

NAPS Background

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- Approximately 250 students admitted to NAPS in 2019: 30 USCGA Candidates, 220 USNA Candidates
- Students take English, Physics and Chemistry 4 days per week, Mathematics 5 days per week
- Three ten-week marking periods
- Four 75-minute classes, 4 days per week with one study period before lunch and one Extra Instruction (EI) period; and four 55-minute classes on one day per week with no EI
- Extra help available from Supplemental Instructors and Tutors evenings and weekends

NAPS Math

- Divided into three tracks: Foundation, Intermediate, and Advanced based on Placement Exam, HS Transcripts and SAT/ACT scores
- Approximately the top 20% to Advanced (based on placement and exposure to Calculus)
- The bottom 30 – 40% placed in Foundation (most with only Algebra I and II in High School)
- The remainder placed in Intermediate implying a HUGE range of ability. Very challenging

NAPS Intermediate Math

- Marking Period 1: Review Algebra Topics, Functions, Polynomials and Rational Functions
- Marking Period 2: Derivatives of Algebraic Functions and their applications
- Marking Period 3: Transcendental and Trigonometric Functions and their Derivatives
- Complicated by “Drop Downs” of Advanced to Intermediate and Intermediate to Foundation over the year

My Motivation to Flip: To address the wide academic diversity in the Intermediate classroom

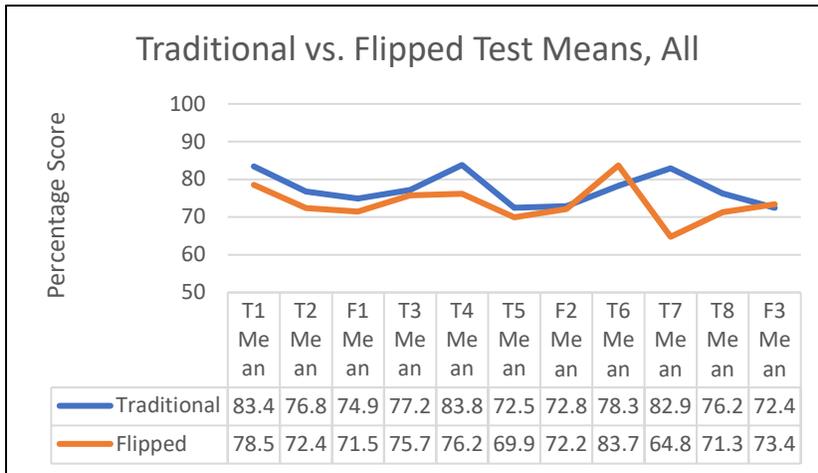
My Method:

- Assign Classroom Preparation Assignments (CPAs) consisting of video lectures embedded in Google Forms. Each video 5 – 10-minute in length each; total time < 30 minutes per CPA.
- Follow up questions given in each form and students were prompted to write a question to follow each video
- Instructor reviews CPAs 1 hour before classes and addresses student feedback for 5-10 minutes at the start of the class
- Worksheets assigned in class to exercise – students allowed to work in groups or individually; board work encouraged.

Data comparing a Traditional Section versus my Flipped Section

In my first comparison, I examined results on student placement exams, administered by the Math department at the beginning of the year and a similar placement exam at the end of the year. I compared the results from the beginning of the year to the end of the year placement exams using a paired t-test for the mean test score in the traditional versus the flipped groups. Based on this test, there was no significant difference (at the 95% level of confidence) in the difference between the placement exam mean scores between the two groups.

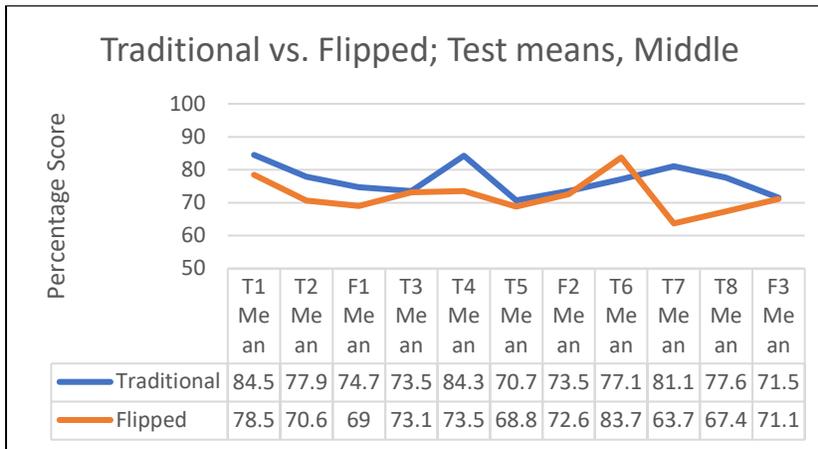
Traditional vs. Flipped for All Unit and Final exams: All students in sample compared



Test:
 T-test for paired means
 $H_0: \mu_2 - \mu_1 = 0$
 $H_A: \mu_2 - \mu_1 \neq 0$
 α -level: 5%
 Rejection Criteria: $p < \frac{\alpha}{2}$
 Conclusion:
If H_0 is rejected, the test shows a significant difference between the mean test scores. (T4 & T7)

 Correlation: $r = 0.1914$

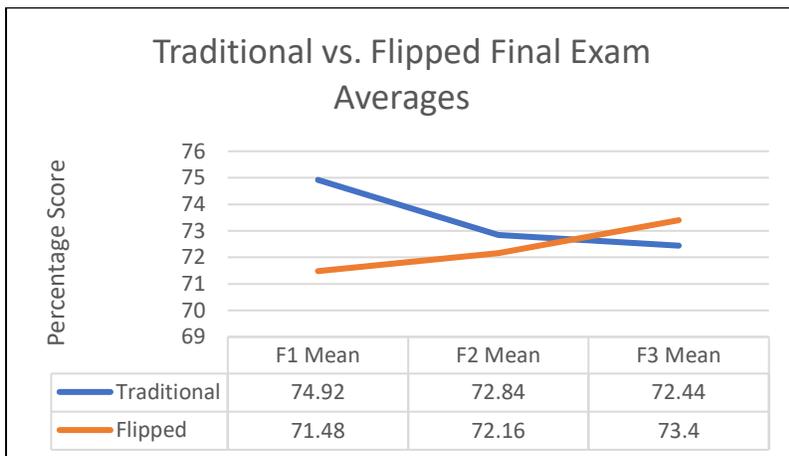
Traditional vs. Flipped for All Unit and Final exams: Middle 80% of all students in sample compared



Test:
 T-test for paired means
 $H_0: \mu_2 - \mu_1 = 0$
 $H_A: \mu_2 - \mu_1 \neq 0$
 α -level: 5%
 Rejection Criteria: $p < \frac{\alpha}{2}$
 Conclusion:
If H_0 is rejected, the test shows a significant difference between the mean test scores. (T4, T7, T8)

 Correlation: $r = 0.1888$

Traditional vs. Flipped for Only Final exam means: All students in sample compared



Test:
 T-test for paired means
 $H_0: \mu_2 - \mu_1 = 0$
 $H_A: \mu_2 - \mu_1 \neq 0$
 α -level: 5%
 Rejection Criteria: $p < \frac{\alpha}{2}$
 Conclusion:
If H_0 is rejected, the test shows a significant difference between the mean test scores. (None)

 Correlation: $r = -0.8579$

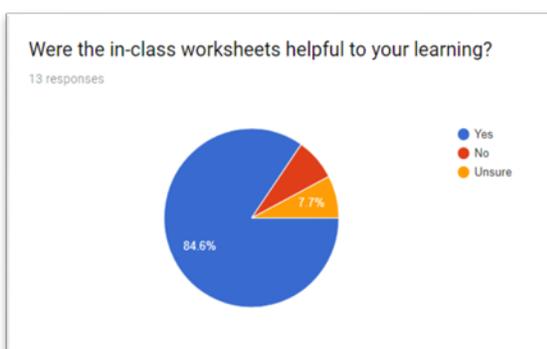
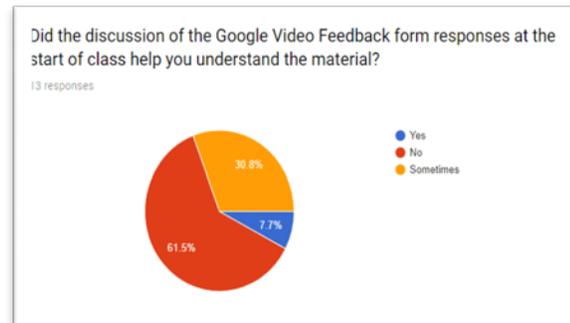
Data and supporting information available upon request to peeples@naps.edu

Results

Statistically, these results indicate that the results of my approach were mixed:

- In terms of the unit test scores, students did no better than if they had been in traditionally taught classes; some weakness in the third marking period
- On the other hand, the final exam evidence indicates that the long-term retention and understanding increased over the year.

Student Feedback



“What aspects, if any, of the class would you change if you could?”

- “I didn’t like going back and doing videos on my own.”
- “Be more strict about messing around in class, and spend less one on one time with individuals. If people aren’t getting it, tell them to come in for EI.”
- “More in class lessons in conjunction with the homework videos.”
- “Maybe on more difficult topics go over the videos in class instead of out of class, I had a few misconceptions sometimes from watching the videos.”

“Were there any aspects you felt worked the best for you?”

- “There should be work time in class all the time.”
- “Going over problems as a class for the worksheet.”
- “In class explanations and example problems.”
- “I liked the constant quizzing”
- “Class participation on the board.”

Recommendations

- Less video lectures: Short or none need to be provided
- More time for student work: Keep lecture time to a minimum (some may be necessary)
- Guided, detailed practice for the individual space
- Differentiated worksheets in the group space
- Accountability: Higher-stake assignments for individual class preparation assignments (example: Entry Quizzes in class)
- Align Objectives between worksheets, quizzes and exams – students need to be clear

Conclusion

If students are to engage with topics in our classroom actively, guidance is always necessary. The results of simply using video lectures as homework and replacing “homework” with “class work” is not as effective, especially in an environment such as NAPS, where such a diverse set of students need very clear guidance and almost constant attention. To engage students in the classroom, we must clearly connect learning objectives of any guided practice given outside of the classroom to learning objectives in the classroom, on quizzes and on tests. The “modified” flip, where guided practice assignments may be the tool needed to accomplish this.

References

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