Studying Blended Learning in a Liberal Arts College Setting

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e-Learning 2.0 Conference
March 29, 2012

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About the Project

NEXT GENERATION | LEARNING CHALLENGES

Transforming education through technology

"Next Generation Learning Challenges is a collaborative, multi-year initiative created to address the barriers to educational innovation and tap the potential of technology to dramatically improve college readiness and completion in the United States."

INNOVATION – EVIDENCE – COLLABORATION

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Research Question

Can we use blended learning approach to improve learning outcomes in introductory STEM courses?

ENGAGEMENT

COMPLETION

MASTERY

PERSISTENCE IN MAJOR

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What do we mean "Blended"?

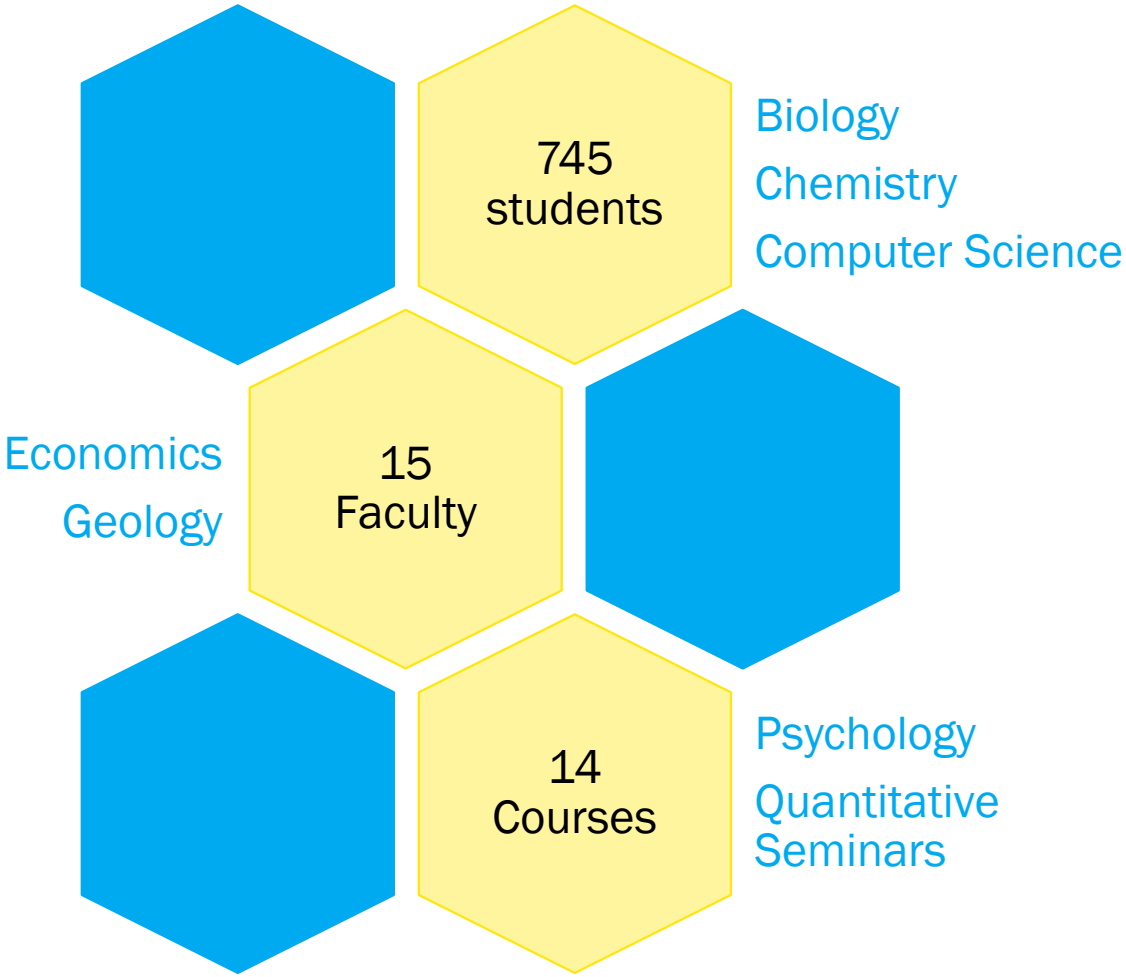
Two key features in our definition

- Students learn and get feedback on learning outside classroom through computer-based materials
- Extra-classroom component alters how instructor teaches or uses in-class time

No prescriptions beyond this

- No requirement to reduce classroom or "seat" time
- Faculty identify pedagogical challenges and goals

Overview of Study



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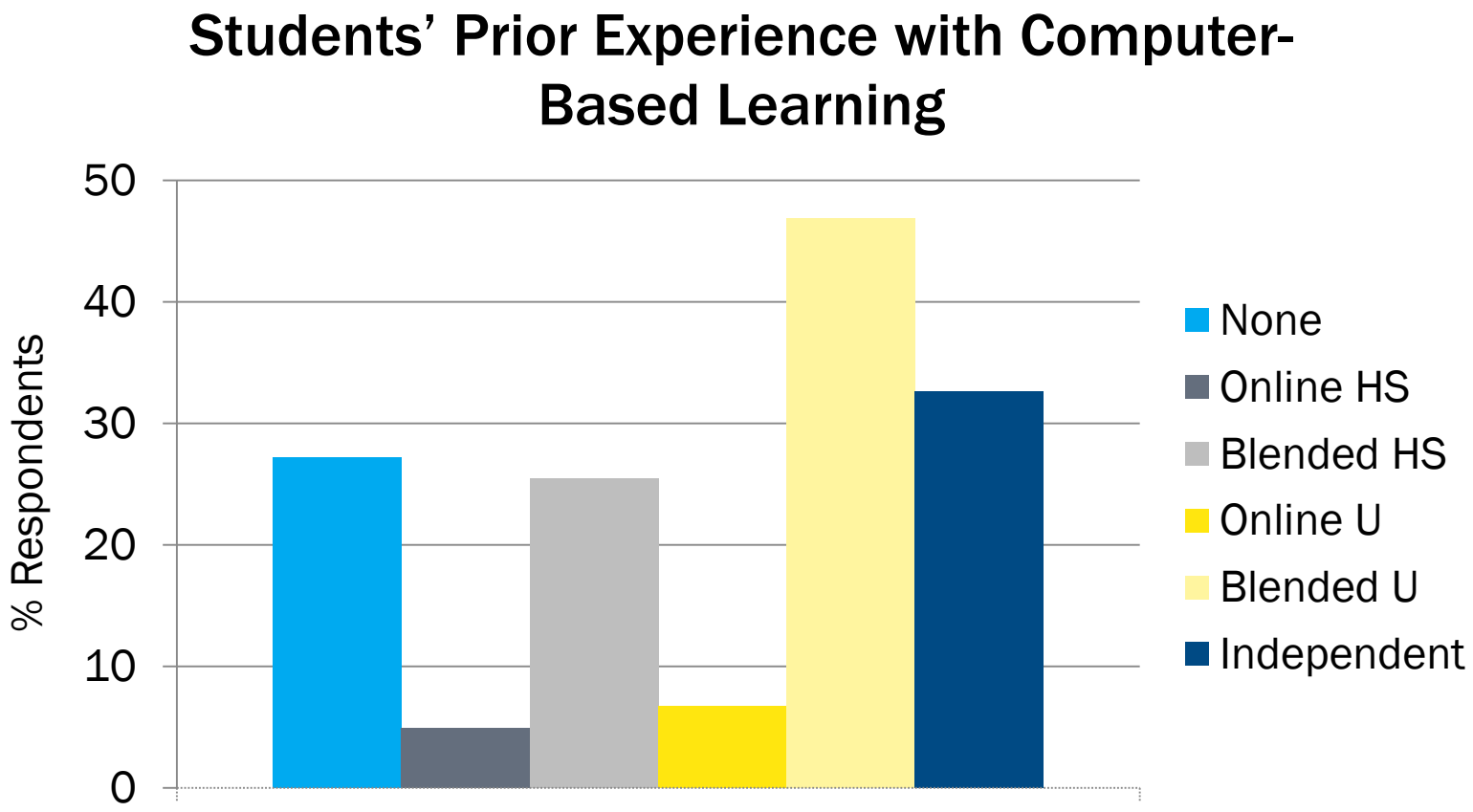
Assessment/Evaluation

For all courses, assess perceptions of impact through

- Faculty start/exit interviews
- Student attitudinal surveys

Where possible, compare perceptions against quantifiable evidence of impact …

Preliminary Findings



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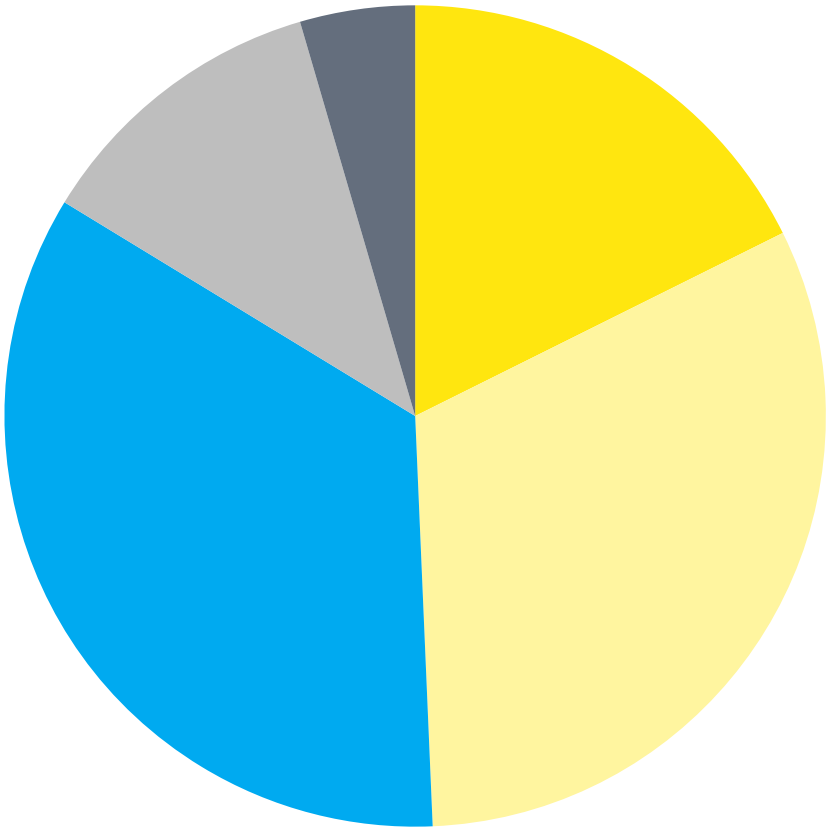
Preliminary Findings



Student Attitudes Toward Computer-Based Learning Prior to Course

- Strongly positive
- Somewhat positive
- Neutral or Uncertain
- Somewhat negative
- Strongly negative

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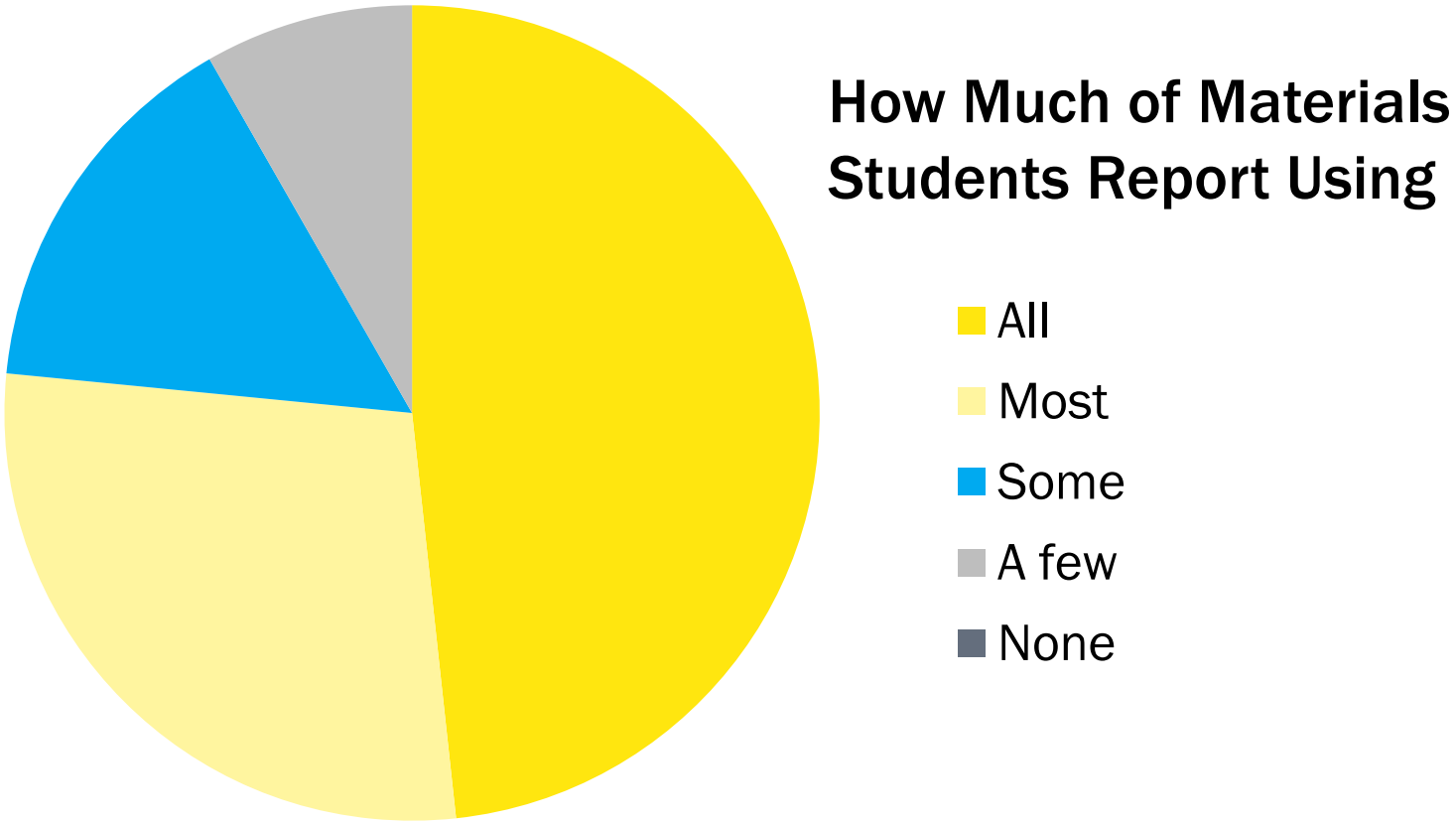
Preliminary Findings



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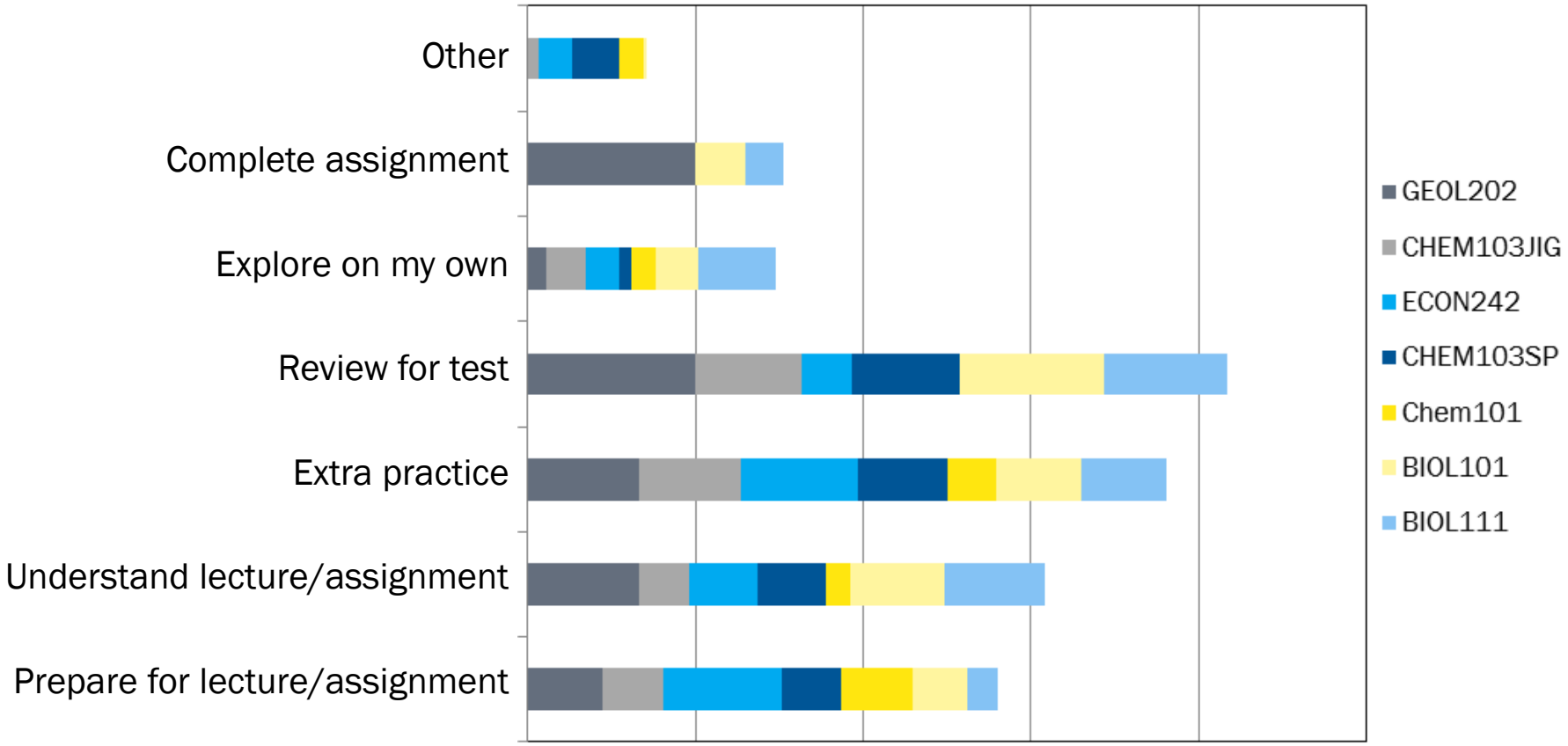
Preliminary Findings

How Students Used Materials



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Preliminary Findings

All fall faculty intended to continue blended approach

WHY?

1. Value automatic grading
2. Value student learning data generated
3. Feel approach is relevant to certain pedagogical challenges or goals

Example of quiz with feedback on answer

Mozilla Firefox

brynmawr.edu https://moodle.brynmawr.edu/mod/quiz/reviewquestion.php?state=8925&number=17

17

Marks:
1/1

Name the mineral:

sillimanite ✓

Note: Case does not matter, but spelling does!

Consciously or unconsciously, we identify minerals using a few key characteristics that we associate with them. Name the two or three characteristics of this mineral that allowed you to name it:

zotero

Example of data collected as students work through quiz

Mozilla Firefox

brynmawr.edu https://moodle.brynmawr.edu/mod/quiz/reviewquestion.php?state=8925&number=17

Name the mineral:

sillimanite ✓

Note: Case does not matter, but spelling does!

Consciously or unconsciously, we identify minerals using a few key characteristics that we associate with them. Name the two or three characteristics of this mineral that allowed you to name it:

radial, gray ✓

*Note: You get credit for listing your criteria -- the green check mark does **not** mean they are correct!*

Make comment or override grade

Correct

Marks for this submission: 1/1.

History of Responses:

#	Action	Response	Time	Raw score	Grade
1	Grade	serpentine,	16:20:38 on 7/09/11	0.5	0.5
2	Grade	andalusite,	16:21:00 on 7/09/11	0.5	0.5
3	Grade	kyanite,	16:21:21 on 7/09/11	0.5	0.5
4	Grade	quartz,	16:21:50 on 7/09/11	0.5	0.5
5	Grade	amphibole,	16:22:03 on 7/09/11	0.5	0.5
6	Grade	pyroxene,	16:22:12 on 7/09/11	0.5	0.5
7	Grade	calcite,	16:22:51 on 7/09/11	0.5	0.5
8	Grade	epidote,	16:23:10 on 7/09/11	0.5	0.5
9	Grade	plagioclase,	16:23:23 on 7/09/11	0.5	0.5
10	Grade	sillimanite,	16:53:08 on 7/09/11	1	1
11	Grade	sillimanite, radial, gray	16:53:29 on 7/09/11	1	1
12	**Close&Grade**	**sillimanite, radial, gray**	**16:53:29 on 7/09/11**	**1**	**1**

zotero

Example of overview instructor gets

Progress key: top quarter | 2nd quarter | 3rd quarter | lowest

Print report | Download text | Download Excel

				Folder/Assignment	Grand Total	1.2a VIS - Chemical and Physical Change: Phosphorus + Chlorine *(Visual Exercise or Active Figure)*	1.2b MAS - Elements and Compounds *(Mastery Pool)*	1.2c VIS - Mixtures and Pure Substances: Identify *(Visual Exercise or Active Figure)*	1.2d MAS - Mixtures and Pure Substances: Macroscopic *(Mastery Pool)*	1.2e MAS - Mixtures and Pure Substances: Particulate *(Mastery Pool)*	1.2f MAS - Elements and Compounds: Macroscopic *(Mastery Pool)*
				Requirement Status	*(mixed)*	Required	Required	Required	Required	Required	Required
				Due Date	*(mixed)*	9/6/2009 11:59 PM	9/6/2009 11:59 PM	9/6/2009 11:59 PM	9/6/2009 11:59 PM	9/6/2009 11:59 PM	9/6/2009 11:59 PM
Login ID	Student Number	Send Email	First Name	Last Name	26.0	1.0	1.0	1.0	1.0	1.0	1.0
darydav1	5538194572		Daryl	Davis	10.0	1.0	1.0	1.0	1.0		1.0
ddismal1	7984651302		Dora	Dismal	2.0		0.0	0.0			0.0
bguy1	0		Buddy	Guy	0.0						
susjon1	4557689100		Susan	Jones	12.0	1.0	1.0	1.0	1.0	1.0	1.0
inbetween1	1489657237		John	Middle	14.0	1.0	1.0	1.0	1.0	1.0	1.0
jplain1	3791486205		Jane	Plain	8.0	1.0	1.0		1.0		1.0
clarasm1	6014789635		Clara	Smith	10.0	1.0	1.0	1.0		1.0	1.0
ssubpar1	9513578426		Skip	Subpar	0.0						
superb1	1346798250		Adam	Superb	14.0	1.0	1.0	1.0	1.0	1.0	1.0
thebest1	2500639784		Valerie	Valedict	15.0	1.0	1.0	1.0	1.0	1.0	1.0
robwill1	9857645231		Robert	Williams	13.0	1.0	1.0	1.0	1.0	1.0	1.0

Preliminary Findings

Value of learning data created by auto-grading

"Real-time" sense of how students are doing

- More "agile" teaching
- More fruitful conversations with students
- Students able to take ownership of learning

Pedagogical benefits of frequent assessment

- Testing effect
- Importance of periodic review

Preliminary Findings

Same features most valued by students

Immediacy of feedback

- Knew sooner whether they had understood
- Enabled them to better structure study time

Emphasis on mastery (not their words)

- Appreciated opportunity for more practice if needed
- But, just as important – no busywork!
- Appreciated opportunity to make mistakes and get feedback before high-stakes assessment

Preliminary Findings

Blended learning supported teaching goals

Reported that blended learning helped them in one or more areas

- Learner-centered teaching
- Responding to classroom diversity
- Approaches that encourage deep learning

Preliminary Findings

Examples

Biology Focus/Exploration courses

- Half-semester, topic-based courses
- Stakeholders fear students won't get fundamentals
- Heterogeneity of student preparation and goals

GEOL202 Mineralogy/Crystal Chemistry

- Better way to ensure mastery
- Frees up class time for more interesting things

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Preliminary Findings

Faculty

- **Greatest concern was time investment**
- **Importance of ability to re-use**
- **Available materials did not always match course**

Students

- **Did not like materials that "wasted time," even if helpful**
  - Slow to download or play
  - Unintuitive interface
  - Difficult to learn how to enter answers correctly

Next Step: Quantitative Analysis

Compare student performance to

- Historical data on student performance in course
- Predicted performance based on SATM, placement tests, etc.
- Learning data tracked by courseware

Supplement grades as performance with

- Widely used standardized assessments
- Tests of long-term retention