# Enhancing a Partially Flipped Classroom with Inquiry Based Learning

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## Abstract

Flipped instruction and inquiry based learning are often discussed as two distinct instructional techniques. However, the flipped classroom model can be enhanced by IBL. In a higher education setting, disadvantages of a flipped classroom model include resistance from instructors due to the perceived amount of time to create instructional videos and materials. Students can grow frustrated at the amount of instruction received out of class, embodied by the response, "I am not paying tuition to teach myself!!" Partially flipped instruction addresses these concerns by incorporating both traditional and inverted instruction, and is still a technique that can facilitate an inquiry-based learning environment. It can also alleviate the amount of time spent on additional materials by instructors while still holding students accountable for their own learning outside of class.

This poster describes a partially flipped model developed for a college trigonometry course in the Spring of 2017 at the University of Iowa, and reflection on how that model was addressed each of the following:  

- The impact of a flipped classroom design on learning performance in higher education: Looking for the best "blend" of lectures and guiding questions with feedback, Computers & Education. 107, 113-126 (2017).

## Methodology

### MATERIALS

- **Supplies:** Miniature dry erase board classroom set, Chalk  
- **Equipment:** iPod Pro 12.9", Overhead Projector, Apple Pencil  
- **Apps:** Doceri for iPad, Notability, GoodNotes, YouTube

### INSTRUCTIONAL VIDEOS

- 15 instructional videos were created using the Doceri App and Apple Pencil on an iPad Pro  
- PDF slides of videos were created with Doceri  
- Some were pulled from YouTube  
- Average length: 9:52  
- Featured introductory content only

### VIDEO QUIZZES

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

### ACTIVITIES

- 11 total flipped periods: 6 periods of group worksheets, 1 period each of the following: Indirect Measurement Activity, Speed Equations, Jeopardy, Top Chef, Trashketball  
- 4 periods incorporated IBL: 2 periods of worksheets featuring guided discovery questions, 1 period with Indirect Measurement Activity, 1 period of Top Chef

## Results

### Quantitative Data

- Video Quiz Average: 7.98/10  
- Semester 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

### Qualitative Data

- 21/24 students completed the final survey

## Reflections

### Instructional Videos

- Enjoyed using Doceri; will upgrade to Desktop version in future  
- Students appreciated having a PDF version of video slides  
- Will make videos available at least 1 week in advance in future

### Assessment

- Online HW system did not align well with course format  
- Online quizzes required great attention to detail to account for user input errors and variation  
- Next will design in-class activities first, video quiz, then video  
- Will count participation in flipped period as part of HW grade

### Inquiry Based Learning

- Worksheets that incorporated guided discovery were inconsistent throughout semester, encountered more resistance and hesitation from students during these periods  
- Next want each flipped period to incorporate IBL through guided discovery, physical manipulatives, games, and/or short projects  
- Will redesign all activities to accommodate guided discovery questions and so that they can be completed within 30 minutes to allow time for student presentations and class discussions  
- Should implement at least one team project homework

## Literature Cited


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## Partially Flipped Model

### COURSE FORMAT

**Monday: Flipped Day**  
- Assessment: Video Quiz (due at beginning of class)  
- Review/Questions (5-10 minutes)  
- In-Class Activity (40-45 minutes)

**Wednesday**  
- Assessment: Online Homework (due at 11:59 pm)  
- Homework Questions (5-10 minutes)  
- Lecture (40-45 minutes)

**Friday**  
- Assessment: Quiz (20 minutes)  
- Lecture (30 minutes)

## Survey

A survey was created with 17 questions requiring responses using a likert scale of agree, neutral, and disagree. The questions addressed each of the following:

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

There were also 3 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 Student Comments

**Question 1:** What did you like about the partially flipped format?

- I like the fact that I actually can ask questions if I need to! It's very unusual to me to be allowed to do this. I also like how much more personal the classroom feels. ("The Food Wars" game was fun too...")  
- It was a nice change from the standard lectures that are typical of a math course here at the UI. It was definitely more engaging.

**Question 2:** What did you dislike about the partially flipped format?

- Since we are just learning it, we might not understand a concept completely or might have questions that cannot be answered until after the video quiz, so the video quiz grades can hurt you.
- The video quizzes were actually good with the new concepts, it layed out the big idea and helped me understand it better.

**Question 3:** What are some suggestions for changes to course format?

- 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 WileyPlus.  
- More in-class examples! They're good learning tools.

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