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Current Practices in On-line Learning


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WEB SESSIONS

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Lessons from an Inverted Classroom

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The Inverted Classroom

In an inverted classroom, typical in-class lecture time is replaced with laboratory and in-class activities. Outside class time, lectures are delivered over some other medium such as video on-demand.¹

¹ Gannod, G. (2007), "WIP: Using Podcasting in an Inverted Classroom," 37th ASEE/IEEE Frontiers in Education Conference, 2 pp.




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4

Alternative Definition & Motivations

Make the best use of (faculty-student) "face time" in fostering student learning.

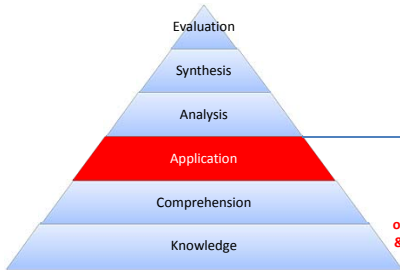
- Value of in-class time
- Student attention span
- Reflects today's technologies
- Perceived Efficiencies




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5

Bloom's Taxonomy



The diagram shows a pyramid with six levels: Evaluation (top), Synthesis, Analysis, Application (highlighted in red), Comprehension, and Knowledge (bottom). A double-headed arrow on the right side of the pyramid spans the Application, Comprehension, and Knowledge levels, with the text "Main Emphasis of CEE 2105 & CEE 3412" next to it.



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6

Courses Where Inverted Classroom Has Been Implemented at Villanova

Semester	Course	Main (Broad) Learning Outcome
Spring 2012	CEE 3412 Structural Design (Steel & R/C)	Design/compute capacity of structural members
Spring 2013	CEE 3412 Structural Design (Steel & R/C)	Design/compute capacity of structural members
Fall 2013	CEE 2105 Mechanics I (Statics/Mech Mat)	Solve basic mechanics problems
Spring 2014	CEE 3402 Structural Steel Design	Design/compute capacity of structural steel members

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Conventional Classroom (Basic Approach)

- 50- or 75-minute lectures delivered in class
 - Mostly theoretical content
- Quickly executed example problems
 - PowerPoint or quick review of pre-solved handout
- Homework ← primary introduction of "application" or higher level cognitive learning

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Inverted Classroom (Basic Approach)

- Pre-recorded lectures viewed outside of class
- Example problems solved in class ← primary introduction of "application" or higher level cognitive learning (real time by students, faculty, or some combination thereof)
- Homework

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Time Estimates (in-class)

	PRE-INVERSION	POST-INVERSION
Theory-Based Lecture	60%	10%
Problem Sets	25%	70%
Assessment (Quizzes/Exams)	10%	15%
Administrative	5%	5%

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Online Recorded Lectures

- Entirely theoretical in nature
 - No solved problems
 - Intended to provide background and base for solving problems in problem sets
- Recorded using College of Engineering Distance Education facilities or simple screen capture software
- Available for viewing via computer or mobile device
- Lecture notes distributed in advance

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Student Feedback

- Students given survey at end of course soliciting feedback on inverted classroom model and course structure
- Separate from standard course evaluations (CATS)
- Mandatory
- Anonymous
- Excellent feedback
 - 140 of 140 surveys returned over two years
 - 82 of 140 students provided written comments

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Sampling of Student Comments

- The fact that more time can be spent with the professors physically working on the problems is more effective than if it were a lecture instead.
- Helped me see the thought process behind each problem.
- The setup was a great way to focus on problems. Problems are what we are tested on so that should be done in class. Really prepared for tests.
- The lectures were not burdensome to watch outside of class & I don't think I would have been able to complete/understand the homework assignment or be successful on the tests & quizzes.




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13

Sampling of Student Comments

- It was also good to look back at the lectures and recorded problems when studying for exams & quizzes.
- Helps me stay awake in class, unlike lectures.
- I felt I knew how to do the problems by the time I went to do the homework. When tests came around, I barely had to study and still did well because the material stuck from class and homework.




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14

Sampling of Student Comments

- I learned a lot in this course from the in-class problems and the take-home problem sets but the lectures were not at all helpful to my learning in this course.
- I watched all the videos in the beginning of the semester but then one day I forgot and class went fine...and then I started "forgetting" more often.
- Out of class lectures were hard to pay attention after 30 min.
- The video lectures were helpful, but it was difficult to stay focused on the video outside of the classroom.




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15

Sampling of Student Comments

- Big time commitment on top of other classes we were enrolled in.
- Way too much work for a 3 credit course.
- I didn't have to spend as much homework time struggling with figuring out problems on my own. I think this saved me time outside of class compared to other CEE courses even though I also spent time watching all lectures.
- I was not a fan at first but now I am sold. I think I learned more efficiently since time in class was dedicated to problems.
- I learned more and completed more successful work in this class than any other this semester, by far.




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16

Survey Responses

The format of this course improved my overall learning over a classical in-class lecture format.

	1 Strongly Disagree	2 Mildly Disagree	3 Neutral	4 Mildly Agree	5 Strongly Agree
2012 (CEE 3412)	4	4	9	15	15
3.70					
2013 (CEE 3412)	1	2	6	11	26
4.28					
2013 (CEE 2105)	0	0	4	11	32
4.60					




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17

Survey Responses

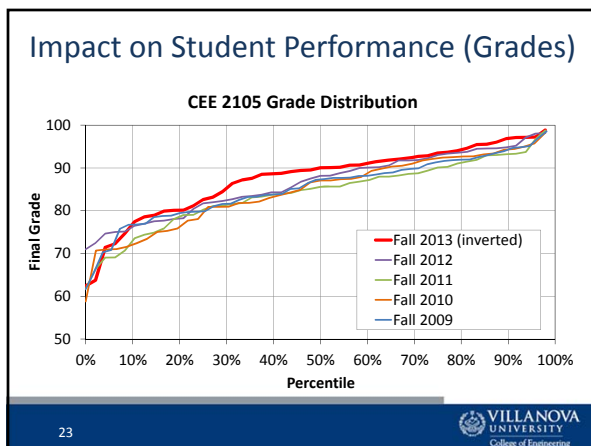
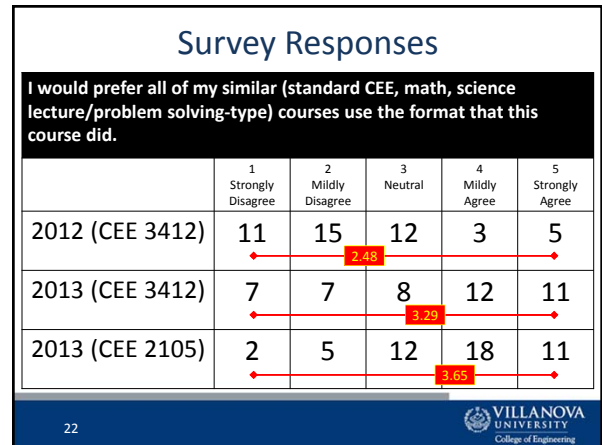
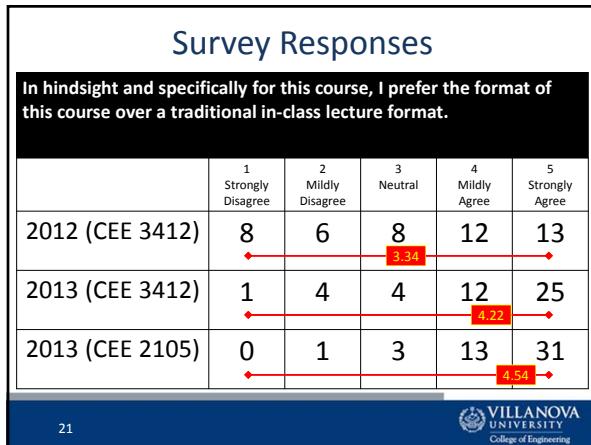
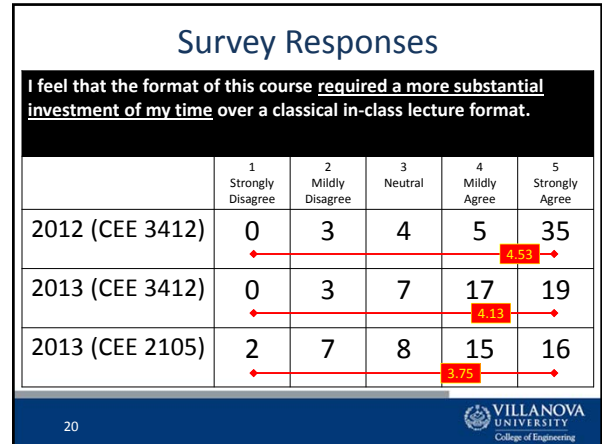
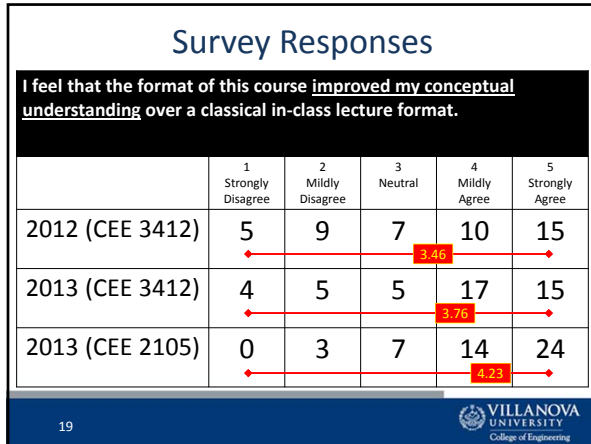
I feel that the format of this course improved my ability to apply knowledge in solving basic problems over a classical in-class lecture format.

	1 Strongly Disagree	2 Mildly Disagree	3 Neutral	4 Mildly Agree	5 Strongly Agree
2012 (CEE 3412)	3	2	7	17	18
3.96					
2013 (CEE 3412)	0	1	8	13	24
4.30					
2013 (CEE 2105)	0	0	1	16	31
4.63					



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18



- ### Thoughts Based on My Experiences
- Accentuates good teaching, exposes poor teaching
 - Not just “lecture delivery”
 - Puts a premium on organization of course
 - Effectively twice the class meetings, but only half of them involve face-to-face interaction
 - Need a good course calendar to keep things clear
 - Format well suited to a pre-packaged course binder/course pack
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Thoughts Based on My Experiences

- Does not require more student time, but that will be the perception
 - Does require more student responsibility
- Day 1 sales pitch is very important
 - Set expectations
 - Provide clarity on organization

25

Thoughts Based on My Experiences

- Promote “circular” path of learning, as needed by each individual student
 - Ability to rewatch lectures (and problems) as needed
- Format is easy to mesh with short labs, demonstrations, overarching problems, etc.
- Different ways to keep theory important, since it really is important
 - Quiz/exam problems
 - Embed theory into examples
- Higher level cognitive learning can be fostered in the same way

26

Thoughts Based on My Experiences

- Faculty time commitment
 - Can be very extensive first time through
 - Much more prep time than just recording lectures
 - Will probably never be totally steady-state in structural design courses (e.g. ACI 318-14)
 - Design best as numerous small pieces that can be replaced/edited/resequenced
 - Actually easier to prep “for class meetings”

27

QUESTIONS?

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28