Mining Data for Student Success

Dr. Henry DeVries
Ellucian
September 25, 2015
BUGMI
Session Rules of Etiquette

Please turn off your cell phone/pager
If you must leave the session early, please do so as discreetly as possible
Please avoid side conversation during the session

Thank you for your cooperation!
Introduction
About Me…

Henry DeVries

• Management Consultant, Principal
  Targeted services for Business Analytics

• Ph.D. Cornell University
  40 years in higher education

• Faculty member, administrator, researcher
  o 16 years as CIO at Calvin College in Grand Rapids, MI
  o 13 years (concurrently) as CFO
  o Active in NACUBO, CACUBO, EDUCAUSE, CCCU
Student Success is a common phrase on our campuses…
This session is intended to help you –

• Understand what “student success” means to our student services colleagues
• Give you a “big picture” perspective on the connection between student success and IT
• Consider how student data and analytical tools can work together to support student success
• Learn about some current examples where BI tools play a role in student success.
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<th>Agenda</th>
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<td>How Can Business Intelligence Help You Address Student Success?</td>
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The Higher Ed Environment
NC Community Colleges Unveil New Gauges of Performance

In a report released on Wednesday, the North Carolina Community College System unveiled its “Performance Measures for Student Success,” detailing how its 58 campuses are performing in their students’ GED-passage rates, graduation rates, transfer success, and five other areas.

Colleges Need Metrics to Measure Student Success - NY Times 10/18/2013

More than half of all recent graduates are unemployed or in jobs that do not require a degree, and the amount of student-loan debt carried by households has more than quintupled since 1999 – Newsweek 9/9/2012

Rising Debt Engulfs Colleges as Well as Students -- Chronicle of Higher Ed 08/26/2103

College leaders Strive for Performance Measures that fit their Institutions – Chronicle of Higher Ed 7/10/2013
The President has also set a new goal for the country that: that by 2020, America would once again have the highest proportion of college graduates in the world.
Helping Middle Class Families Afford College

American is home to the best colleges and universities in the world — and increasing college attainment has never been more important to our economic competitiveness — yet tuition and fees have skyrocketed over the past decade, making it more difficult for American families to invest in a higher education for their future. Today’s college students borrow and rack up more debt than ever before. In 2010, graduates who took out loans left college owing an average of more than $26,000. Student loan debt has now surpassed credit card debt for the first time ever.

Keeping Costs Down

The President is calling on Congress to advance new reforms to give more hard working students a fair shot at pursuing higher education, because education is not a luxury. It is an economic imperative that every hard working and responsible student should be able to afford. President Obama has emphasized that the federal government, states, colleges, and universities all have a role to play in making higher education more affordable, by rein in college costs, providing value for American families, and preparing students with a solid education to succeed in their careers.

Strengthening Community Colleges

The President has placed a strong emphasis on making America’s community colleges stronger, ensuring that they are gateways to economic prosperity and educational opportunities for millions of Americans each year. Each year, over 1,100 community colleges provide students and workers with critical skills to succeed in a 21st century economy. To help reach the President’s college attainment goal, the Obama Administration has called for an additional 5 million graduates from community colleges by 2020. Working in partnership with states and communities, community colleges are well suited to promote the dual goal of academic and on-the-job preparedness for the next generation of American workers.

Improving Transparency and Accountability

President Obama has consistently strived to lead the most open, efficient and accountable government in history. Over the last two years, new initiatives have increased public participation in government, opened up new information to Americans on a variety of topics, and improved citizens’ everyday lives. In the vein of transparency and accountability, the President tasked his Administration with giving students and families new tools and relevant information that will help them make sound financial decisions in pursuing their higher education goals.
EDUCAUSE Top-Ten IT Issues, 2014: “Be the Change You Can See”

1. Improving student outcomes through an institutional approach that strategically leverages technology
3. Assisting faculty with the instructional integration of information technology
5. Using analytics to help drive critical institutional outcomes
9. Determining the role of online learning and developing a strategy for that role
Defining Student Success
Three Questions

1. What constitutes postsecondary student success? (definition or description)
2. How do postsecondary institutions promote student success? (processes, activities)
3. How can student success be measured or assessed? (evidence)

-- Student Success: Definition, Outcomes, Principles and Practices, Joe Cuseo
Student success is more than just moving the needle on persistence ("retention") and attainment ("graduation"), although those concepts are probably the most commonly understood definitions.

Also considers the concepts of
-- holistic development
-- academic achievement
-- student advancement
Issue #1. Improving student outcomes through an institutional approach that strategically leverages technology

Two approaches that leverage technology:

- Learning analytics and automated advising tools -- to increase retention and graduation rates
- Delivering and shaping the learning environment -- to better match our students learning preferences
### Summary Table: National First- to Second-Year Retention Rates by Institutional Type

<table>
<thead>
<tr>
<th>Degree Level/Control</th>
<th>N</th>
<th>Mean (%)</th>
<th>SD*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-year Public</td>
<td>647</td>
<td>54.9</td>
<td>11.6</td>
</tr>
<tr>
<td>Two-year Private</td>
<td>50</td>
<td>64.3</td>
<td>22.5</td>
</tr>
<tr>
<td>BA/BS Public</td>
<td>80</td>
<td>64.2</td>
<td>14.1</td>
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<tr>
<td>BA/BS Private</td>
<td>249</td>
<td>69.8</td>
<td>18.8</td>
</tr>
<tr>
<td>MA/MS/MBA/1st Professional Public</td>
<td>174</td>
<td>68.4</td>
<td>12.3</td>
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<tr>
<td>MA/MS/MBA/1st Professional Private</td>
<td>401</td>
<td>73.2</td>
<td>13.5</td>
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<tr>
<td>PhD Public</td>
<td>233</td>
<td>77.9</td>
<td>11.9</td>
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<tr>
<td>PhD Private</td>
<td>254</td>
<td>80.9</td>
<td>11.9</td>
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<tr>
<td><strong>Total</strong></td>
<td>2,088</td>
<td><strong>67.6</strong></td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: ACT Institutional Data File, 2014

### Summary Table: National Persistence to Degree* Rates by Institutional Type

<table>
<thead>
<tr>
<th>Degree Level/Control</th>
<th>N</th>
<th>Mean (%)</th>
<th>SD*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-year Public</td>
<td>326</td>
<td>21.9</td>
<td>15.1</td>
</tr>
<tr>
<td>Two-year Private</td>
<td>19</td>
<td>43.7</td>
<td>32.6</td>
</tr>
<tr>
<td>BA/BS Public</td>
<td>51</td>
<td>36.5</td>
<td>23.5</td>
</tr>
<tr>
<td>BA/BS Private</td>
<td>150</td>
<td>56.7</td>
<td>24.8</td>
</tr>
<tr>
<td>MA/1st Professional Public</td>
<td>148</td>
<td>38.8</td>
<td>17.3</td>
</tr>
<tr>
<td>MA/1st Professional Private</td>
<td>315</td>
<td>54.5</td>
<td>16.5</td>
</tr>
<tr>
<td>PhD Public</td>
<td>213</td>
<td>49.7</td>
<td>17.6</td>
</tr>
<tr>
<td>PhD Private</td>
<td>223</td>
<td>52.4</td>
<td>17.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,445</td>
<td><strong>45.5</strong></td>
<td>NA</td>
</tr>
</tbody>
</table>

*Completion in three years for associate's degree; five years for BA/BS

Source: ACT Institutional Data File, 2014
“At a time when the value and cost of higher education are being challenged, we do need to think in new ways about what determines a valuable education…”

“Universities need to focus on what is learned and what that insight and experience contribute to society. It’s not what students bring to the university; it’s what they leave with that’s important.”

- Alice P. Gast - President, Lehigh University
- *Colleges Need Metrics to Measure Student Success* NY Times 10/18/2013
Agreement that graduates/new hires are adequately prepared

% of respondents

<table>
<thead>
<tr>
<th></th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employers¹</td>
<td>42</td>
</tr>
<tr>
<td>Providers²</td>
<td>72</td>
</tr>
<tr>
<td>Youth³</td>
<td>45</td>
</tr>
</tbody>
</table>

*Education to employment: Designing a system that works: McKinsey & Company, 2012*
Promoting Success: Identification, and Follow-up

It's not enough to identify students at risk. To be successful, we need to ensure follow-through, so that students are provided the support they need in order to remediate problems and connect with the resources they need to succeed."

— Morris Beverage, Jr., President, Lakeland Community College

EDUCAUSE Top Ten IT Issues: 2013
Promoting Success: Engagement

Student Engagement / Community Engagement / Campus Engagement

Identifying and finding the right connection with at-risk students
In the learning environment – classroom, faculty office-hours, LMS
Outside the ‘classroom’ – advising, residence life, athletics, campus life
That Brings us to Student Data…

What data do we have?
What data do we need?
What can the data tell us about how things are going now, and why?
What else can we learn from the data based on what we already know?
Common Uses of Student Data
Tactical – Operational Reporting and Queries

Reports on what it happening, transactions
• Class enrollment
• Student grades
• Financial reporting
• Student accounts
• Gifts and donations

Standard reports and ad-hoc queries
These types of reports often generate lots of data that requires further analysis
Statewide System Reports

In its commitment to increase transfer and degree and certificate attainment, the California Community Colleges Board of Governors has established a performance measurement system that tracks student success at all 112 community colleges.

This scorecard represents an unprecedented level of transparency and accountability on student progress and success metrics in public higher education in the United States. The data available in this scorecard tell how well colleges are doing in remedial instruction, job training programs, retention of students and graduation and completion rates.

With data reported by gender, age and ethnicity, colleges, students and the public can also better determine if colleges are narrowing achievement gaps, which is vitally important for our students and our state’s economy.

Please contact us at scorecard@cccco.edu if you have questions about the data or documentation used to develop the Student Success Scorecard.
Affordability and “fit”
Public “right to know”
Enrollment, financial aid, pricing and tuition
Core retention, graduation, placement data
Strategic – Institutional Effectiveness and Improvement

Dashboards, Scorecards, and other **evaluative** data

Key Performance Indicators (KPIs) -- used to evaluate the success of a particular activity or goal of an organization

Performance Management -- use of institutional data to illustrate institutional **effectiveness** and institutional **success**
Performance Management

The GRAD Act was approved by the legislature and signed into law by Governor Bobby Jindal in June, 2010.

As a result, the Board of Regents has entered into six-year performance agreements with each of the participating institutions. In the agreements, the institution commits to meeting specific performance objectives in exchange for increased tuition authority and eligibility to participate in certain autonomies. Read more
NCCCS’s 8 Measures (KPIs)

1. Basic Skills Student Progress
2. GED Diploma Passing Rate
3. Developmental Student Success Rate in College-Level English Courses
4. Developmental Student Success Rate in College-Level Math Courses
5. First Year Progression
6. Curriculum Completion
7. Licensure and Certification Passing Rate
8. College Transfer Performance
## July 2013 Performance Summary

<table>
<thead>
<tr>
<th></th>
<th>A. BASIC SKILLS PROGRESS</th>
<th>B. GED PASS RATE</th>
<th>C. DEV ENG SUBSEQ SUCCESS</th>
<th>D. DEV MATH SUBSEQ SUCCESS</th>
<th>E. YEAR ONE PROGRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System Goal</strong></td>
<td>51.2%</td>
<td>82.0%</td>
<td>74.9%</td>
<td>75.4%</td>
<td>74.6%</td>
</tr>
<tr>
<td><strong>System Baseline</strong></td>
<td>20.6%</td>
<td>49.3%</td>
<td>45.2%</td>
<td>47.5%</td>
<td>53.2%</td>
</tr>
<tr>
<td><strong>Average College Percentage</strong></td>
<td>41.0%</td>
<td>71.1%</td>
<td>63.7%</td>
<td>64.8%</td>
<td>67.8%</td>
</tr>
<tr>
<td><strong>System Totals</strong> (All Students)</td>
<td>41.5%</td>
<td>69.6%</td>
<td>64.5%</td>
<td>64.1%</td>
<td>67.8%</td>
</tr>
<tr>
<td>Alamance CC</td>
<td>30.8%</td>
<td>72.9%</td>
<td>66.9%</td>
<td>62.9%</td>
<td>69.0%</td>
</tr>
<tr>
<td>Asheville-Buncombe TCC</td>
<td>39.6%</td>
<td>53.7%</td>
<td>61.3%</td>
<td>65.4%</td>
<td>71.6%</td>
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<tr>
<td>Beaufort County CC</td>
<td>38.2%</td>
<td>82.5%</td>
<td>65.4%</td>
<td>51.3%</td>
<td>60.3%</td>
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<tr>
<td>Bladen CC</td>
<td>45.1%</td>
<td>63.4%</td>
<td>52.1%</td>
<td>61.0%</td>
<td>53.8%</td>
</tr>
<tr>
<td>Blue Ridge CC</td>
<td>36.0%</td>
<td>65.6%</td>
<td>70.6%</td>
<td>77.9%</td>
<td>75.2%</td>
</tr>
<tr>
<td>Brunswick CC</td>
<td>46.6%</td>
<td>36.9%</td>
<td>73.8%</td>
<td>59.6%</td>
<td>72.1%</td>
</tr>
<tr>
<td>Caldwell CC &amp; TI</td>
<td>41.7%</td>
<td>65.5%</td>
<td>65.3%</td>
<td>71.8%</td>
<td>68.2%</td>
</tr>
<tr>
<td>Cape Fear CC</td>
<td>30.6%</td>
<td>79.2%</td>
<td>63.5%</td>
<td>59.3%</td>
<td>72.0%</td>
</tr>
<tr>
<td>Carteret CC</td>
<td>27.4%</td>
<td>91.9%</td>
<td>71.9%</td>
<td>68.1%</td>
<td>68.7%</td>
</tr>
<tr>
<td>Catawba Valley CC</td>
<td>36.9%</td>
<td>67.6%</td>
<td>75.0%</td>
<td>56.3%</td>
<td>69.7%</td>
</tr>
<tr>
<td>Central Carolina CC</td>
<td>55.2%</td>
<td>69.1%</td>
<td>60.6%</td>
<td>70.8%</td>
<td>65.3%</td>
</tr>
<tr>
<td>Central Piedmont CC</td>
<td>49.8%</td>
<td>75.1%</td>
<td>77.8%</td>
<td>71.5%</td>
<td>70.4%</td>
</tr>
<tr>
<td>Cleveland CC</td>
<td>59.8%</td>
<td>73.9%</td>
<td>73.4%</td>
<td>68.9%</td>
<td>64.4%</td>
</tr>
</tbody>
</table>
Impacts to date

Lots of data collection vs. significant unused data; mostly quantitative data

Credentialing and reporting focus vs. strategic questions – in most cases

- Performance-based funding, and performance metrics, are gaining importance
- Some headway in analytics for enrollment management, student progress
Data Mining and Analytics
You know this and experience it regularly:

- Amazon / Google / Facebook / Social Media targeting
- Pandora Internet Radio
- Coupons at the grocery store
“Practically speaking, at almost any higher ed institution, everything every student does now is being recorded, including his or her activities, assignments, and performance. So at its heart, data-driven intelligence generated by analytics can help improve the student experience.”

- IBM “Building a Smarter Campus”
Two Relevant Dimensions of Data Analysis

Predictive analysis --
Based on what’s already happened, what’s going to happen next?

Prescriptive analysis --
In light of what we believe is going to happen, here are recommendations on how to best respond.

…allow educational decision-makers to detect patterns that exist within the masses of data, project potential outcomes, and make intelligent decisions
Not a new phenomenon....
Purdue U. Software Prompts Students to Study—and Graduate
– CHE, 09/26/2013

Signals Project @ Purdue University

• Course Signals, a data-mining and analysis program, keeps track of how students approach class work.
• The data gathered since 2007…confirm what he [Pistilli] has heard from students: The software helps them stay on track with their classes.
• Improved retention and graduation rates…
  e.g., 1 Signals course resulted in a 20.9% increase in the 6-yr graduation rate
RioPACE - Progress And Course Engagement
Began in 2009 -- early intervention pilot for students at-risk of not achieving a grade of “C” or better in their college course.
…by tracking student behaviors, such as how often they log in
…those at risk of failure are offered extra help right away.
3 Questions

Which factors are effective as early/point-in-time predictors of successful course outcome* in an online environment?

Can we predict course outcomes using data retrieved from our SIS and LMS? If so, can we generate early and/or rolling (i.e. daily) predictions?

How do we respond to students flagged as at-risk?

* Successful = ‘C’ grade or higher.
Multi-faceted Response -- RioPACE
How can Business Analytics Help you Address Student Success?
Some of the data comes from usual sources…

“Real-time” academic data
from the course management system

Institutional data
placement tests, historical data

Admissions data
standardized test scores, HS grades, etc.
And some the data is coming from different sources...

University of North Georgia –
Using “card swipe” data to collect student participation data

- [http://blog.lib.umn.edu/ldss/](http://blog.lib.umn.edu/ldss/)
- [http://www.usg.edu/educational_access/documents/University_of_North_Georgia_-_Capturing_Student_Services_Data.pdf](http://www.usg.edu/educational_access/documents/University_of_North_Georgia_-_Capturing_Student_Services_Data.pdf)

Riverside CCCD

- MIS files / student success metrics
Logical Progression to the Questions that BA addresses

What happened?  
Why did it happen?  
What’s happening/trending now?  
What do we think will happen?  
What do we want to happen?

Descriptive analytics  
Diagnostic analytics  
Trend Analytics  
Predictive Analytics  
Prescriptive Analytics
BA Maturity in Higher Education

Data Sophistication & Institutional Value

Business Analytics Maturity

EDW

EDW + Statistical

PREDICTING
What do we THINK
will happen?

MONITORING
WHAT is trending
NOW?

ANALYZING
WHY did it happen?

INFORMING
WHAT happened?

ERP

ODS

Increase in ad hoc reporting and Information on demand

Managed Reporting

Ad Hoc Reporting & Queries

Operational Dashboards

Scorecards, KPIs & Benchmarking

Predictive Analytics

Managed Reporting

PM

OPTIMIZING
What do we WANT
to happen?

Ability to model, manage, and adapt

Data-driven planning and forecasting

Dashboards for managers and analysts

Primarily batch and some ad hoc reports

Increase in ad hoc reporting and Information on demand

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What Else Happens with Business Analytics Evolution?

Data **volume** grows
Number of **users** grows
Depth of **analysis** grows
Query **complexity** grows
Need to **visualize** grows
**Expectations** grow

We hope that:
**Data-driven decision-making** grows
Student Success Requires A Fresh look at Business Analytics

A new approach to research and data analysis for higher education,

- Descriptive, inferential, exploratory research techniques
- “Data snooping” i.e., pattern recognition

Unit-level analytics vs. Institutional-level statistical research

“You know your data better than anybody else. Let’s give you the skills you need to be an analyst, to go grab your own data, to create your own reports, and do those instantaneously when you need them and for what you need.” - David Wright, WSU
The PAR Framework applies descriptive, inferential, and predictive analytical data mining techniques to a single, federated dataset to better gauge risks and implement interventions that remove barriers to student success.

www.parframework.org
Multi-institutional, data-mining collaborative

- Twenty institutions (2-yr, 4-yr, public, private)
- 1,800,000 anonymized student records
- 8,100,000 institutionally de-identified course level records

Provides a unique multi-institutional lens:

- To better understand the variables affecting student loss and student momentum
- Find effective practices that improve student retention
The PAR Framework

Blueprint for Student Success incorporates a multi-dimensional structure, with tools to:

• Predict academic risk for the student
• Assess institutional readiness to support students
• Align student supports at the points of greatest need

Built on common data definitions
• https://community.datacookbook.com/public/institutions/par
Efficiencies, Learning Outcomes Bolstered by Analytics, Data-Informed Decision Making
-- EDUCAUSE review online; July 18, 2012

Key Takeaways:

• Using various tools to investigate trends in areas such as enrollment, learning outcomes, and student engagement.

• Demonstrated success in course scheduling, curriculum re-design, and selection of new course offerings and degrees

Take Home Points

• Student Success is a major concern in HE today
• Data mining is common practice in many venues, and is becoming increasingly important in higher education
• Predictive analytics can be a valuable factor in making decisions about effective student interventions, programs and services
• Appropriate use of student data is outcomes-focused and can influence student engagement and success
• Many tools, including BI, exist to support your efforts
Questions & Answers
Thank you!

Dr. Henry DeVries

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616-560-5477