Inspire the world to learn

Using Analytics to Encourage Responsibility for Learning and Identify Effective Course Designs that Help

John Fritz, UMBC
July 23, 2015

#BbWorld15
“Institutions can't absolve students from at least partial responsibility for their own education. To do so denies both the right of the individual to refuse education and the right of the institution to be selective in its judgments as to who should be further educated” (p. 144).
Khan (2012)

"I believe that personal responsibility is not only undervalued but actually discouraged by the standard classroom model, with its enforced passivity and rigid boundaries of curriculum and time. Denied the opportunity to make even the most basic decisions about how and what they will learn, students stop short of full commitment” (p.43).
Thaler & Sunstein (2008)

How organizations can help people make better decisions . . .

“if they had paid full attention and possessed complete information, unlimited cognitive abilities, and complete self control.” (p.5)

“Choice architecture” of the environments and contexts in which people make decisions:

• School cafeterias
• Credit card rates
• Organ donation
• Online learning?
Questions

1. How prevalent is LMS use at UMBC?
2. How does student LMS usage relate to final grades?
3. How does feedback to students impact usage & grades?
4. How does LMS course design impact student usage?
5. How does LMS course design impact grades?
1. LMS USE @ UMBC
About UMBC

- Founded in 1966 (5 mins from BWI Airport)
- Research extensive Carnegie classification
- Student Enrollment, Fall 2014
  - 13,979 (11,379 undergrad, 2,600 graduate)
- 769 Faculty (501 FT, 268 PT), 1,248 staff

Selected Brags
- Leading producer of minority undergrads who earn doctorates in STEM disciplines
- One of 50 Best Colleges for Women
- 7-time National College Chess Champions
About Blackboard @ UMBC

• Began using in Spring 2000
• Current version: 9.1.2x
• Adoption
  – 96% of all students
  – 87% of all instructors
  – 82% of all course sections
  – 300 Communities
Analytics Highlights (doit.umbc.edu/analytics)


2014: Integrating Bb Analytics Student & A4L modules

2013: ECAR Case Study: “Using Analytics at UMBC”

2012: Bb Analytics for Learn (A4L) limited trial & Implementation

2011: Analytics in Gateway Courses sub-grant from Purdue Univ.

2010: Adopted iStrategy for analysis of all Bb courses


2008: myUMBC Check My Activity (CMA) for Students

2007: Developed homegrown Bb analytics reporting

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Defining LMS “Usage”

• Faculty (AFTER making course “available”)
  – Content/User Mgmt.
  – Interactive Tools
  – Assessments

• Students (Avg. per student per course)
  – Accesses (or logins)
  – Interactions (or “hits” & clicks)
  – Minutes (or duration)
UMBC Bb Adoption % (2013-14)

- Undergrads (10.8k avg. total)
- Instructors (1.1k avg. total)
- Sections (2.4k avg. total)

- Used Bb: 96, 87, 82
- No Bb: 4, 13, 18
- Used Bb: 97, 87, 81
- No Bb: 3, 13, 19
UMBC Fr/Txfer Sample Bb Adoption % (2013-14)

![Bar chart showing Bb adoption rates for Undergrads (2,620 Avg), Instructors (581 Avg), and Sections (838 Avg) for FA2013 and SP2014.]

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2. STUDENT LMS USE & GRADES
Final Grades by Student Activity, FA2013

Count of Grades

<table>
<thead>
<tr>
<th>Accesses</th>
<th>Interactions</th>
<th>Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

- Count of Grades for Accesses:
  - Yes: 7438
  - No: 2469

- Count of Grades for Interactions:
  - Yes: 7438
  - No: 2469

- Count of Grades for Minutes:
  - Yes: 7373
  - No: 2470

Bar chart showing the distribution of grades for different activities.
Term GPA by Activity, AY2013-14

**Bar Chart**

- **FA2013 Bb Activity**:
  - Yes: 2,380 >=2.0, 306 <2.0
  - No: 6, 4

- **SP2014 Bb Activity**:
  - Yes: 2,111 >=2.0, 428 <2.0
  - No: 5, 4

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3. FEEDBACK ON LMS USE, GRADES
Check My Activity (CMA)

Spotlights for Wednesday, 11/19

Visit Library Media
Free 7-day rental!
With over 8,000 DVDs & Blu-rays—including TV shows, popular movies, and documentaries—there’s something for everyone at Library Media.

Blackboard »
Your courses and activity inside of Blackboard.

System Announcement
Blackboard Down for Maintenance 10 pm 11/22 to 1 am 11/23

Courses* Rank Activity (?) Below Average Above Grade Report

Fall 2013
ENCH 664 24
PHYS 121 317

* Note: This list only includes active Blackboard courses.

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Activity for ENCH 664:

- How active you (the black bar) are compared to the average activity of other students in the course (the gray bar).

Activity Rank (What's this?)
- Your activity ranks 24th out of 25 students in this course.
- This course's activity ranks 5th out of 13 ENCH courses in Blackboard.

Your Usage

<table>
<thead>
<tr>
<th>Tool</th>
<th>Hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcements</td>
<td>4</td>
</tr>
<tr>
<td>Content Folder/Content Area</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
</tr>
</tbody>
</table>

Course Usage (Average Hits per User)

<table>
<thead>
<tr>
<th>Tool</th>
<th>Hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcements</td>
<td>84.36</td>
</tr>
<tr>
<td>Assignment</td>
<td>23.30</td>
</tr>
<tr>
<td></td>
<td>Used CMA</td>
</tr>
<tr>
<td>------------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>FA2013</strong></td>
<td></td>
</tr>
<tr>
<td>&gt;= C Final</td>
<td>84.8</td>
</tr>
<tr>
<td>&gt;= 2.0 Term</td>
<td>86.6</td>
</tr>
<tr>
<td><strong>SP2014</strong></td>
<td></td>
</tr>
<tr>
<td>&gt;= C Final</td>
<td>85.4</td>
</tr>
<tr>
<td>&gt;= 2.0 Term</td>
<td>84.6</td>
</tr>
<tr>
<td><strong>AY2013-14</strong></td>
<td></td>
</tr>
<tr>
<td>&gt;= C Final</td>
<td>87.5</td>
</tr>
<tr>
<td>&gt;= 2.0 Term</td>
<td>83.9</td>
</tr>
</tbody>
</table>
4. LMS COURSE DESIGN & USAGE
How Faculty Use LMS

1. User & Document Management | Bb A4L Weight = 1
   - Auto course creation and enrollment
   - Password-protected class & group space
   - Attach or Copy/Paste Documents, perhaps with expiration dates.

2. Communications | Bb A4L Weight = 2
   - Announcements
   - Email, Messages
   - Discussion & Chat

3. Assessments | Bb A4L Weight = 2
   - Electronic assignment delivery & collection
   - Quizzing, surveys, online grade center.
   - Adaptive release of content based on prior student action or grades.
Student Bb Use by Course Design Rank, AY2013-14

![Graph showing Student Bb accesses (logins) by quartiles for FA2013 and SP2014. The graph includes bars for Q1, Q2, Q3, and Q4, with different colors representing different quartiles (25%, 50%, 75%, 100%).]
CMA Use by Course Design Rank, AY2013-14

![Bar chart showing CMA use by course design rank for AY2013-14.](chart.png)
5. LMS COURSE DESIGN & GRADES
Final Grades by Course Design Rank, AY2013-14
Term GPA by Course Design Rank, AY2013-14

Bar chart showing the count of distinct students with different GPA quartiles across different course design ranks and terms (FA2013 and SP2014) for both institution and department.
Grade Center as Proxy for LMS Course Design?

UMBC Bb & Student Activity – SP2014

<table>
<thead>
<tr>
<th></th>
<th>Grade Center Not Used</th>
<th>Grade Center Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinct Courses</td>
<td>44.5</td>
<td>912</td>
</tr>
<tr>
<td>Avg. Interactions</td>
<td>290.3</td>
<td>890</td>
</tr>
<tr>
<td>Avg. Logins</td>
<td>10.4</td>
<td>50.1</td>
</tr>
<tr>
<td>Avg. Minutes</td>
<td></td>
<td>1,154.5</td>
</tr>
</tbody>
</table>

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Grade Center Used by Course Design, AY2013-14

Course Design Quartile Rank
- 25%
- 50%
- 75%
- 100%

Grade Center Used?

Count of Final Grades

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inst.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dept.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FA2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP2014</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Student Activity by Grade Center Used, AY2013-14

- Student Activity
  - No Bb Use
  - Used Bb
  - No CMA Use
  - Used CMA

Count of Final Grades

<table>
<thead>
<tr>
<th>Grade Center Used?</th>
<th>Fall 2013</th>
<th>Spring 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Student Activity by Grade Center Used, AY2013-14

- <2.0 Term GPA
- >=2.0 Term GPA
- D/F Grades
- >=C Grades

Count of Outcome

<table>
<thead>
<tr>
<th>Grade Center Used?</th>
<th>Fall 2013</th>
<th>Spring 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#BbWorld15
<table>
<thead>
<tr>
<th></th>
<th>Adaptive Release Rules</th>
<th>No Adaptive Release Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Distinct Courses</td>
<td>% Items Accessed</td>
</tr>
<tr>
<td>Coll Arts Humanities &amp; Soc Sci</td>
<td>52</td>
<td>57.2%</td>
</tr>
<tr>
<td>Engineering &amp; Info Tech</td>
<td>12</td>
<td>100.0%</td>
</tr>
<tr>
<td>Erickson School of Aging St</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Natural &amp; Math Sciences</td>
<td>6</td>
<td>92.5%</td>
</tr>
<tr>
<td>Social Work</td>
<td>4</td>
<td>100.0%</td>
</tr>
<tr>
<td>UMBC</td>
<td>2</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>76</strong></td>
<td><strong>65.1%</strong></td>
</tr>
</tbody>
</table>
IMPLICATIONS & NEXT STEPS
Redefining Student Success

“Student success is not only passing a course, but also passing the next one that requires it.”

- Freeman A. Hrabowski, III
  President, UMBC
Kal Nanes’ TBL Redesign: MATH 221

• AY2011-12: Started teaching 221
  – FA2011 (1 section) | SP2012 (1 section)
  – Attended SU2012 TBL Workshop
    • teambasedlearning.org

• AY2012-13: Redesigned 221 w/TBL
  – FA2012 (1 section) | SP2013 (2 sections)
  – Attended 2013 FDC SoTL workshop
  – Co-led SU2013 TBL Workshop w/Sarah Leupen

• AY2013-14
  – Published journal article on his 221 TBL redesign
MATH 221 Final Grades

[Bar chart showing the percentage of students for different grades (A, B, C, D, F, W, DFW) for Traditional and TBL methods.]

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MATH 221 Final Exam Scores
Changes in MATH 221 Bb Activity

SP2013 Avg. Minutes was closer to 2k.
Lessons Learned by Students?

“I have heard anecdotal evidence that TBL was useful to my students after my class was over. I spoke to one student two months after her TBL course had ended. She told me that she had gotten into the habit of reading her math textbook before class, and that it was making her next math class much easier to handle. I have also started to hear from other instructors that my former students liked my TBL course and want TBL to be used in their other math courses.”

A modified approach to team-based learning in linear algebra courses

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(Received 15 July 2013)

This paper documents the author's adaptation of team-based learning (TBL), an active learning pedagogy developed by Larry Michaelsen and others, in the linear algebra classroom. The paper discusses the standard components of TBL and the necessary changes to those components for the needs of the course in question. There is also an empirically controlled analysis of the effects of TBL on the student learning experience in the first year of TBL use.

Keywords: team-based learning; TBL; quantitative sciences; linear algebra; pedagogy; active learning

1. Introduction

As educators in collegiate mathematics, we find ourselves at a crossroads in the development of modern pedagogy. I have found in my classrooms that today's student body includes a significant segment of learners, previously absent from higher education, who do not respond well to traditional lecture-based teaching methods. Current research into lecturing as a pedagogy, while not unequivocal, does provide evidence that alternate pedagogies can help us address this problem ([1–7] and many others). On the other hand, we do not seem, as a community, to have found a widely applicable alternative approach. While active learning methods do exist for the collegiate classroom, most do not seem to be geared towards the study of mathematics and other quantitative sciences. Current presentations on collegiate mathematics education tend to focus only on single activities that can at best engage students on a particular topic for one classroom session. A more holistic approach is required in order to bring active learning into the mathematics classroom in a systemic fashion.
# MATH 221 to 301 Pre TBL - Nanes

## Grade Comparison - Course to Course

### Parameter Selections

<table>
<thead>
<tr>
<th>Section(s): All</th>
<th>Course: MATH 301</th>
<th>Course: Not Taken</th>
<th>Course Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6</td>
<td>36</td>
<td>51</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>48</td>
<td>63</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>40</td>
<td>47</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Not Set</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>1</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>45</td>
<td>222</td>
</tr>
</tbody>
</table>

### Course A: MATH 221

- Section(s): 01.04

- Course B Total: 124
- Not Taken: 117
- Total: 442

### Course Summary

<table>
<thead>
<tr>
<th>Course A</th>
<th>Course B</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 221</td>
<td>MATH 301</td>
<td>45</td>
</tr>
<tr>
<td>Not Taken</td>
<td>MATH 301</td>
<td>177</td>
</tr>
<tr>
<td>Total</td>
<td>MATH 301</td>
<td>442</td>
</tr>
</tbody>
</table>

### Grade Group Summary

<table>
<thead>
<tr>
<th>MATH 301</th>
<th>ABC</th>
<th>DFW</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 221</td>
<td>24</td>
<td>13</td>
</tr>
<tr>
<td>Not Taken</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

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MATH 301 Grades After Taking MATH 221

<table>
<thead>
<tr>
<th></th>
<th>Before 221 TBL Redesign (AY2012-13)</th>
<th>Since 221 TBL Redesign</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;=C</td>
<td>28</td>
<td>179</td>
</tr>
<tr>
<td>DFW</td>
<td>56</td>
<td>19</td>
</tr>
<tr>
<td>DFW %</td>
<td>60</td>
<td>34</td>
</tr>
</tbody>
</table>

Nanes (started 221 in AY2011-12)  Dept. (2 yrs before/1.5 yrs after 221)
Limitations & Possible Next Steps

• Assessment of Student Learning Outcomes
  – Getting better in General Education, accredited programs (Education, Engineering, Social Work, etc.).
  – Motivation, Adoption, Consistency by faculty?
  – Ideal: Should inform and then evaluate a course redesign.

• Course to Course Grade Comparison Report
  – Does not have “drill to detail” to identify & control for student demographics.
  – Does not indicate “returned next term” or “returned next academic year” or “graduated” to assess student success.
  – Does not filter by instructor, only section.
Three Keys to Faculty Motivation to Use IT

1. Clear indication/evidence that students would benefit.
2. Release time to design/redesign courses.
3. Confidence that the technology would work as planned.

--- ECAR Study of Faculty and IT (2014)
THANKS & QUESTIONS?

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doit.umbc.edu/analytics