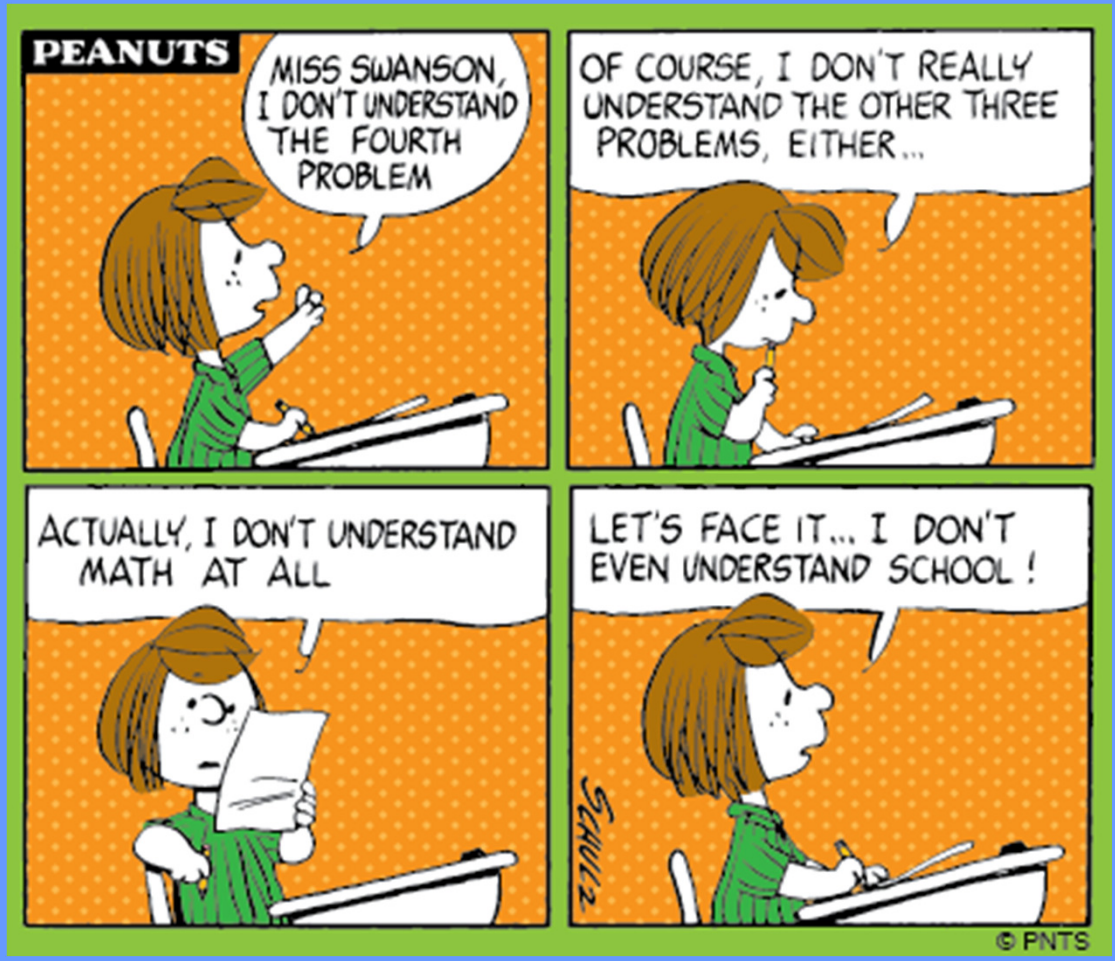

TITLE
Cut! Adventures in Student-Produced Instructional Videos for Thermodynamics
DIRECTOR
J. Patrick Abulencia, David Silverstein, and Margot Vigeant
CAMERA
Manhattan College University of Kentucky Bucknell University
DATE
June 27, 2016
SCENE
1
TAKE
1

COMMUNICATION is important for EFFECTIVE TEACHING



Source: http://www.robertamodulo.com.br

Students of Past Generations Communicate Differently

Source: http://www.nhcs.net/science

Ease of Obtaining Information

Source: http://naldzgraphics.net

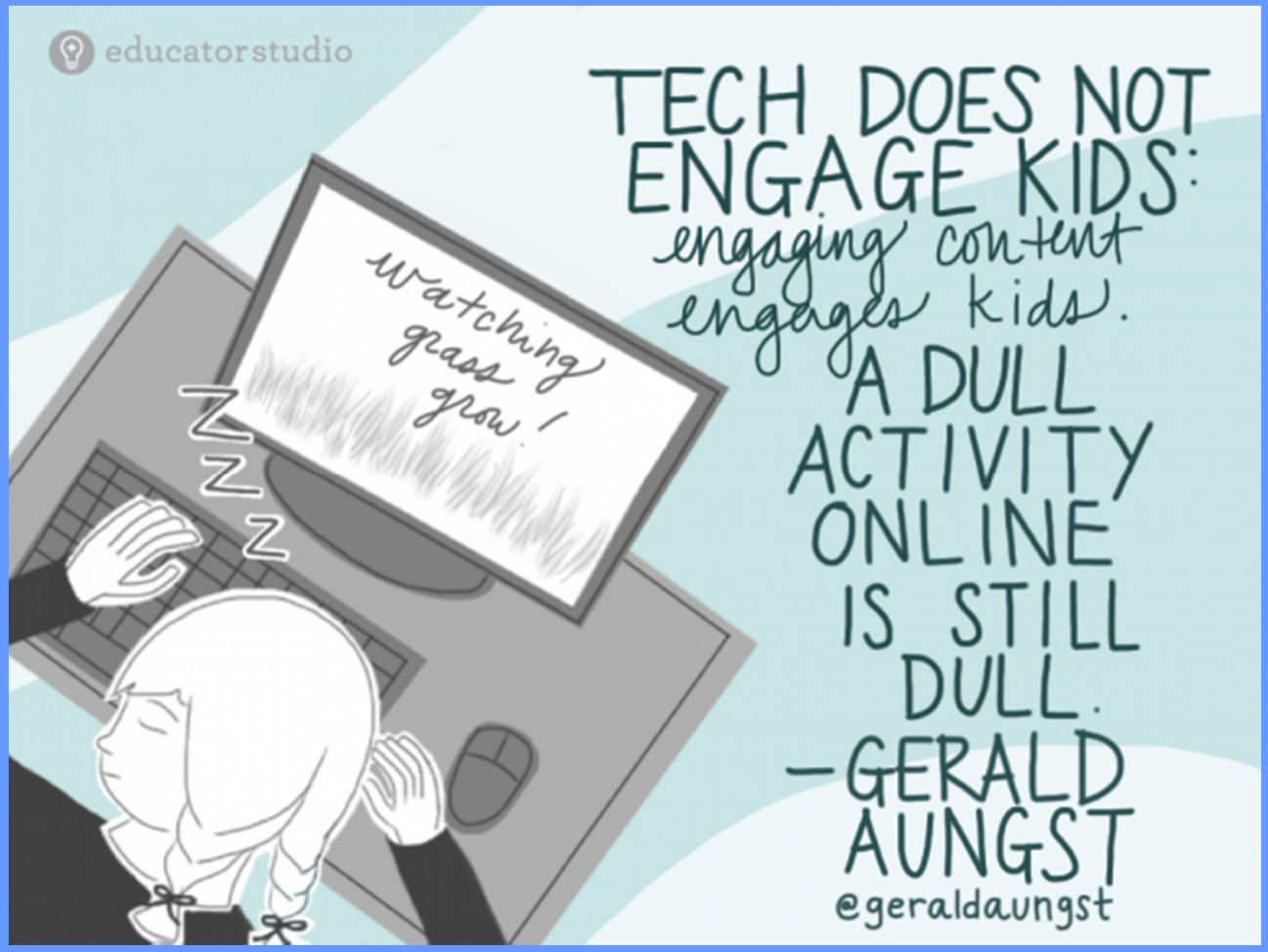
How we transmit information

Source: http://www.englishblog.com

Communication is part of the story

Source: http://www.teacherstraining.com.au

Increasing Student Engagement



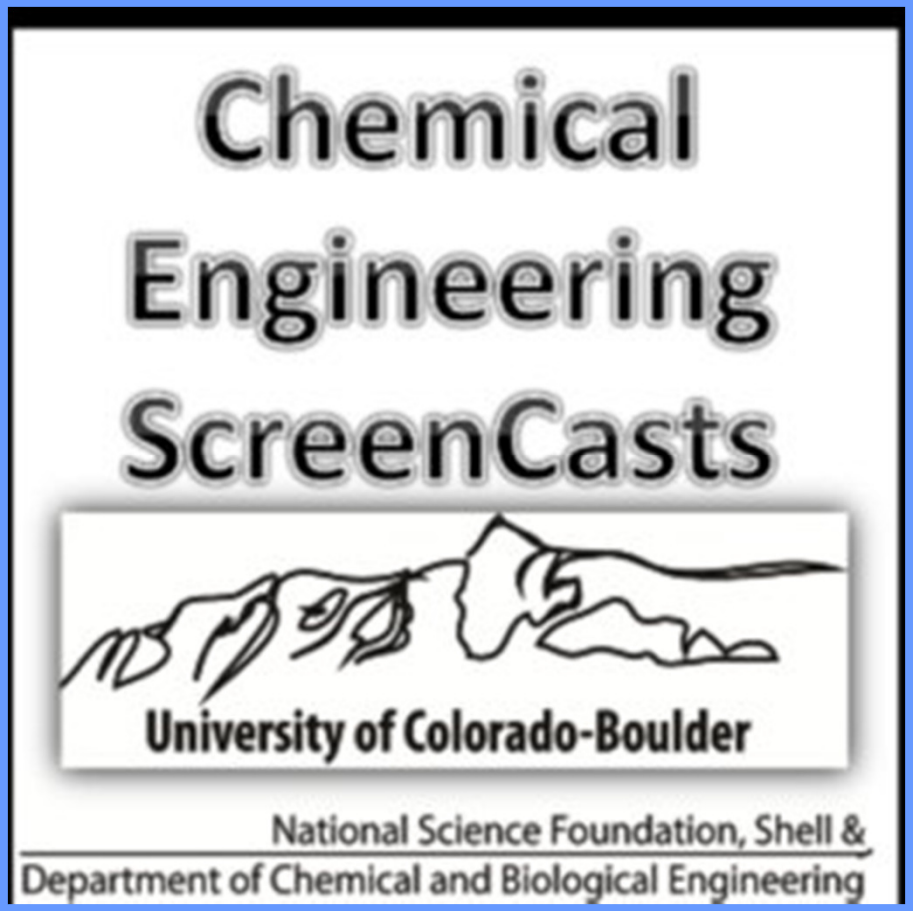
Source: http://educatorstudio.com

Let's use VIDEO!

Source: http://nanigans.com

Other Work

1) Falconer et al.



Other Work

1) Falconer et al.

2) Liberatore et al.

Our Project

Students who GENERATE and/or

WATCH an instructional video that teaches

a thermodynamics concept will ENHANCE

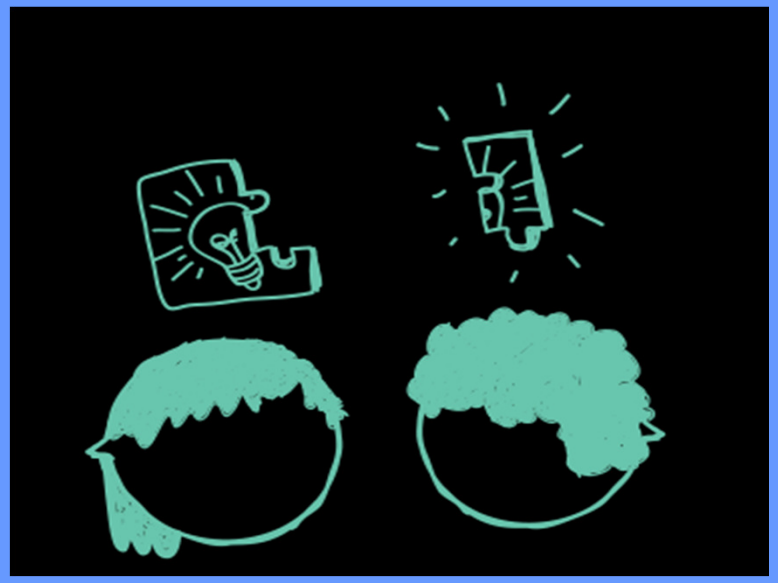
CONCEPTUAL LEARNING.

Modes of Learning

Autodidactic

Source: http://lifehack.com

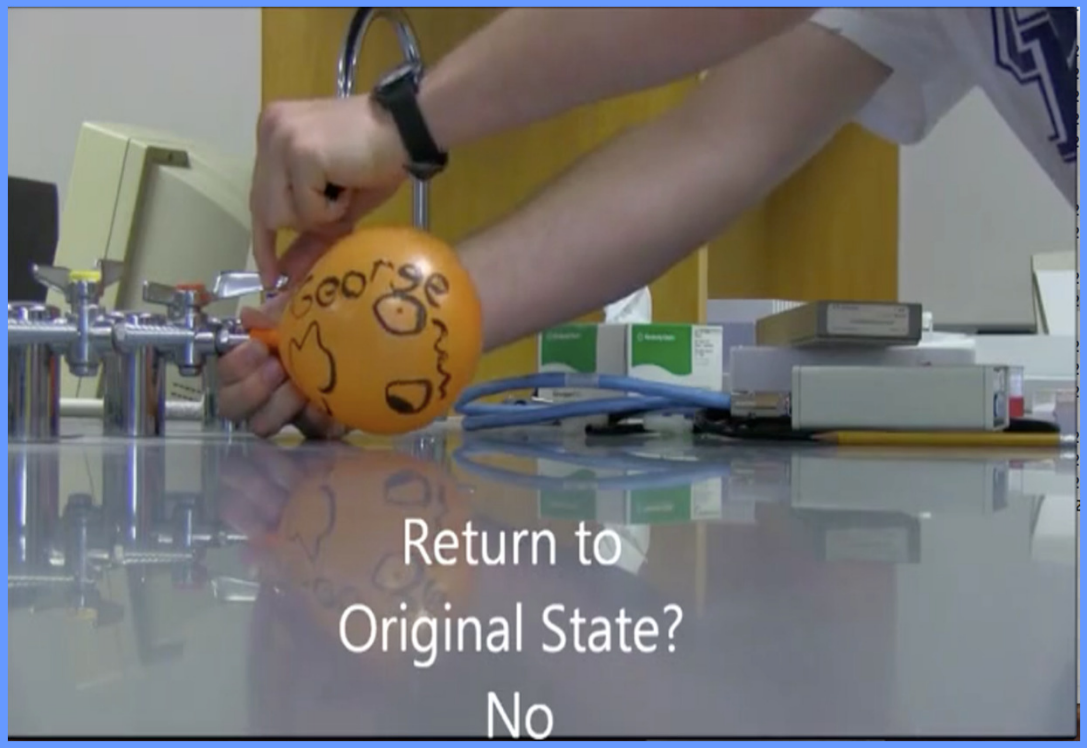
Peer-to-Peer



Source: http://adigaskell.org

Topics

1) Equilibrium vs Steady State
2) Reaction Rate vs Equilibrium
3) Reversibility
4) Second Law
5) U vs H

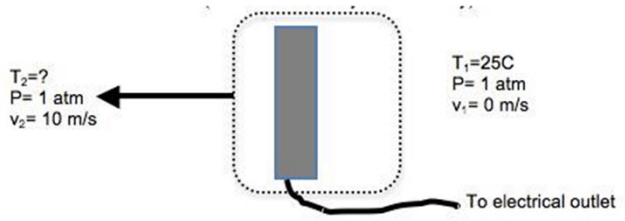


Assessment

Thermodynamics Concept Inventory

- Vigeant et al.

Bucknell UNIVERSITY



A conventional electric table-top fan is placed in a large room and turned on, causing air to move as shown above (dotted line shows system boundary).

Air behind the fan is at room temperature (T1=25°C), atmospheric pressure, and is not flowing. Air coming out of the fan is also at atmospheric pressure, but is at a higher net velocity (v2=10 m/s). Recall that at room temperature, the kinetic theory of gasses tells us ideal gas molecules are typically moving at about 500 m/s.

How do you expect the temperature of the air coming out of the fan to compare to the temperature of the air entering?

- The temperature of exiting air will be slightly lower than of entering air because of convective cooling.
- The temperature of exiting air will be identical to that of entering air because there is no change in air pressure.
- The temperature of exiting air will be slightly higher than that of entering air because of its higher kinetic energy.
- The temperature of exiting air will be slightly higher than that of entering air because of the work added to the system by the fan.

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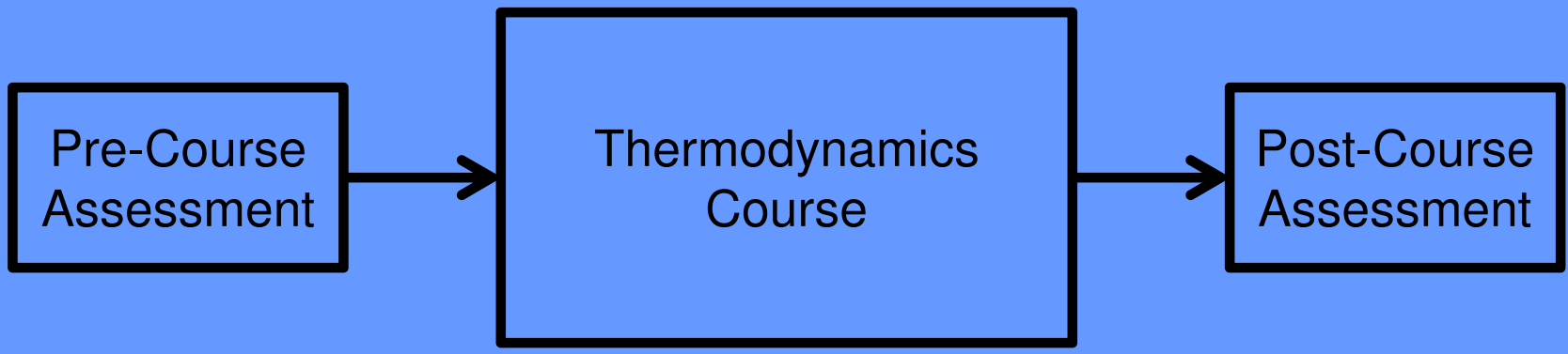
Groupings

Year 0 = Baseline
Year 1 = Video Generation
Year 2 = Video Viewing
Year 3 = Video Generation and Viewing

Source: http://tribecafilm.com

Year 0 - Baseline



Results

	Pre-Course Assessment (Mean Score)	Post-Course Assessment (Mean Score)
Control	15.35 ± 4.71 (n = 60)	23.72 ± 4.37 (n = 58)

Results

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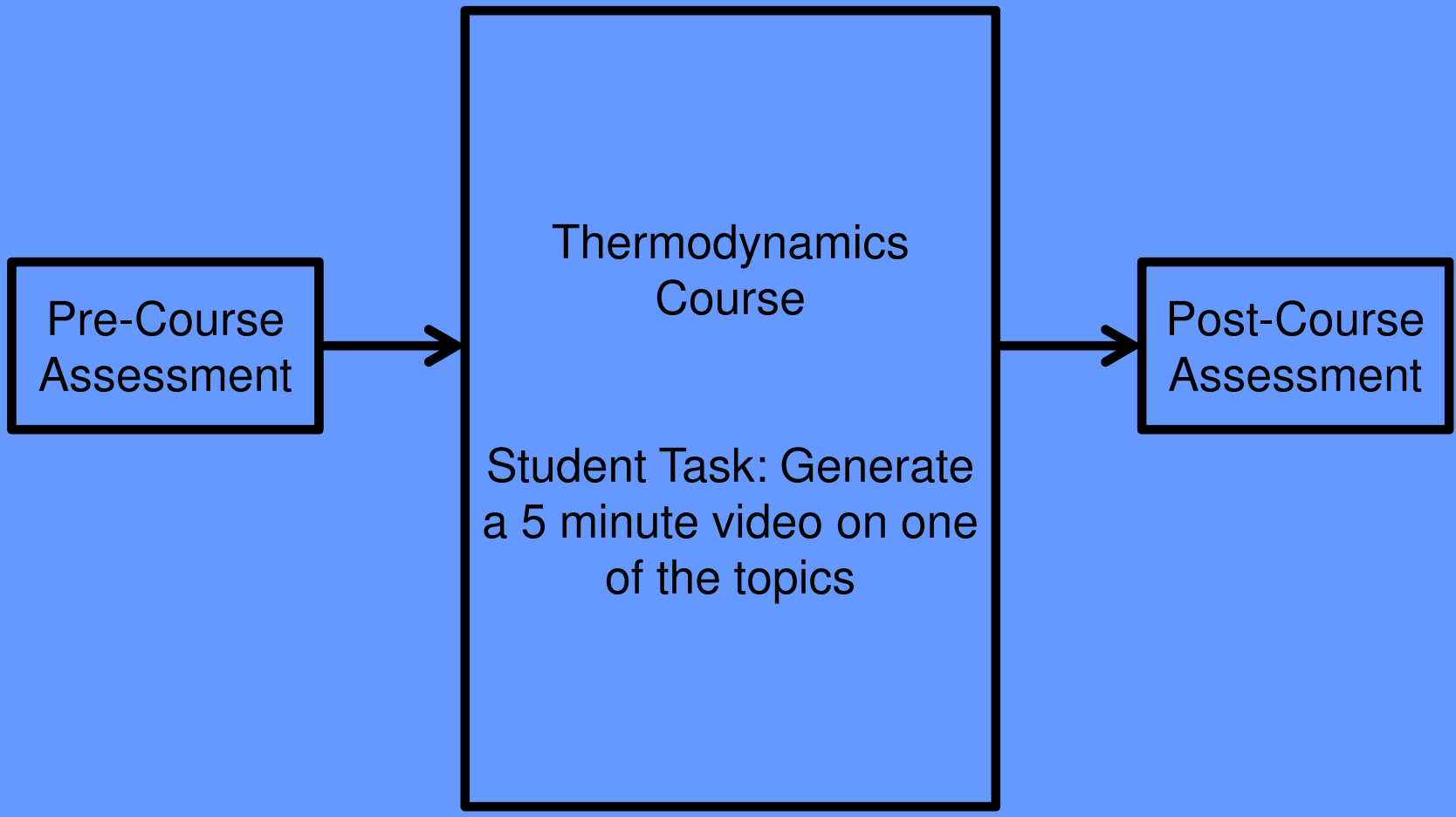
Control	15.35 ± 4.71 (n = 60)	⟺	23.72 ± 4.37 (n = 58)

Significant Difference

Year 1 – Video Generation



Results

	Pre-Course Assessment (Mean Score)		Post-Course Assessment (Mean Score)
Control	15.35 ± 4.71 (n = 60)	⟷	23.72 ± 4.37 (n = 58)
Generated Video	16.47 ± 5.10 (n = 76)		22.51 ± 6.66 (n = 65)

Significant Difference

Results

	Pre-Course Assessment (Mean Score)	Post-Course Assessment (Mean Score)
Control	15.35 ± 4.71 (n = 60)	23.72 ± 4.37 (n = 58)
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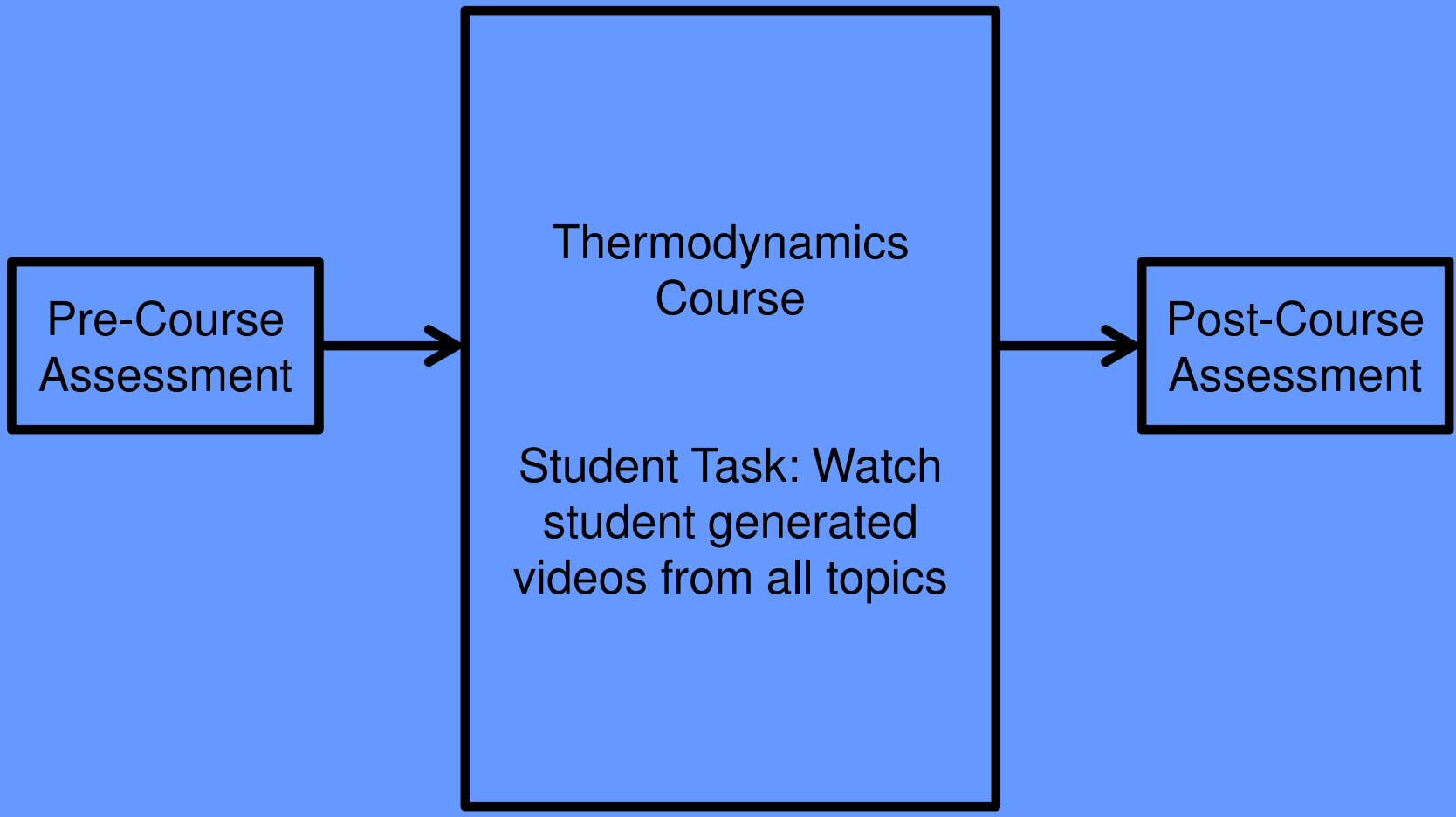
Not Significant

Year 2 – Video Viewing



Results

	Pre-Course Assessment (Mean Score)		Post-Course Assessment (Mean Score)
Control	15.35 ± 4.71 (n = 60)	⟷	23.72 ± 4.37 (n = 58)
Watched Video	15.57 ± 4.89 (n = 68)		22.97 ± 4.83 (n = 68)

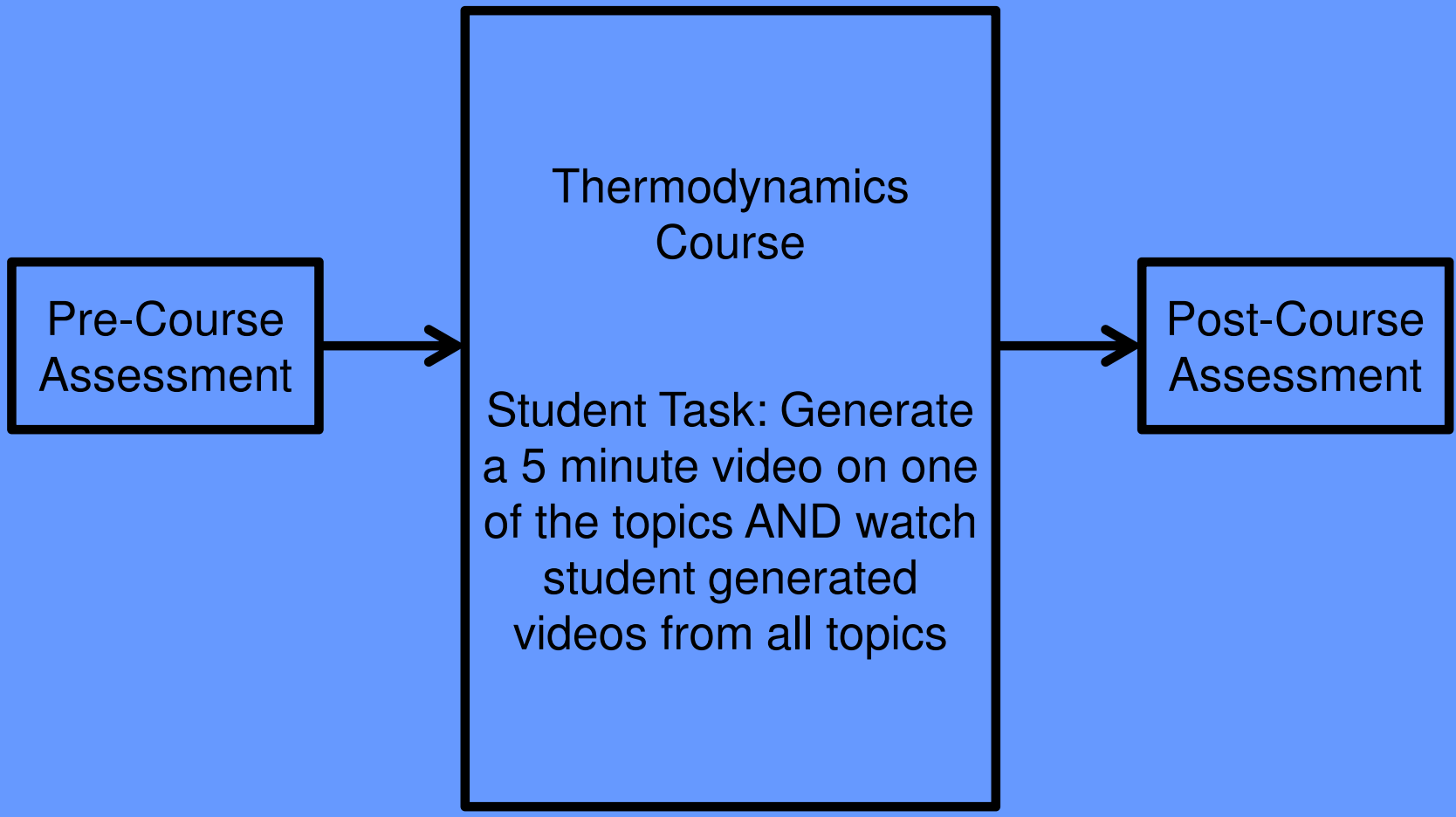
Significant Difference

Results

	Pre-Course Assessment (Mean Score)	Post-Course Assessment (Mean Score)
Control	15.35 ± 4.71 (n = 60)	23.72 ± 4.37 (n = 58)
Watched Video	15.57 ± 4.89 (n = 68)	22.97 ± 4.83 (n = 68)

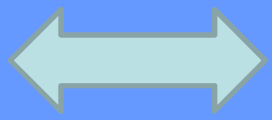
Not Significant

Year 3 – Video Generation and Viewing



Results

	Pre-Course Assessment (Mean Score)	Post-Course Assessment (Mean Score)
Control	15.35 ± 4.71 (n = 60)	23.72 ± 4.37 (n = 58)
Generated and Watch Video	15.57 ± 4.05 (n = 81)	21.18 ± 5.60 (n = 71)



Significant Difference

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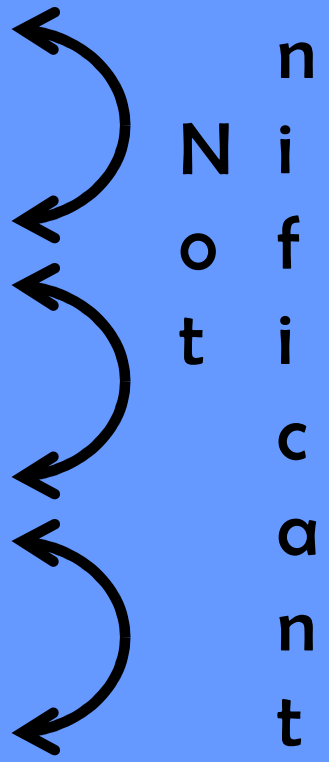


Now what ??

"Year 4"

1) Shorten the videos
2) Make two of them on two different topics

Results – Year 4

	Pre-Course Assessment (Mean Score)	Post-Course Assessment (Mean Score)
Generated Short Video	15.62 ± 4.82 (n = 84)	21.33 ± 5.34 (n = 75)

Results

	Pre-Course Assessment (Mean Score)	Post-Course Assessment (Mean Score)
Control	15.35 ± 4.71 (n = 60)	23.72 ± 4.37 (n = 58)
Generated Video	16.47 ± 5.10 (n = 76)	22.51 ± 6.66 (n = 65)
Watched Video	15.57 ± 4.89 (n = 68)	22.97 ± 4.83 (n = 68)
Generated and Watch Video	15.57 ± 4.05 (n = 81)	21.18 ± 5.60 (n = 71)
Generated Short Video	15.62 ± 4.82 (n = 84)	21.33 ± 5.34 (n = 75)

Fitting this In

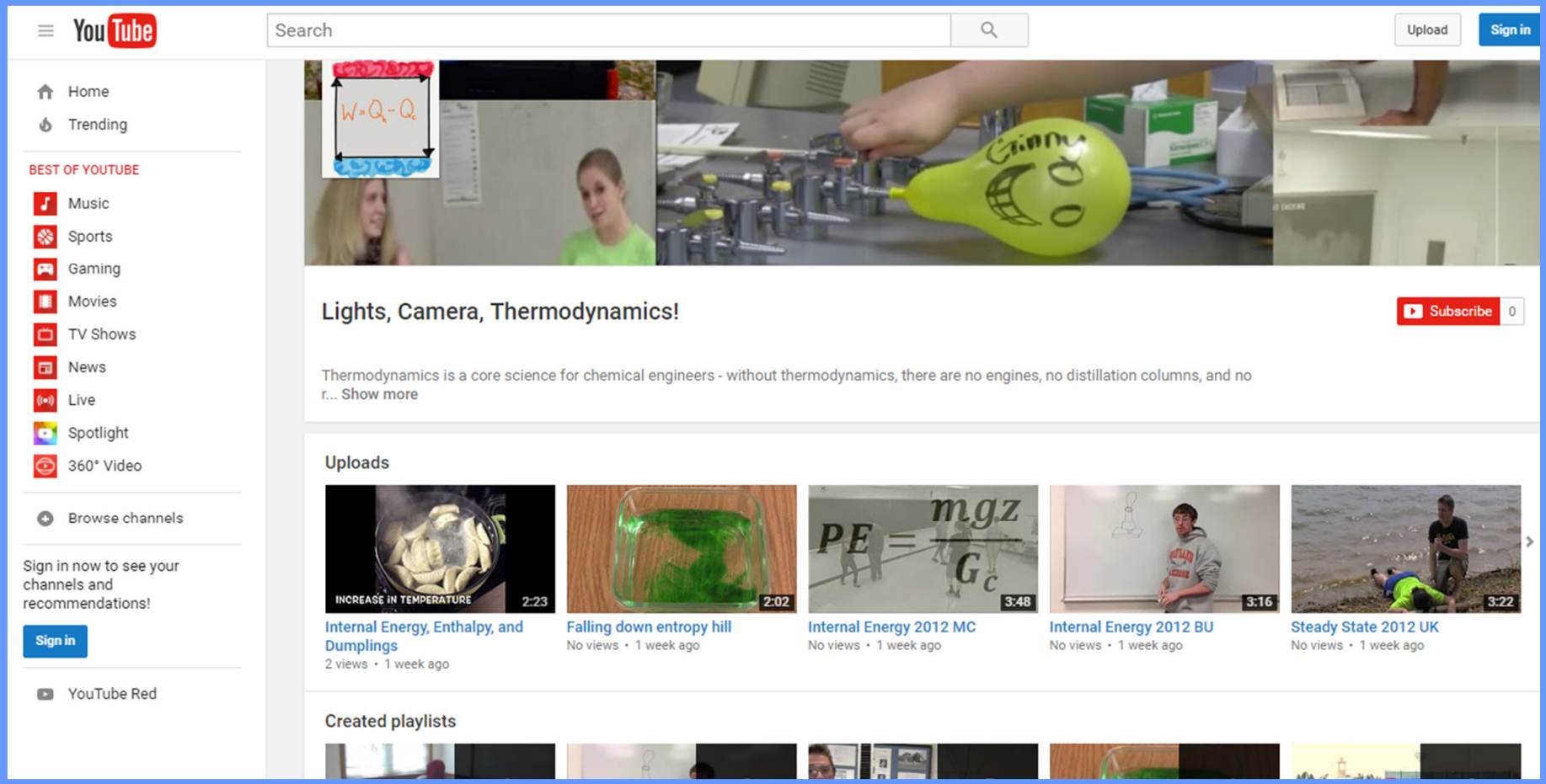
Yong et al., "Why No Difference? A Controlled Flipped Classroom Study for an Introductory Differential Equations Course", PRIMUS 25 (2015)

Lape et al., "Probing the Inverted Classroom: A Controlled Study of Learning and Teaching Outcomes in Undergraduate Engineering and Mathematics", ASEE (2014)

No differences in Active Learning Classroom vs Flipped Classroom

Another Outcome

Generate an online repository of videos



Acknowledgements

- National Science Foundation (TUES)
- Dr. Katharyn Nottis

Let's chat, but meanwhile, take a snap

https://www.youtube.com/channel/UCTodgDc0AqJ84PpDtnyAWfg

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J.P. Abulencia, D.L. Silverstein, and M.A. Vigeant – ASEE 2016