



Flipping the Classroom:

Lessons Learned at NAPS

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Flip or Flop?

- Flipping the classroom is a great idea!



- Flipping the classroom is a terrible idea!



NAPS

2PANI



- One year college preparatory program
 - Three ten-week marking periods
- Classes in Mathematics, English, Physics and Chemistry

Mathematics at NAPS

- Placement
 - Foundation
 - Intermediate
 - Advanced
- Intermediate math
- Intermediate math students
- Student engagement



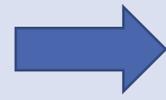


TRADITIONAL OR FLIPPED?

TRADITIONAL OR FLIPPED?



Traditional Approach



My Flipped Approach



Chapter 8 Section 2B Videos

This form presents the videos and allows you a place to respond so that we can prepare some questions to discuss in class (outside of the board problems you'll do in the classroom, that is)

Your email address (peeples@naps.edu) will be recorded when you submit this form. Not you? [Switch account](#)

You should also run off the lecture notes. The link for the file is provided below:

<https://drive.google.com/open?id=0B3HC0nUJePTBblVtak5JZWwWGM>

Derivative of an exponential function with a base other than e

We use the chain rule, along with the rules for implicit differentiation to develop rules for the derivatives of exponential and logarithmic functions with base other than e.

$$\frac{d}{dx} e^x = e^x \quad \text{and} \quad \frac{d}{dx} e^{u^x} = e^u \cdot u'$$

Finding the derivative of an exponential function with a base other than e

Develop the rule this way: $y = a^x$ $y = d^x$

$$\begin{aligned} \ln y &= \ln a^x \\ \ln y &= x \cdot \ln a \\ \frac{d}{dx} (\ln y) &= \frac{d}{dx} x \cdot \ln a \\ \frac{1}{y} y' &= 1 \cdot \ln a \\ y' &= a^x (\ln a) \end{aligned}$$

Example for use: $y = 4^x$

$$\frac{d}{dx} 10^{2x} = \dots$$

a) $= 20^{2x} \cdot \ln 10$

b) $= 2 \cdot 10^{2x} \cdot \log 10$

c) $= \frac{2 \cdot 10^{2x}}{\ln 10}$

d) $= 2 \cdot 10^{2x} \cdot \ln 10$

In regard to the question above, choose the best answer *

- a) $20^{2x} \cdot \ln 10$
- b) $2 \cdot 10^{2x} \cdot \log 10$
- c) $(2 \cdot 10^{2x}) / \ln 10$
- d) $2 \cdot 10^{2x} \cdot \ln 10$

Write at least one substantial question about the videos presented in this set.

Your answer

Send me a copy of my responses.

SUBMIT

Never submit passwords through Google Forms.

$$\frac{d}{dx} 10^{2x} = \dots$$

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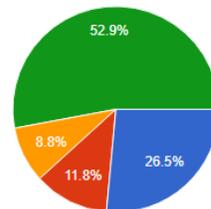
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Chapter 8 Section 2B Videos

In regard to the question above, choose the best answer

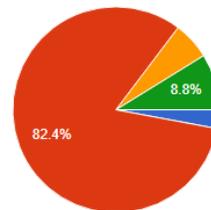
34 responses



- a) $20^{2x} \cdot \ln 10$
- b) $2 \cdot 10^{2x} \cdot \log 10$
- c) $(2 \cdot 10^{2x}) / \ln 10$
- d) $2 \cdot 10^{2x} \cdot \ln 10$

In regard to the question above, choose the correct answer

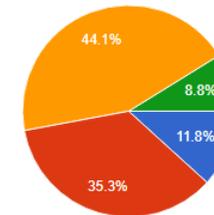
34 responses



- a) $2 \ln 3 / (2x - 5)$
- b) $2 / (2x - 5) \ln 3$
- c) $\ln 3 / (x - 5)$
- d) $(2 / (2x - 5)) \ln 3$

In regard to the question above, choose the correct answer

34 responses



- The factor $\ln 4$ should be in the numerator
- The quantity $(2x - 1)$ should be under a square root
- Neglected to cancel 2 from the numerator
- There was no error

Write at least one substantial question about the videos presented in this set.

34 responses

What happens if there is a number in front of the log expression or if it has more than one expression with it? For example \log of $(x/x+1)$?

If there was an error in the last video I do not know what it is. However will we be given these rules or are these two more we have to memorize?

Can the problem in the last question be put into exponential form and then have the derivative be taken? Are these equations that we need to memorize or are they more of just shortcuts for using the general rules of derivatives that we know?

Need more help taking derivative of the log function

Would you just set the quantity that contains "x" equal to zero to find extrema?

Follow directions for each problem as shown. Show all work.

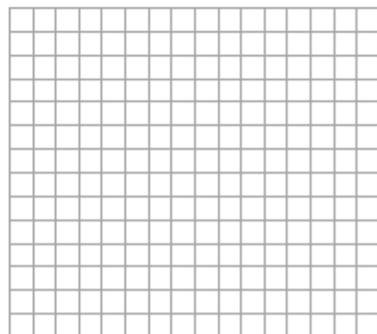
1. Find an equation of the tangent line to the graph of $y = 4 - x^2 - \ln\left(\frac{1}{2}x + 1\right)$ at $(0, 4)$

Use implicit differentiation to find $\frac{dy}{dx}$

2. $\ln xy + 5x = 30$

3. $4xy + \ln x^2y = 7$

4. Find any relative extrema and inflection points of $y = \frac{\ln x}{x}$. Sketch your function.



Find $\frac{dy}{dx}$ using logarithmic differentiation:

5. $y = \sqrt{(x-1)(x-2)(x-3)}$

6. $y = \frac{(x+1)(x+2)}{(x-1)(x-2)}$

7. $y = (1+x)^{1/x}$

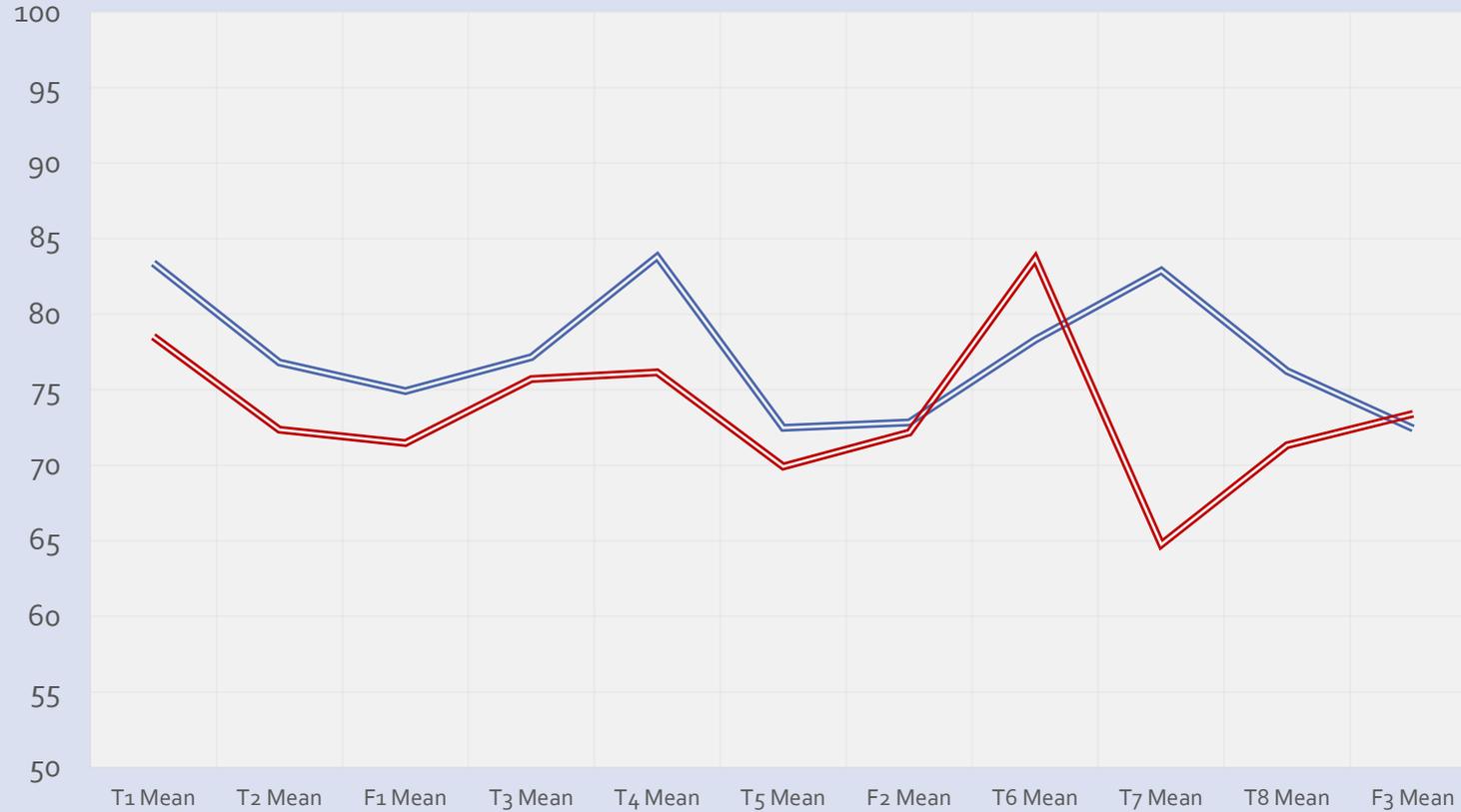


THE DATA

THE DATA

TRADITIONAL VS. FLIPPED TEST AVERAGES FULL GROUP

— Traditional — Flipped



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

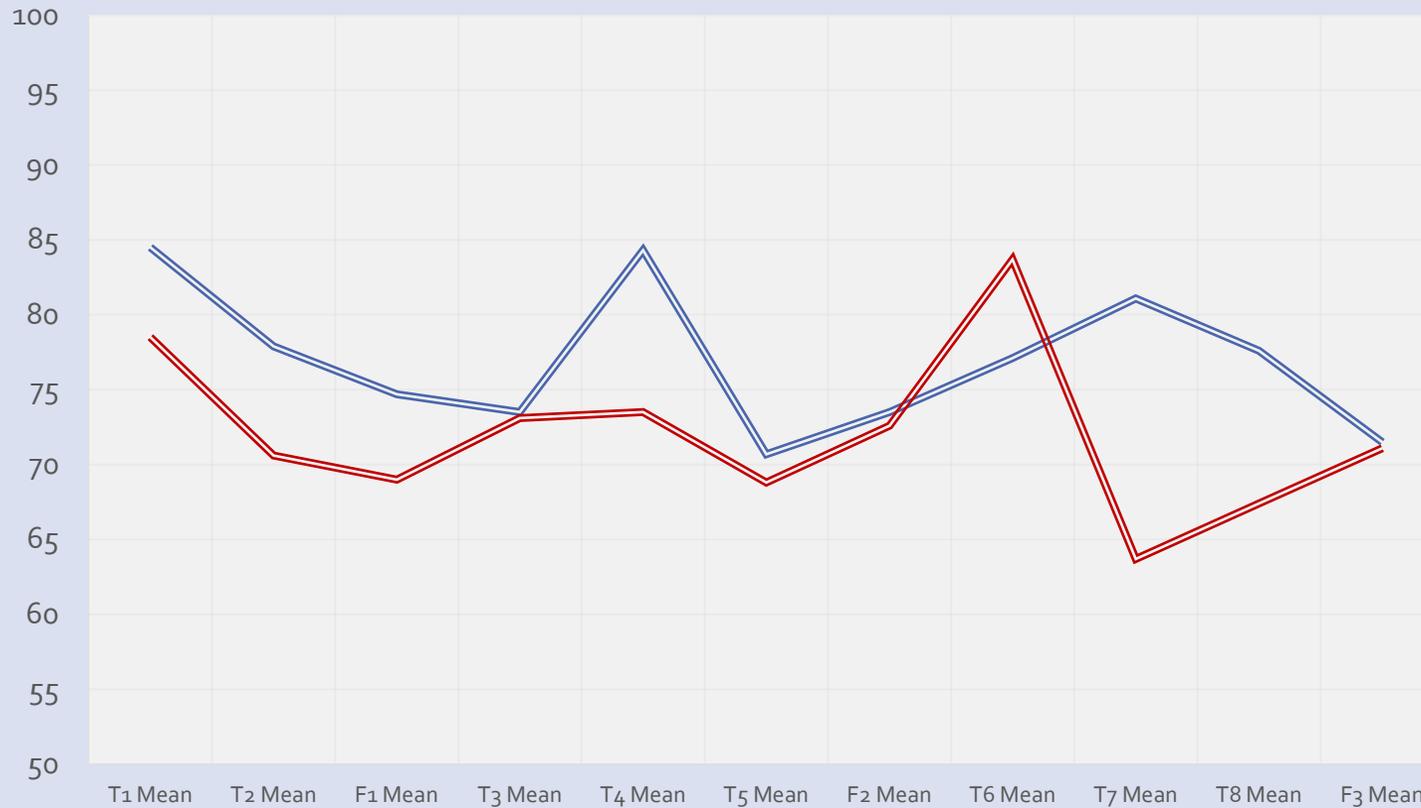
Correlation: $r = 0.1914$.

	Marking Period 1			Marking Period 2				Marking Period 3			
	T1 Mean %	T2 Mean %	F1 Mean %	T3 Mean %	T4 Mean %	T5 Mean %	F2 Mean %	T6 Mean %	T7 Mean %	T8 Mean %	F3 Mean %
Traditional, μ_2	83.4	76.8	74.92	77.16	83.8	72.48	72.84	78.32	82.88	76.24	72.44
Flipped, μ_1	78.52	72.36	71.48	75.72	76.16	69.92	72.16	83.68	64.76	71.32	73.4
P-value	0.165	0.138	0.197	0.686	0.023	0.556	0.851	0.081	2.85×10^{-6}	0.126	0.803
Conclusion?	Same	Same	Same	Same	Significant	Same	Same	Same	Significant	Same	Same

TRADITIONAL VS. FLIPPED TEST AVERAGES

MIDDLE 80%

— Traditional — Flipped



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.

Correlation: $r = 0.1888$

	Marking Period 1			Marking Period 2				Marking Period 3			
	T1 Mean %	T2 Mean %	F1 Mean %	T3 Mean %	T4 Mean %	T5 Mean %	F2 Mean %	T6 Mean %	T7 Mean %	T8 Mean %	F3 Mean %
Traditional, μ_2	84.467	77.867	74.733	73.533	84.267	70.733	73.533	77.133	81.133	77.6	71.533
Flipped, μ_1	78.467	70.6	69	73.133	73.533	68.8	72.6	83.667	63.667	67.4	71.133
P-value	0.1255	0.035	0.032	0.892	0.006	0.544	0.790	0.065	9.71E-06	0.009	0.925
Conclusion?	Same	Same	Same	Same	Significant	Same	Same	Same	Significant	Significant	Same



A Flop?



GODZILLA FACEPALM

When Godzilla gives you the facepalm, you know the fail is epic.



TRADITIONAL VS. FLIPPED FINAL EXAM AVERAGES

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.

Correlation: $r = -0.8579$



	F1 Mean %	F2 Mean %	F3 Mean %
Traditional, μ_2	74.92	72.84	72.44
Flipped, μ_1	71.48	72.16	73.4
P-value	0.032	0.790	0.925
Conclusion?	Same	Same	Same



THE RESULTS

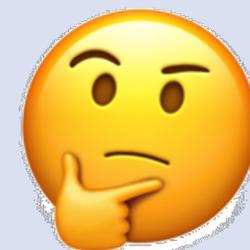
THE RESULTS



Was my Flip a Flop?

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



On the other hand, the final exam evidence indicates that the long-term retention and understanding increased over the year.





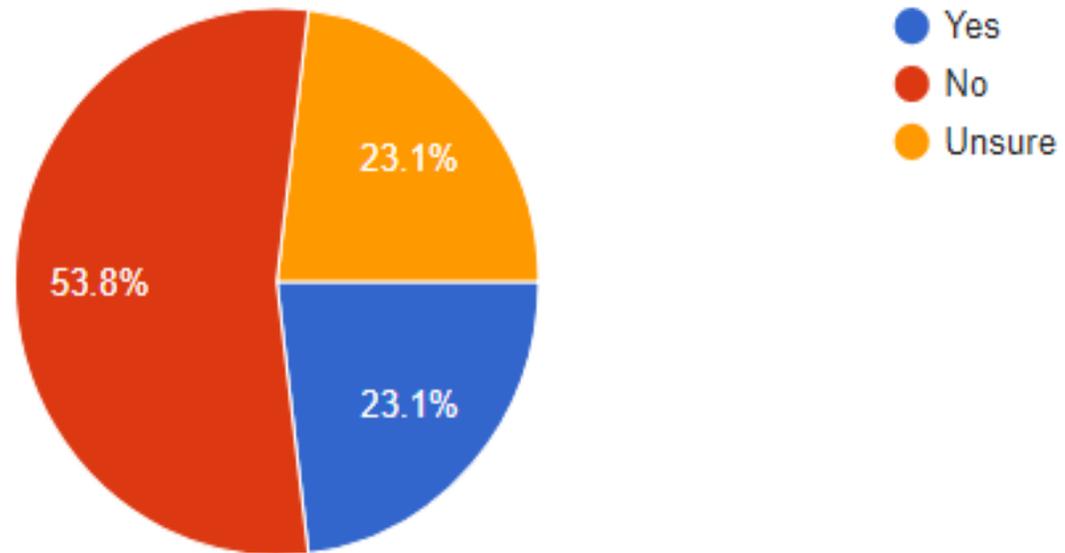
STUDENT FEEDBACK

STUDENT FEEDBACK

Student Feedback

Did the video lectures help to improve your learning?

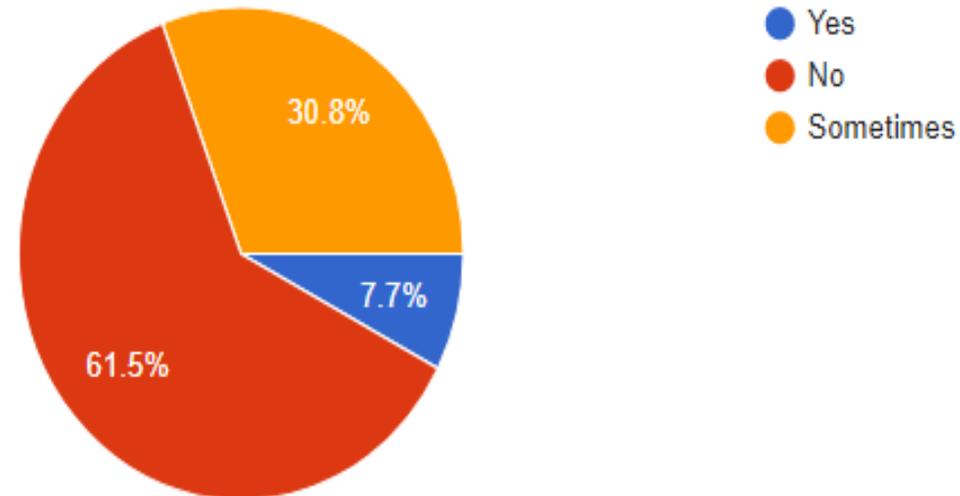
13 responses



Student Feedback

Did the discussion of the Google Video Feedback form responses at the start of class help you understand the material?

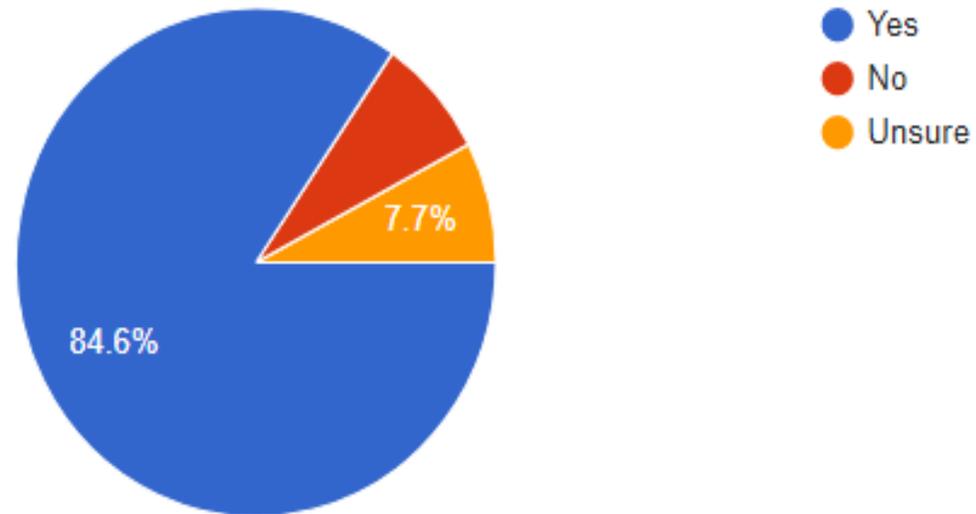
13 responses



Student Feedback

Were the in-class worksheets helpful to your learning?

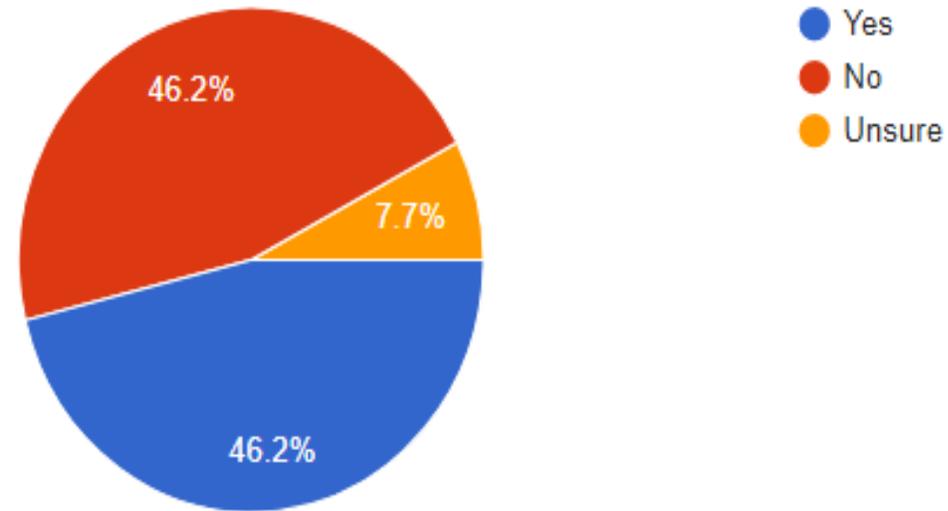
13 responses



Student Feedback

Were the learning objectives made clear to you during the year?

13 responses





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.”



Student Feedback

- **“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

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Recommendations

- Less video lectures
- More time for student work
- Guided practice
- Accountability
- Time for short lectures
- Align Objectives

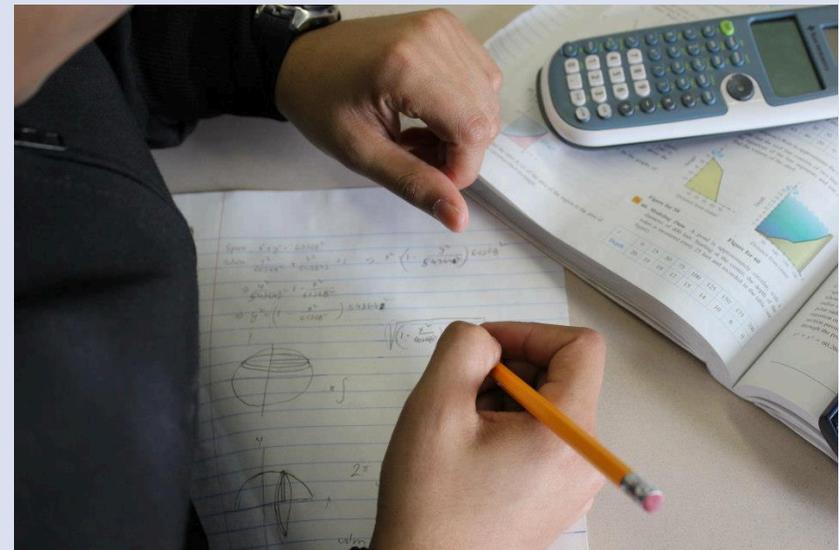


CONCLUSIONS

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Conclusions

- Video lectures are out
 - Ineffective Approach at NAPS
- Structured group space activities
- Structured individual assignments
- Aspects supported:
 - Guided practice
 - Short lecture time
 - Differentiated practice
- Modified “flip” desired





QUESTIONS?

QUESTIONS?

References

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- Honeycutt, B. (2016). *Flipping the Classroom: Practical Advice from Faculty*. Magna Publications. Madison, WI.