

# Online modules increased active learning in graduate astronomy course.

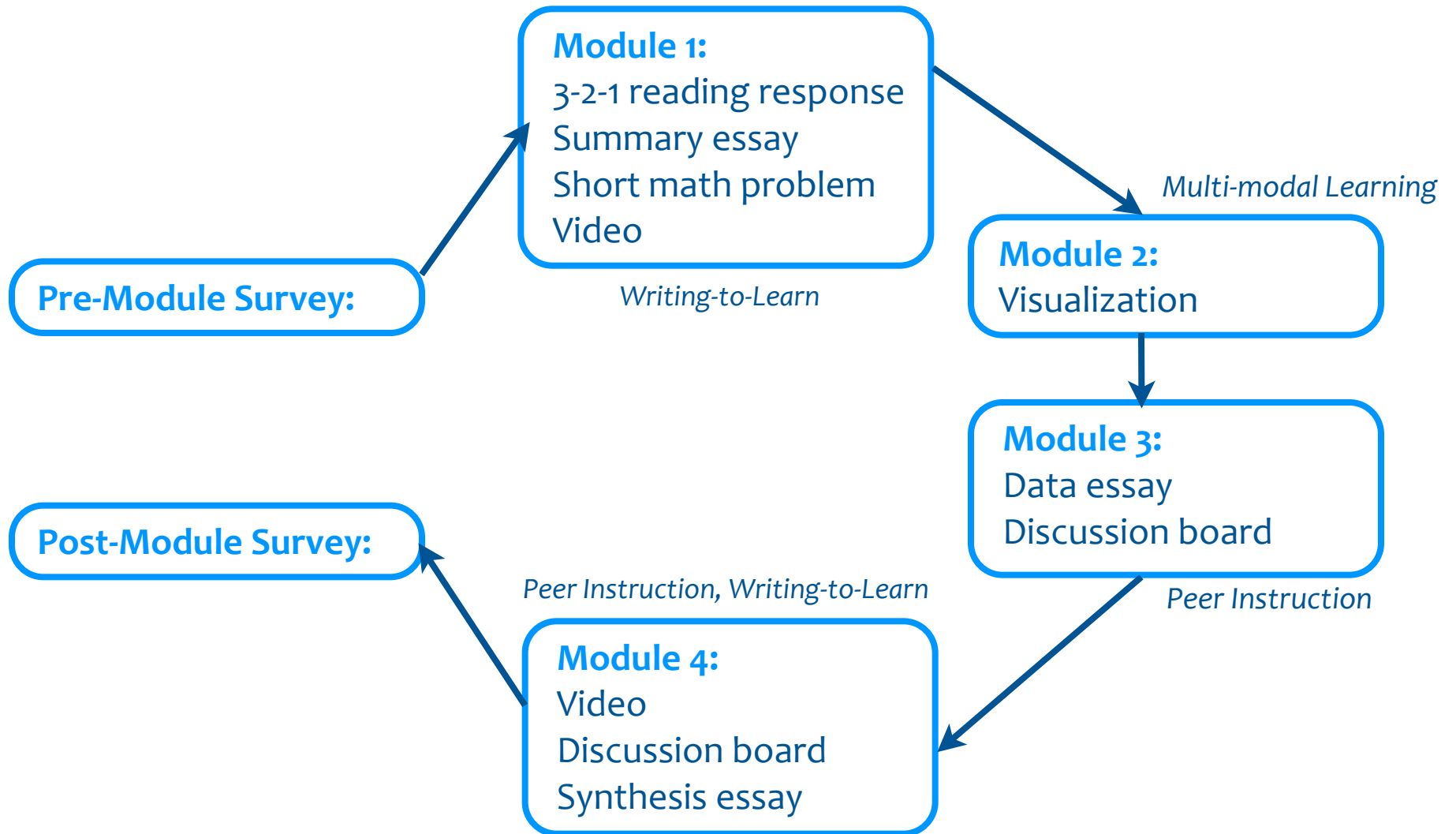
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Vanderbilt University



# Motivation for the project

- \* Graduate students were not engaged, minimal classroom discussion; passive learners
- \* Seminal galaxy formation model could not be seamlessly integrated into in-class lessons

# Project Design: 4 online modules



# Evidence of student learning

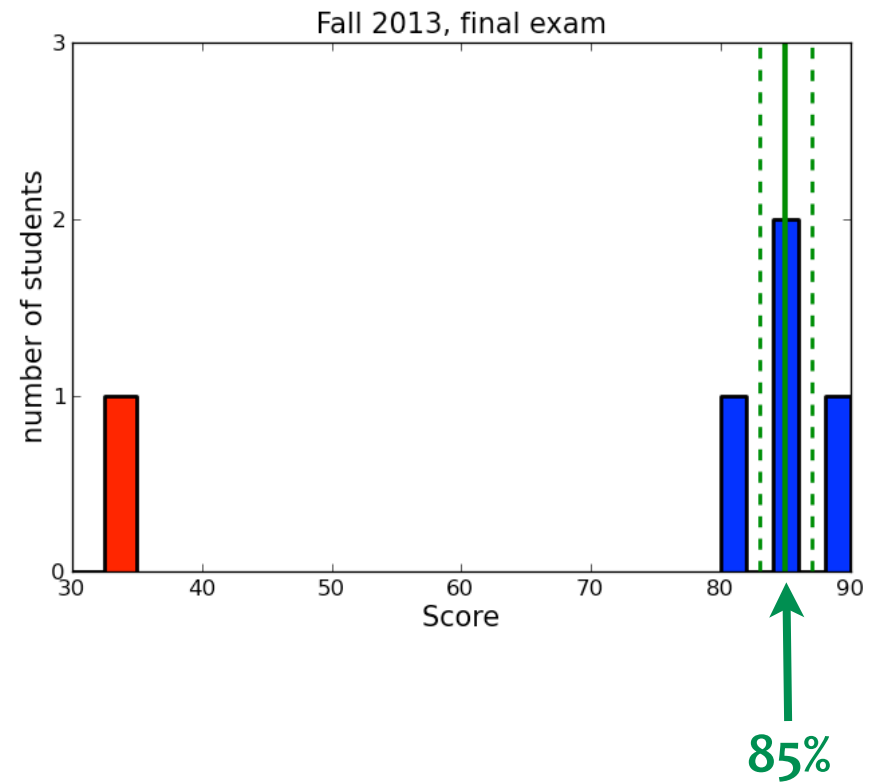
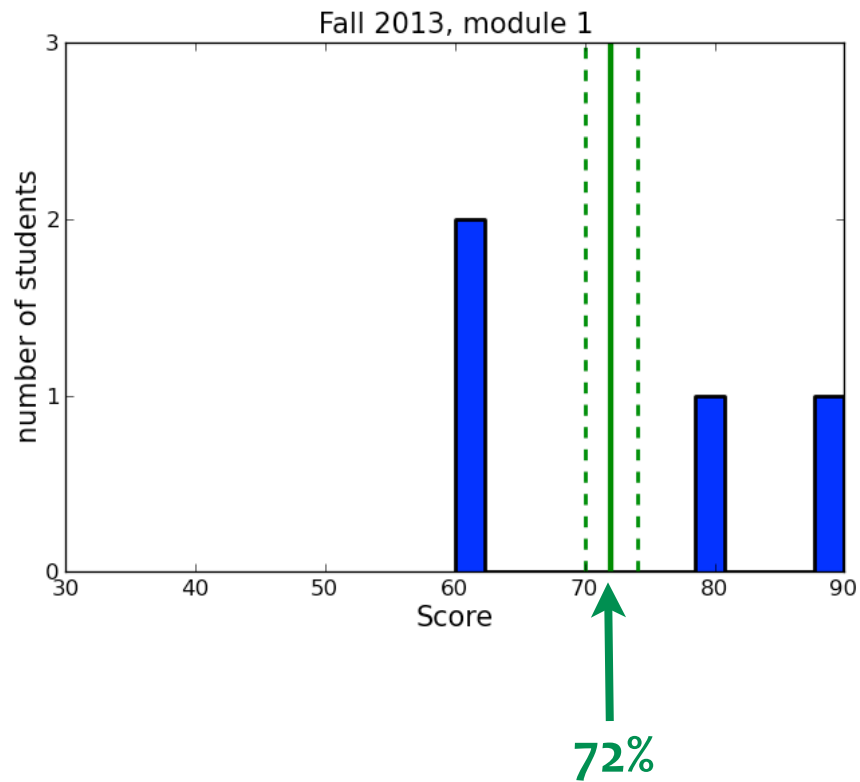
## **Quantitative:**

- \* Comparison of summary essays from Module 1 and exam
- \* Comparison of exam summary essays from Fall 2012 (lecture-style) and Fall 2013 (online modules)

## **Qualitative:**

- \* Comparison of Pre- and Post-module surveys
  - \* student familiarity
  - \* student comfort level
  - \* student learning experience (post-)
- \* Visualizations and written responses
  - \* monitor evolution of understanding
  - \* identify common misconceptions
  - \* develop individual case studies

# Evidence of student learning



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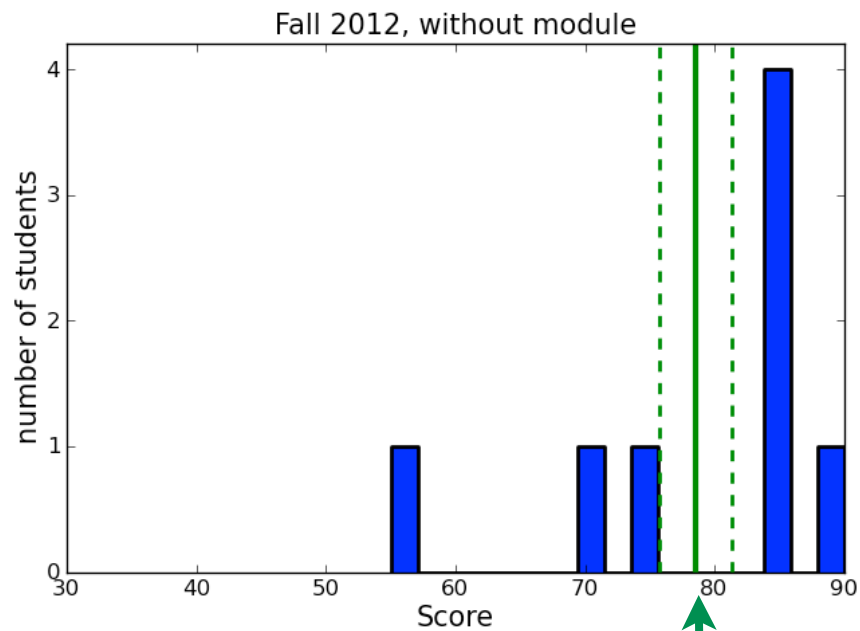
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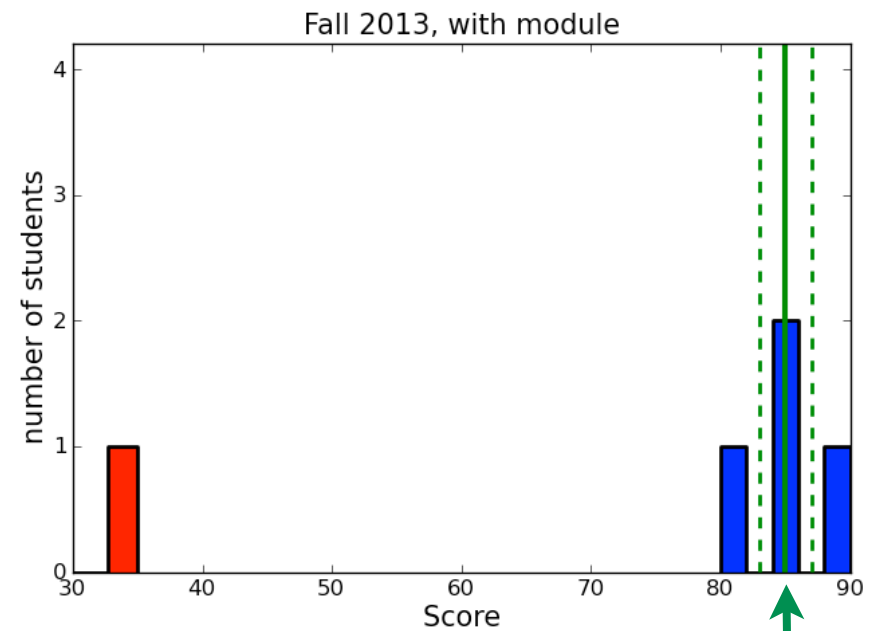
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# Evidence of student learning



78.5%



85%

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# Evidence of student learning

## Pre-Module Survey

I feel comfortable explaining the ELS model to a member of the general public.	Strongly Agree	0
	Agree	0
	Neither Agree nor Disagree	0
	Disagree	75%
	Strongly Disagree	25%
I feel comfortable explaining the ELS model to another astronomer.	Strongly Agree	0
	Agree	0
	Neither Agree nor Disagree	0
	Disagree	50%
	Strongly Disagree	50%

# Evidence of student learning

		Pre-Module Survey	Post-Module Survey
I feel comfortable explaining the ELS model to a member of the general public.	Strongly Agree	0	25%
	Agree	0	75%
	Neither Agree nor Disagree	0	0
	Disagree	75%	0
	Strongly Disagree	25%	0
I feel comfortable explaining the ELS model to another astronomer.	Strongly Agree	0	0
	Agree	0	100%
	Neither Agree nor Disagree	0	0
	Disagree	50%	0
	Strongly Disagree	50%	0

# Evidence of student learning

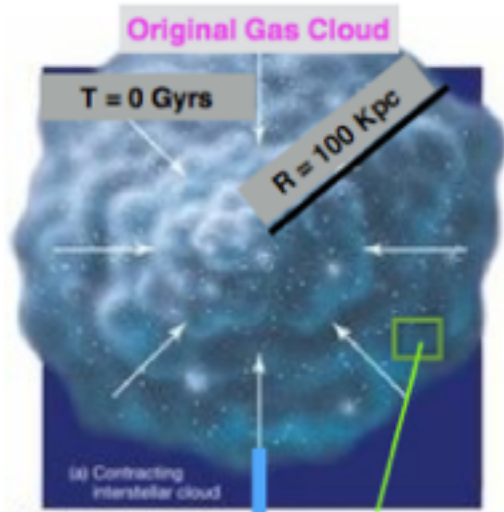
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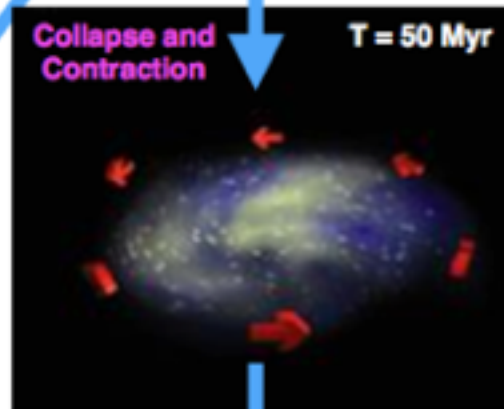
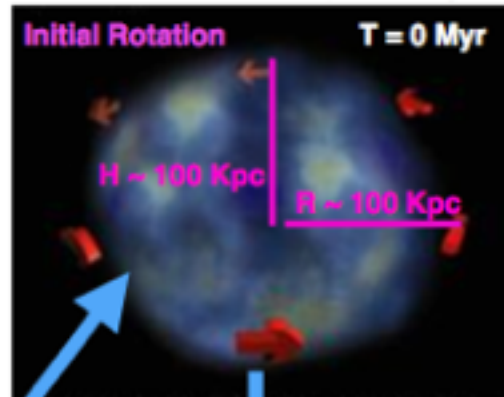
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# ELS Model

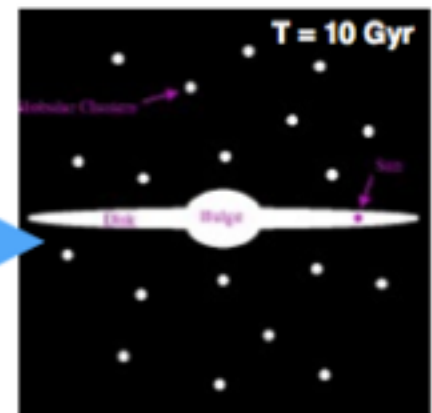
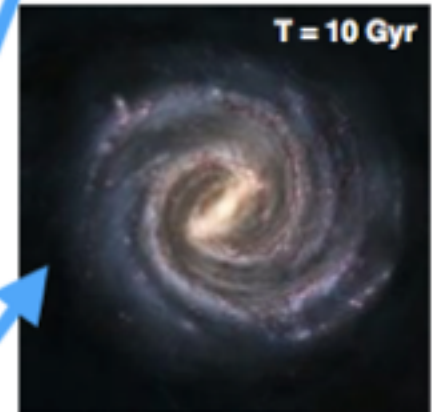
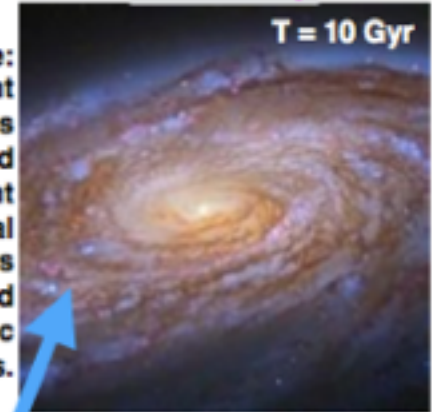


Note: Star formation occurred prior to and during the collapse.



Note: Collapse halted my angular momentum of material.

Note: Different outcomes correspond to different initial parameters and intergalactic exchanges.



# Conclusions and Future Directions

- \* Preliminary results imply online modules are effective modes of content delivery and encourage active participation among graduate students.
- \* Will launch again, with modifications:
  - \* repeated\*, explicit instructions and expectations
  - \* feedback
  - \* open text box for student comments in post-module survey