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Signals: The Past, Current, and Future Application of Analytics

John P. Campbell, Ph.D.
Associate Vice President for Academic Technologies
jpcampbe@purdue.edu

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X
A Different Focus

• How can IT bring strategic impact at scale?
In the beginning…

• What can institutions do to improve student success?
• How can institutions help students take advantage of existing campus resources?
• What existing information on campus can be utilized to better identify students at risk?
• How can students become self-aware of what effort is necessary to be successful in college?
Process of Analytics
Developing “actionable intelligence”

Early Alert/Early Warning systems

“The Watchlist”

SIS

ACADEMIC ADVISOR

“Faculty trouble ticket”

INSTRUCTOR

ACADEMIC ADVISOR

Course Signals

Grade book CMS SIS

INSTRUCTOR

More “real time” data

More “real time” data
Birth of Academic Analytics

- Portal engagement
- Social Network engagement
- Classroom engagement
- Gradebook
- CMS
- SIS
- Tutoring Center
- Faculty referrals
- Specialized Learning tools
- Student surveys
- Class attendance
- Chapel attendance

Data Warehouse/Data Store
Analytics/reporting tools

Predictive models
Communication tools

STUDENT
INSTRUCTOR
STAFF
Challenge: How do you find the student at risk?

Challenge: How do you find the student at risk?
Project Catalysts

- Large number of courses/students using the course management system
- Relationship between academic technology and student retention staff
- Staff member interest in the issue of student retention

- RESULT: Signals
Original Approach: Increasing Student Success

- Using analytics to determine what students might be “at risk” based on current campus information
Project Approach

Student Demographics/Academic Preparation +

Student Effort (sessions, quizzing, discussions, etc.) +

Student Performance (grade book data) +

+ Messages
+ Interventions
Signals at Purdue

• Original Analysis – Historical Perspective:
  – Selection of CMS Users
  – 27,276 unique students
  – 597 courses – over 3,000 sections
  – 75 departments and 9 colleges
Growing interest

NBC Nightly News with Brian Williams

http://www.msnbc.msn.com/id/3032619/vp/32634348#32634348
Signals Today

- 104 instructors
- 71 courses
- 167 sections
- 17,253 students (unique)

- Goal: 20,000 unique students in one semester by end of 2012-2013 school year
### Section: MATH - 105

<table>
<thead>
<tr>
<th>Student</th>
<th>4/30 2013</th>
<th>4/30 2010</th>
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<td>Student424</td>
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<tr>
<td>Student427</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Student488</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>Student477</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Student467</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Student476</td>
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<td>Student300</td>
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<td>Student454</td>
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</tr>
<tr>
<td>Student385</td>
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</tr>
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</table>

**Risk Summary:**
- **High:** 28
- **Medium:** 35
- **Low:** 37

**Filter By:**
- **All**
Preview Of: High Risk, Low Effort E-Mail

From: Aviansh Kaul

Subject: [Subject]

Salutation: Dear [Student]

I am sending this out due to your low percentages in class and your low usage of Sakai.

You are using the resources provided to you less than other students in your class. I want to remind you that completing all the practice exercises in Sakai is a very important component to this course.

Not only are the points valuable, they prepare you for the exams. You need to spend more time in Sakai and get help outside of class. If you need help, please see me in my office, [office location].

I am in the hall of the week from [h:mm]AM to [h:mm]AM. You can also use the other help sources listed on the syllabus.

Please ask for help. I know you can be successful in this course.
General Findings

- Signals was able to change academic success within a course (but not course retention in a significant manner)
- Impact of Signals varied depending on faculty approach (best practices being developed)
- Signals is not a “magic pill” designed to solve “student success issues” – it is another tool for faculty to utilize
- Faculty involvement is critical to success
### Signals after 4 Years

#### Fall 2007 Cohort

<table>
<thead>
<tr>
<th>Number of Signals Courses</th>
<th>Cohort Size</th>
<th>1 year</th>
<th>2 year</th>
<th>3 year</th>
<th>4 year</th>
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</thead>
<tbody>
<tr>
<td>No Signals</td>
<td>5,134</td>
<td>83.44%</td>
<td>73.14%</td>
<td>70.47%</td>
<td>69.40%</td>
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<tr>
<td>At least 1</td>
<td>1,518</td>
<td>96.71%</td>
<td>94.73%</td>
<td>90.65%</td>
<td>87.42%</td>
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<tr>
<td>1 instance</td>
<td>1,311</td>
<td>96.57%</td>
<td>94.13%</td>
<td>89.70%</td>
<td>86.50%</td>
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<tr>
<td>2 or more</td>
<td>207</td>
<td>97.58%</td>
<td>98.55%</td>
<td>96.62%</td>
<td>93.24%</td>
</tr>
</tbody>
</table>

#### Retention Rate

<table>
<thead>
<tr>
<th>Number of Signals Courses</th>
<th>Average SAT Score</th>
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</thead>
<tbody>
<tr>
<td>No Signals</td>
<td>1155</td>
</tr>
<tr>
<td>At least 1</td>
<td>1129</td>
</tr>
<tr>
<td>1 instance</td>
<td>1133</td>
</tr>
<tr>
<td>2 or more</td>
<td>1102</td>
</tr>
</tbody>
</table>

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### Four Year Graduation Rates

#### Fall 2007 Cohort

<table>
<thead>
<tr>
<th>Number of Signals Courses</th>
<th>Cohort Size</th>
<th>4 year Graduation Rate</th>
<th>Average SAT Score</th>
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</thead>
<tbody>
<tr>
<td>No Signals</td>
<td>5,134</td>
<td>69.40%</td>
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<td>207</td>
<td>93.24%</td>
<td>1102</td>
</tr>
</tbody>
</table>

Graduation Rate | Average SAT Score
----------------|-------------------
41.20%          | 1155              
45.27%          | 1129              
38.65%          | 1102              

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Results from Biology

- Results

<table>
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<tbody>
<tr>
<td>A</td>
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<td>C</td>
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<td>D</td>
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<td>E</td>
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<tr>
<td>F</td>
<td>10</td>
<td></td>
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</tbody>
</table>

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Student Experience

- 89% of students that experienced Signals had a positive experience and 73% said they would like Signals in every course
- 61% of students felt they got a higher grade in a course because of Signals
- 58% of students said they sought more help because of the personalized interventions
Student Experience

- 74% of students believed that their motivation was directly affected by Signals.
- 86% of students said that the benefits outweigh the drawbacks in Signals.
Student responses

• “Really appreciate knowing how I’m doing before I get too far into the course.”
• “Your message was a ‘kick in the butt’ that woke me up.”
• “You mean, if I get help, I’ll do better, and it won’t be counted against me?”
• “This biology lab is the hardest I’ve ever taken, but your message let me know that I need to get more help. Also, I can see that this lab is helping me in my biology lecture course, and in my chemistry lab.”
Student Comments

• It gave me a general idea of how I was doing in the class, and if it were a yellow light, I made sure that I did all my homework and went to every class to take the quizzes to get back to the green light. It was motivational tool for me personally.

• I really felt like Professor [name removed] really did care about you when he would send personal emails about your progress in his course. (Obviously it was from a TA) Nevertheless I still enjoyed the communication between professor and student

• I would regularly check my stoplight in Ma154 because I really want to get a good grade in this class and since there are so many students one on one attention is hard to get. The stoplight helped me know that I was doing well…
Student perceptions: Focus groups

Suggestions/ Criticism

- More gradation
- Traffic signals never change
- More specific information (percentage, move, etc.)
- Too much notification (over penetration)
- Felt demoralized
Student perceptions: Focus groups

Positive

- I’m not just a number/my instructor really cares
- I always knew where I was
- Motivating/made me work harder
- I knew where to go to get help
- I liked the reinforcement
## Faculty: Positives and Negatives

<table>
<thead>
<tr>
<th>Positives</th>
<th>Negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>– User friendly interface</td>
<td>– Concerns with setting the right criteria of success</td>
</tr>
<tr>
<td>– Clear visualization of class performance</td>
<td>– Composing and sending the right message to students in e-mail interventions</td>
</tr>
<tr>
<td>– Provides timely and frequent performance feedback to students</td>
<td>– Being able to track student “help seeking behavior” with the Signals</td>
</tr>
<tr>
<td>– Shows support and care for students in professional way</td>
<td>– Scalability of Signals across various classes for advising</td>
</tr>
<tr>
<td>– Allows instructors to visualize the effects of class assignments and overall trends in class</td>
<td></td>
</tr>
</tbody>
</table>
Outstanding questions

- How do we get the attention of the students?
- How do we word the message? How does the wording change over time? How complex do we make the messaging scheme?
- What is the most effective medium? Do we take advantage of text messaging? Is the web page enough?
Outstanding questions

• How can we refine our predictions? How do we take advantages of course-specific modeling?
• How do we include help-seeking behavior?
• How do we bring new analytical models to scale?
• How do we balance the course-specific needs with the institutional need to scale the project?
• How do we involve other campus groups (e.g. advising)?
Data Challenge

• The number of potential “data” providers is growing exponentially - not all data may be owned by the institution

• Amount of information does not always correlate to the quality of information

• Ability to import/export data is limited

• Ability to have common identifiers will challenge the usefulness of the data
Modeling/Analytics Challenge

• Best models for determining “at risk” behavior are currently a course-by-course basis

• New models may involve non-course specific data – increasing the difficulty of modeling (learning communities, library usage, etc.)

• Models should become “self learning” over time

• Potential models are only limited by our “imagination”
Which One is Not Like the Others?
Can we be simple and effective?
Messaging Challenge

• Email is no longer the single best way to reach students (was it ever?)
• Need standard approaches to provide a multi-modal platform for reaching students
• Messages may need to include changing icons/graphics in one system based on data from another system
Reporting Challenge

• Pulling together common views will remain a challenge – e.g. advisors, athletics

• As additional views are created, new functionality will be requested (ability to send “special” messages)

• As additional views are created, faculty and students may become more concerned with how data is being utilized
Institutional Challenge

- Data in many places, “owned” by many people/organizations
- Different processes, procedures, and regulations depending on data owner
- Everyone can see potential, but all want something slightly different
- Sustainability – “can’t you just…”
- Faculty participation is essential
- Staffing is a challenge
New Possibilities

- Using data that exists on campus
- Taking advantages of existing programs
- Bringing a “complete picture” beyond analytics
- Focusing on the “Action” in “Actionable Intelligence”
The Big Question

- Let’s assume we can be successful with analytics – what is the obligation that we act upon the results?
Learning Analytics and Knowledge Conference

• 2nd International Conference on Learning Analytics & Knowledge
  April 29-May 2, 2012, Vancouver

• http://lak12.sites.olt.ubc.ca/cfp/
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