Age: Post-traditional	0.222***	0.0713***	0.0728***	0.0792***	0.0815***	0.0383***
	(0.0104)	(0.0107)	(0.0109)	(0.0109)	(0.0138)	(0.0140)
R-Squared	**91,834**	**91,834**	**89,644**	**89,644**	**64,185**	**64,185**
N	**0.094**	**0.153**	**0.163**	**0.167**	**0.165**	**0.216**

Regressions of Age, Developmental Course-taking (any time), and Controls on Likelihood of Graduating: Transferring Students

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	No Controls	Enrollment Controls	Enrollment and Demographic Controls	Enrollment, Demographic, and High School Controls	Enrollment, Demographic, High School, and Household Controls	Enrollment, Demographic, High School, and Household Controls with Inst. Dummies
Enrolled in devEd Credit	-0.134***	-00836***	-0.0756***	-0.0771***	-0.0678***	-0.0633***
	(0.00981)	(0.00973)	(0.00987)	(0.00994)	(0.0119)	(0.0119)
Age: Delayed Enrollment	0.0544***	0.0475***	-0.0392***	-0.0396***	-0.0300***	-0.0316***
	(0.00635)	(0.00618)	(0.00624)	(0.00656)	(0.00816)	(0.00810)
Enrolled in devEd Credit x Age: Delayed Enrollment	0.0778***	0.0648***	0.0620***	0.0615***	0.0528***	0.0518***
	(0.0117)	(0.0114)	(0.0115)	(0.0116)	(0.0139)	(0.0138)
Age: Post-traditional	-0.152***	0.0915***	-0.0766***	-0.0752***	-0.0328***	-0.0300***
	(0.00618)	(0.00635)	(0.00647)	(0.00679)	(0.0106)	(0.0105)
Enrolled in devEd Credit x Age: Post-traditional	0.0746***	0.0485***	0.0515***	0.0526***	0.0268*	0.0164
	(0.0121)	(0.0119)	(0.0121)	(0.0121)	(0.0145)	(0.0144)
R-Squared	**0.015**	**0.065**	**0.075**	**0.075**	**0.077**	**0.111**
N	**69,700**	**69,700**	**66,769**	**66,769**	**45,069**	**45,069**

Regressions of Age, Developmental Course-taking and Controls on Likelihood of Graduating, Final Models

Model	(1) New Entering Students, DevEd at Any Time	(2) New Entering Students, DevEd at in Fall Term of Entry	(3) Transfer Students, DevEd at Any Time	(4) Transfer Students, DevEd in Fall Term of Transfer
VARIABLES				
Enrolled in DevEd Credit	-0.0825***	-0.0825***	-0.0633***	-0.0887***
	(0.00627)	(0.01359)	(0.0119)	(0.0138)
Age: Delayed Enrollment	-0.0404***	-0.0402***	-0.0316***	-0.0231***
	(0.0105)	(0.0105)	(0.00810)	(0.00769)
Enrolled in DevEd Credit x Age: Delayed Enrollment	0.0119	0.0114	0.0518***	0.00437
	(0.0131)	(0.0141)	(0.0138)	(0.0171)
Age: Post-traditional	0.0050	0.0050	-0.0300***	-0.0322***
	(0.0134)	(0.0136)	(0.0105)	(0.0103)
Enrolled in DevEd Credit x Age: Post-traditional	0.0383***	0.0389***	0.0164	0.00928
	(0.0138)	(0.0141)	(0.0144)	(0.0168)
R-Squared	0.216	0.216	0.111	0.113

Regressions of Age, Developmental Course-taking and Controls on Likelihood of Earning A Credential, Final Models

Model	(1) New Entering Students, DevEd at Any Time	(2) New Entering Students, DevEd at in Fall Term of Entry	(3) Transfer Students, DevEd at Any Time	(4) Transfer Students, DevEd in Fall Term of Transfer
VARIABLES				
Enrolled in DevEd Credit	-0.1171***	-0.1175***	-0.1017***	-.01378***
	(0.0295)	(0.0058)	(0.0115)	(0.0131)
Age: Delayed Enrollment	-0.0471***	-0.0468***	-0.0187**	-0.0079
	(0.0103)	(0.0112)	(0.0080)	(0.0076)
Enrolled in DevEd Credit x Age: Delayed Enrollment	0.0093	0.0088	0.0704***	0.0023
	(0.0131)	(0.0132)	(0.0134)	(0.0167)
Age: Post-traditional	0.0296**	0.0296**	-0.0094	-0.0131
	(0.0133)	(0.0145)	(0.0104)	(0.010)
Enrolled in DevEd Credit x Age: Post-traditional	0.0297 **	0.0302**	0.0156	0.0006
	(0.0138)	(0.0151)	(0.0142)	(0.0165)
R-Squared	0.192	0.192	0.098	0.102

Levels of DevEd by Age Group and Entry Status (graduation models)

Credit-based Regressions Predicting Graduation by Age Group and Entry Status (Enrolled in Developmental Courses at Any Time)

VARIABLES	(1) New Entering Traditional-age Students	(2) Transferring Traditional-age Students	(3) New Entering Delayed Enrollment Students	(4) Transferring Delayed Enrollment Students	(5) New Entering Post-traditional Students	(6) Transferring Post-traditional Students
1-3 Developmental credits	-0.0663***	-0.0394**	-0.0571***	-0.0151	-0.00587	-0.0284**
4-6 Developmental credits	-0.0706***	-0.0426**	-0.0730***	0.00731	-0.0519***	-0.0507***
7-9 Developmental credits	-0.114***	-0.106***	-0.0513**	0.00872	-0.0770***	-0.0773***
10+ Developmental credits	-0.130***	-0.143***	-0.0894***	-0.0681***	-0.124***	-0.0939***
R-Squared	**0.196**	**0.134**	**0.100**	**0.124**	**0.091**	**0.092**
N	**53,278**	**8,495**	**5,423**	**19,002**	**5,484**	**17,572**

Comparison of DevEd Measures for Credit-based Regressions Predicting Graduation by Age Group and Entry Status

VARIABLES	(1) Transferring Traditional-age Students (DevEd at any time)	(2) Transferring Traditional-age Students (DevEd at entry)	(3) Transferring Delayed Enrollment Students (DevEd at any time)	(4) Transferring Delayed Enrollment Students (DevEd at entry)	(5) Transferring Post-traditional Students (DevEd at any time)	(6) Transferring Post-traditional Students (DevEd at entry)
1-3 Developmental credits	-0.0394**	-0.0630***	-0.0151	-0.0774***	-0.0284**	-0.0489***
4-6 Developmental credits	-0.0426**	-0.0852***	0.00731	-0.0467***	-0.0507***	-0.0744***
7-9 Developmental credits	-0.106***	-0.173***	0.00872	-0.161***	-0.0773***	-0.115***
10+ Developmental credits	-0.143***	-0.126**	-0.0681***	-0.199***	-0.0939***	-0.147***
Prior DevEd		-0.0231		0.0124		0.0745***
R-Squared	**0.134**	**0.135**	**0.124**	**0.126**	**0.092**	**0.093**
N	**8,495**	**8,495**	**19,002**	**19,002**	**17,572**	**17,572**

Levels of DevEd by Age Group and Entry Status (overall completion models)

Credit-based Regressions Predicting Completion by Age Group and Entry Status (Enrolled in Developmental Courses at Any Time)

VARIABLES	(1) New Entering Traditional-age Students	(2) Transferring Traditional-age Students	(3) New Entering Delayed Enrollment Students	(4) Transferring Delayed Enrollment Students	(5) New Entering Post-traditional Students	(6) Transferring Post-traditional Students
1-3 Developmental credits	-0.0889***	-0.0513***	-0.0961***	-0.0235**	-0.0352	-0.0514***
4-6 Developmental credits	-0.108***	-0.0879***	-0.124***	-0.0227**	-0.129***	-0.107***
7-9 Developmental credits	-0.151***	-0.144***	-0.0836***	-0.0183	-0.118***	-0.128***
10+ Developmental credits	-0.154***	-0.160***	-0.127***	-0.0739***	-0.180***	-0.143***
R-Squared	**0.196**	**0.134**	**0.100**	**0.124**	**0.091**	**0.092**
N	**53,278**	**8,495**	**5,423**	**19,002**	**5,484**	**17,572**

Comparison of DevEd Measures for Credit-based Regressions Predicting Completion by Age Group and Entry Status

VARIABLES	(1) Transferring Traditional-age Students (DevEd at any time)	(2) Transferring Traditional-age Students (DevEd at entry)	(3) Transferring Delayed Enrollment Students (DevEd at any time)	(4) Transferring Delayed Enrollment Students (DevEd at entry)	(5) Transferring Post-traditional Students (DevEd at any time)	(6) Transferring Post-traditional Students (DevEd at entry)
1-3 Developmental credits	-0.0513***	-0.0785***	-0.0235**	-0.124***	-0.0514***	-0.0965***
4-6 Developmental credits	-0.0879***	-0.131***	-0.0227**	-0.101***	-0.107***	-0.176***
7-9 Developmental credits	-0.144***	-0.210***	-0.0183	-0.204***	-0.128***	-0.242***
10+ Developmental credits	-0.160***	-0.137***	-0.0739***	-0.254***	-0.143***	-0.255***
Prior DevEd		-0.0455***		0.00545		-0.00452
R-Squared	**0.137**	**0.139**	**0.104**	**0.110**	**0.087**	**0.092**
N	**8,495**	**8,495**	**19,002**	**19,002**	**17,572**	**17,572**

Controls

Enrollment controls: a binary variable for not being full-time at entry; binary variables for institutional sector (base group: public); binary variables for degree level (base group: bachelor's degree); and a fall term year time trend.

Demographic controls: binary variables for gender (base group: male) and race/ethnicity (base group: White).

High School controls: binary variables for students graduating from out-of-state high schools; for students receiving their General Education Development (GED) certificate; for students who did not graduate high school; for students for whom high school graduation data was missing; for homeschooled students; and for students who did not recently graduate (within two years of entry) from a Minnesota high school.

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Institution dummy controls create a series of binary variables (~140) for the institution a student enrolled into in their cohort year. These variables are not reported individually, in keeping with the parameters of this paper's Data Access Agreement.

DevEd and the "Question of When"

Graduation Rates for Transferring Students Taking Developmental Courses at Different Times

Enrolled in devEd Credit Before 2011	Enrolled in devEd Credit 2011 or Later	Percent Graduating	Number of Students
Associate Degrees, Transferring Fall Term 2011			
No	No	31.6%	10,220
Yes	No	31.4%	1,729
No	Yes	17.0%	4,081
Yes	Yes	21.6%	987
Bachelor's Degrees, Transferring Fall Term 2007			
Enrolled in devEd Credit Before 2007	Enrolled in devEd Credit 2007 or Later	Percent Graduating	Number of Students
No	No	57.8%	11,325
Yes	No	65.3%	1,077
No	Yes	56.3%	435
Yes	Yes	59.0%	244

Some thoughts on quantifying impact: pathways and the role of institutional research

Some parting thoughts

I could not have done any of this without your reporting efforts and the high quality of the data OHE gets from your institutions.

There is so much more to see here, and we now have the tools to start properly digging. I hope everyone here has thought of at least one dimension of these models that could be added or nuanced, and has questions about how this translates to developmental activity in the context of your institution. I also hope OHE's increasing ability to reach across institutions to pin down student pathways becomes valuable to your research questions.

Thank you!