

FEATURES OF SUCCESSFUL CALCULUS PROGRAMS AT FIVE 4- YEAR INSTITUTIONS

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OUTLINE

- Demographics of case studies
- Selection criteria
- Features identified as contributing to success
- In-progress research



Our Five Cases

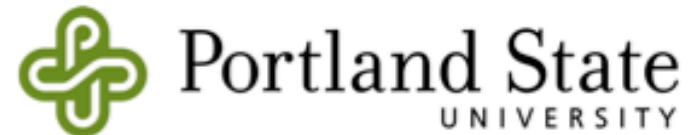
School	Description	Enrollment	Demographics
Fake Catholic University	Private, Urban	3,500	70% White 9% Asian 7% Hispanic/Latino
Urban State University	Large Urban, Public	29,000	64% White 16% Hispanic/Latino, 6% African American
Private College	Private, Liberal Arts	6,000	84% white, 4% Hispanic/Latino, 4% African American
University of Suburb	Private, Suburban	8,000	57% white 13% African American
Regional University	Private, Suburban	4,000	82% White



School	Selected Because...
Fake Catholic University	<ul style="list-style-type: none"> • High (and increasing) pass rates for Calculus I (86%) and Calculus II (91%) • Overwhelmingly positive views of the calculus program expressed during interview piloting
Urban State University	<ul style="list-style-type: none"> • Outperformed predicted pass rate by 14%. • Above average performance on CSPCC survey outcomes items • Above average percentage of <i>persisters</i> • Different (and important institution type)
Private College	<ul style="list-style-type: none"> • Outperformed predicted pass rate by 20%. • High percentage of <i>persisters</i> and low percentage of <i>switchers</i>.
University of Suburb	<ul style="list-style-type: none"> • Outperformed expected pass rate by 12% • High percentage of <i>peristers</i> and low percentage of <i>switchers</i>. • Strongest performance on CSPCC Survey <i>outcomes</i> items.
Regional University	<ul style="list-style-type: none"> • Very high percentage of <i>persisters</i> and very low percentage of <i>switchers</i>. • Strong performance on CSPCC Survey <i>outcomes</i> items.

Characteristics of Successful Four-Year Calculus Programs

- Placement
- Staffing
- Supporting Instructors
- Learning Centers
- Technology and Innovation
- Coordinated Independence



Placement

School	Placement
Fake Catholic University	<ul style="list-style-type: none">• MAA online placement exam which places students into Calculus I or Pre-Calculus.• Students may enroll in Calculus without passing the exam, but this is rare. The placement advisor corresponds with such students directly.
Urban State University	<ul style="list-style-type: none">• Accuplacer is used for placement into Calculus.• Students who have college algebra completed, do not need to the placement exam.
Private College	<ul style="list-style-type: none">• Calculus placement is based on SAT scores• Very generous late drop-back date
University of Suburb	<ul style="list-style-type: none">• Pre-test at the beginning of the term• Pre-calculus, Calculus I, and Calculus II are scheduled so that students can easily transfer at the start of the term.
Regional University	<ul style="list-style-type: none">• MAA online placement exam which places students into Calculus I or Pre-Calculus.



Staffing

School	Staffing
Fake Catholic University	All Calculus I courses are taught by full-time tenure track faculty
Urban State University	Calculus is taught by full-time instructors
Private College	Exception: Adjuncts teach Calculus I courses
University of Suburb	In the fall of 2012 all Calculus I sections were taught by full time faculty
Regional University	Calculus I courses are taught primarily by full-time faculty



Learning Centers

School	Learning Centers
Fake Catholic University	<ul style="list-style-type: none">• Learning Resource Center (houses the Math Resource center which provides support to Calculus I students.)• Freshman Resource center
Urban State University	<ul style="list-style-type: none">• University-wide tutoring center with peer tutors for mathematics
Private College	<ul style="list-style-type: none">• Center for Teaching and Learning -staffed by tutors who work directly with instructors to tutor specific courses
University of Suburb	<ul style="list-style-type: none">• Student Success Center (matches students with tutors along with other academic support)• Math department tutoring center
Regional University	<ul style="list-style-type: none">• Academic Support Center (tutoring all subjects)• Math department tutoring center

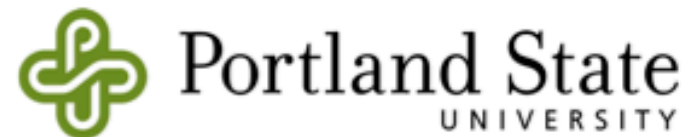
Technology and Innovation

School	Technology
Fake Catholic University	<ul style="list-style-type: none">• The Teaching and Learning Collaborative provides support for instructional technologies• Technology usage varies by instructor – reported technology: Geogebra
Urban State University	<ul style="list-style-type: none">• Technology usage varies by instructor - reported technology: SMARTboards, clickers, WeBWork, projectors of tablets and doc cams, pencast videos, course wikis and Mathematica
University of Suburb	<ul style="list-style-type: none">• Faculty Center for Teaching and Learning assists teachers with the use of educational technology to promote learning• This year, the department is “flipping” half of calculus sections – funded by large internal grant and NSF grant
Regional University	<ul style="list-style-type: none">• Department committee for the purpose of effectively using technology in instruction



Supporting Instructors

School	Teaching Center or Collaborative	Professional organizations encouragement (such as travel money)	Mentoring/ observation options
Fake Catholic University	X	X	X
Urban State University	X	X	X
Private College	X		X
University of Suburb	X		
Regional University	X	X	



Coordinated Independence

Summary of Coordination by Institution

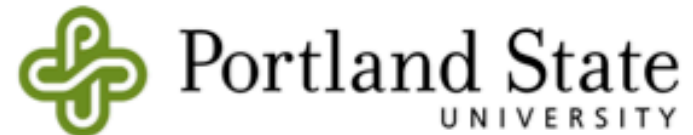
Aspect of Coordination	Institution				
	\overline{FCU}	\overline{USU}	\overline{RU}	\overline{PC}	\overline{US}
Syllabus	X	X	X		X
Content		X	X	X	X
Calendar			X		
Textbook	X	X	X	X	X
Homework	(X)	--	(X)	--	(X)
Worksheet	(X)		(X)		--
Quizzes	X		--		--
Exams	(X)	--	X		(X)
Final Exams	(X)	(X)	X	--	X
Gateway Exam	X	X	X		
Technology	(X)	--	--	--	(X)

Note. X = Coordinated, (X) = partially coordinated, -- = not coordinated, and a blank indicates that the aspect was not mentioned

On-going Research

How do Calculus instructors view:

- their calculus students
- use of technology in their classrooms
- the role of calculus in their students' educational career

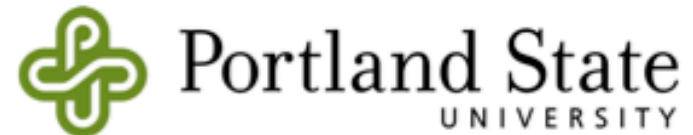


HOW INSTRUCTORS TALK ABOUT THEIR STUDENTS IN SUCCESSFUL PROGRAMS

Based on pre/post survey questions:

Instructors at selected case study schools (all levels)

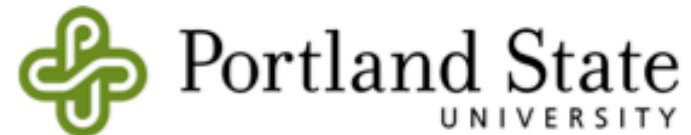
- predicted higher percentages of prepared students and higher percentage of successful students on the pre-surveys.
- reported higher levels of preparation and success on post-surveys.
- expressed a higher level of agreement that students in beginning calculus are capable of understanding the ideas of calculus.



HOW INSTRUCTORS TALK ABOUT THEIR STUDENTS IN SUCCESSFUL PROGRAMS

Next Steps:

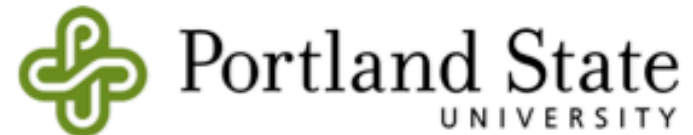
- Analyzing interview tagged transcripts qualitatively using open coding
- Exploring connection between stated views of students and instructional practices



HOW INSTRUCTORS USE AND VIEW TECHNOLOGY

Survey results showed that instructors at selected schools permitted (and required) use of graphing calculators at a significantly higher percentage than the schools that were not selected.

These instructors reported more demonstrations in class using graphing calculators and more use of graphic calculators by students during class.



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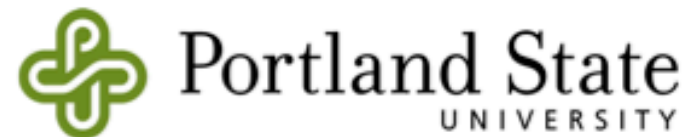
“I do wonder sometimes about the future of lecturing. I certainly don't want it to become just a bunch of online videos that you watch. I think there is something really soulless about that and personally I can't concentrate on those...It's boring somehow watching it on a screen. You're not there. You don't sort of feel a connection. I think it's hard.”

“Technology is harder to do than people think. You can do things, **but do they actually make a dent in learning?**”



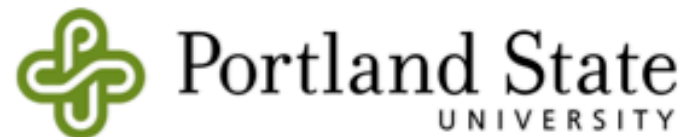
HOW INSTRUCTORS VIEW THE ROLE OF CALCULUS

The Role of Calculus in the Institution	The Role of Calculus in the Mathematical Development	The Objectives of Calculus (is to learn/change)
Gatekeeper	Foundation for Advanced Mathematics	Nature of Mathematics
Freshmen Experience	Algebra Capstone	Mathematical Practices
Service Course		Content
Prep for Calculus II		Calculus Appreciation
		Backward Transfer
		Attitude Towards Math
		General Skills



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HOW INSTRUCTORS VIEW THE ROLE OF CALCULUS

Gatekeeper

“It’s the course that sort of tests their mettle...”

Freshmen
Experience

“I just see it as an opportunity to really get people interested in math and hopefully snag them into the major.”



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Gatekeeper

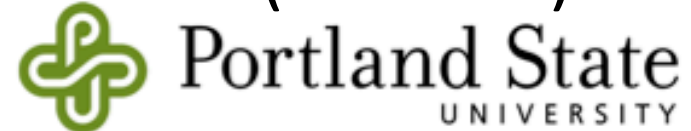
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1 INSTRUCTOR OF 53

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MENTIONED AT ALL INSTITUTION TYPES (12 of 53)



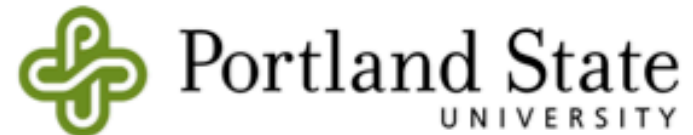
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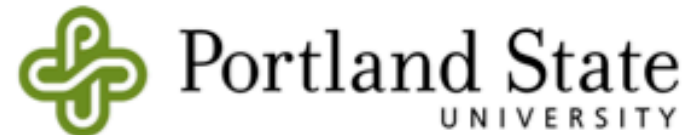
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- Institutions are open to and exploring technology and innovations
- Instructors and students are part of an environment that actively supports them



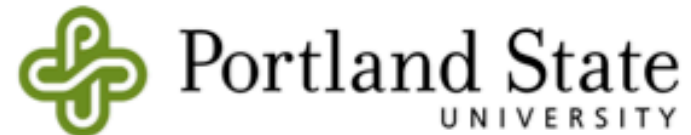
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- Effort and attention towards students being placed correctly



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- Institutions are open to and exploring technology and innovations
- Instructors and students are part of an environment that actively supports them
- Staffing for calculus courses is taken seriously
- Effort and attention towards students being placed correctly
- Balance between coordination and autonomy

