One Stone Two Birds:
Embedding program assessments in student persistence and success analytics

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Summary

This paper elaborates on the key points in the narrative section of the proposal and lays out the analytical models used to guide the integration of program assessments and student success analytics. It consists of five sections: 1) background about the federal and state policy context and the institutional missions that motivate the integration of program assessments and student success studies, 2) literature review on the connection between program assessments and student success as well as the IR role in promoting the integration, 3) the analytical framework and models that enable the integration, 4) a list of practical illustrations that will be described in the presentation, and 5) the conclusion that connects the issue addressed in this presentation with the vision of learning organizations.

Background

The presenters will briefly describe the federal and state policy context, the collaborating institutions' missions and characteristics, and their students' characteristics to explain why program assessments should be embedded in student success studies.

At both federal and state levels, policy emphasis has been shifting from access to success. For example, the proposed changes to Pell Grant eligibility include adding student degree completion to the award criteria (Kanter, 2011) and shifting the award amount toward later years (Hsiao, 2011). At state level, funding policies are shifting toward "performance-based" criteria that use student outcome to define institutional performance (Dougherty & Natow, 2009). The presenters point out that the lack of distinction between student success, institutional impacts, and institutional performance underlines many misaligned policies that create obstacles for institutions committed to the already challenging task of achieving both access and success, particularly the minority-serving institutions that are the organizational homes of the presenters and their collaborators.

Literature Review

Review of the extant literature on student retention and success leads to our belief that one reason of the current policy misalignment is that the majority of student success studies focus too much on predicting outcomes for students and too little on efforts to isolating the factors into conceptually meaningful categories that distinguish student success from institutional

success (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Perna & Thomas, 2008; Tinto, 1994; Tinto & Pusser, 2006). Although "college impact" studies have indeed addressed the need of controlling for student input factors(Pascarella & Terenzini, 1991, 2005), there is little distinction between the effects of institutional contexts and institutional practices/interventions. Worse, many accountability and related funding policies even fail to control for student differences (Astin, 1997, 2004). To effect changes to the current policy discourses to create an environment conducive to institutional needs for improvement and the right kinds of accountability, institutional and program assessments must be addressed as an inseparable part of student success studies.

Review of the assessment and evaluation literature shows that programs that are initiated to promote student success (e.g., first-year seminars, learning communities, etc.) or expected to have positive impacts on student success (e.g., research grants are increasingly expected to have educational outcomes) are pressed by both internal and external funders to show evidence to back up their claims about program impacts. They are expected to provide evidences based on methods with higher standards of validity and reliability, which simple group comparisons fail to satisfy because they are often plagued by selection bias and reliability issues (St. John, 2006). In addition, despite the vast research literature on student success, there is still a shortage of empirical evidence about the effects of institutional actions on student success and a lack of theories of institutional actions that guide the development of institutional policies, programs, and practices (Tinto, 2005).

However, in order to raise the methodological rigor when evaluating programs and institutional actions, institutions will incur much higher information and analytical costs if each assessment is conducted in isolation. In addition, the knowledge about synergetic effects of multiple programs is lost in this isolated way of conducting program assessments. From the institutional improvement perspective (Kuh, Kinzie, Schuh, & Whitt, 2010), analyzing program effects in an integrated framework enables practitioners to gain knowledge about both specific programs' impact and the combined effects of co-existing programs.

IR professionals are constantly asked to address the informational and analytical needs to support program assessment and the needs to identify student success factors; however, program assessments largely exist as separate projects from student success studies because the audiences for program assessments often focus on specific programs while the student success studies often take the institutional perspective.

The presenters offer an integrated perspective: a way of thinking and practice that incorporate the IR support of student success and program success in the same knowledge infrastructure. The key strategy is to layout practical and analytical questions in connection with multiple audiences and their purposes before using these questions to drive the data collection and modeling efforts.

Instead of looking at what data are available from existing data sources and letting the data availability drive the analytical efforts, the presenters advocate for a proactive role of IR professionals as action researchers (Lewin, 1946; Susman & Evered, 1978) who strive for deeper understandings of the institutional missions, the organizational structure and efforts that serve these missions, and the information and knowledge needs of these efforts. The organizational understandings coupled with their technical expertise enable IR professionals to serve as the crucial two-way link between the "practical" and "technical" communities: 1) effectively translate organizational missions and needs to actionable guidance of data collection and analytical efforts and 2) bring the analytical insights to bear on continuous reflection upon organizational missions, goals, and improvement of practices. In addition, the IR professionals also serve as the analytical educators who help promote an institution-wise propensity of using analytics to support decision making. This will help build a learning organization that not only includes a cybernetic system (Birnbaum, 1991) that provides negative feedbacks to keep the organization on course toward predetermined goals, but also continuously evaluate the goals in terms of their alignment with organizational missions to enable adaptive learning (Morgan, 2006).

Analytical framework and models

The Tinto model and its various derivatives are good starting point for building the student success knowledge infrastructure. However, they are inadequate for the purpose of program assessment because there is a lack of focus on the distinction between the control variables and treatment variables and further differentiation of various treatment variables – federal/state policy, institutional context, institutional practice, and program interventions.

Building upon the value-added model with two types of school effects (Raudenbush, 2004; Raudenbush & Willms, 1995), we established a conceptual and analytical framework consisting of three types of models, which are constructed upon four types of data elements: Y, S, C, P.

Predictive Model: Y_{ijkt1} ($S_{i\,t0}$, $C_{jk\,t0}$, $P_{jk\,t0}$, Y_{ijt0}, e_{ij})

Assessment Model (student perspective): Y_{ij} (S_i, jk, e_{ij})

Assessment Model (evaluator perspective): Y_{ij} (S_i, C_{jk}, P_{jk}, e_{ij})

Y: student outcomes (e.g., academic persistence, learning performance, etc.)
i: student
j: institution
k: program
t: time period
S: student characteristics (e.g., pre-entry academic preparation, etc.)
C: context (out of institution/program control)

P: practice (under institution/program control)
e: error

Predictive Model

- Tinto-type models, which focus on identifying predictors of student persistence outcomes
- Statistical design: the analytical goal is to optimize the accuracy of predicted outcome of individual students in a particular period in time. Therefore, the outcomes from previous periods are strong predictors that should be included in the models.

Assessment Model (student/advisor perspective)

- Focus: combined effects of context and practice
- The difference between student i's potential outcome in institution j (program k) and an alternative institution (program)
- Ideal design: students are assigned randomly to schools (programs)
- Statistical design: the analytical goal is to identify the aggregate effects of both contexts and practice on students' outcome because the audience (parents and students) are indifferent regarding the relative contribution of context and practice. However, student differences in terms of academic and socioeconomic capital need to be statistically controlled for in order to provide unbiased advice to individual students regarding their institution/program choices.

Assessment Model (evaluator/practitioner perspective)

- Focus: the difference between student i's potential outcome in institution j (program k) when practice P_{jk} is in operation and the same student's potential outcome in the same institution (program) when an alternative practice P'_{jk} is in operation
- Ideal design: institutions (programs) are assigned randomly to alternative practices
- Statistical design: the analytical goal is to identify the effects of institutional (program) practices on student outcome. Whether the audiences' purpose is accountability or improvement, variables that are beyond institutional (program) control need to be statistically controlled for. Different from the predictive model, intermediate outcomes that are under influence of the practices should be excluded from the model to avoid overcontrol and downward bias.

These three models are simplified versions that serve as prototypes of many model variations. For example, when program effects are studied from the evaluator/practitioner perspective, differential effects on different subgroups of students are often expected and need to be analyzed with models that examine interactions between student characteristics and program interventions.

Illustrations

To ground the perspective in practice, the presenters will draw from their experiences as the analytical team of a series of institution-initiated and Lumina-funded student success projects that involve multiple institutions (UTEP, EPCC, TAMIU, and PVAMU) and multiple professions (IR, student affairs, and academic affairs) to collaboratively enhance their organizational intelligence in support of student success and institutional improvement. More specifically, they will draw from real processes, data, and findings to illustrate how their data collection and analytical efforts are driven by institutional missions and to highlight the methodological implications of using the same knowledge infrastructure to serve the dual purposes of promoting student success and supporting program assessment.

First, the presenters will offer the following dynamic and iterative view of the IR functions in support of building a learning organization (Howard, 2001; Koshy, 2010; McLaughlin, 1998). This view provides the organizational anchor for the more specific task of building student success knowledge infrastructures to integrate the support for both assessments and student needs.

- Data management (data retrieval, integration, validation, updating, documentation, and security, as guided by information needs to support decision making)
  - What are worth measuring and what are measurable?
  - How to obtain the data efficiently and properly?

- Reporting (accuracy, timely, relevant, and user friendly, e.g., real-time online reporting tools)
  - What have happened? (Some IR offices may have time lags in fact finding.)
  - What are happening? (IR offices with greater capacity can achieve real-time fact finding.)

- Analytics: projection/prediction models
  - What will happen if the trend continues?

- Analytics: explanatory/assessment models
  - Why have things happened the way they have? What factors are the major contributors?

- Optimization: “what if” analysis
  - What may have happened or would happen if some of the predictive factors are changed through institutional policies and actions?
  - To achieve certain goals, what options are available (including inaction), what pros and cons should be considered, and which ones are more cost-effective?

- Actions: evidence-supported policies and practices

- Communication of the insights to practitioners to support decisions and practices at all levels

- Evaluation of the action impacts: assessment models
  - Have the actions achieved the effects as expected? What explains the differences in real outcomes and expected outcomes?

- Circle back to data, reporting, analytics, actions, and evaluation, with adaptations based on prior knowledge and changes in organizational environment and resources.

Next, the presenters will provide a template of program inventory that have been developed to collect information of existing programs that are either designed to promote student success or are expected to have impacts on student success.

Name of the Program	
Department	Name of department overseeing the program
Purpose	What is the overall purpose of the program?
Students Targeted	Who is the program intended to impact?
Annual # of Students Served	How many students are served by the program each school year?
Components	What activities comprise the program?
Objectives	What does the program intend to do?
Intended Outcomes	How will the objectives be met?
Years in Effect	How long has the program been in effect?
Impact Measure	What institutional priorities will this program address?
Notes for Analysis	How might we measure effectiveness at the institutional level? What data would be needed? Any ideas for analyses? Any ideas for an appropriate control or comparison group?
Status of Evaluation	What is the status of the program's evaluation and inventory?
Summary	Results; presented as available

Last, the presenters will use the following analytical examples to illustrate how to address program assessment needs as an embedded component of the knowledge infrastructure.

- Assessment of the impacts of an undergraduate research program based on student propensity scores
- Program cost-effectiveness assessment based on estimated effects of failing a course on student departure

- Assessment of aggregated and differential impacts of a group of student intervention programs

Some of the key points from the framework section will be reemphasized during the discussion of the practical examples. For example, analytical decisions are closely aligned with institutional mission. The joint missions of "access and excellence" dictate that findings will not be used to support exclusive admissions policies. Students' pre-entry characteristics are conceptually identified as "control variables" instead of "intervention variables." In other words, the inclusion of these variables in the models is intended to reach a better understanding of intervention variables and to provide better measures of value-added by the institution and by specific programs. Model specification decisions are also closely aligned with the intended audience. For example, to support "early alert" systems that help channel attention to students who need help, prediction precision need to be optimized so that all strong predictors of student persistence, including academic performance indicators, are included in the predictive models. However, when the purpose is to assess program impact, performance variables are removed from the model to avoid over control and biased estimates of program effects. In addition, alternative statistical models will be described to show how decisions on model selections are guided by mission and purpose. For example, event history analyses that estimate students' term-specific odds of departure are used to support advising programs because individual students are the focus whereas the estimates of cumulative incidence functions serve the purpose of assessing program effects on educational attainment (Allison, 1984, 1995; DesJardins, Ahlburg, & McCall, 1999, 2002; Johnson, 2006).

Conclusion

The participants will walk away with the vision of a learning organization where iterative loops of organizational intelligence and informed actions are sustained to promote student success and institutional success simultaneously. Equipped with a road map toward this vision, the participants will achieve enhanced confidence and appreciation of the IR role in bridging the gap between data and insights as well as fostering collaborative communities among higher education professionals who are often separated by bureaucratic and knowledge boundaries.

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Tracks

This presentation is relevant to three tracks – analysis, assessment, and students.

Analysis: Research Methods and Data Analysis (primary track)

The Analysis Track focuses on research methods, experimental design, survey techniques and response rates, and analytic methods (both qualitative and quantitative) that produce sound analyses for decision making. The use of national datasets or consortia data is included as well. The emphasis of this track is on the tool, methods, or sources used to arrive at a result, with the result itself of secondary importance.

Assessment: Accountability, Institutional Effectiveness, and Accreditation (secondary)

The Assessment Track encompasses the development and measurement of student learning outcomes, general education and academic program assessment studies, assessments of co-curricular offerings, analyses undertaken for accreditation review, strategic planning assessment, and the ties between assessment results and measuring institutional effectiveness.

Students: Enrollment and Experience (secondary)

The Students Track includes studies of enrollment management, retention/graduation, student engagement, transfer, student and alumni satisfaction, demand for majors and programs, and co-curricular activities. Studies focusing on student financial aid practices and findings are included as well.