

A Partially Flipped Model for a College Trigonometry Course

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Outline

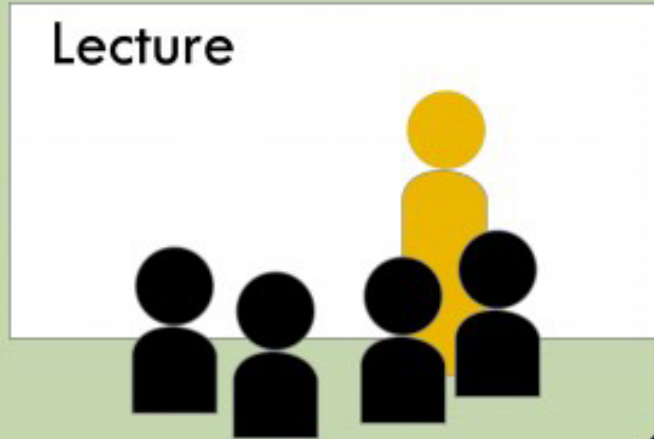
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Motivation

- Used instructional videos intermittently in Basic Algebra Course
- Trigonometry follows college algebra and precedes calculus
- Capstone project for Teaching Fellowship
- Teaching as Research (TAR) Project for CIRTLL at UIOWA center for the integration of teaching research and learning)

What is Flipped Instruction?

TRADITIONAL



Homework activities

The diagram shows a student (black figure) sitting at a desk, working on a piece of paper, representing homework activities.

FLIPPED



Methodology

- Model: One day of flipped instruction, two days of traditional lecture
- Created 15 instructional videos on my iPad Pro using Doceri app and Apple Pencil
- Created Video Quiz assessment due each Monday excluding exam weeks (11 total quizzes)
- Final Anonymous Survey was created using likert scale to address research questions

The final survey addressed the following:

- 1) Students' perception of the utility of the flipped instructional period and videos/slides on course assessments
- 2) Students' perception of their own learning after viewing the video/slides and the flipped instructional period
- 3) Students' attitudes towards the partially flipped format

Format of the Partially Flipped Course

MONDAY

- Assessment: Video Quiz (due beginning of class)
- Review/questions (5-10 min)
- In-Class Activity

WEDNESDAY

- Assessment: Online HW (due at midnight)
- Homework questions (5-10 min)
- Lecture

FRIDAY

- Assessment: Quiz (20 minutes)
- Lecture

Note: All instructional materials, including solutions to video quizzes, select homework problems, extra worksheets, links to instructional videos, and classnotes were available on the course ICON site

Instructional Videos

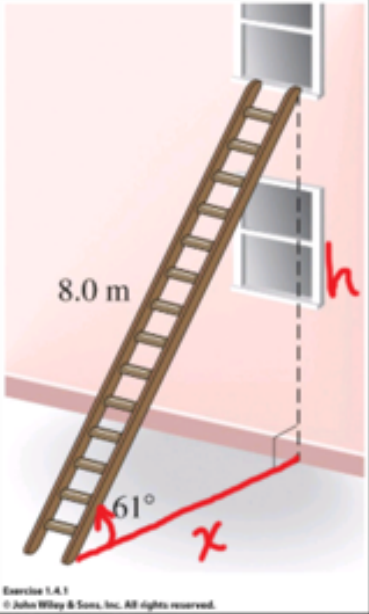
- Created with Doceri for iPad on iPad Pro 12.9"
- Some were pulled from YouTube
- Average Length: 9:52
- Introductory content only
- Video Quiz created before the instructional video

Verizon 4:53 PM 31%

REC

6 of 8

ex. A ladder 8.0m long is placed against a building. The angle of elevation between the ladder and the ground is 61° . How far is the base of the ladder from the building?



8.0 m

61°

x

h

Exercise 1.A.1
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$$\sin(61) = \frac{h}{8} \quad \csc(61) = \frac{8}{h}$$
$$\cos(61) = \frac{x}{8} \quad \sec(61) = \frac{8}{x}$$
$$\tan(61) = \frac{h}{x} \quad \cot(61) = \frac{x}{h}$$

Video Quizzes

- 10 points each
- Worth 1/3 of total quiz grade
- Submitted online before class or at the beginning of class
- Format: True/False, Multiple Choice, Fill in the blank, Plot, Graph, Short Answer
- Average Length: 6 questions

6. (1 pt.) Given the diagram to the right which of the following statements is false:

- a. $\tan 55^\circ = \frac{y}{x}$
- b. $\cot 55^\circ = \frac{x}{y}$
- c. $\tan 31^\circ = \frac{y}{4.8}$
- d. $\cot 31^\circ = \frac{x + 4.8}{y}$

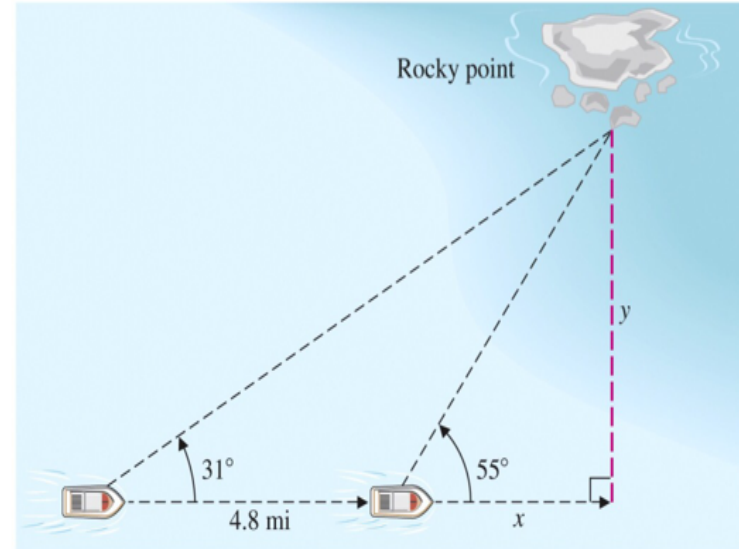
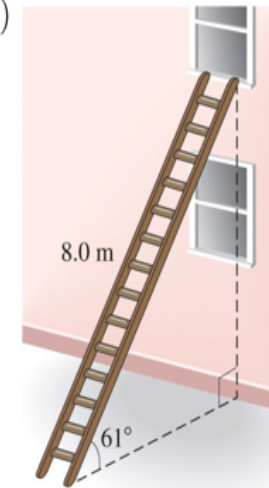


Figure 1.4.5
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7. (2 pts.) A ladder 8.0m long is placed against a building. The angle of elevation between the ladder and the ground is 61 degrees. How high will the top of the ladder reach up the building? (Round your answer to the nearest meter, i.e. 3.78m rounds to 4m.)

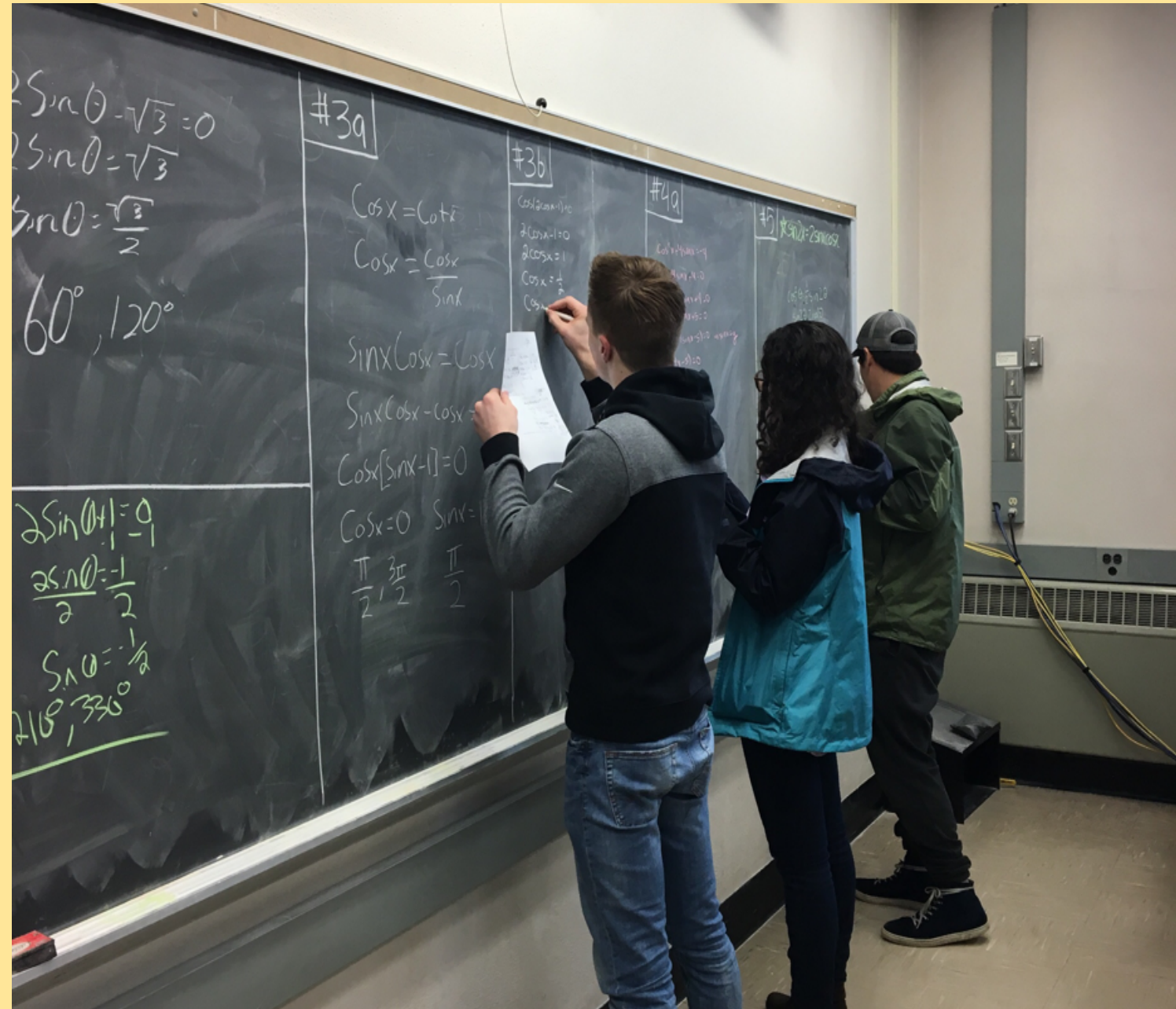


Monday Class

- Short review of video quiz content
- Interactive activities to expand upon video content

11 flipped periods:

- Group Worksheets (6)
- Indirect Measurement Activity
- Top Chef Graphers Game
- Trashketball Game
- Jeopardy Game
- Speed 'Equating'

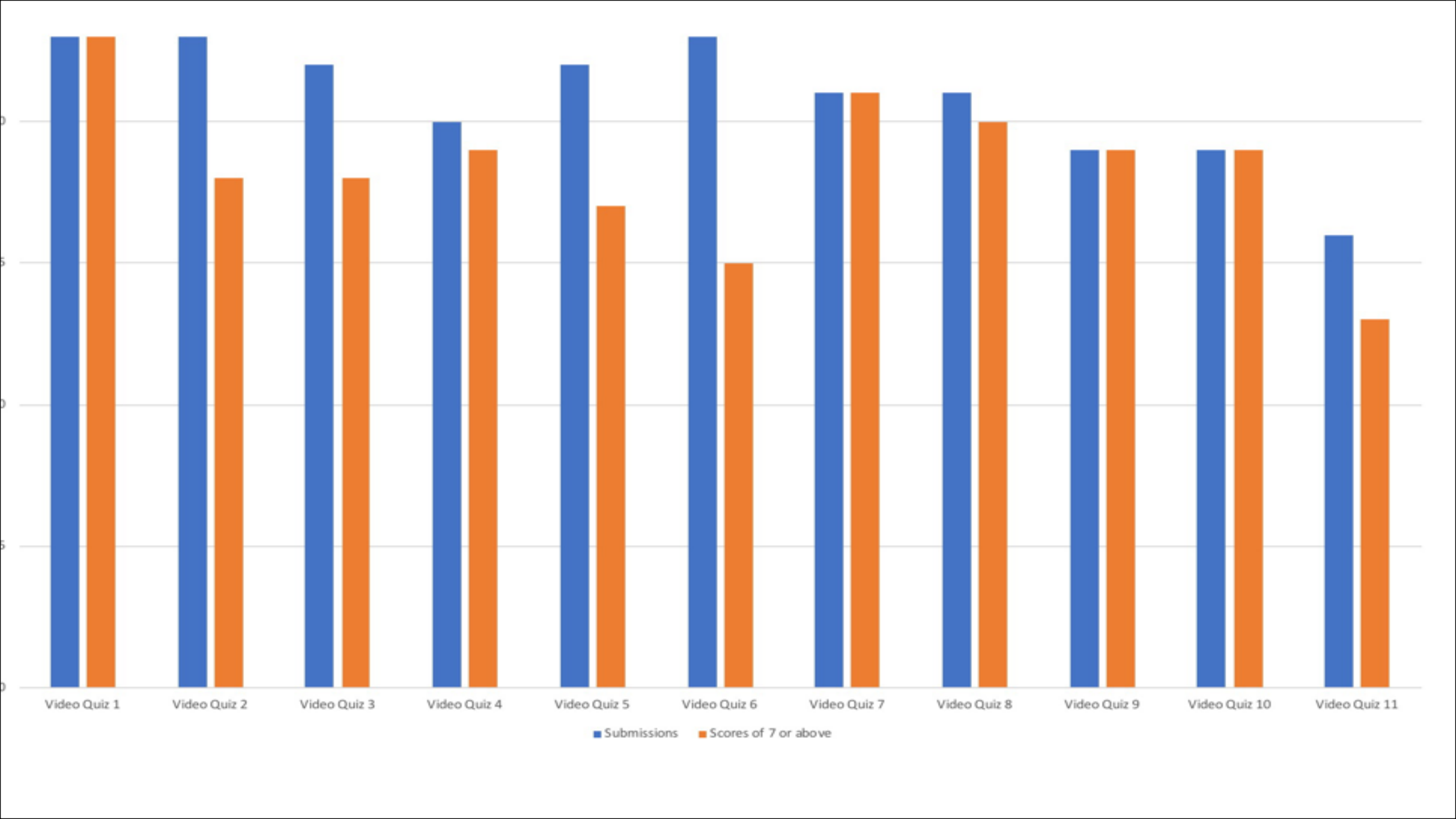


Results

- Video Quiz Average: 7.98/10
- Passing Rate for Video Quiz: 88.55% (percent of class scoring at least 7/10)
- 20/24 students with final grade of 70% and above
- 21/24 completed the final survey

Video Quiz Scores

| Assessment | Class Average | High Score | Low Score (excluding 0) | Submissions | Scores of 7 or Above |
|---------------|---------------|------------|-------------------------|-------------|----------------------|
| Video Quiz 1 | 9.905 | 10 | 8 | 23 | 23 |
| Video Quiz 2 | 7.92 | 10 | 4 | 23 | 18 |
| Video Quiz 3 | 8.03 | 10 | 2 | 22 | 18 |
| Video Quiz 4 | 7.6 | 10 | 4 | 20 | 19 |
| Video Quiz 5 | 7.7 | 10 | 5 | 22 | 17 |
| Video Quiz 6 | 7.88 | 10 | 2 | 23 | 15 |
| Video Quiz 7 | 8.25 | 10 | 7.5 | 21 | 21 |
| Video Quiz 8 | 8 | 10 | 6 | 21 | 20 |
| Video Quiz 9 | 7.33 | 10 | 7 | 19 | 19 |
| Video Quiz 10 | 7 | 10 | 7 | 19 | 19 |
| Video Quiz 11 | 8.14 | 10 | 5 | 16 | 13 |



Final Survey Results

| Survey Questions | Agree | Neutral | Disagree |
|----------------------------------------------------------------------------------------------------------------------------------|-------|---------|----------|
| I prefer in-class activities to lecture based instruction | 6 | 11 | 4 |
| I prefer a mix of in-class activities and lecture based instruction | 16 | 4 | 1 |
| The format of this class is enjoyable | 13 | 5 | 3 |
| I would enroll in another course that uses videos outside of class | 16 | 2 | 3 |
| I recommend that faculty who teach other math courses develop videos for students to view outside of class | 18 | 0 | 3 |
| I prefer lecture based instruction to in-class activities | 8 | 8 | 5 |
| Watching the videos helps me understand concepts that are new to me | 18 | 1 | 2 |
| I feel confident about the material after watching the video and/or viewing the video slides | 9 | 9 | 2 |
| The in-class work helps me learn the course content | 18 | 2 | 1 |
| I felt confident about the video content after completing the in-class activities on Monday | 13 | 5 | 3 |
| It is helpful to work through problems on Monday when other students and the instructor are available to answer questions | 16 | 5 | 0 |
| Watching the videos helps me complete the in-class activities | 15 | 5 | 1 |
| I used the videos and/or slides of the videos to prepare for quizzes | 11 | 6 | 4 |
| I used the videos and/or slides of the videos to prepare for exams | 9 | 5 | 7 |
| Watching the videos and/or viewing the slides of the videos helps me complete the video quizzes | 18 | 2 | 1 |
| The in-class activities helps me do the homework | 15 | 3 | 3 |
| I would watch the instructional videos and/or view the slides of the videos if I did not have to complete a video quiz afterward | 10 | 3 | 8 |



Final Survey Open Response Questions

- 1) What, if anything, did you like about the partially flipped format of the course?
- 2) What, if anything, did you dislike about the partially flipped format of the course?
- 3) If you could offer one suggestion for change in the format of the course, what would it be?

Select Comments

- “I like the fact that I can actually ask questions if I need to! It’s very unusual/new to me to be allowed to do so. I also like how much more personal the classroom feels. The “Food Wars” game was kind of fun too...”
- Video quizzes were actually good with the new concepts, it layer out the big idea and helped me understand it better.”
- “The video quizzes meant there was an extra assignment to complete each week.”
- “Sometimes the group activities made me nervous but sometimes they were fun—like jeopardy. Probably good to get out of comfort zone.”
- “If possible do the video quiz in class the following day that way the teacher can answer a few questions and if everyone is struggling on a concept it can be reviewed before the quiz. Also no Wiley Plus.”
- “Make homework due on the day of the [in-class] quiz!”

Reflections

Instructional Videos

- Will make videos available at least 1 week in advance
- Students appreciated having a PDF version of the video slides
- Enjoyed using Doceri; will upgrade to Desktop version
- Next will design in-class activities first, then video quiz, then video

Assessment

- Online HW system did not align well with course format
- Online quizzes troublesome using Canvas by Instructure

Extensions

- Useful technique for special class periods
- Useful for reviewing information not appropriate for class time
- Model could still be used with all videos pulled from sources online
- Models can be adapted for use with guided notes instead of videos

References

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Q & A