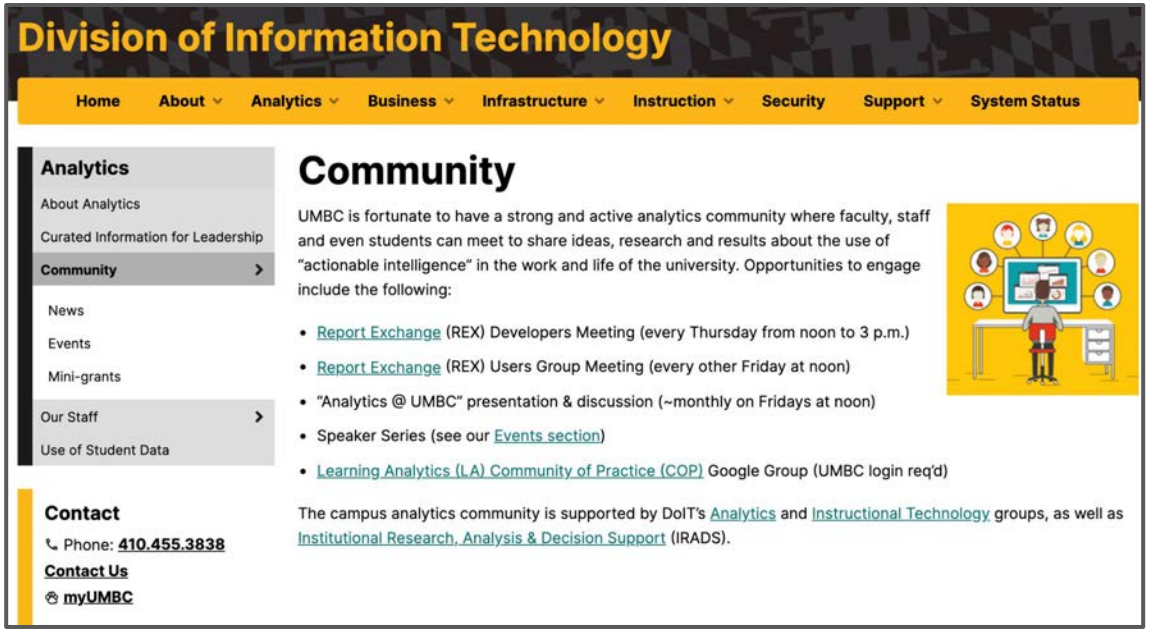
Do Students Carry “Lessons Learned” from One Course to the Next?

Tara S. Carpenter, Ph.D.
Principal Lecturer, Chemistry
March 10, 2022

About UMBC LA Community

- Started in Spring 21
- ~60 faculty are members of a Learning Analytics Community of Practice (LACOP) Google Group
- ~60 staff who also provide analysis support to colleges regularly attend an institutional "Analytics @ UMBC" demo & discussion.
- All faculty have data warehouse access, mini-grant recipients get tableau license & consulting.
- Smaller group regularly attend a biweekly users group meeting.



https://doit.umbc.edu/analytics/community

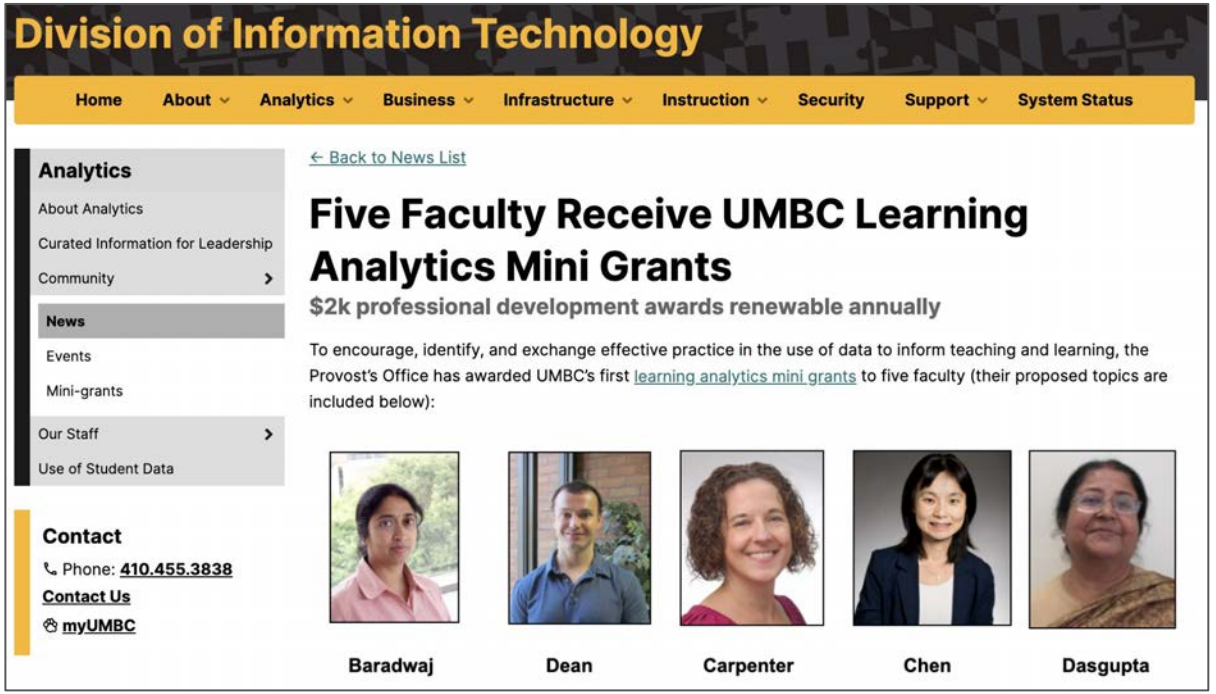
*Reminder: The next round of Learning Analytics "Mini-grant" proposals will be due **5/27/22**.*

Overview

1. Background
   a. Assumptions
   b. Problems
2. Methods
3. Findings
4. Next Steps
5. Q & A

Background

- Teaching at UMBC for 18 years
- Primarily responsible for General Chemistry
- CHEM 101 & 102 enroll ~1000 students per semester (chemistry, biochemistry, biology, engineering and pre-professional)



https://doit.umbc.edu/analytics/news/post/111234/

Gen Chem partner in crime: Sarah Bass
Accomplice in this work: Tiffany Gierasch and Mark Perks

Assumption – And High Bar

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

- Freeman A. Hrabowski, III
President, UMBC

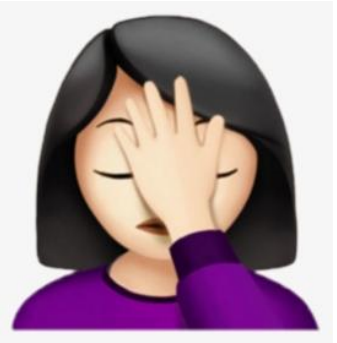
Problems

- Incoming college students are often unfamiliar with the differences between memorization and learning. They struggle with time management.

- Students are often conditioned to memorize information and reproduce it on a test. This leaves them unprepared for the rigor of college and often leads to cramming for exams.

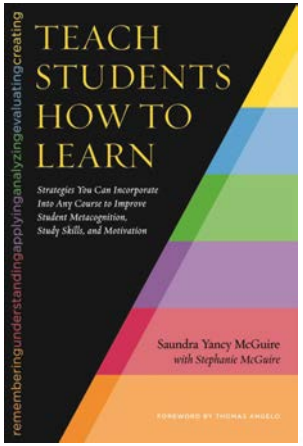
- Even when faculty attempt to educate their students on effective learning strategies, students often do not know how to set up and carry them out properly.

- Without guidance, learning how to learn is simply too overwhelming.



Metacognition

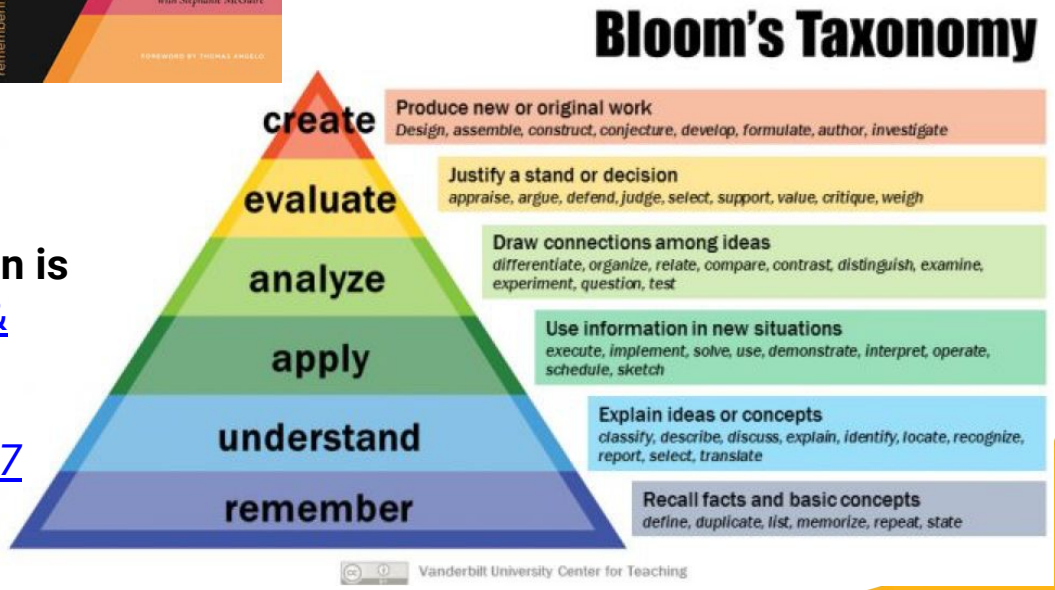
2016 FDC book discussion: ***Teach Students How to Learn: Strategies You Can Incorporate Into Any Course to Improve Student Metacognition, Study Skills, and Motivation***, Saundra McGuire, (2015)



Followed by Saundra McGuire's keynote presentation, "**Get Students to Focus on Learning Instead of Grades: Metacognition is the Key!"** at the [2017 Provost's Teaching & Learning Symposium](#) | recording below:

https://umbc.box.com/v/McGuirePTLS2017

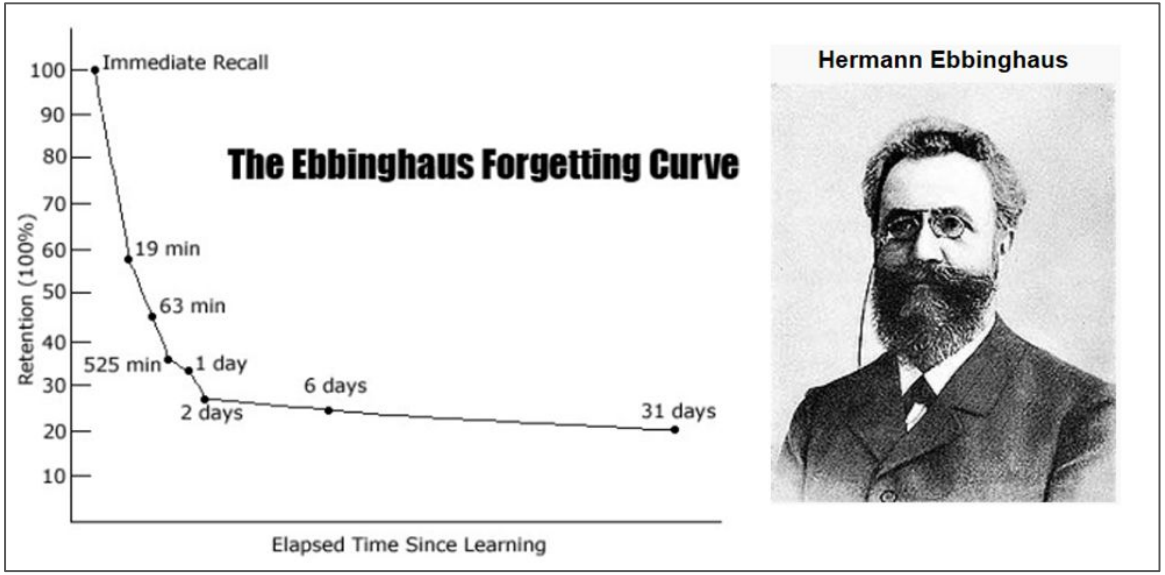
Followed up with her daughter, Stephanie, aimed at students, ***Teach Yourself How to Learn: Strategies You Can Use to Ace Any Course at Any Level*** (2018).



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.**

- Spaced practice (repetition) assignments were used in CHEM 102 in the 2nd half of Spring 2021.

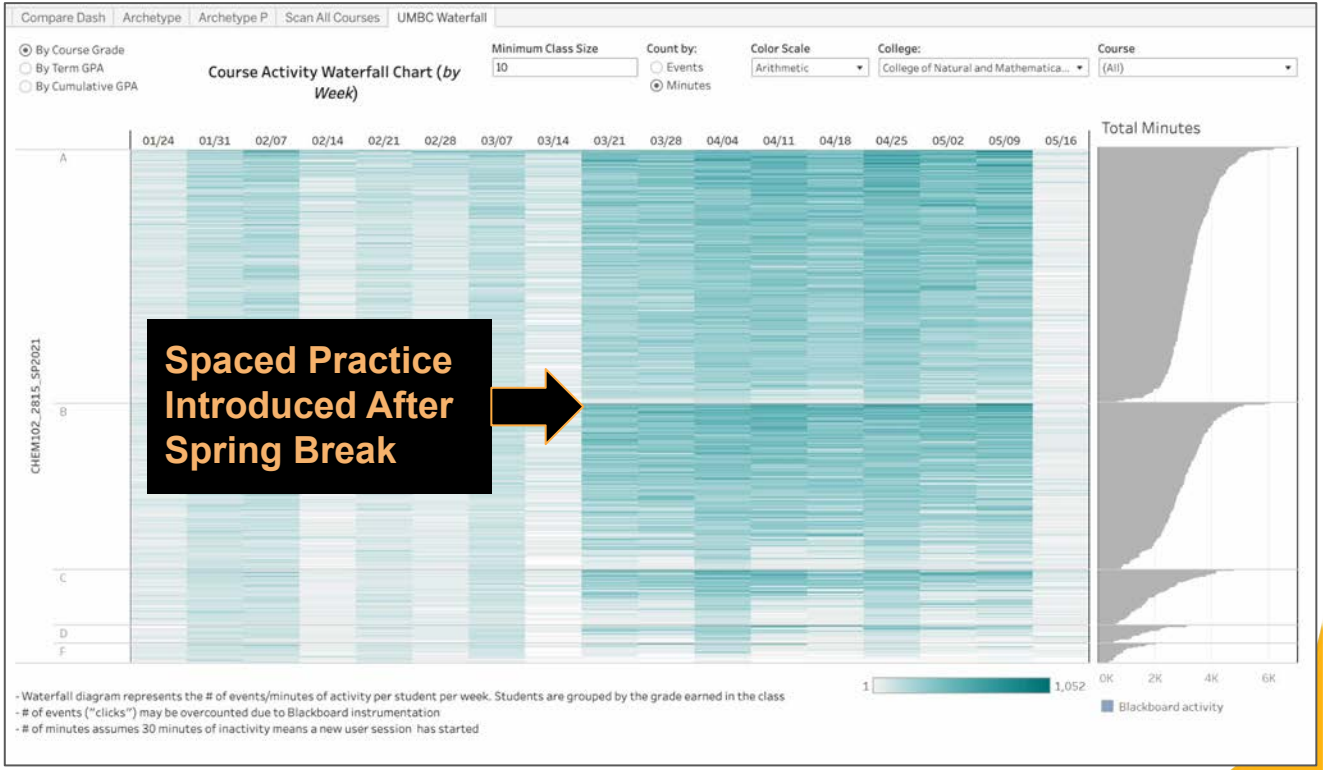


Goal: Promote understanding *and* recall.

CHEM 102 (SP21) “Waterfall”

- Row = student
- Column = week
- Cut line = final grade
- Color = Bb mins*

** darker color = more time*



Grades: CHEM 102 (SP21) to CHEM 351 (FA21)

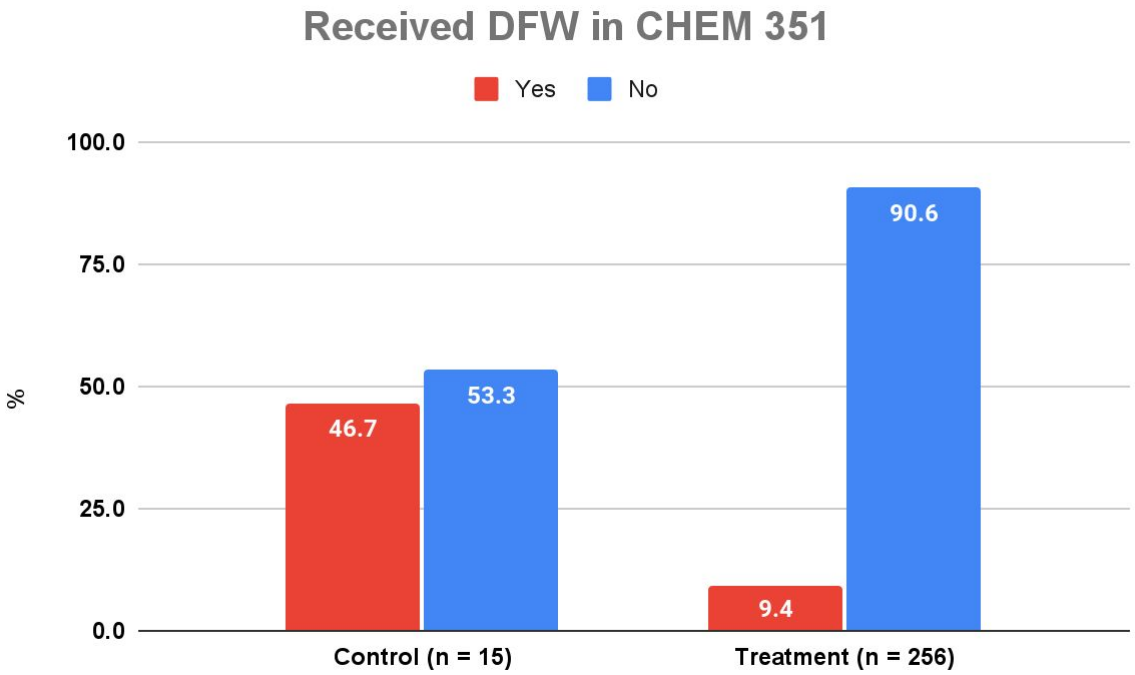
(the mini-grant)

CHEM 102 (SP21):

- Students who went *all in* using SP earned C or better.
- *I wonder how these students will do in the next course…*

CHEM 351 (FA21):

- 46% of students who opted out of SP in 102 went on to earn a DFW (n=15).
- 9% of students using SP in 102 earned DFW (n=256).



Survey: CHEM 102 (SP21) to CHEM 351 (FA21)

CHEM 102 (SP21):

- Majority agreed or strongly agreed that using SP improved their grade performance and that doing these activities was a good use of their time.

CHEM 351 (FA21):

- Pre-survey: 78% of respondents indicated they ***would*** leverage SP in 351
- Post-survey: However, only 34% of students in CHEM 351 ***actually*** reported that they ***used*** this strategy.

In other words, students valued SP in CHEM 102, but were unable or unwilling to use it on their own in CHEM 351.

Telling Comments From One Student . . .

- *The biggest challenge in carrying out Spaced Practice (SP) was **formulating my own types of questions** that integrated the many learning objectives (LOs) [for CHEM 351 "Orgo"].*
- ***Translating LOs into challenging questions** was very difficult.*
- ***Creating a practice schedule** that followed the class schedule closely was a bit difficult to do.*
- ***Any tips that could help us in creating an appropriate SP schedule** for a given section of units before an exam, would be very helpful.*
- *Many students in class chats spoke of their problems actually **forming a SP schedule** despite really wanting to continue the great studying technique.*

Common Themes	% response (n = 216)
Planning it out, finding material	50%
Time	28%
Accountability	20%
Less helpful in Orgo	2%

Next Steps?

Key Questions?

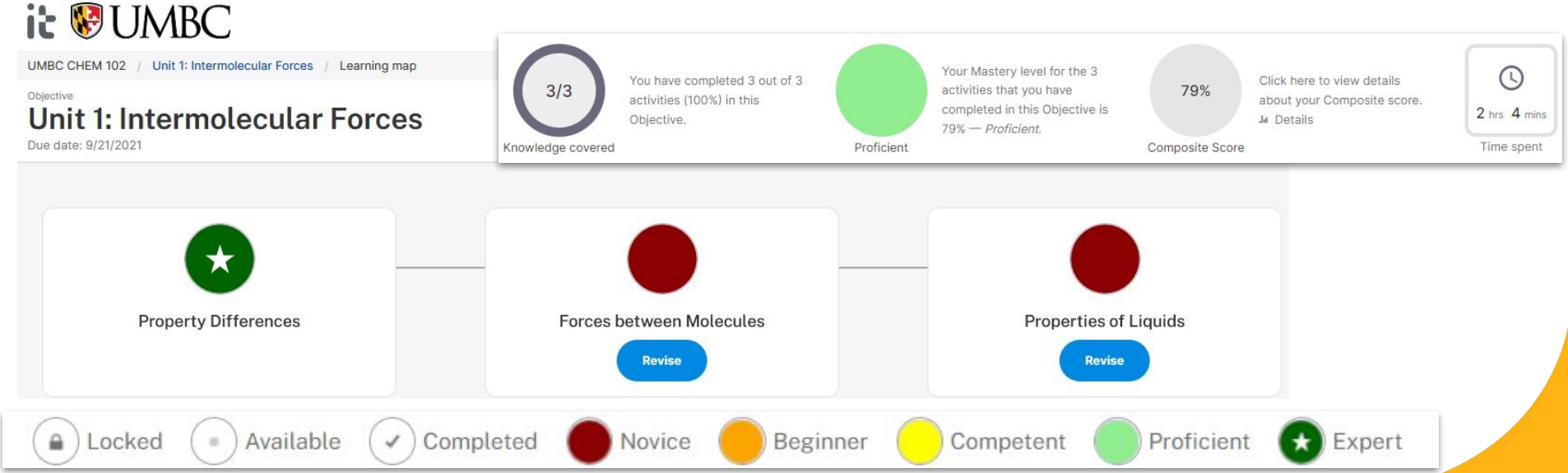
1. Why do some students ***strongly resist*** Spaced Practice in CHEM 102 at the start of the semester and then (surprisingly) ***embrace*** it by the end?

2. What might help students be more successful in implementing Spaced Practice in CHEM 351 after successfully doing so in CHEM 102?

3. What is the ***least*** amount of Spaced Practice per unit students need to do to be . . .
   a. Successful in CHEM 102?
   b. Proficient in self-regulating their learning in CHEM 351?

Refining Spaced Practice

- Piloted RealizeIt Learning in FA21 CHEM 102, based on recommendation from UCF, which has written extensively about their experiences in 2020, 2018 and 2017 (for *Educause Review*).
- Offers robust conditional logic & branching students must practice & get right before proceeding.
- Key benefit: being able to author/edit content vs. just accepting a publisher's homework system.
- Key cost: Instructor time and effort to learn and develop the system.

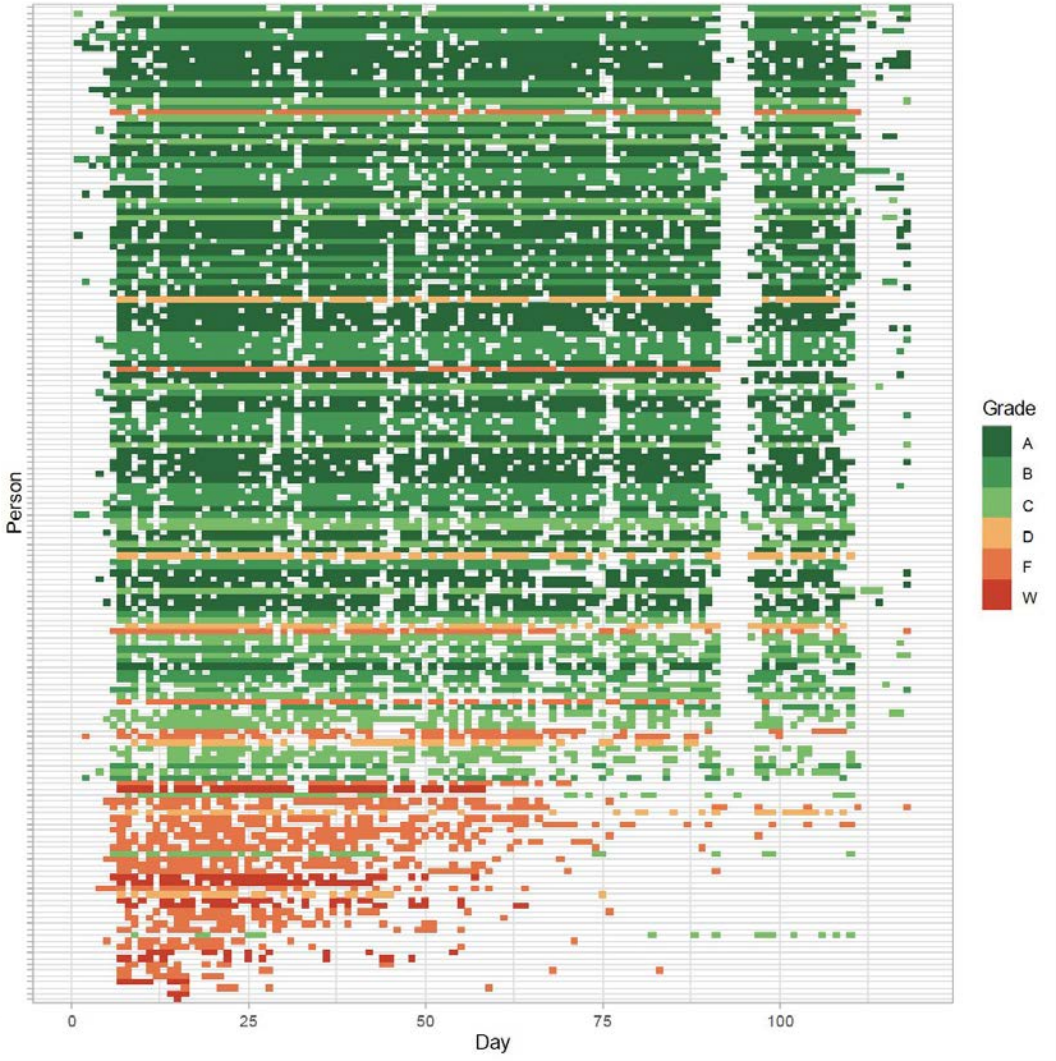


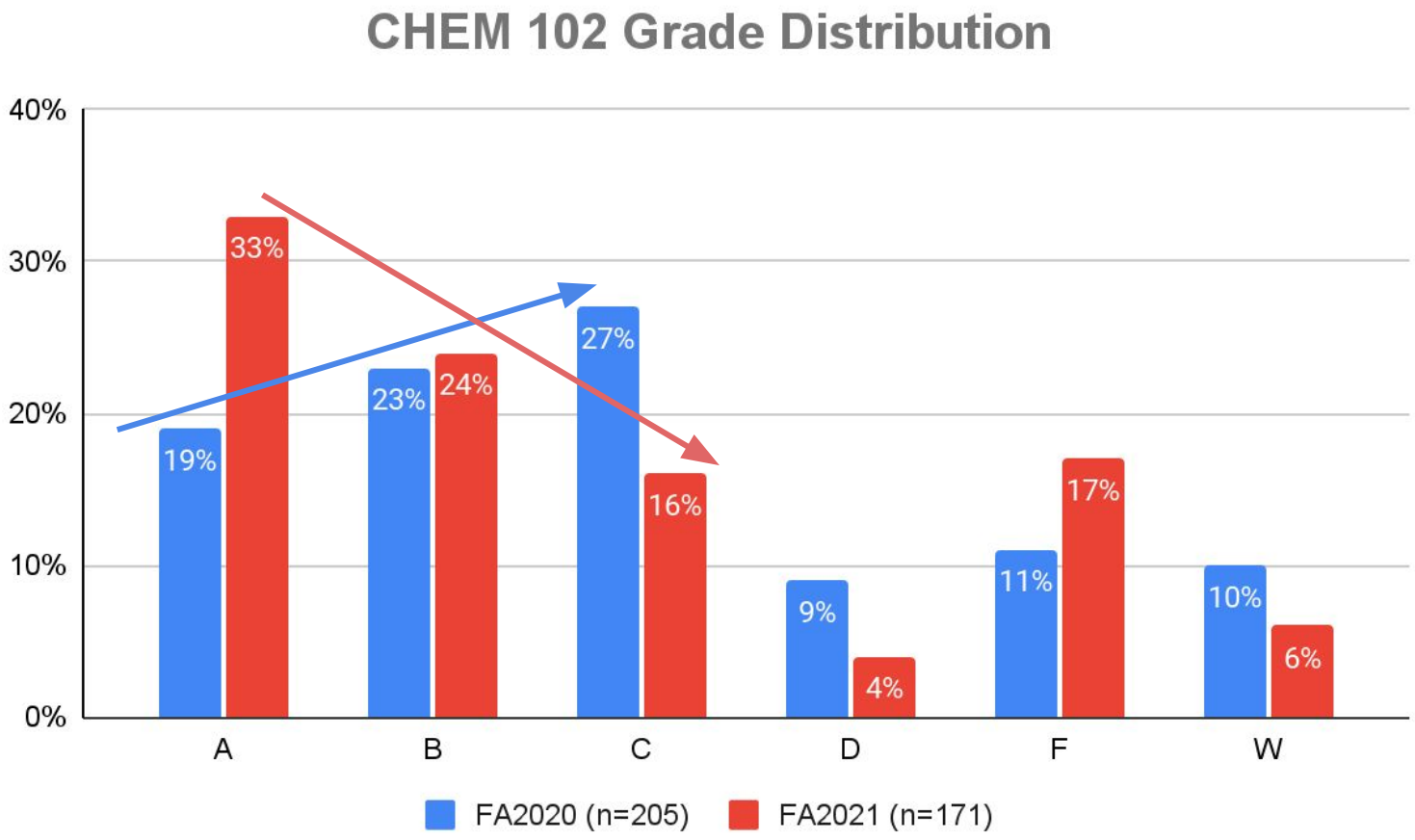
CHEM 102 (FA21)

Interactions over time by final grade earned.

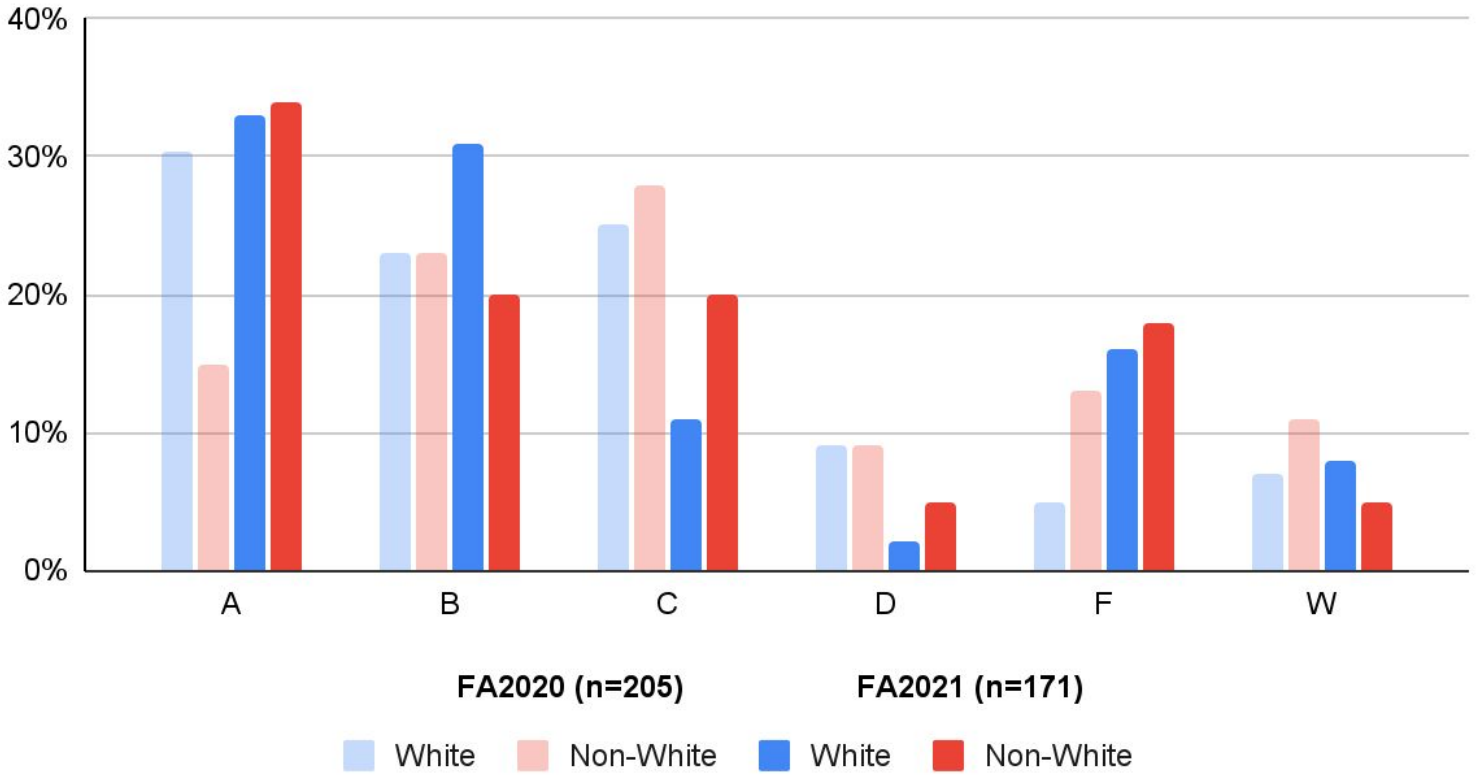
- Every row is a student.
- Every column is an active day in the semester using RealizeIt.

*Note: Excerpted with permission from [2/24/22 analysis] (UMBC login req'd) by **Colm Howlin**, RealizeIt Learning.*




CHEM 102 Grade Distribution
40%
30%
20%
10%
0%
33%
19%
23%
24%
27%
16%
9%
4%
11%
17%
10%
6%
A
B
C
D
F
W
FA2020 (n=205)
FA2021 (n=171)

CHEM 102 Grade Distribution by Race



What If . . . ?

- CHEM 101
  - Students are introduced to a SP “lite” via Aktiv or even Khan Academy
- CHEM 102
  - Continue more robust and adaptive SP environment in CHEM 102 using RealizeIt.
- CHEM 351
  - Students who liked SP in 102 could be encouraged to read Saundra McGuire’s ***Teach Yourself How to Learn*** (2018) over winter or summer break before taking 351.
  - Students given a framework in which to do SP on their own with existing course materials
- Reach out to students who opted out in spring ‘21 to learn why they did not participate.

Thanks, Questions & Feedback

Tara Carpenter
Principal Lecturer
UMBC Chemistry Dept.
carpent@umbc.edu

http://tiny.cc/101268