How do LMS Course Designs Correlate to Final Grades?

John Fritz, Tom Penniston, Mike Sharkey

Learning Analytics Community of Practice
February 17, 2022

Agenda

1. Introductions
2. Background & Assumptions (John), 5 mins
3. Problem: Generalizing DFWs by Course Design (Tom), 5-7 mins
4. Tableau Dashboard Demo (Mike & John), 15-20 mins
    a. Waterfall demo of "time on task" in a course
    b. Visual & Tabular Scan of all courses' "Strength of Relationship"
    c. Filters by course archetype, enrollment size, college, PIVOT participation
5. Takeaways & More Info., 5 mins
6. Q&A (All), 20 mins

Basis for this talk

UMBC-only version available here:
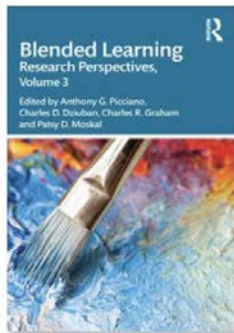
https://umbc.box.com/blrpvol3ch5jftpmsjw

Learning Analytics Defined

At its core, learning analytics (LA) is the collection and analysis of usage data associated with student learning. The purpose of LA is to observe and understand learning behaviors *in order to enable appropriate interventions.*

~Educause Learning Initiative (ELI), 2011

...the measurement, collection, analysis and reporting of data about **learners and their contexts**, for purposes of **understanding and optimizing learning and the environments** in which it occurs.

~Learning and Knowledge Analytics Conference, 2011

Analysis without action is not analytics

The problem with grades is they occur too late in a term to be actionable.

Student Data Trails as Proxy for Engagement?

The *Oxford English Dictionary* defines proxy as . . .

> "the action of a substitute or deputy" or "agency of another" and from science and economics **"a variable that can be used as an indirect estimate of another variable with which it is correlated; (more generally) a property used as an estimate or indicator of another with which it is associated."**

Rise of the LMS as a source of LA "actionable intelligence"

- FYI: Since 2007, UMBC students earning a final grade of D or F use the LMS ~40% less than students earning a C or higher. Every semester.

Time on Task (#5)

Time plus energy equals learning. There is no substitute for time on task. ***Learning to use one's time well is critical for students and professionals alike.*** *Students need help in learning effective time management. Allocating realistic amounts of time means effective learning for students and effective teaching for faculty. How an institution defines time expectations for students, faculty, administrators, and other professional staff can establish* ***the basis for high performance for all.*** *[equity?]*

Chickering and Gamson's 7 Principles of Good Practice in Undergraduate Education (1987)

The seven principles of good practice are:
1) Encouraging student-faculty contact
2) Encouraging cooperation among students
3) Encouraging active learning
4) Giving prompt feedback
5) Emphasizing time on task
6) Communicating high expectations
7) Respecting diverse talents and ways of learning

Chickering, Arthur W., and Zelda F. Gamson. "Seven Principles for Good Practice in Undergraduate Education." *American Association for Higher Education Bulletin* 39, no. 7 (March 1987): 3–7.

An Issue -- And Opportunity?

We think we know that . . .

    a.   LMS course design is related to higher student LMS usage.

    b.   Higher student LMS usage is related to better student outcomes.

However, can we establish that . . .

    c.   LMS course design is related to better student outcomes (i.e., an "intervention").

Does faculty use of the LMS not matter to student success?

Bb Course Archetypes

Supplemental
Content-heavy. Low interaction.

Complementary
One-way communication through content, announcements, and gradebook.

Social
High peer-to-peer interaction through discussion board.

Evaluative
Heavy use of assessments.

Holistic
High LMS activity with balanced use of assessments, content, and discussion.

Whitmer, J., Nunez, N., Harfield, T., & Forteza, D. (2016). *Patterns in Blackboard Learn tool use: Five Course Design Archetypes* [Blackboard Blog]. Retrieved from https://www.blackboard.com/sites/default/files/resource/pdf/Bb_Patterns_LMS_Course_Design_r5_tcm136-42998.pdf

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UMBC Blackboard Use Differs from Most Schools

Findings based on Bb's "course archetypes" research

December 11, 2018 11:23 PM

Earlier this year, Blackboard released a "course archetype" system administrator's tool that allows institutions to see how the company's Learning Management System (LMS) software is being used across campus. The "course archetype" tool was informed by Blackboard's 2016 research on clients it hosts, including UMBC (since 2014). The primary reason DoIT was interested in the "course archetype" tool was to get a better understanding of the depth and complexity of our current Bb usage, as we gauge the work to be done to move to our Ultra migration in Fall 2019 (see umbc.edu/go/ultra).

A few observations are worth noting:

1. Blackboard's course archetype research initially focused on more than 3M students, in 70k courses from 927 institutions hosted by Blackboard in Spring 2016. After extensive filtering for courses between 10 and 500 students, at least average student use of 60 minutes, and faculty use of the grade book, the resulting data set for analysis "included 601,544 learners (16.25%) in 18,810 (26.87%) courses" (p.2 of the study). When DoIT ran the course archetype tool on our 1,469 active FA18 Bb courses, only 464 (31%) did not meet the same enrollment size and usage criteria compared with 51,190 (73%) of the 70k courses hosted by Blackboard, but also filtered off for the study.

2. Blackboard found the vast majority of courses it studied were "supplemental" (content-heavy, low interaction) or "complementary" (1-way, instructor-led, minimal communication) courses, or 53% and 24%, respectively (77% total). By contrast, DoIT found nearly 40% of UMBC's remaining 991 FA18 courses are characterized at the top end of Blackboard's course design archetype: "evaluative" (heavy use of assessments) and "holistic" (high LMS activity with balanced use of assessments, content and discussion), or 21% and 18%, respectively (or 39% total).

https://doit.umbc.edu/news/?id=80996
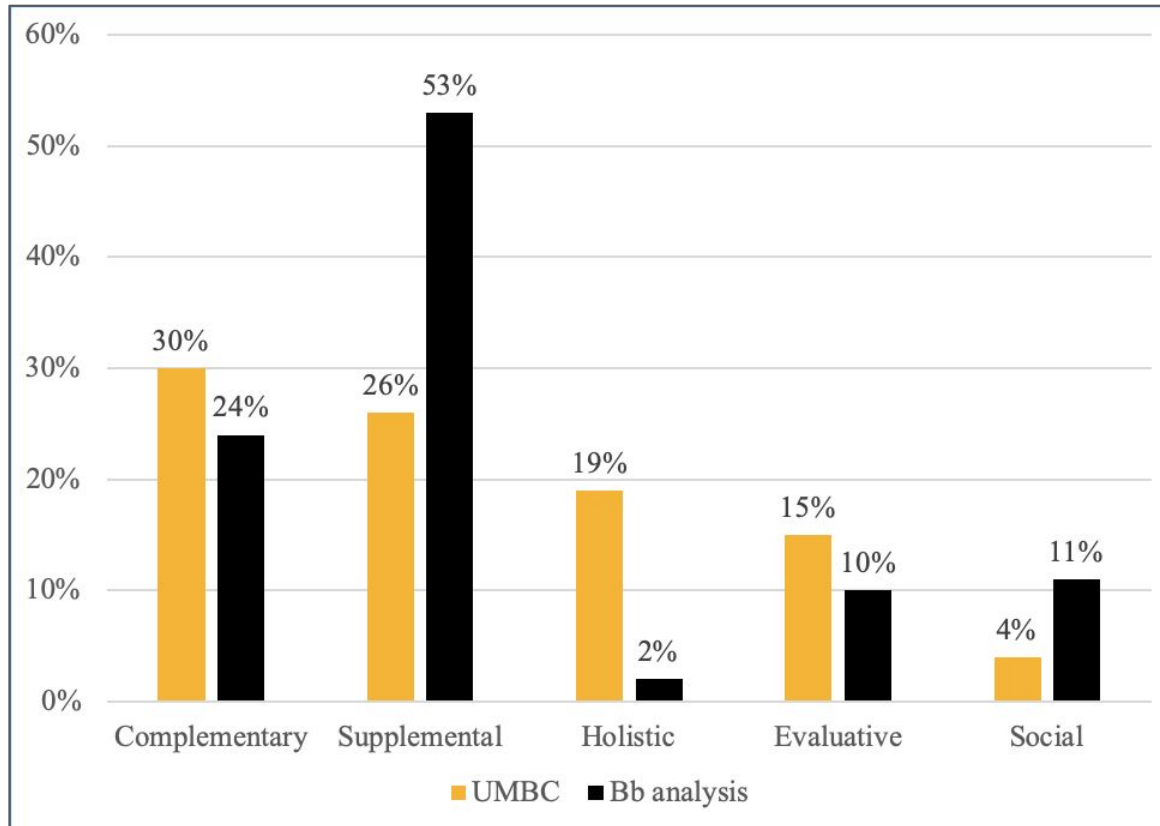
Table 5.1: How faculty use an LMS

Learning Analytics Research & Practice[1]	Blackboard Course Archetypes[2]
User & Document Management • *Auto course creation and enrollment* • *Password-protected class & group space* • *Post documents, perhaps w/expiration dates*	Supplemental • *Content-heavy* • *Low interaction*
Interactive Tools • *Announcements* • *Email, Messages* • *Discussion & Chat*	Complementary • *One-way communication via content, announcements and gradebook* Social • *High peer-to-peer interaction through discussion board*
Assessments • *Electronic assignment delivery & collection* • *Quizzing, surveys, online grade center.* • *Adaptive release of content based on prior action or grades.*	Evaluative • *Heavy use of assessments* Holistic • *High LMS activity* • *Balanced use of assessments, content and discussion*

Table 5.2: UMBC Mean DFW Rates and Counts by Archetype

Archetype	All Courses	Upper Division	>Median Enrollment	>90% Enrollment
Complementary	11.15 (1,004)	8.76 (607)	11.56 (534)	15.51 (107)
Supplemental	11.01 (852)	9.48 (522)	11.85 (425)	15.17 (60)
Holistic	12.83 (645)	8.84 (348)	14.10 (374)	17.50 (119)
Evaluative	8.93 (508)	7.89 (329)	9.66 (238)	12.77 (38)
Social	9.26 (147)	6.73 (110)	8.62 (12)	NA

July 28, 2018

blog.blackboard.com/combining-data-to-improve-student-success-predictions

Blackboard

Improving Student Risk Predictions:
Assessing the Impact of
Learning Data Sources

Authors:

Diego Forteza, Blackboard | John Whitmer, Ed.D., Blackboard
John Fritz, Ph.D., University of Maryland, Baltimore County (UMBC) | Daniel Green, VitalSource

Key Findings

Using IMS Caliper Analytics® with Blackboard Learn & VitalSource at
the University of Maryland Baltimore County

Inspiration

This video of David Wiley's 2/15/12 [ELI keynote presentation](#) has long since disappeared from this Educause site, but a few years ago, I made a copy of my own for my dissertation and eventual follow up.

https://youtu.be/nXIR9tgyZlk

David Wiley Waterfall (2012 ELI Annual Me...

Copy link

0:01 / 4:30

A Key Finding: Student Tool Use & Final Grade Varies by Class

UMBC Course #1
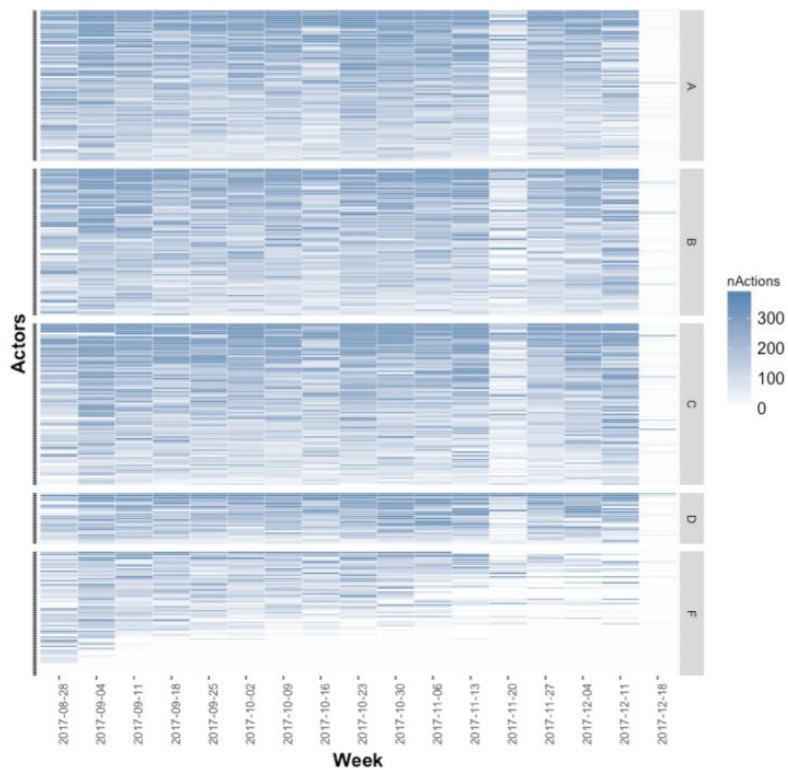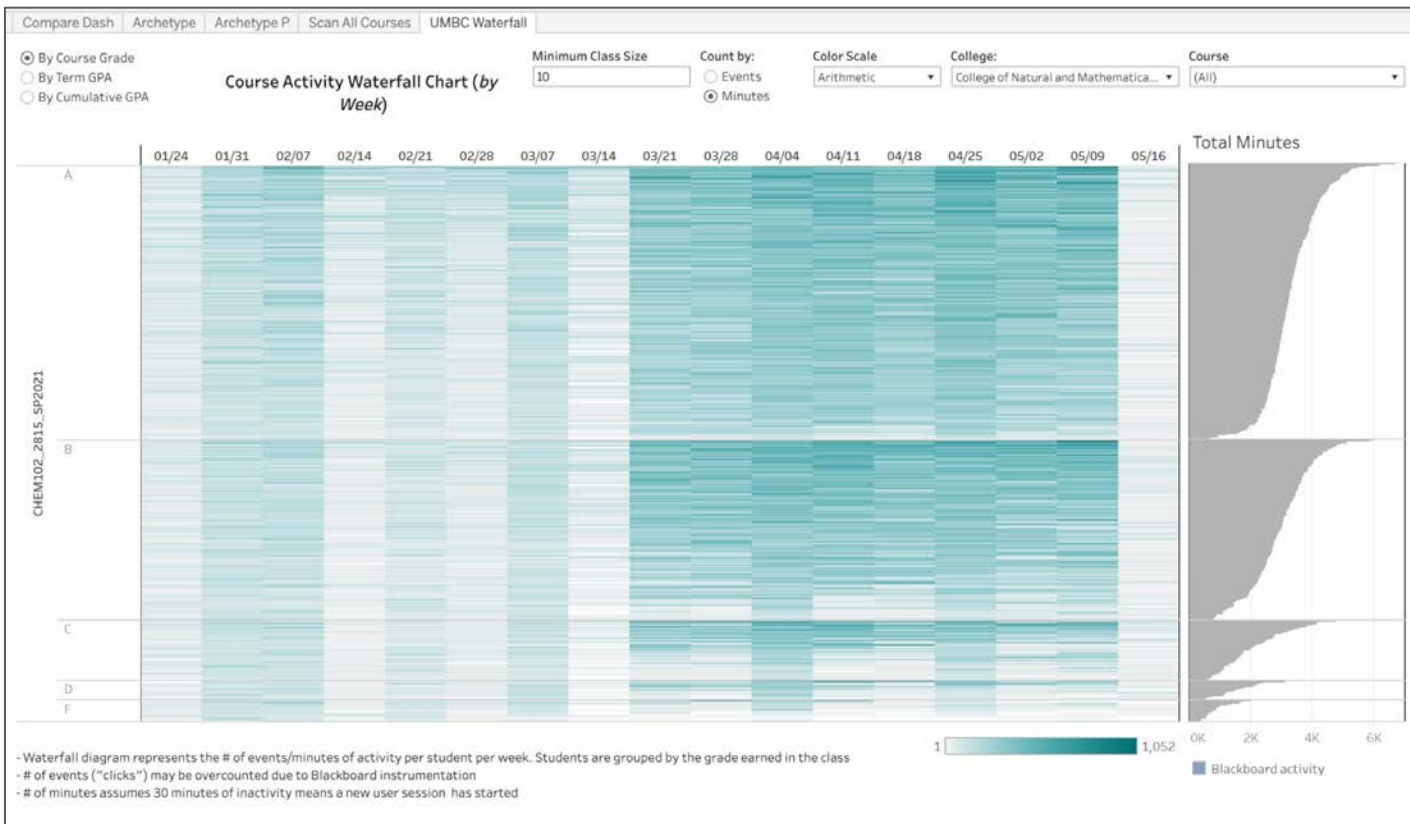
UMBC Course #2
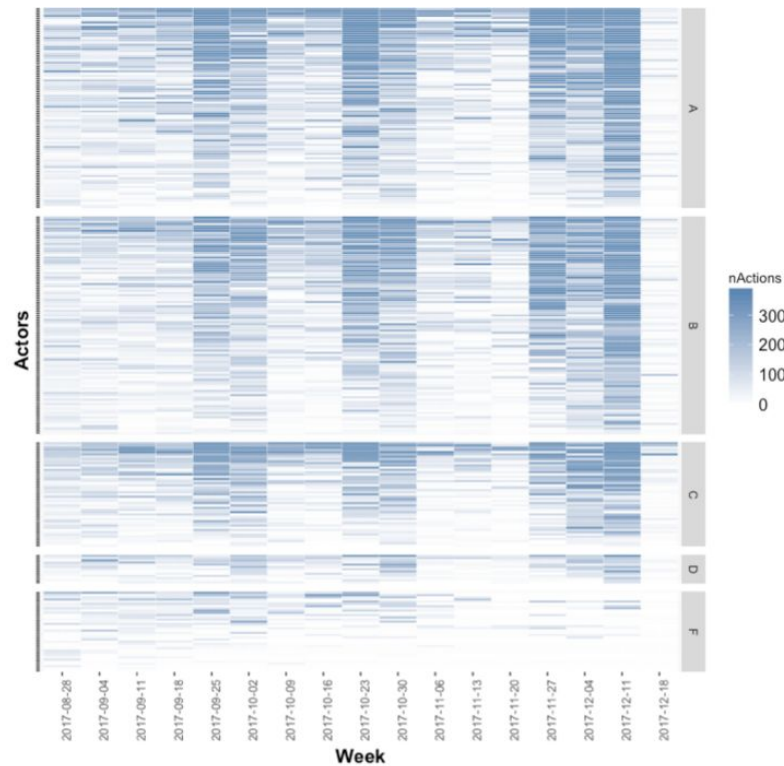
Tableau Live Demo

Why CNMS Student Bb Use Is So High?

- The tree map shows all courses in each college (box size = number of students/course, SP19)
- **Greener box means more actions/student per course.**
- **CNMS has relatively more green boxes** due to CHEM, BIOL, PHYS **that use quizzes/assessments.**
- Other colleges have relatively fewer green courses as well as other courses that "weigh down" avg. number of actions/student.

Blackboard Actions/Student (by College/Course)

College of Arts, Humanities and Social Sciences

College of Engineering and Information Technology

College of Natural and Mathematical Sciences

Division of Undergraduate Academic Affairs

College:	College of Natural and Mathematical Sciences
Course:	CHEM 351
Number of Students:	216
Bb Actions/Student:	1,364

Actions/Student
1   4,280

More Info:
https://doit.umbc.edu/whats-new/post/88786

CHEM 102 (SP21) "Waterfall"

Spaced Practice

"Designed to discourage students from cramming for high stakes exams, spaced practice encourages regular, smaller study & practice focused on promoting long-term proficiency and retention."

Do students carry lessons learned to the next course?

How analytics & adaptive learning might help

Thursday, March 10, 2022 · 12 - 1 PM
Online

In this Learning Analytics Community of Practice (LACOP) workshop, Chemistry Principal Lecturer **Tara Carpenter** will share early results from her learning analytics mini-grant to see if and how students continue the habit of using "spaced practice" in CHEM 351 "Organic Chemistry" during Fall '21 – after they learned it in her Spring '21 CHEM 102 course. Designed to discourage students from cramming for high stakes exams, spaced practice encourages regular, smaller chunks of study & practice focused on promoting long-term proficiency and retention. To do so, Carpenter leveraged adaptive learning in her CHEM 102 course, and will share data and findings, including student survey results from her pedagogical approach. FYI: The next round of Learning Analytics "Mini-grant" proposals will be due 5/27/22.
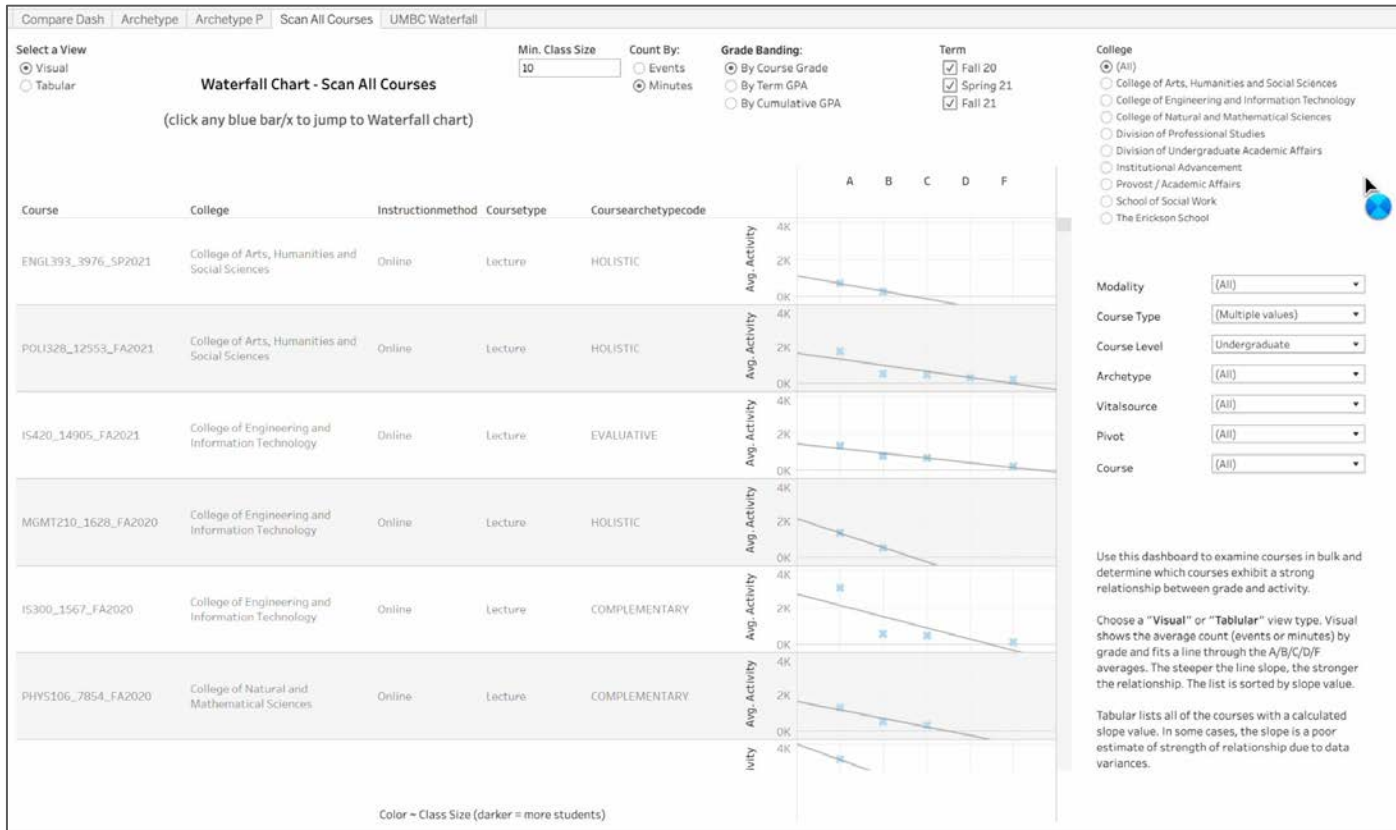
Also, this workshop is part of a Spring 22 series about data science and learning analytics for the UMBC community. More information.
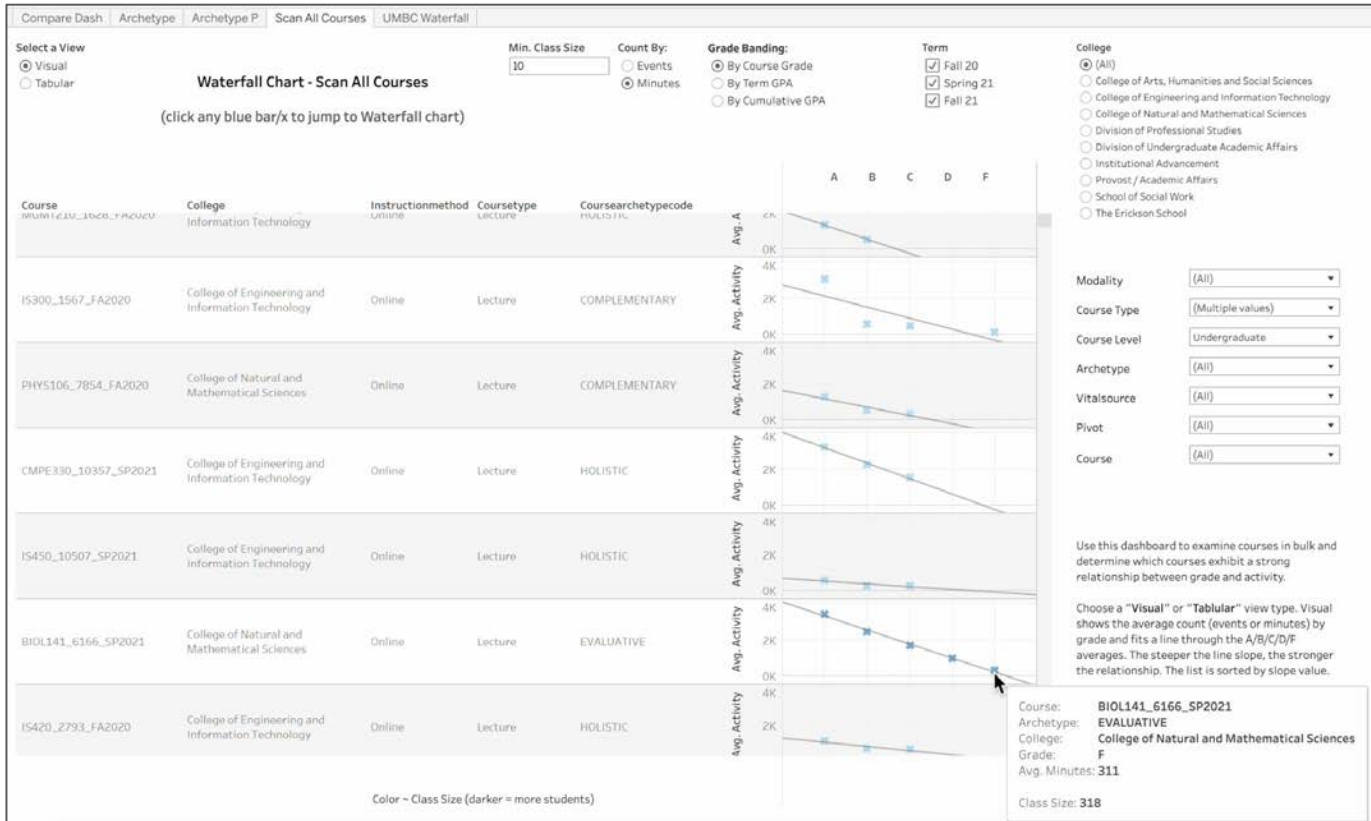
http://events.umbc.edu/go/101268
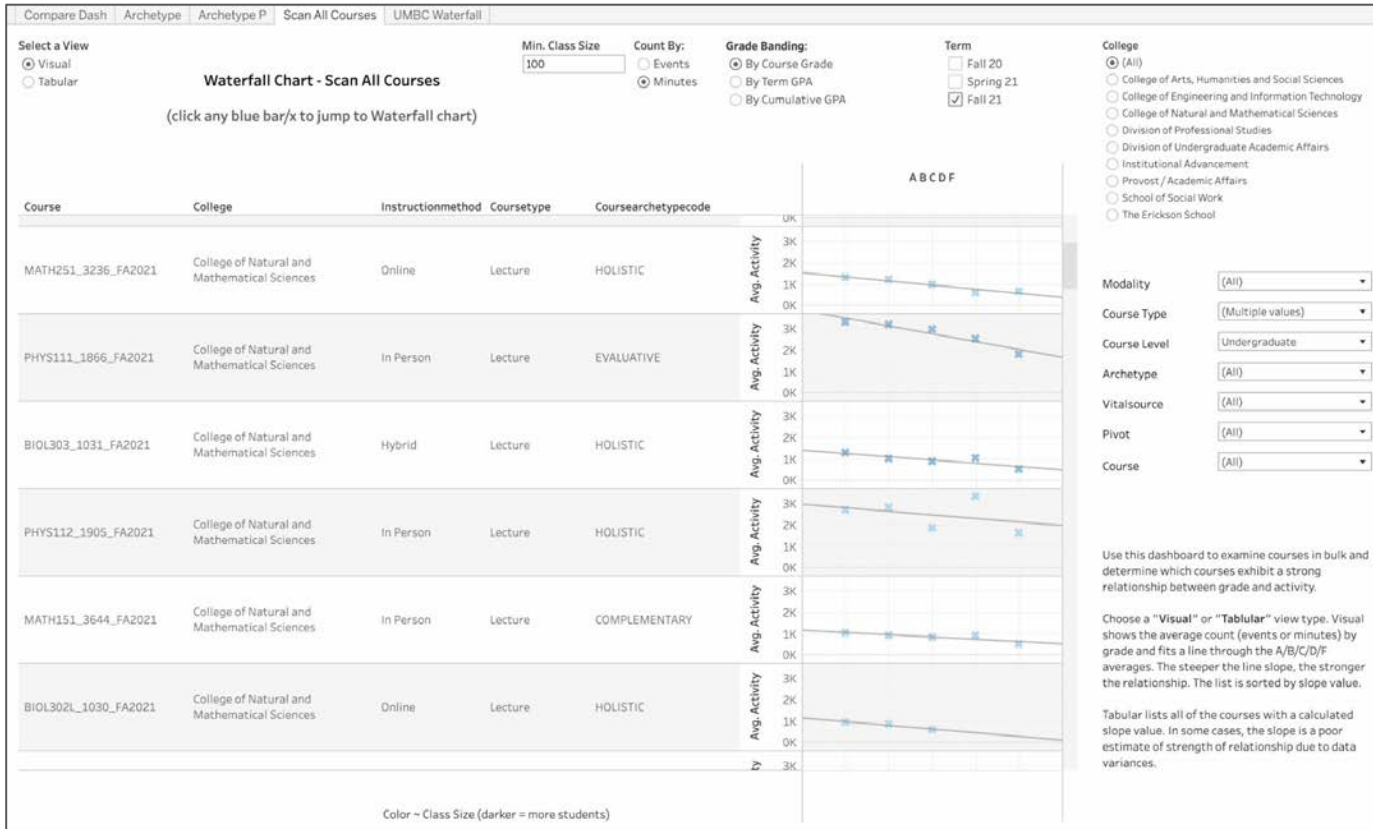
CHEM 102 (FA21) "Waterfall"
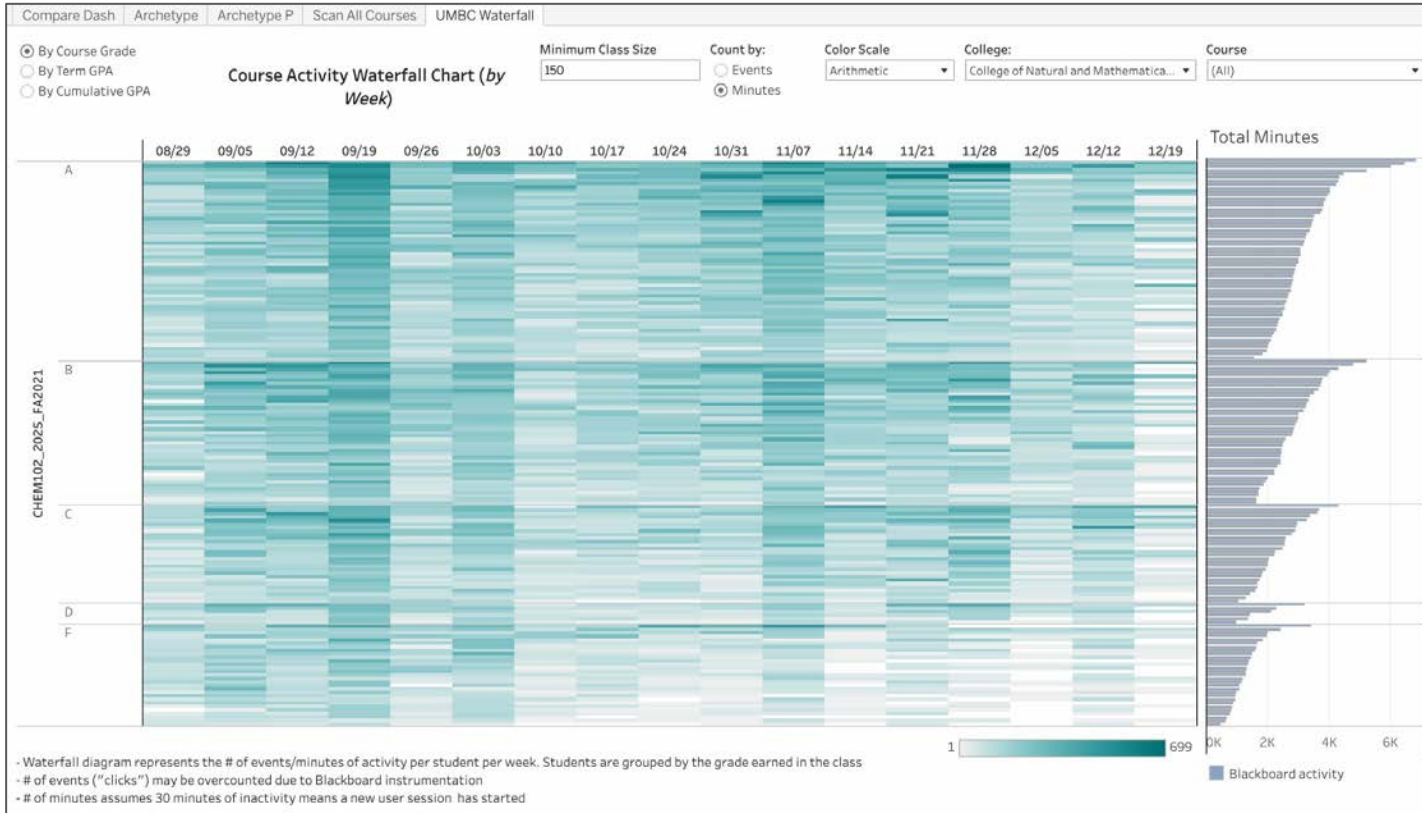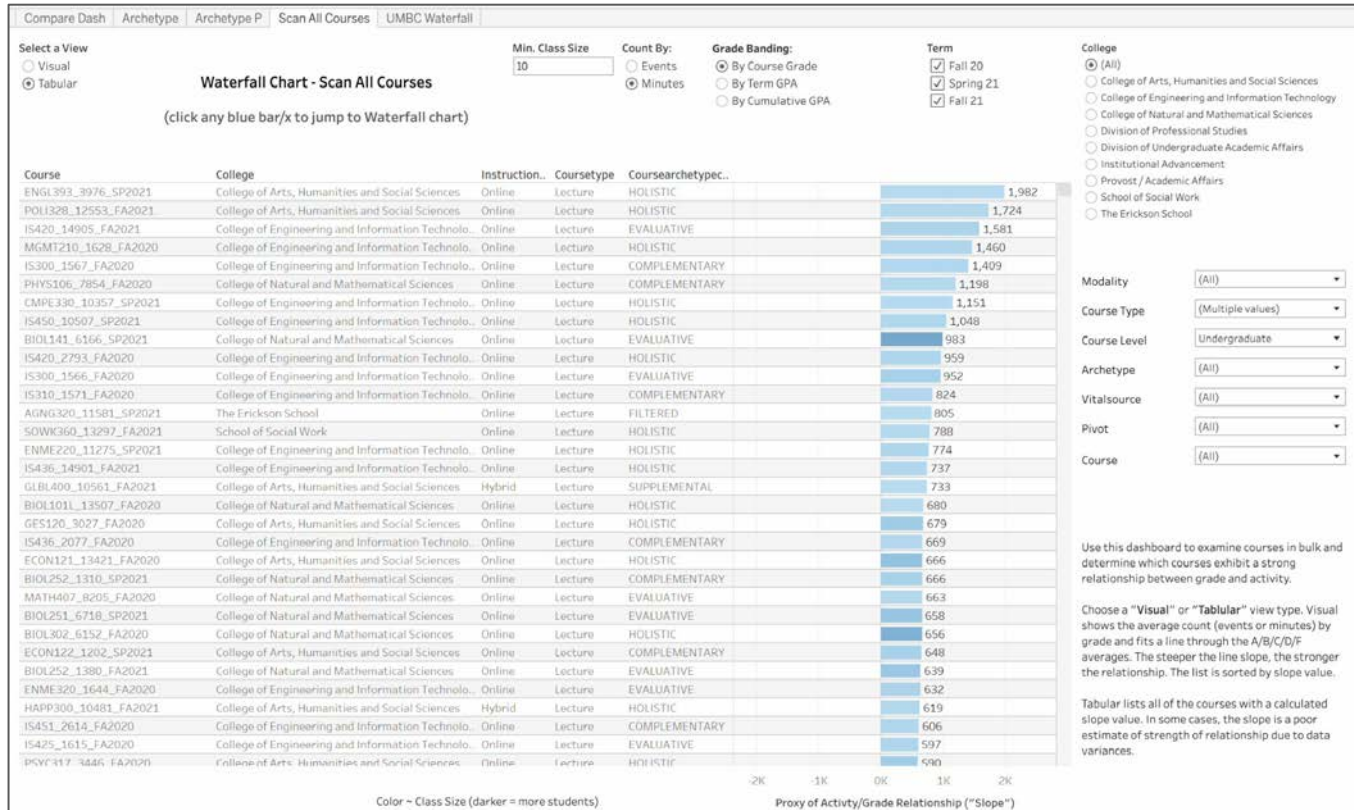
All Courses by "Slope" (Visual)

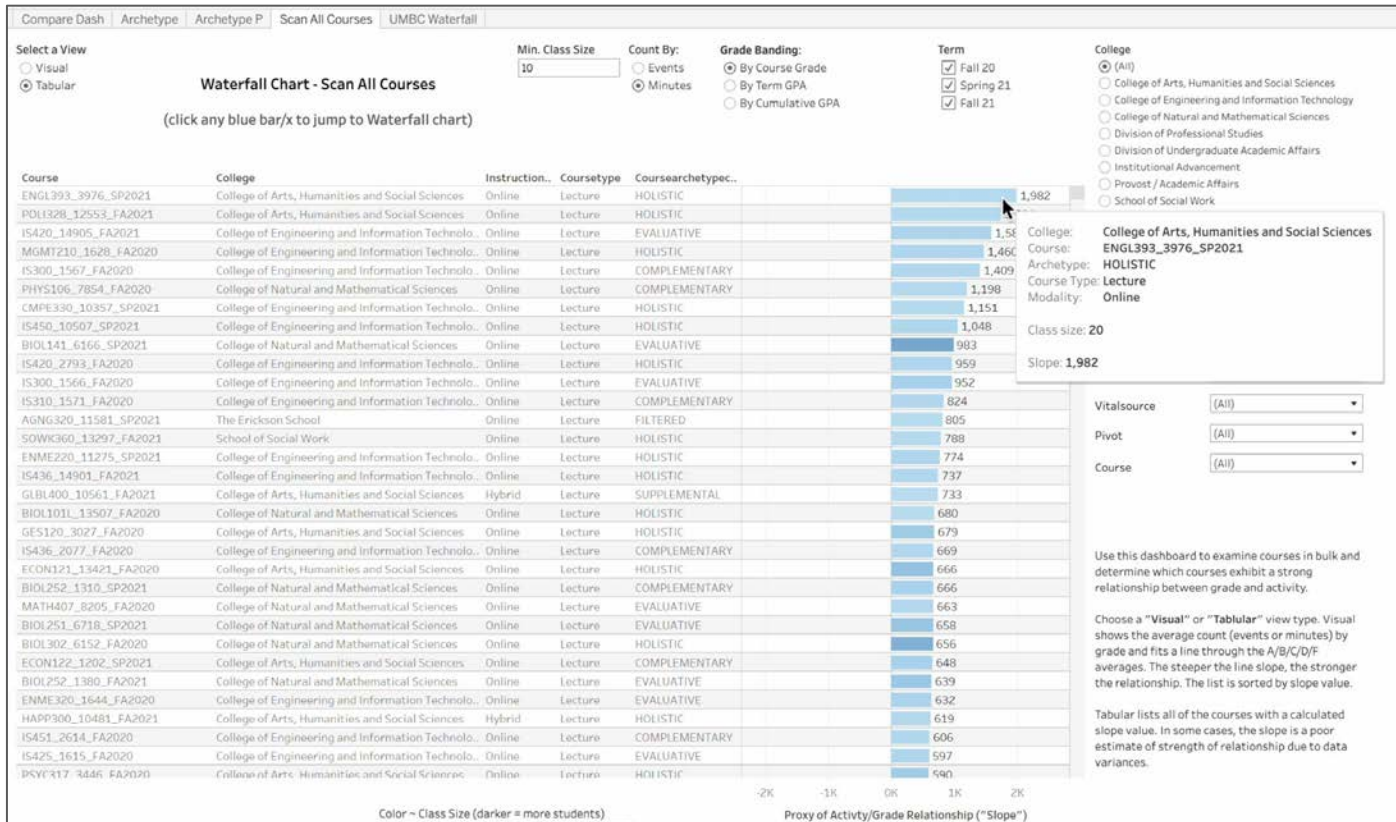# All Courses by "Slope" (Visual), cont'd

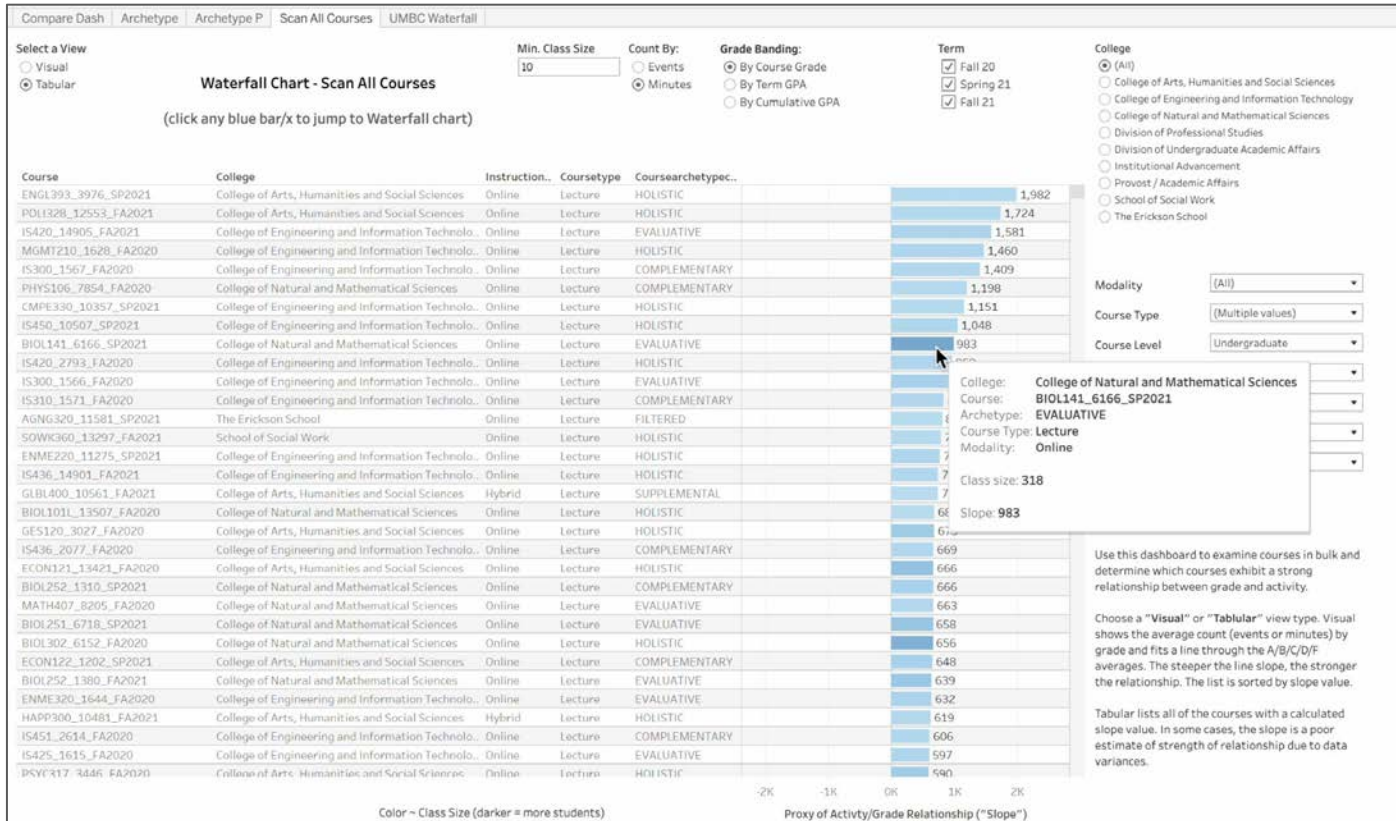# All Courses by "Slope" (Visual), cont'd

All Courses by "Slope" (Tabular)

All Courses by "Slope" (Tabular), cont'd

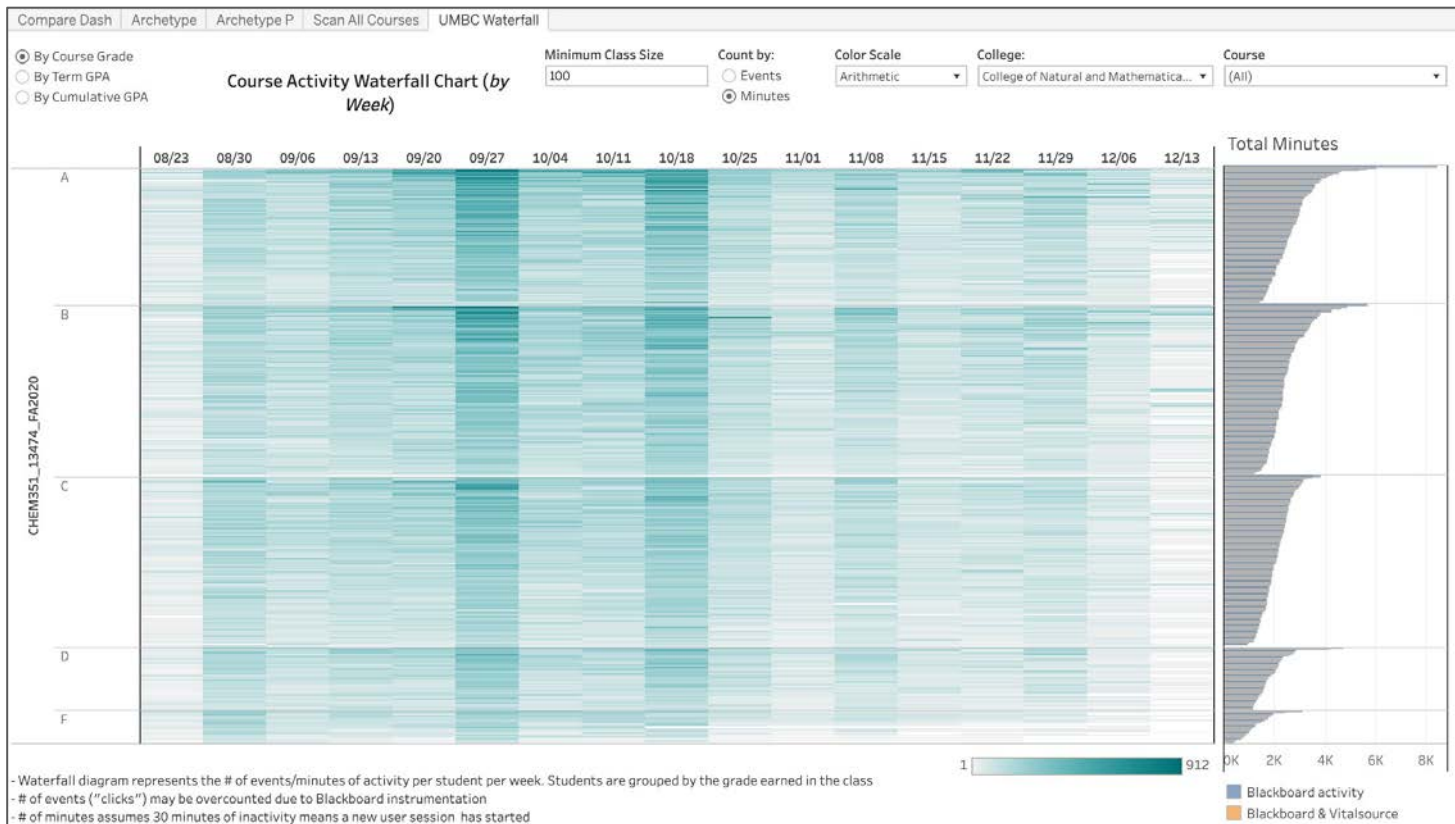# All Courses by "Slope" (Tabular), cont'd

Redefining Student Success

"Student success is not only passing a course, but also passing the next one that requires it."
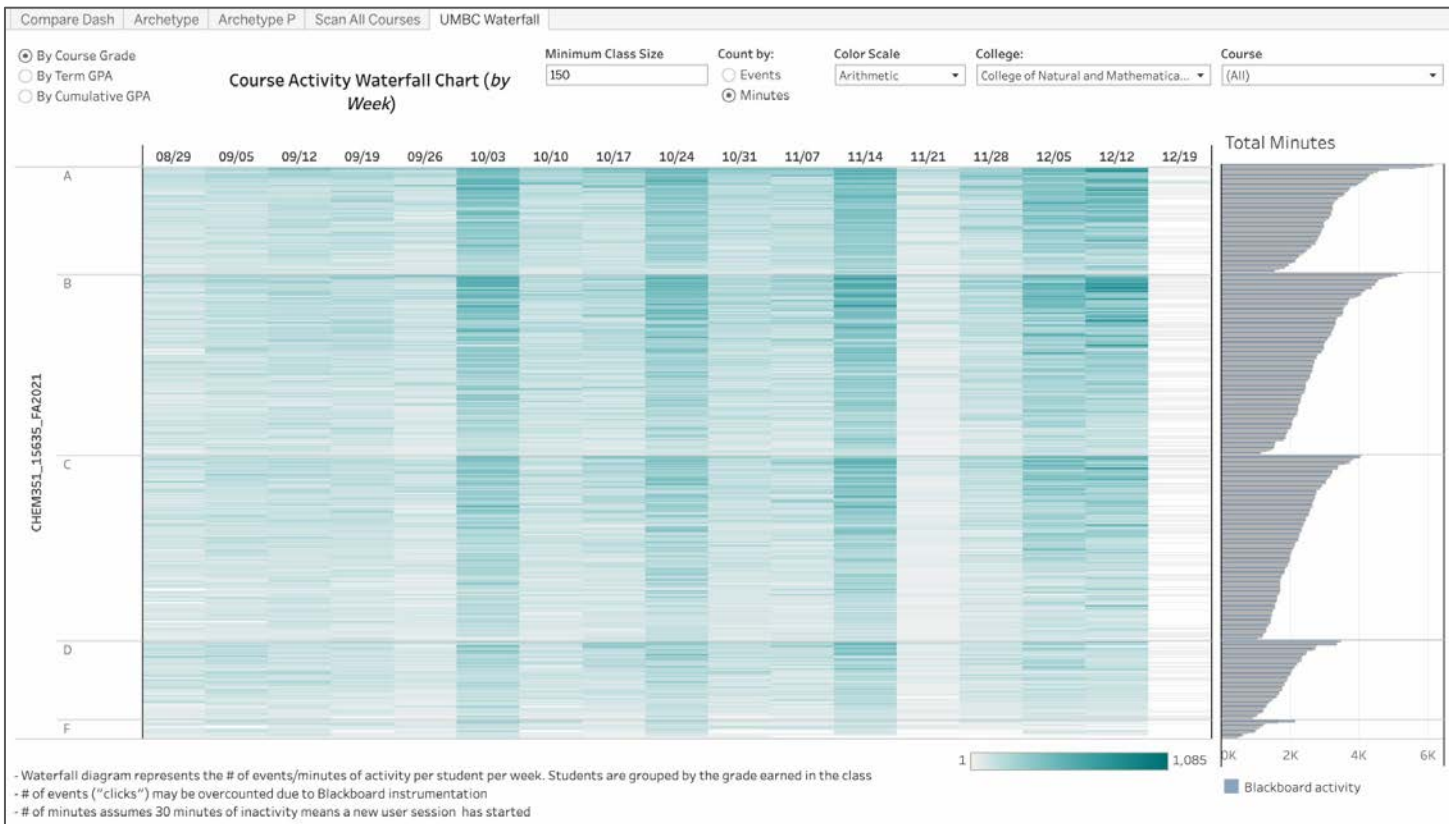
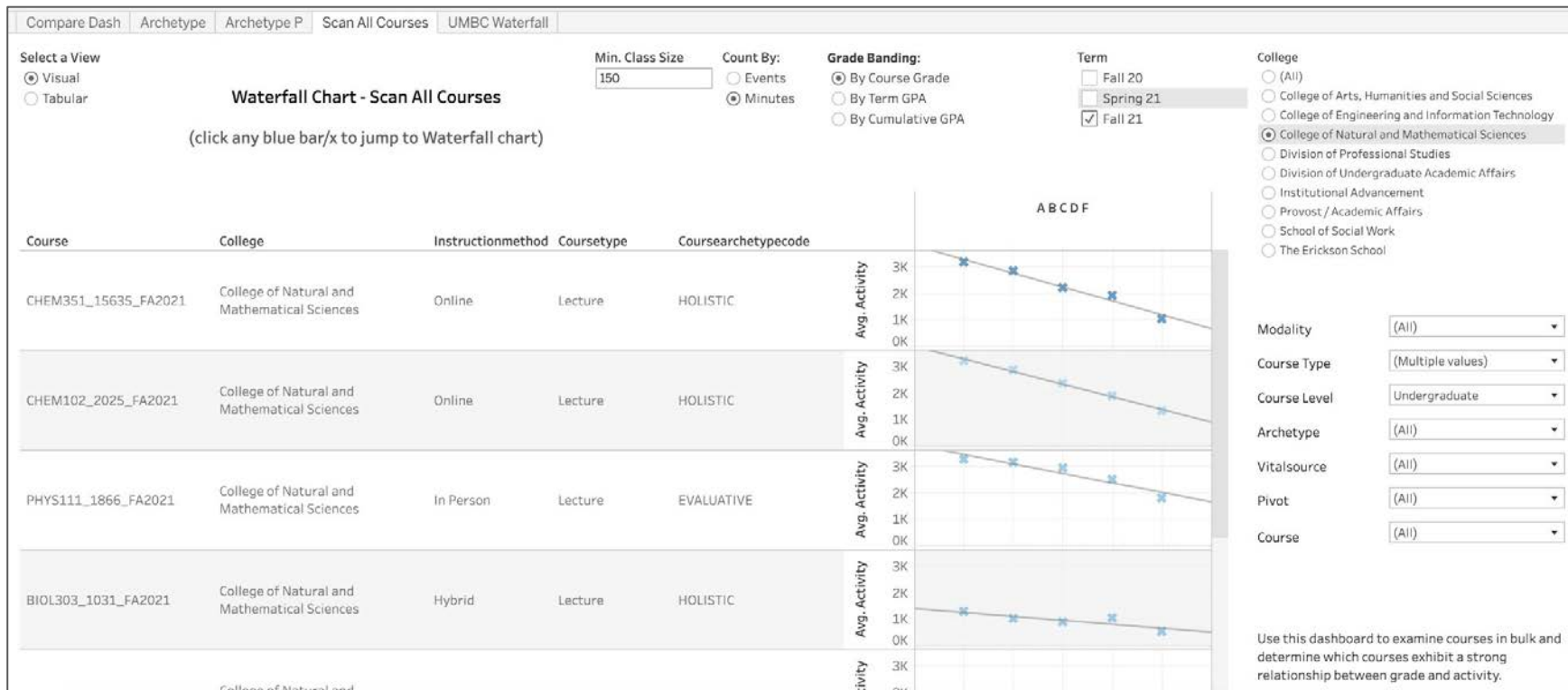- *Freeman A. Hrabowski, III*
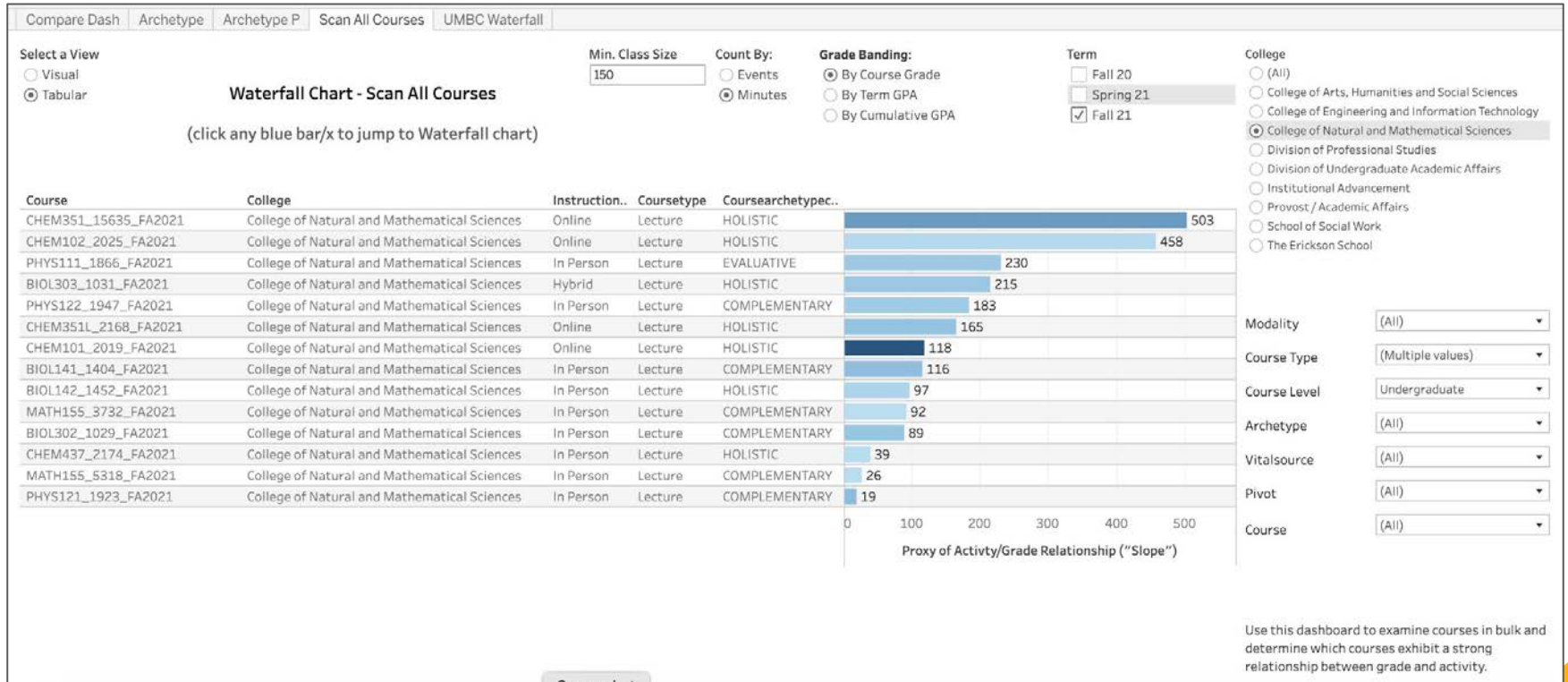 *President, UMBC*

CHEM 351 (FA20) "Waterfall"
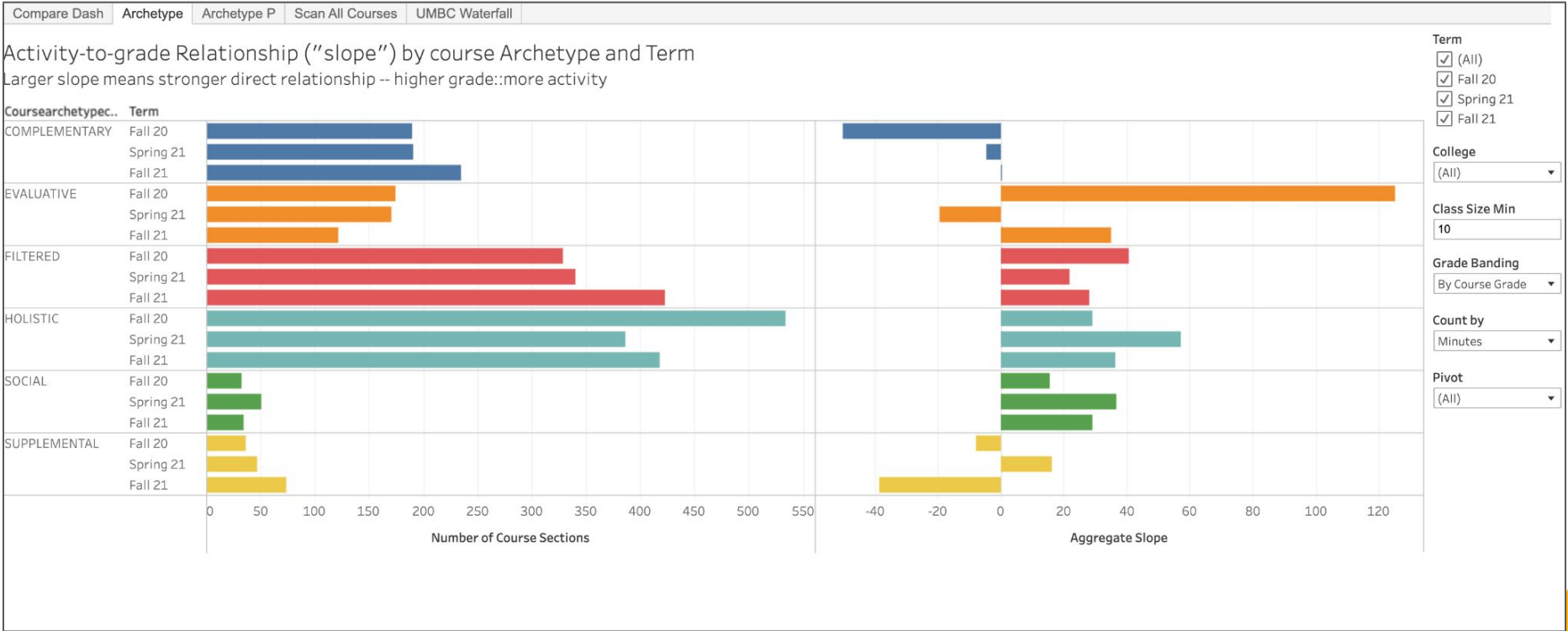
CHEM 351 (FA21) "Waterfall"

CHEM 102 & 351 "Slope" (Visual), FA21

CHEM 102 & 351 "Slope" (Tabular), FA21

All Courses by Archetype & Aggregate Slope

Compare Dash | Archetype | Archetype P | Scan All Courses | UMBC Waterfall

Activity-to-grade Relationship ("slope") by course Archetype and Term
Larger slope means stronger direct relationship -- higher grade::more activity

All Courses by Archetype, Slope & PIVOT participation

Right Message, Right Person, Right Time

Student Agency

Intrusive Advising

Week 1 (thru add/drop)	Week 4	Week 6-8	Week 12 & beyond
Syllabus Quiz	**Digital Tool Usage**	**Midterm Alerts & Nudges**	**Finish/Start Strong**
PSCY100: Since SP17, students who didn't take SQ were 4x more likely to earn DFW (p<.001, n=1,455)	**LMS & eTextbooks**: 70-98% predicting >=C final grades (p<.005, n=986 in 5 FA17 courses)	**First Year Intervention** (FYI) alert asks faculty to ID students in jeopardy of D/F "if semester ended tomorrow." (~60% go on to get >=C)	**Early Registration**: 50% of non-persisting students enroll for the next term less than 40 days before 1st day of classes.
ECON122: Students req'd to take SQ before submitting 1st assignment for credit. Class earns 20% higher grade on dept. common final exam.	**Check My Activity:** Students can compare LMS activity w/anonymous summary of course peers earning same, higher or lower grade on any assignment -- if instructors post grades	**Bb Predict**: 87% accurate predicting >=C by week 4, AYs 16-18).	**Countdown Timer & Checklist**
Nudging Course Repeaters: Go to the Math Lab! It works.		**Two Empathetic Nudges**: 1) to predicted DFW and 2) to predicted DFW & FYI (slightly different but key is "talk to your instructor" & seek tutoring).	- *Verify Declared Degree* - *Schedule Advisor Meetings* - *Review course options* - *Meet with advisor* - *Register for classes*
High Credit, Low GPA Nudge: "Are you sure?"	**High Credit, Low GPA Nudge**: "Here's where other students have gone to get help, if you need it."		**Last Day to Withdraw** (Week 11)
		2nd Nudge of Rourse Repeaters to use the math lab.	**Course Repeat Policy**

Takeaways

1. Be open to the use of students' digital footprints as a proxy of their engagement, especially earlier in term.

2. Use big data for a "bird's eye view" to study quantitative trends that warrant a deeper dive for qualitative insights among colleagues & peers.

3. The stronger a relationship between LMS course design and student outcomes in prior terms, the more reliable it may be for early warning and intervention in future terms.

4. Early, ongoing and consistent feedback to students about their engagement (e.g., course analytics, myUMBC "Check My Activity" tool) and outcomes/gradebook could be one of the most scalable forms of intervention and institution can muster.

Related Information

- [DoIT's Tableau Self-guided Training Resources](#)

- **For Faculty**
  - [REX Tools for Teaching](#) (3/28/17 DoIT News)
  - [Bb Course Analytics Reports](#): [Related UMBC FAQ](#)

- **For Students**
  - [*my*UMBC Check My Activity (CMA) feedback tool](#) | [YouTube Demo](#) | [Research](#) (UMBC login req'd)
  - [Blackboard's "How am I doing?" Course Report](#)

- [Learning Analytics Community of Practice](#)
  - [SP22 Data Science & Analytics Workshops](#)

Thanks, Questions & Feedback

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http://tiny.cc/event101263