Predictive Models Based on Behavioral Patterns in .edu

What We’ve Been Learning From the PAR Framework

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Ten Years from Now, When We Look Back at How This Era of Big Data Evolved...

We Will Be Stunned at How Uninformed We Used to Be When We Made Decisions

– Billy Bosworth, DataStax CEO (2015)
From Hindsight to Foresight
While “Big Data” raise expectations, student data drive big decisions in .edu
Are You “Scorecard-Ready”?

http://collegecost.ed.gov/
Performance Based Funding and US Post-Secondary Institutions

The US college completion problem

Graduation rates at 150% of time

Source: New York Times; NCES
So – How are we doing?

• The president’s ambitious goal of being 1st in the world by 2020 looks unachievable.

• While the national college-graduation rate has climbed to 44 percent, the gulf between the United States and other nations remains wide, and the target is moving.

• How are we doing? We have moved up from 12th place into a tie for 11th place

  [link](http://chronicle.com/article/6-Years-in-6-to-Go-Only/151303/)

• Meanwhile, US Ed Tech companies hit paydirt in 2014, raising 1.36 Billion in 201 rounds of funding with more than 386 unique investors.

  [link](https://www.edsurge.com/n/2014-12-23-2014-us-edtech-funding-hits-1-36b)
INNOVATION:

A TECHNOLOGY TRIGGER?

OR

NOVEL SOLUTION TO WICKED PROBLEMS?
Driving student success via Analytics, Interventions, Measurement, and Benchmarks
PAR Framework

• Collaborative, member-driven, non-profit analytics as a service provider.

• Comprehensive approach to student success
  – Cross institutional benchmarks
  – Institutional specific predictive models
  – Individual student-level watch lists for retention & academic success
  – Actionable framework for understanding campus intervention programs and measuring efficacy
A massive, commonly defined dataset for analytics

- More than 2,500 downloads of PAR data definitions
- > 2.4 million students and >25 million student courses in the PAR data warehouse, in a single federated data set, developed using common data definitions.
- 351 unique campuses
- 77 discrete variables are available for each student record in the data set. Additional 2 dozen constructed variables used to explore specific dimensions and promising patterns of risk and retention.
PAR Differentiators

• PAR open frameworks
• Massive dataset for analytics
• Community of practice and research, with a focus on research outcomes
• Market validated and member driven institutional intelligence tools
Game Changer:
Common Data Definitions
Common Data Elements

Difficult to define data variables

- What is a passing grade?
- What is a term?
- What is retention?

<table>
<thead>
<tr>
<th>Student Demographics &amp; Descriptive</th>
<th>Student Course Information</th>
<th>Course Catalog</th>
<th>Lookup Tables</th>
<th>Student Financial Information</th>
<th>Student Academic Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Course Location</td>
<td>Subject</td>
<td>Credential Types Offered</td>
<td>FAFSA on File – Date</td>
<td>Current Major/CIP</td>
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<tr>
<td>Race</td>
<td>Subject</td>
<td>Course Number</td>
<td>Course Enrollment Periods</td>
<td>Pell Received/Awarded – Date</td>
<td>Earned Credential/CIP</td>
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<tr>
<td>Prior Credits</td>
<td>Section</td>
<td>Subject Long</td>
<td>Student Types</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perm Res Zip Code</td>
<td>Start/End Dates</td>
<td>Course Title</td>
<td>Instructor Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS Information</td>
<td>Initial/Final Grade</td>
<td>Course Description</td>
<td>Delivery Modes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer GPA</td>
<td>Delivery Mode</td>
<td>Credit Range</td>
<td>Grade Codes</td>
<td></td>
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</tr>
<tr>
<td>Student Type</td>
<td>Instructor Status</td>
<td></td>
<td>Institution Characteristics</td>
<td></td>
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</tr>
</tbody>
</table>

New Features Planned for 2015-16

- Placement Tests
- Admission/Application Data
- College Readiness Surveys
- LMS Data
- Satisfaction Surveys
- Intervention Measures
Common Framework for Examining Interventions

<table>
<thead>
<tr>
<th>PREDICTOR CATEGORY</th>
<th>CONNECTION</th>
<th>ENTRY</th>
<th>PROGRESS</th>
<th>COMPLETION</th>
</tr>
</thead>
<tbody>
<tr>
<td>italics = research literature</td>
<td>application to enrollment (advising to enrollment)</td>
<td>completion of gatekeeper courses (beginning of class)</td>
<td>entry into program to 75% of classes complete (middle of class)</td>
<td>of course of study &amp; credential w/ market value (end of class)</td>
</tr>
<tr>
<td>regular = partner experience</td>
<td>bold = PAR Framework findings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>—limited list of predictors below each category—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEARNER CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>prior GPA; achievement beliefs; content knowledge &amp; skills; ... 1st time in college</td>
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<tr>
<td>LEARNER BEHAVIORS</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>attendance/leg ins; participation in orientation programs; withdrawals; ... engagement</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>ACADEMIC INTEGRATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>participation in student learning communities; peer mentoring; ... specialized program coordinators</td>
<td></td>
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</tr>
<tr>
<td>SOCIAL/PSYCHOLOGICAL INTEGRATION</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>perceived social presence; participation in freshmen interest groups; ... specialized program coordinators</td>
<td></td>
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</tr>
<tr>
<td>OTHER LEARNER SUPPORT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ongoing student support services...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COURSE/PROGRAM CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>perceived interactivity; ...perceived utility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSTRUCTOR BEHAVIORS/CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>faculty responsiveness; ...perceived social presence</td>
<td></td>
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</tr>
</tbody>
</table>
PAR Puts it All Together

• Determine students probability of failure (predictions)
• Determine which students respond to interventions (uplift modeling)
• Determine which interventions are most effective (explanatory modeling)
• Allocate resources accordingly (cost benefit analysis)
PAR Framework Benefits to Members

- **STUDENT SUCCESS PROGRAMS THAT WORK**
  Take the guesswork out of finding which students are at risk and why, and learn how to successfully respond.

- **INTERVENTION PORTFOLIO MANAGEMENT**
  Identify gaps and overlaps in intervention strategies for specific student segments, for an entire campus, comparison to peers.

- **INSTITUTIONAL ROI**
  Evaluate the cost and benefit of myriad student success programs to eliminate redundancy and operate sustainably.

- **BEST-IN-CLASS COLLABORATION**
  Work with peer institutions to collaborate on what programs work best, enabling rapid scale of interventions that work.
Gartner Research on the PAR Framework, July 2014

... In this complex endeavor we recommend a “learning by doing” approach and joining or at least studying the PAR Framework project experience. This is the most advanced openly available information in higher education to our knowledge.”

Reflections on 4 Years in the Learner Analytics Trenches

• In .edu, big data *may* be in our future, but we also need to leverage little and medium data to help drive better decision-making.

• Common data definitions are a game changer for scalable, generalizable, repeatable learner analytics.

• Predictions are of greater institutional value when tied to treatments and interventions for improvement, and intervention measurement to make sure results are being delivered.
Reflections on 4 Years in the Learner Analytics Trenches

• Infrastructure matters, but EXOSTRUCTURE matters more.

• Scale requires reliable, generalizable outcomes and measures that can be replicated in a variety of settings with a minimal amount of customization. In the case of PAR, common definitions and look-up tables served as a “Rosetta Stone” of student success data, making it possible for project to talk to one another between and within projects.

• Using commercial software stacks already in place on campuses and data exchanges to extend interoperability with other IPAS systems extends value and utility of tech investments.
Reflections on 4 Years in the Learner Analytics Trenches

• Change happens when fueled by collaboration, transparency and trust.

• Data needs to matter to everyone on campus. While data professionals will be needed to help construct new modeling techniques, ALL members of the higher education community are going to need to “up their game” when it come to being fluent with data-driven decision-making, from advisors to faculty to administrative staff to students.

• It takes all of us working together toward the same goal in our own unique ways to make the difference.
Scaling what’s working at each college

David Yaskin
Sr. VP, Student Success, Hobsons;  
Founder, Starfish Retention Solutions
Student Services: 5-12% of Institutional Budget
### Vendor Landscape

<table>
<thead>
<tr>
<th>LMS</th>
<th>SIS &amp; DEGREE AUDIT</th>
<th>STUDENT SERVICES TECH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard +</td>
<td>Ellucian =</td>
<td>RedRock *=</td>
</tr>
<tr>
<td>Brightspace by D2L +</td>
<td>PeopleSoft =</td>
<td>Gradesfirst =</td>
</tr>
<tr>
<td>Canvas +</td>
<td>Jenzabar =</td>
<td></td>
</tr>
<tr>
<td>Pearson eCollege +</td>
<td>Campus Management =</td>
<td></td>
</tr>
<tr>
<td>Remote-Learner +</td>
<td>College Source *</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASSESSMENT</th>
<th>ANALYTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mapworks</td>
<td>Civitas Learning +</td>
</tr>
<tr>
<td>Noel-Levitz +</td>
<td>EAB *</td>
</tr>
<tr>
<td>ETS +, ACT, Campus Labs</td>
<td>PAR +</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PUBLISHERS</th>
<th>STUDENT SERVICES</th>
<th>CALL CENTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson MyLabsPlus +</td>
<td>Pearson Smarthinking +</td>
<td>Blackboard +</td>
</tr>
<tr>
<td>McGraw Hill</td>
<td>Ever Fi</td>
<td>Ruffalo Cody *</td>
</tr>
<tr>
<td>Cengage</td>
<td>Inside Track</td>
<td>Greenwood &amp; Hall +</td>
</tr>
<tr>
<td></td>
<td>Student Resources Svcs +</td>
<td></td>
</tr>
</tbody>
</table>

+ Current Partner  * Working on Partnership  = Success obtaining data/working together
Creating Student-Centric Action

LMS:
- Blackboard
- Brightspace by D2L
- Canvas
- Moodle
- Sakai
- eCollege

SIS:
- Banner/Colleague by Ellucian
- Peoplesoft
- Jenzabar
- Campus Management

Starfish:
- Appointments Tool
- Attendance Tool
- Kiosk Tool
- Custom Flags
- Notes Tool
- Progress Survey Tool

Others:
- AdvisorTrac/TutorTrac
- Civitas Learning
- Clickers
- DegreeWorks
- GradesFirst
- Hobsons
- Noel-Levitz
- Pearson MyLabsPlus
- Smarthinking

Starfish Intelligent Data Integration
Starfish® Enterprise Success Platform™

Learn More, Earlier, About Your Students
- Let both people and systems trigger alerts
- Faculty-friendly progress surveys
- Customize unlimited flags and Kudos

Make it Easy for Students to Engage
- Embedded services catalogues and kiosks
- Simple appointment tools that sync with calendars
- Capture notes, tasks, Referrals and Success Plans

Point Students in the Right Direction
- Deploy Academic Plans based on custom templates
- Show students the impact of their choices
- Track student’s changing goals and enrollments

Measure Your Efforts
- Leverage a leading business intelligence engine
- Extensive department-specific dashboards
- Automated report generation and delivery
Student View: What’s next for my success?

PAST DUE
- Create Academic Plan
  - Due 11/01/2014
  - 3 Days Past Due

TODAY
11/05/2014
- Tutoring Referral
  - Lab Skills Refresher
- Behavior Concern
  - Success Skills Seminar (SRV101)
  - Missed 2 class meetings
  - General Biology (BIO101)
- General Biology (BIO101)
  - Assignment Due: Chapter 6 Questions
  - Yasmin Gold
  - 300 Main Hall
- Appointment
  - Reason: Career Advice
  - Yasmin Gold

Recent Kudos
- Grade above 90
- Significant Progress
- Team Leader

System Announcement: Fall course approvals are required for registration and must be in by the end of the month.

Recent Kudos
- Tuition Due
  - Due 11/04/2014
  - 1 Days Past Due
- Attendance Concern
  - Missed 2 class meetings
  - General Biology (BIO101)
- Work Life Interfering
  - Raised on 11/04/2014 by Yasmin Gold
- Failed Assignment
  - Raised on 11/04/2014
  - Success Skills Seminar (SRV101)
- Visit Academic Advisor
  - Raised on 11/04/2014 by Yasmin Gold
Student View: Status and help, unique to each class
Executive view: Analysis of outcomes by cohort

6-Year Completion Rate

50%

Average Years to Completion
for students who complete

5.0 Years

Retention Over Six Years

Academic Outcomes

Average Cumulative GPA per Class Level

Overall Course Pass Rate
Executive view: Analysis of impact of initiatives: FYE

Select a Service: FYE

Overall Rate of Completion

- Entire Institution: 98%
- Supported Students: 97%

Time to Complete

- Institution: Average Years to Complete: 4.4
- Supported Students: Average Years to Complete: 4.4

Completion Over Time: Per FTIC Cohort

Completion Rate: Supported Students Over Time
2014: Starfish by the Numbers

4.5 million students
20% of US students
1.6m impacted directly

2.25 million flags raised on 676,000 students
1.15m flags raised by hand
873,000 kudos on 427,000 students
144,000 kudos on demand
136,000 referrals + to dos (follow ups)

1.52 million meetings arranged
855,000 for advising
409,000 for tutoring
63,000 for instructor office hours

3.7 million notes (excl. emails)
2m general notes
512,000 comments on appointments
156,900 flags cleared with notes
The Starfish Community: Diverse & Collaborative
## Case Studies

<table>
<thead>
<tr>
<th><strong>Northeast Wisconsin Technical College</strong></th>
<th><strong>Paul Smith’s College</strong></th>
<th><strong>Youngstown State University</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Year Public Technical College</td>
<td>Four Year Private College offering bachelors and associate degrees</td>
<td>Four Year Public, Open Access</td>
</tr>
<tr>
<td>Client since 2013</td>
<td>Client since 2009</td>
<td>Client since 2011</td>
</tr>
<tr>
<td>10,000 students</td>
<td>1,000 students</td>
<td>15,000 students</td>
</tr>
<tr>
<td>Starfish CONNECT™</td>
<td>Starfish CONNECT™</td>
<td>Starfish EARLY ALERT™ (charter)</td>
</tr>
</tbody>
</table>
  Starfish EARLY ALERT™                    | Starfish EARLY ALERT™    |                                 |
  Starfish ADVISING™                      | Starfish ADVISING™       |                                 |
  Starfish INSIGHT™ (charter)              |                         |                                 |

- Gateway course pass rates increased to 70.7% in 2013-2014 (up 7.6 percentage points since 2009-2010)
- 2014: +5% bachelors completion; +18% associate completion
- $4m more kept in 4 years
- In spring 2014, YSU undergraduates completed 85.2% of the courses they attempted, up from 78.4% in fall 2011

“Using the Starfish platform, employees across the College are increasingly able to record, share, and act upon information to improve student outcomes.”
- Lori Suddick, Vice President for Learning

“Our Comprehensive Student Support Program – powered by the Starfish system – has had a profound impact the success of our students.”
- John Mills, President

“The outreach initiatives from using the Starfish platform have truly impacted our students’ engagement with University resources and progress toward degree completion.”
- Ikram Khawaja, Interim President (2014)
What Needs to Change?

1. More colleges need similar systems
   - Holistic and open
   - Don’t just find the students at risk, manage the problems to resolution
   - Support the American Way: best way to achieve success, not prevent it

2. Colleges need help with change management of these systems – campus culture determines success
   - System fatigue
   - Many departments don’t trust one another

3. Research data needs to be correlated and shared
   - Student Success Taxonomy

4. Rigorous evaluation needs to be easier

5. Open architectures need to be encouraged
   - Grades & Registration data ✔
   - Tutoring ✔
   - Advising ✔
   - Predictive analytics ✔
   - Career counseling
   - Financial counseling
   - And many more