

One Stone, Two Birds: Embedding Program Assessment in Student Persistence and Success Analytics

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Center for Institutional Evaluation
Research and Planning (CIERP)

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The University of Texas at El Paso



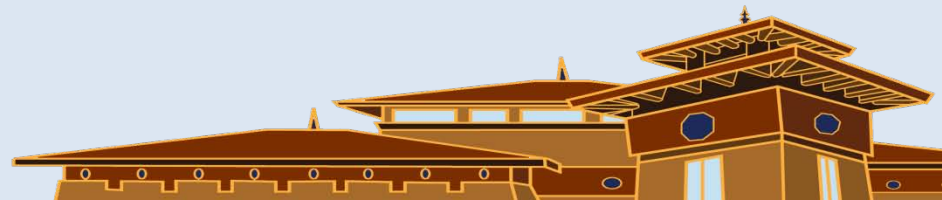
Introduction

Background

- A series of Lumina-supported, multi-institutional student success projects at minority-serving institutions
 - Yan: Research design
 - Denise: Program assessment
 - Anthony: Student persistence and success modeling

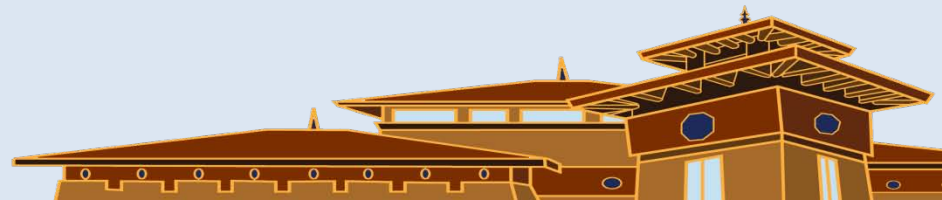
Learning outcomes

- Thinking about interconnections of multiple IR projects
- Awareness of information costs and benefits
- Insights about organizational effectiveness and accountability
- Vision of building a learning organization

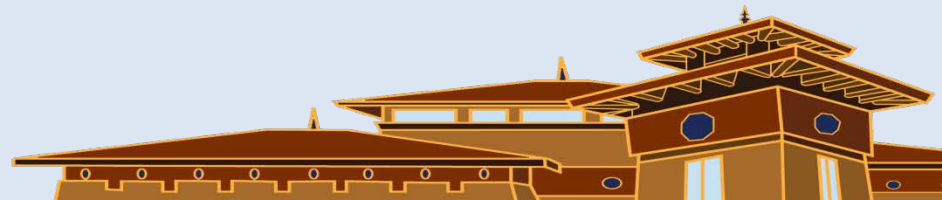


Outline

- Policy contexts and institutional missions (**why**)
- Literature review (**whether**)
 - Student success
 - Program assessment
 - The disconnection
- Integration
 - An integrated analytical framework (**how**)
 - IR role in building knowledge infrastructures (**who**)
- Examples of Lumina-supported projects (**what**)
- Conclusion (**Q&A**)

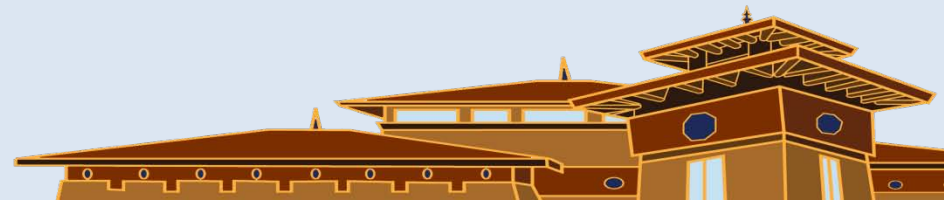


Why



The Benefits

- Make meaningful and efficient use of information resources
 - Convert part of the externally imposed information cost of accountability to information investments for quality enhancement
- Address the Policy-Mission Misalignment
 - Clarify what “student success” means:
More college completers or higher completion rates?
 - Distinguish between two different definitions of institutional success



Accountability & Information Costs

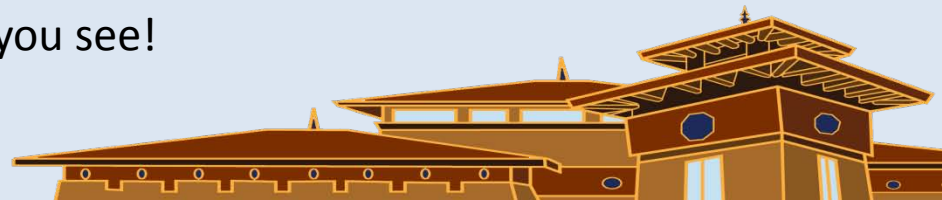
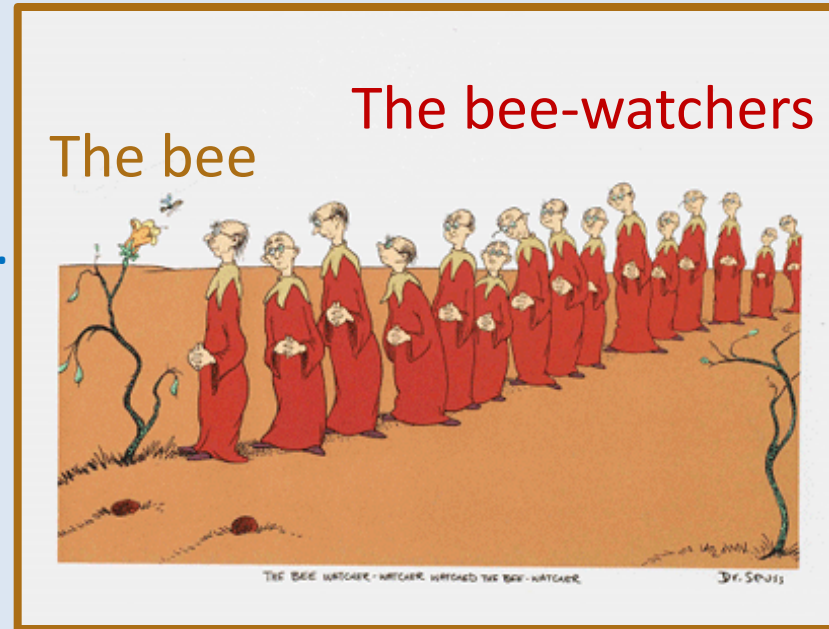
Out west, near Hawtch-Hawtch,
there's a Hawtch-Hawtcher Bee-Watcher,
His job is to watch...
is to keep both his eyes on the lazy town bee.
A bee that is watched will work harder, you see.

Well...he watched and he watched.
**But, in spite of his watch,
that bee didn't work any harder. Not mawtch.**

So then somebody said,
"Our old bee-watching man
just isn't bee-watching as hard as he can.
He ought to be watched by another Hawtch-Hawtcher!
**The thing that we need
is a Bee-Watcher-Watcher!**

...

You're not a Hawtch-Watcher. You're lucky, you see!



Improvement is the Key

What *the bee-watcher-watchers* did:

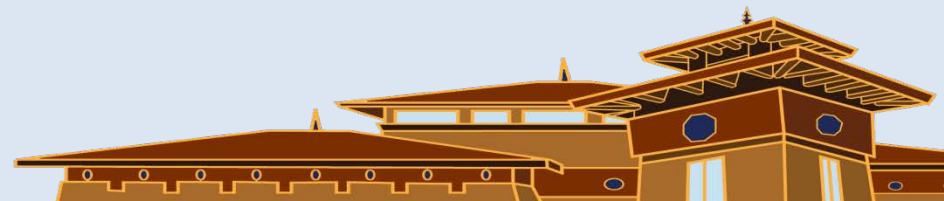
An NRC report about the measurement of institutional productivity was reported costing \$900,000.

(The Chronicle of Higher Education, May 17, 2012)

What *the bees* said:

“Nearly \$1 million for a report ... that generates headlines which inform us measuring outcomes is a difficult thing to do. ...?”

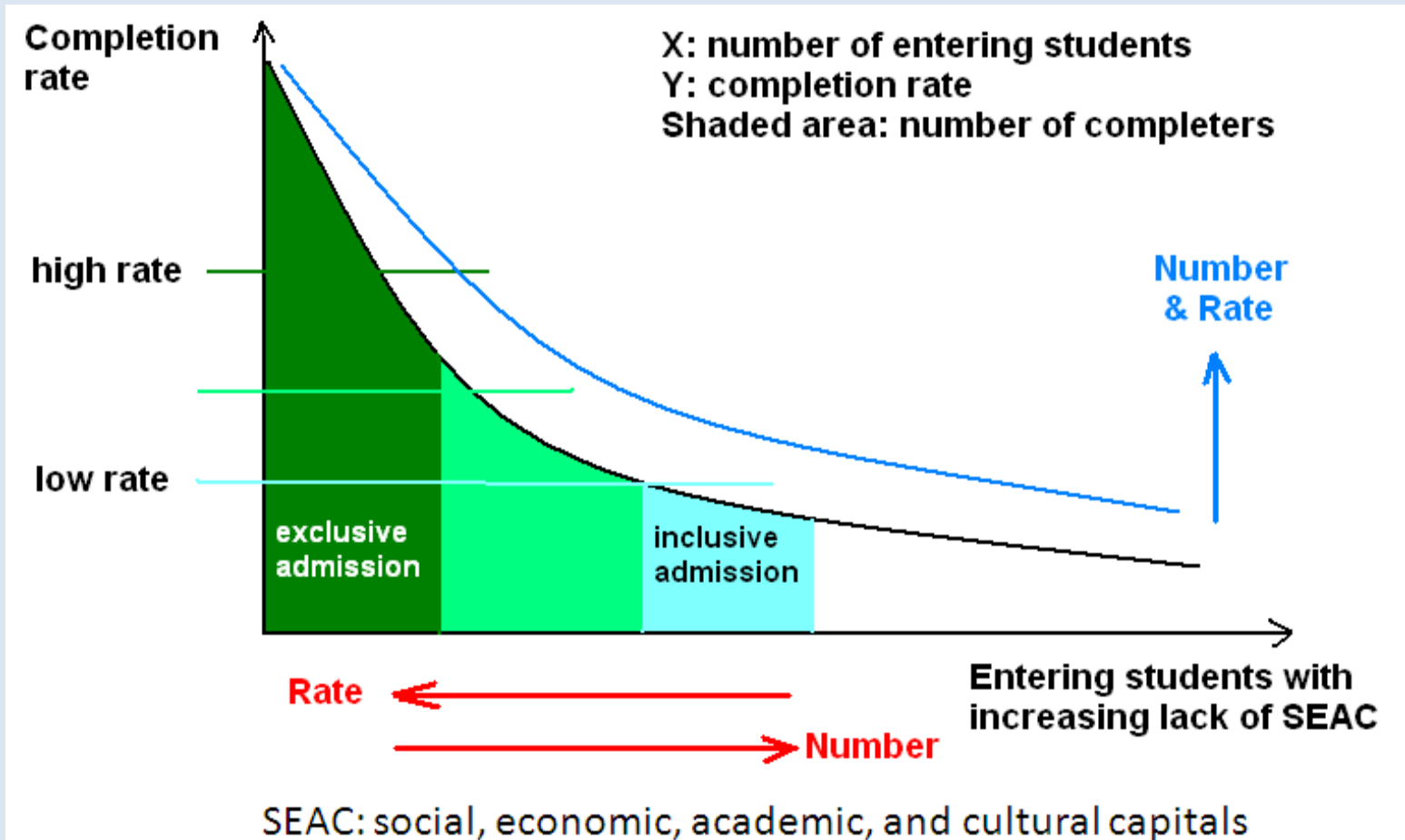
*“Most of the educators I know would rather see more resources applied to **improving education** and less to measuring it.”*



Student Success: Number or Rate?

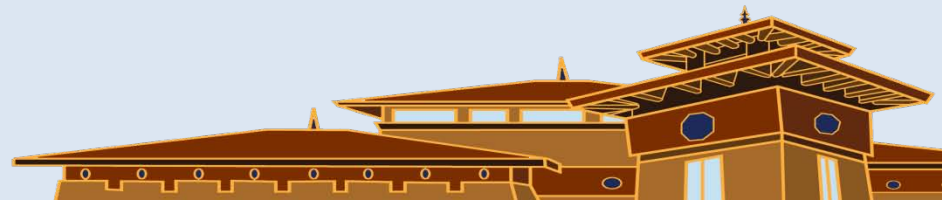
Attainment Curve

Number of completers = Number of entering students X Completion rate

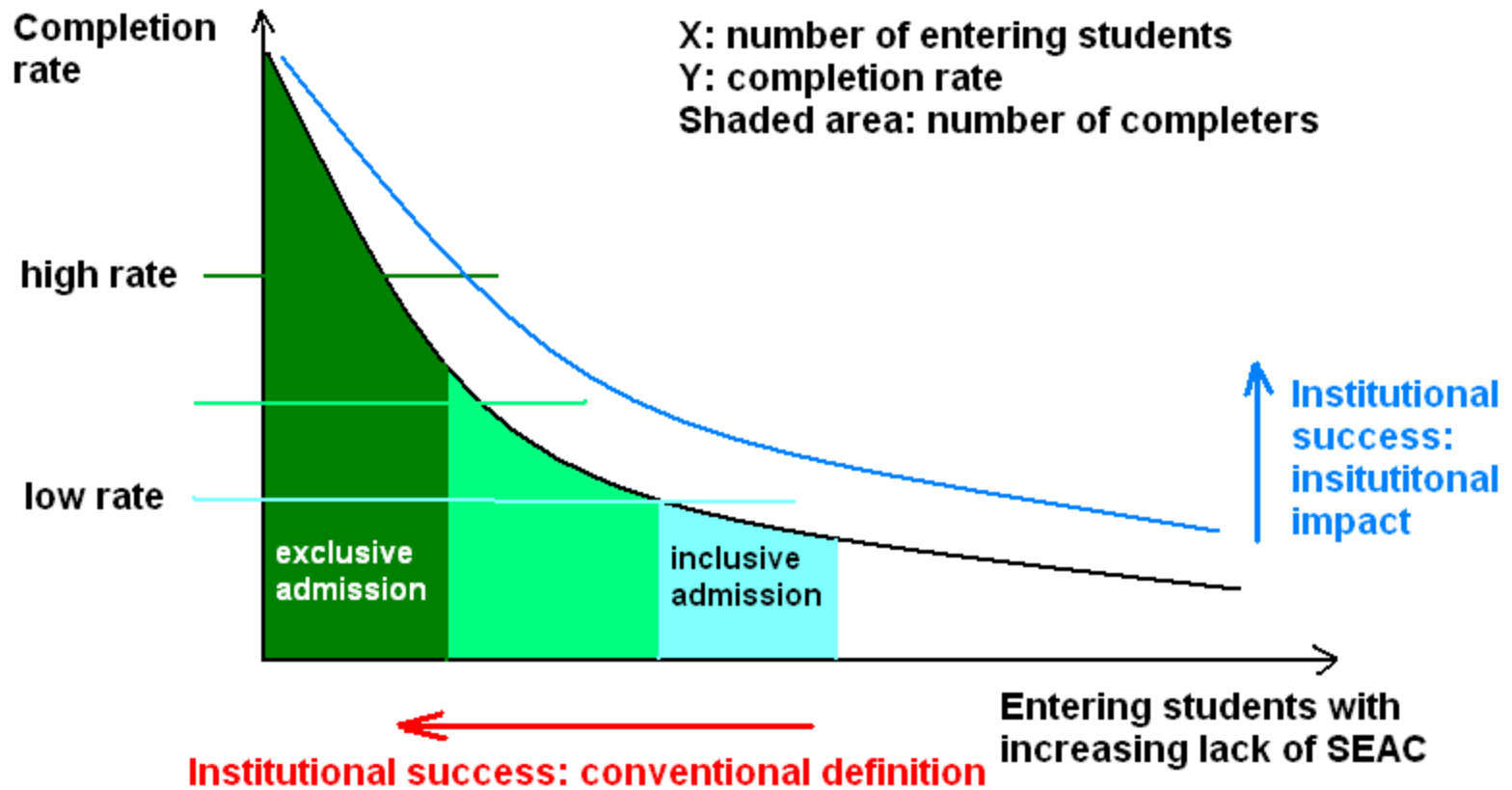


Institutional Missions & the Meaning of Excellence

- Excellence as conventionally defined
 - **Institutional success = observed student success**
 - Mission: maximize efforts of enrolling students with the most SEAC capitals, who are most likely to succeed
- Excellence defined as institutional impact
 - **Institutional success = conditional student success**
 - Mission: maximize efforts of promoting both the access and success of students with less SEAC capitals, who face numerous hurdles before, during, and after college



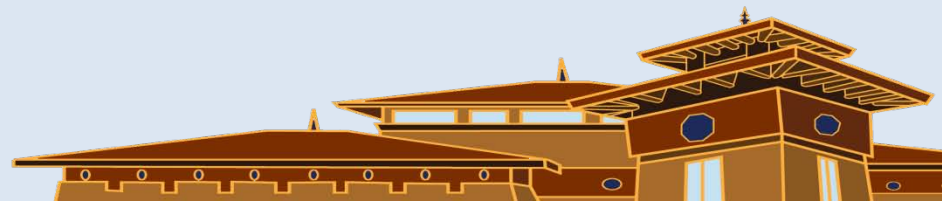
Institutional Success: Missions and Definitions



SEAC: social, economic, academic, and cultural capitals

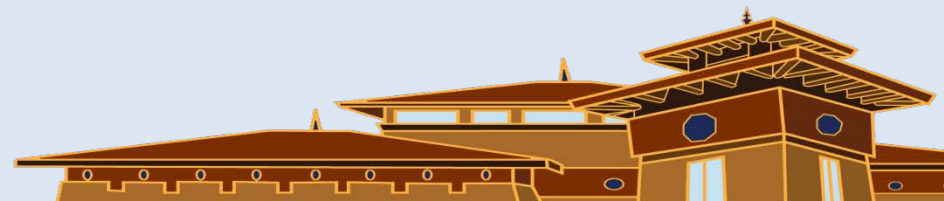


Why...Whether



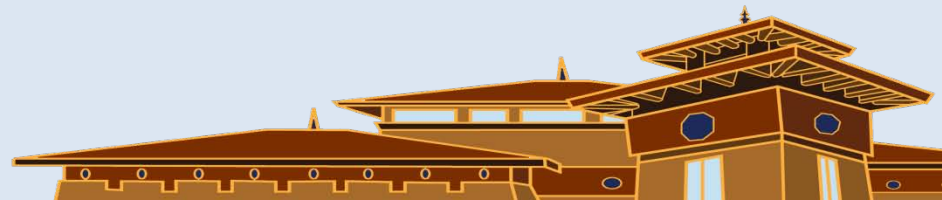
Student Success Literature

- The majority of student success studies focus on predicting outcomes for students.
- There is a lack of **differentiation between actionable factors** to help practitioners measure and identify the sources of program impacts.



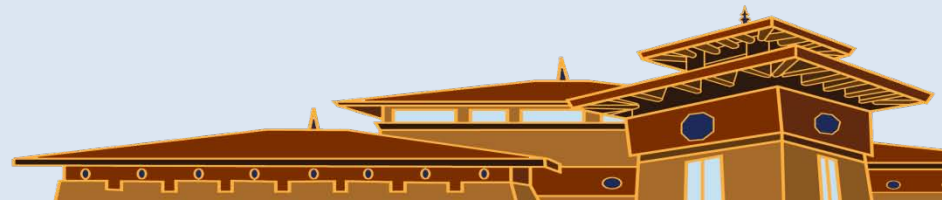
Assessment Literature

- Program funders increasingly require evidence about program impacts in terms of student outcomes.
- Due to **selection bias**, group comparisons fail to satisfy the call for methodological rigor in program assessment.
- There is a shortage of empirical evidence about the effects of program/institutional actions on student success.

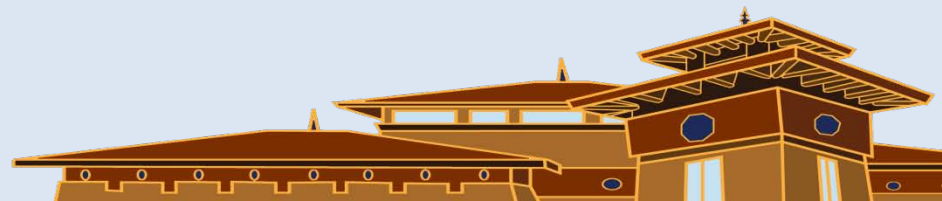


Disconnection

- Assessment and student success are treated as **separate areas of inquiry** by the knowledge and professional communities.
- Projects are often requested by **different internal users** working in various academic or student service units.
- Projects fulfill different purposes for **different external audiences**.
- Data collections are project driven and involve **disconnected efforts**.



Why...Whether...How



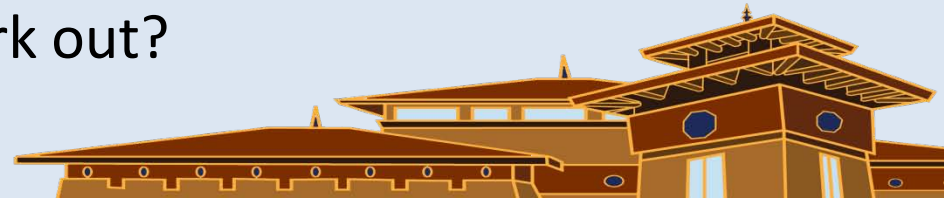
Integrated Analytical Framework

- Four categories of variables: **Y, S, C, P**
 - Y: Outcomes (cognitive, affective, persistence, completion, socioeconomic, etc.)
 - X: **S**tudent attributes, **C**ontexts, and **P**ractices
- Three types of analytical models
 1. Predictive Models: $Y_t = \{S, C, P, Y_{t-1}\}$

Planning perspective: what happens in the future?
 2. Impact Assessment Models: $Y = \{S, C+P\}$

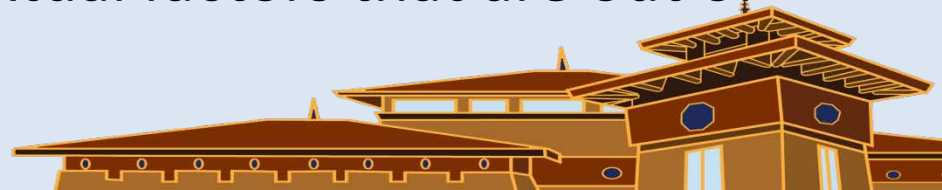
Student perspective: which program/institution to attend?
 3. Performance Assessment Models: $Y = \{S, C, P\}$

Managing perspective: how well did this course of action work out?



Impact vs. Performance Assessment

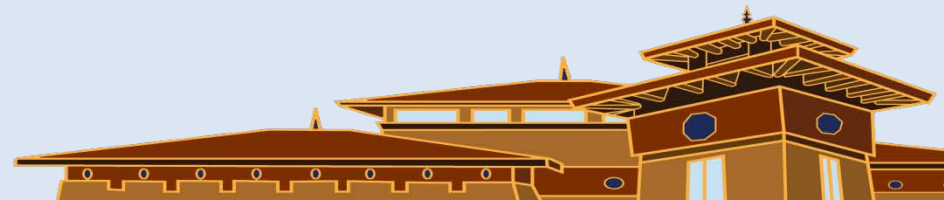
- Impact & **effectiveness**: $Y=\{S, C+P\}$
 - Purpose: to identify overall effects to facilitate students' program/institutional choice
 - Forces that shift up the attainment curve: both contexts and practices matter
- Performance & **accountability**: $Y=\{S, C, P\}$
 - Purpose: to identify actionable factors to guide institutional improvement and evaluate staff performance
 - Practitioners are held accountable for their course of actions but not for contextual factors that are out of their control



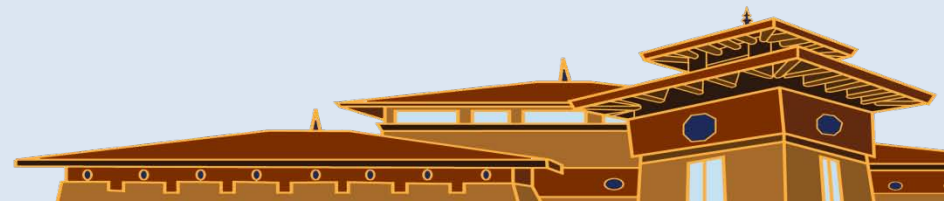
One Database, Multiple Uses

The same person-period longitudinal database (panel data) may be used for multiple analytical needs:

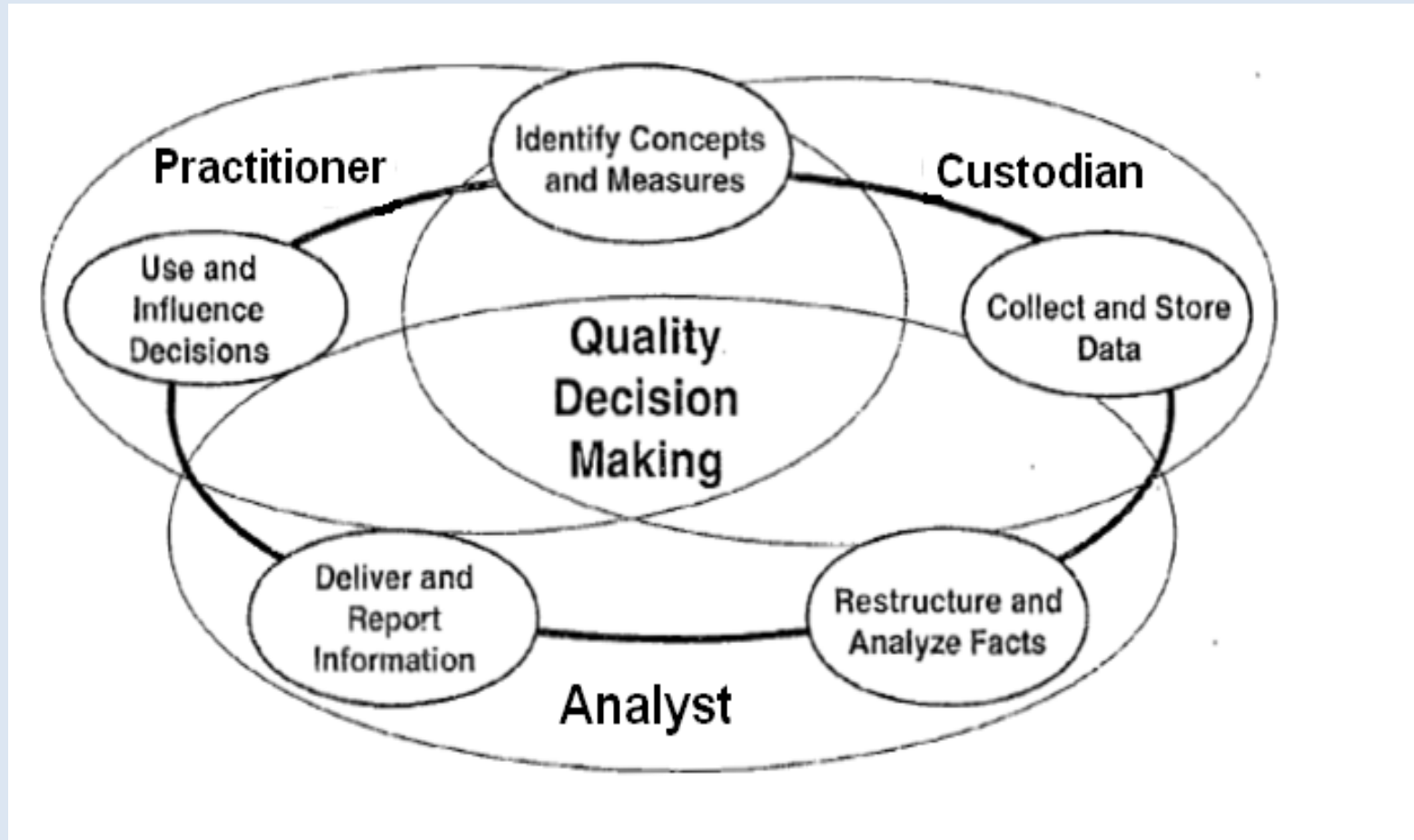
- Study of change
 - Continuous outcomes that change over time
 - Factors that affect the rate of change
 - Time is a predictor
- Study of event occurrence
 - Whether and when does an event occur?
 - Factors that affects the occurrence and the timing of the occurrence
 - Time is an outcome



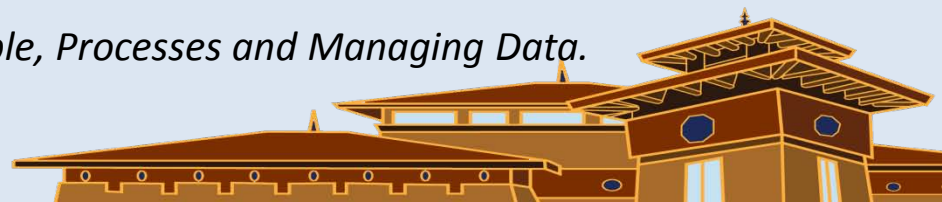
Why...Whether...How...Who



IR Roles in Building Knowledge Infrastructures

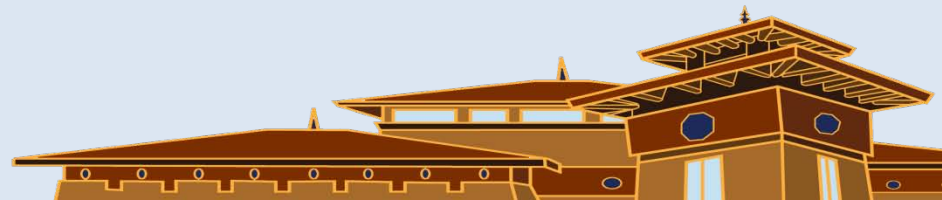


Adapted from McLaughlin, G., et. al. (1998). *People, Processes and Managing Data*.



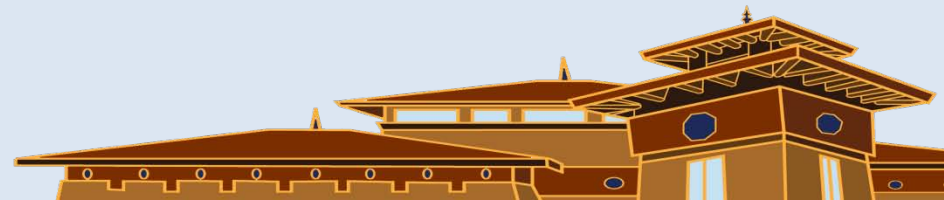
IR Roles in Making the Connection

- Analyst
- Broker
- Translator
- Mediator
- Analytical educator
- Information integrator
- Action researcher
- Anonymous leader



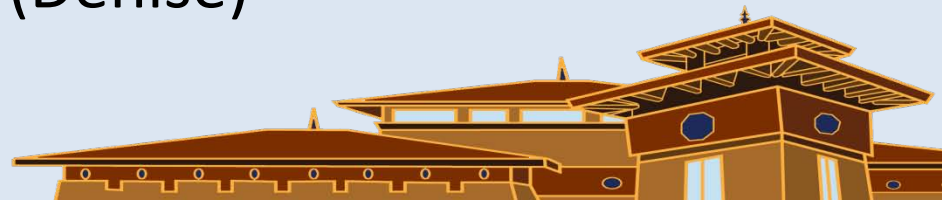
Why...Whether...How...Who...What

Our efforts
An evolving process



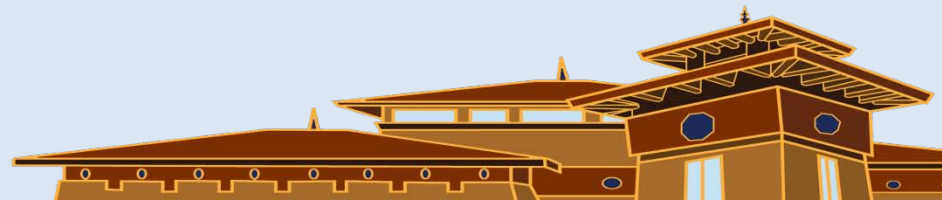
Lumina-Supported Projects

- **Risk classification to support targeted interventions (Anthony)**
- Assessment of the effects of single programs using student propensity scores to control for selection bias (Denise)
 - An undergraduate research program
 - Housing analysis
- Assessment of aggregated and differential impacts of a group of student intervention programs (Anthony)
- Program inventory and the collection of individual program participation data (Denise)



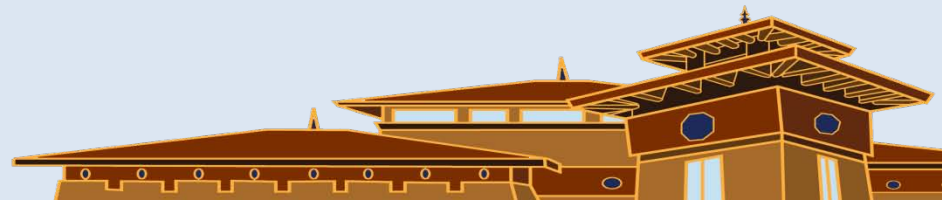
Risk Classification to Support Targeted Interventions

- Predictive Models
 - Planning perspective, $Y_t = \{S, C, P, Y_{t-1}\}$
- The Method
 - Binary Outcome
 - Longitudinal Data
 - Discrete Time
 - Longitudinal Logistic Regression



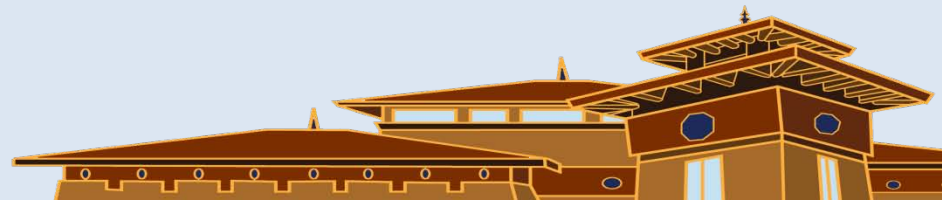
Variables

- Inputs (S , C , P , Y_{t-1})
 - Student Characteristics (High School Percentile, SAT, etc.)
 - Context (College, ?)
 - Programs (Student Loans, Pell Grant, etc.)
 - Performance (Semester GPA, Failed Classes, etc.)
- Observed Outcome (Y_t)
 - Departure – binary indicator variable



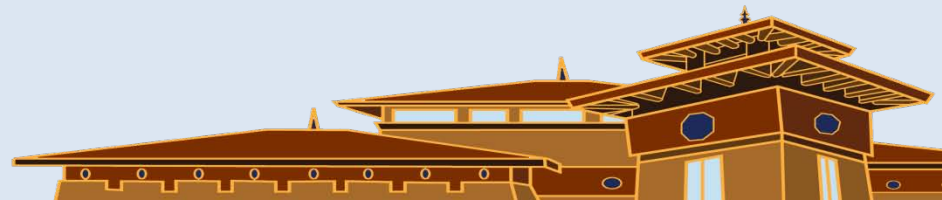
The Propensity Score

- Predicting odds of departure
 - Plugging in Input Variables
 - Output is estimate of log odds of departure
 - Solve for the probability



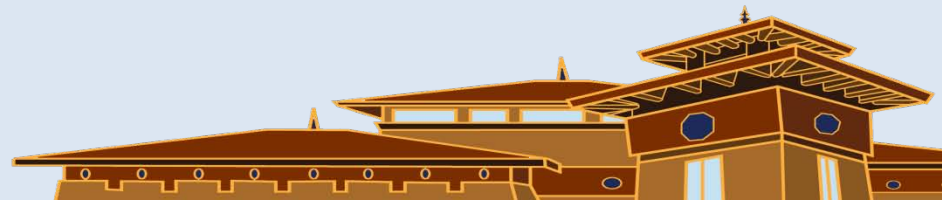
Risk Groups

- Number of Groups
 - Three
- Distribution of Groups
 - 33%,33%,33%
- Observe Cut Points
- Assign Group Based on Score
 - High-, Medium-, Low-Risk



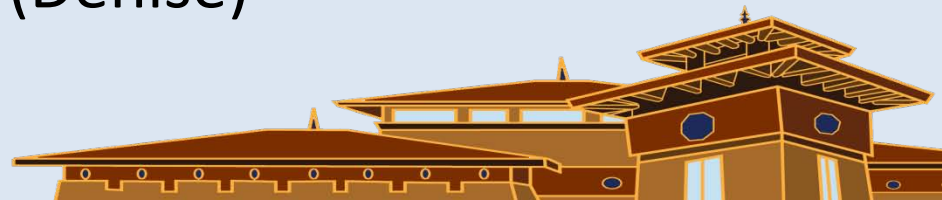
Time Dependent

- Calculation is different for the first term
 - $Y_t = \{S, C, P\}$
- Can be updated every semester
 - $Y_t = \{S, C, P, Y_{t-1}\}$
- Becomes dependent solely on previous term performance as time elapses
 - $Y_t = \{Y_{t-1}\}$



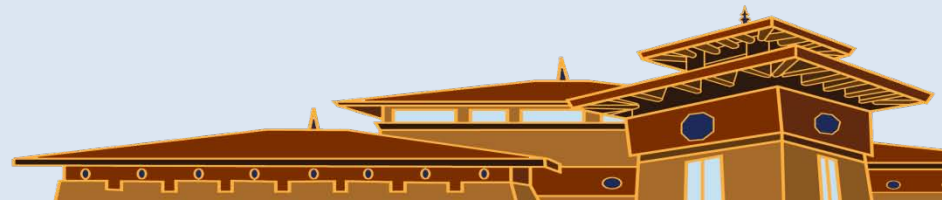
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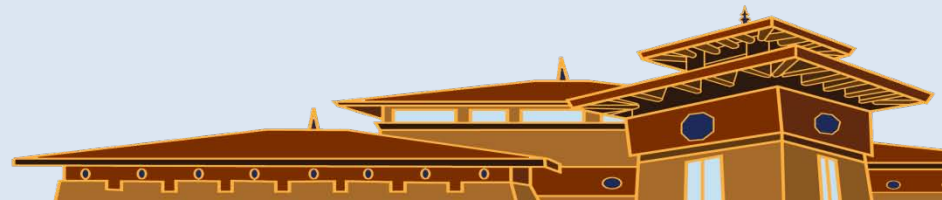
Lumina Student Success Project Implications

- Move away from single view of students: Consider how the institution's mission results in service to students with different levels of SEAC capitals.
- Understand the efficacy of interventions (programs) for students in each risk group
- Modify interventions as needed, based on information about program impact and differential effects on students



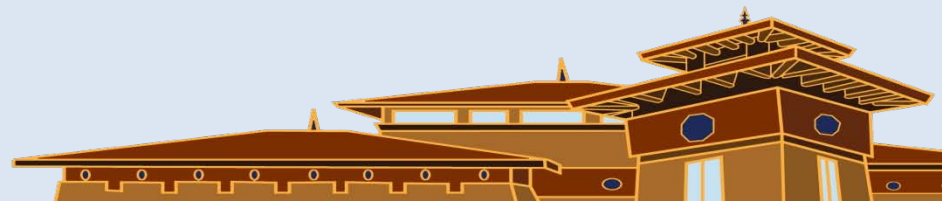
Single Program Assessment: Undergraduate Research Program

- Intended to:
 - Increase the number of students from underrepresented backgrounds who are prepared for and choose to pursue graduate programs in biomedical sciences
 - Provide access to educational and research training activities
- Primary Program Activities
 - Research with faculty members
 - Research presentations for peers and at conferences
 - Awareness of careers in biomedical research through Journal Club



Conventional Approach to Assessment: The Undergraduate Research Program Example

- Cumulative GPA
- Semester credit hours attempted & earned
- Majors in a biomedical sciences-related area
- Graduation

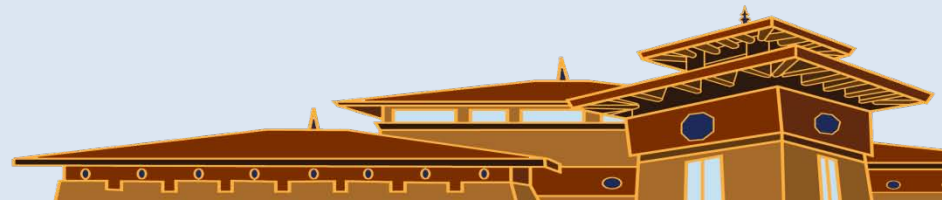


Program Impact Analysis Approach: The Undergraduate Research Program Example

Key Question:

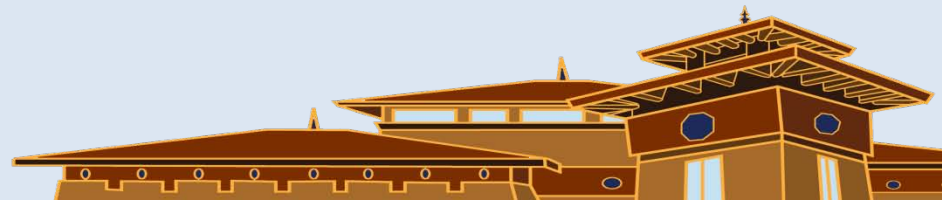
Could the success of the program be attributed to the students who were served?

- Propensity scores of students served
- Impact Assessment Model
 - Student perspective, $Y=\{S, C+P\}$
Includes both contextual and program component effects



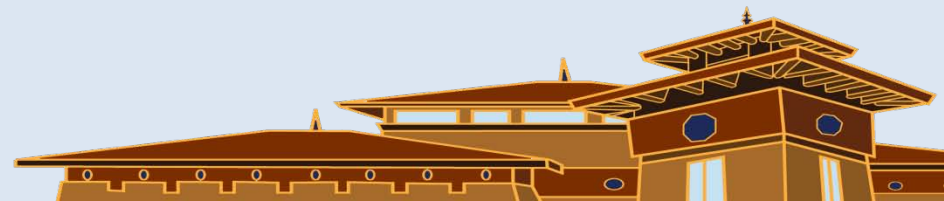
Undergraduate Research Program Findings

- After controlling for propensity scores:
 - RISE students still had significantly higher GPAs than non-participating students.
 - Program participants had higher retention rates than non-participating students



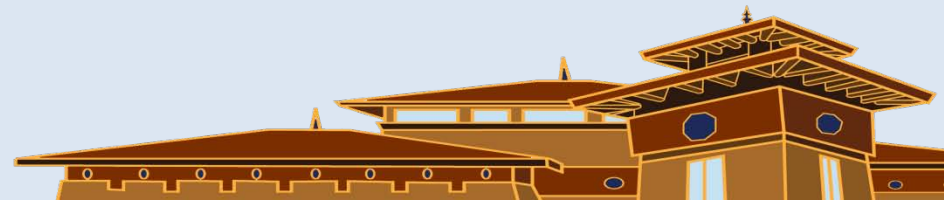
Program Impact Analysis Approach: Housing Analysis Example

- Used propensity scores to determine impact of living in on-campus housing during an undergraduate's first year on retention and graduation.
- For students with a high risk level who lived in housing, 6-year graduation rates were higher than expected.



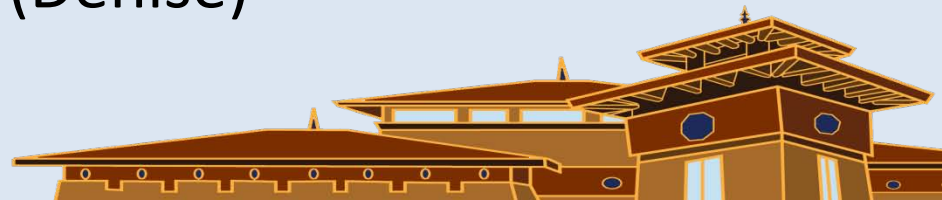
Lessons from Single-program Assessments

- Identify differential effects of programs on students
- Limitation: Effects of participation in multiple programs are not controlled.



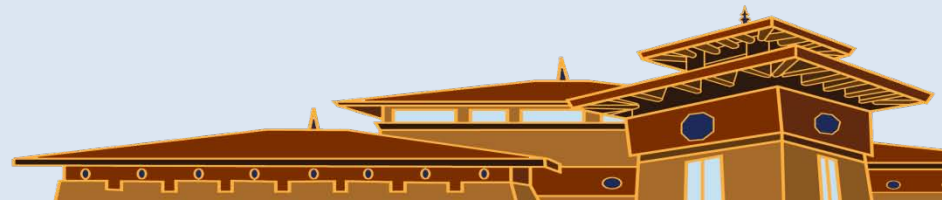
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Multiple Program Impact

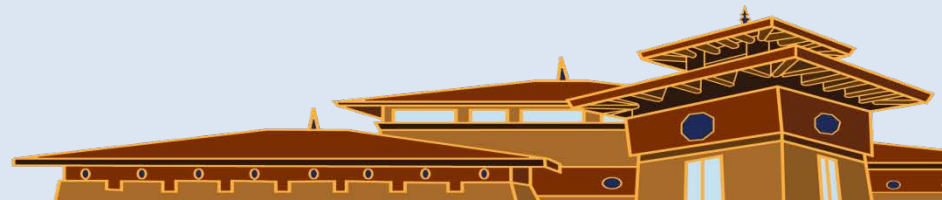
- Using cohort indicator variable as a proxy for the group of interventions.
- Control for changes in student population.
- How do we measure if the interventions were successful?
- Differential effects of the programs on sub-groups of students



Context

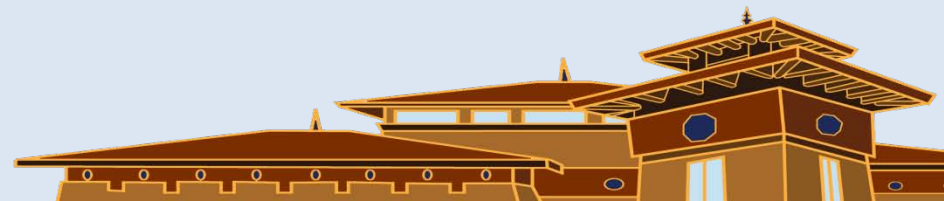
Institutional Setting

- Bilingual and bicultural setting
- 4-year, Public
- Awards offered: BA, MA, PHD
- Student-to-faculty ratio: 21 to 1
- About 7,000 students (5000+ undergrad)
- Majority: Hispanic, low income, Pell grant recipients
- Campus setting: Rural-Fringe
- Campus housing: Yes but mainly commuter



Student Success Programs

- **First Year Success Program**
- **Summer Bridge Program**
- **Freshman Advising**
- **Summer Recovery Program**
- **Sophomore Advising**
- **Learning Communities**
- **Student Retention**



Assessment of Multiple Programs

Data

Reference group

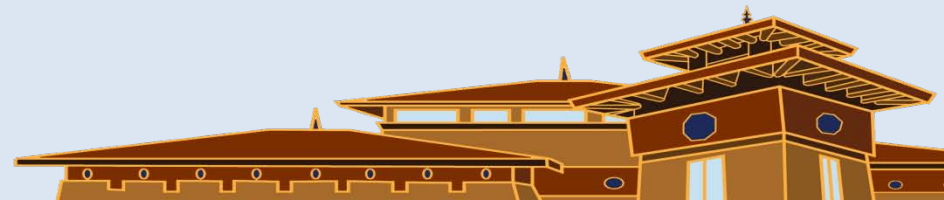
- Fall 2002
- Fall 2003

Treatment group

- Fall 2008
- Fall 2009

Methods

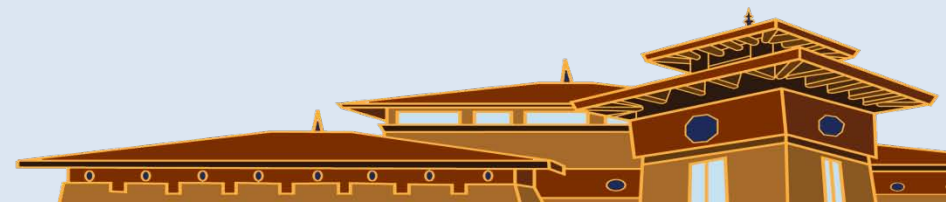
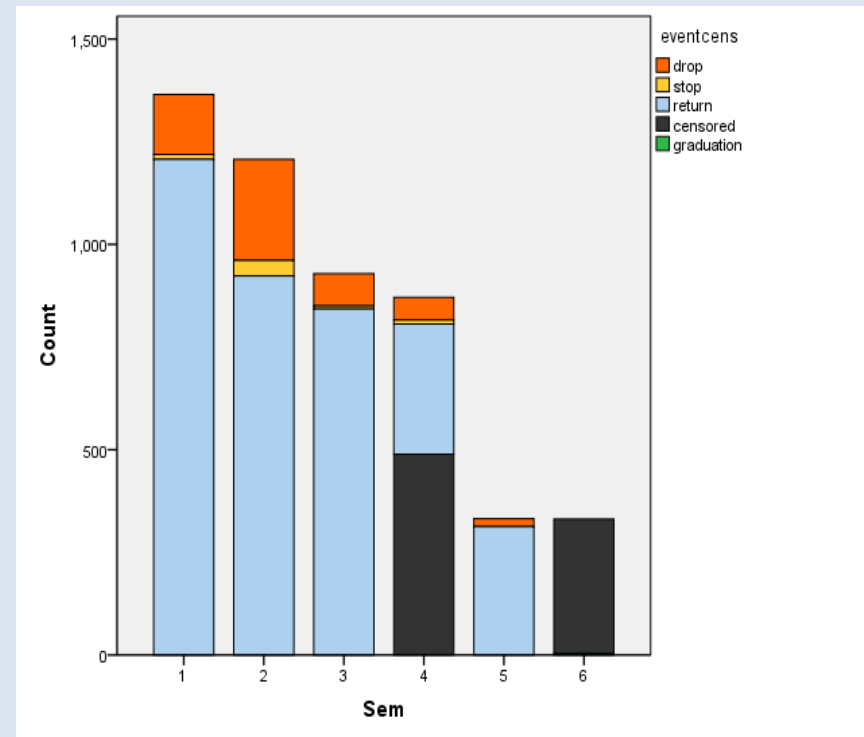
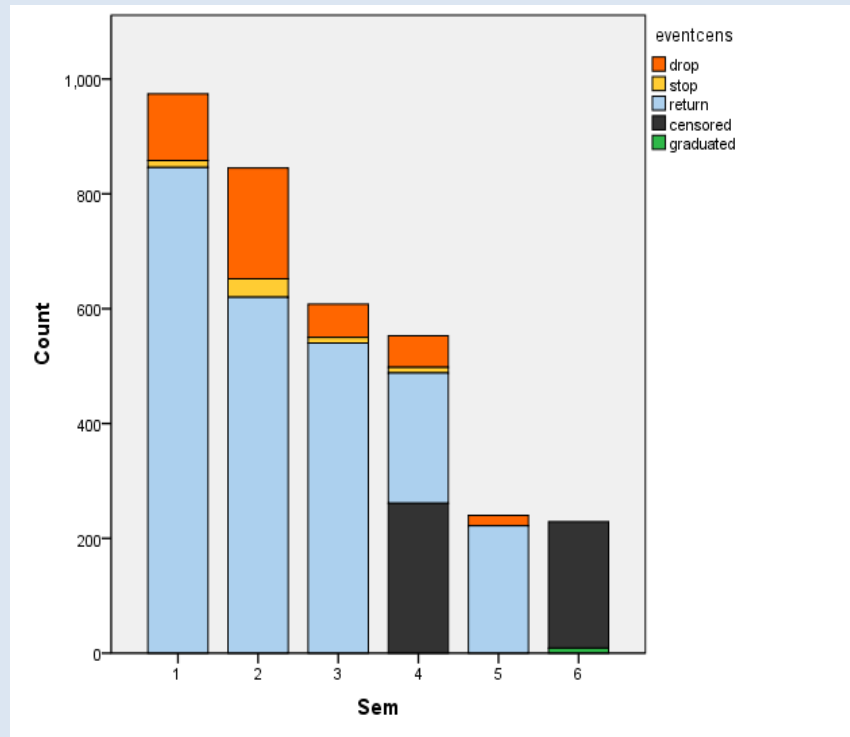
- Conventional pre-post comparison of persistence outcomes
- Pre-post comparison with statistical control for confounding factors



Pre-Post Comparison of Persistence

- 2002 and 2003 Fall cohorts

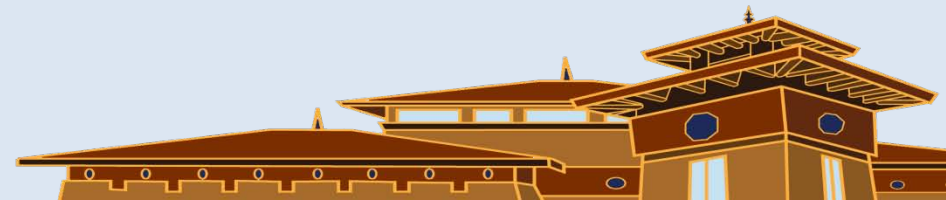
- 2008 and 2009 Fall cohorts



Pre-Post Comparison of Persistence: Conventional Approach

Fall 2002 and 2003								
	Drop		Stop		Return		Censor	
1	116	11.9%	12	1.2%	845	86.8%	0	.0%
2	193	22.9%	32	3.8%	619	73.3%	0	.0%
3	58	9.6%	10	1.6%	539	88.8%	0	.0%
4	55	10.0%	9	1.6%	227	41.1%	261	47.3%
5	18	7.5%	0	.0%	222	92.5%	0	.0%
6	0	.0%	0	.0%	0	.0%	220	96.1%

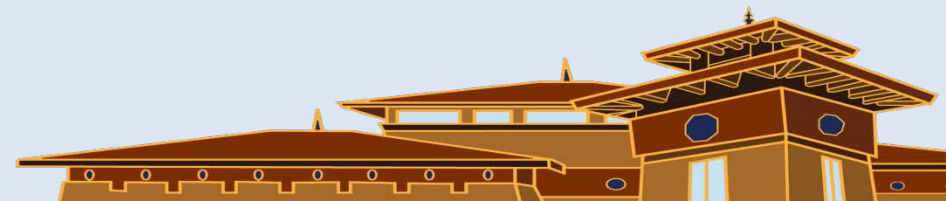
Fall 2008 and 2009								
	Drop		Stop		Return		Censor	
1	146	10.7%	12	.9%	1207	88.4%	0	.0%
2	246	20.4%	38	3.1%	923	76.5%	0	.0%
3	79	8.5%	7	.8%	843	90.7%	0	.0%
4	55	6.3%	10	1.1%	317	36.4%	489	56.1%
5	19	5.7%	0	.0%	313	94.3%	0	.0%
6	0	.0%	0	.0%	0	.0%	327	98.8%



Confounding Factors

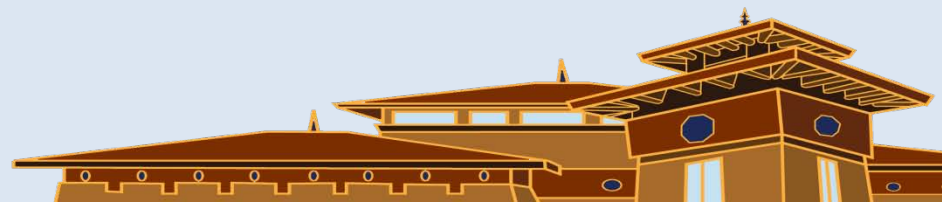
Coexisting Programs that Changed

	% Receiving Aid in 2002 and 2003	% Receiving Aid in 2008 and 2009
Loan	9.9	38.1
Work Study	24.7	4.2
Grant	81.9	90.7
Scholarship	46.7	46.9



Pre-post Comparison (the dummy variable approach)

Program effect with control for timing factor (baseline model)	Program effect with full control	Differential program effect by certain groups
$\beta_{\text{Program}} = -.060$ standard error = .084 $p = .472$	$\beta_{\text{Program}} = -.101$ (se = .089, $p = .261$)	$\beta_{\text{Program}} = -.144$ (se = .059, $p = .808$) $\beta_{\text{Female*Program}} = .255$ (se = .180, $p = .157$) $\beta_{\text{Lowincome*Program}} = .041$ (se = .176, $p = .817$) $\beta_{\text{Firstgeneration*Program}} = -.122$ (se = .176, $p = .562$) $\beta_{\text{M Placement*Program}} = .475$ (se = .216, $p = .028$) $\beta_{\text{HSP*Program}} = -.004$ (se = .004, $p = .405$) $\beta_{\text{DirectMat*Program}} = -.207$ (se = .496, $p = .676$)
The odds of departure decrease by 6%	The odds of departure decrease by 10%	The odds of departure decrease by 13% for the baseline group

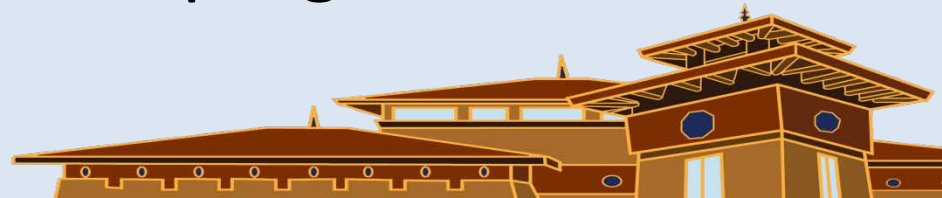


Multiple Program Impact: Summary

- Impact Assessment Models

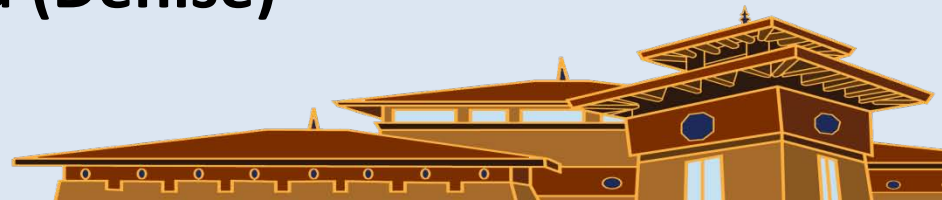
$$Y = \{S, C_{\text{fixed}}, P_{\text{aid}}, \Delta C + P\}$$

- Retrospective
- Cost-effective
- Interventions had positive effects on populations targeted: first-generation students, developmental math students, etc.
- Effectiveness of a particular program is hidden



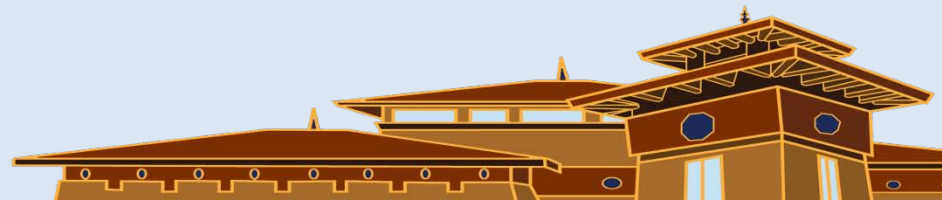
Lumina-Supported Projects

- Risk classification to support targeted interventions (Anthony)
- Assessment of the effects of single programs using student propensity scores to control for selection bias (Denise)
 - An undergraduate research program
 - Housing analysis
- Assessment of aggregated and differential impacts of a group of student intervention programs (Anthony)
- **Program inventory and the collection of individual program participation data (Denise)**



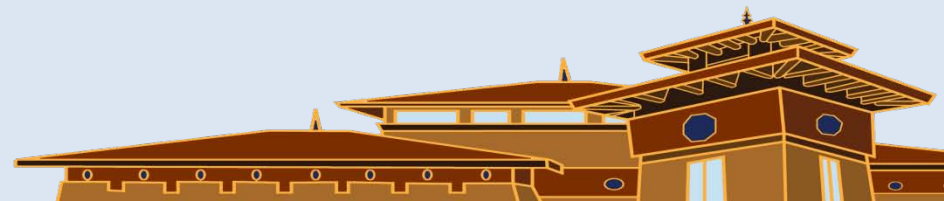
Strategy: Program Inventory

- Develop a live repository about programs that are intended to promote student success or have an impact on student success metrics
- Add student-level program participation data to the existing longitudinal database



Advantages of a Program Inventory

1. Wider dissemination of beneficial programs and/or components within an institution.
2. Reduced information costs for an institution because information is centrally available.
3. Enhanced decision-making: Knowledge of successful programs for students with specific characteristics enables better use of institutional resources.



Sample Program Inventory Template

Name of Program	
Department	Name of department overseeing program
Purpose	What is the overall purpose of the program?
Students Targeted	Who is the program intended to impact?
Annual # of Students Served	# of students are served by the program each year
Components	activities that comprise the program
Objectives	What does the program intend to do?
Intended Outcomes	How will the objectives be met?
Years in Effect	Timing of program implementation
Impact Measure	institutional priorities the program will address
Notes for Analysis	<ul style="list-style-type: none"> -Effectiveness measures at the institutional level -Data needed -Analyses proposed or conducted -Proposed control or comparison group(s)
Status of Evaluation	status of program's evaluation and inventory
Summary	Summary of findings

Sample Program Inventory Template

Undergraduate Research Program

Department	Biological Sciences, College of Science
Purpose	Increase number of students from underrepresented groups who pursue doctoral degrees in biomedical sciences
Students Targeted	UG students from underrepresented groups
Annual # of Students Served	approximately 15
Components	Research experiences, Journal Club, conference participation
Objectives	Increased # of graduates prepared for doctoral study in biomedical sciences
Intended Outcomes	Increased academic success measures
Years in Effect	Since 2003
Impact Measure	Degrees awarded; Alumni success measures
Notes for Analysis	What are the propensity scores of participants? What other success program are/have students participated in? Include data about retention in the major, SCH attempted & earned, cumulative and semester GPA, graduation, and graduate programs pursued.
Status of Evaluation	Annual evaluation
Summary	Program serves a mix of students as classified by propensity scores; those at



Why...Whether...How...Who...What...

Next?

As the “brain relies on patterns of **increasing refinement**,” a learning organization is built through sustained efforts.

“In becoming converts to the idea of developing learning organizations, ... we can easily overlook **the political realities** that block effective learning.”

Morgan, *Images of Organization*



Thank You!

Questions?

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