Clickers Beyond the Basics

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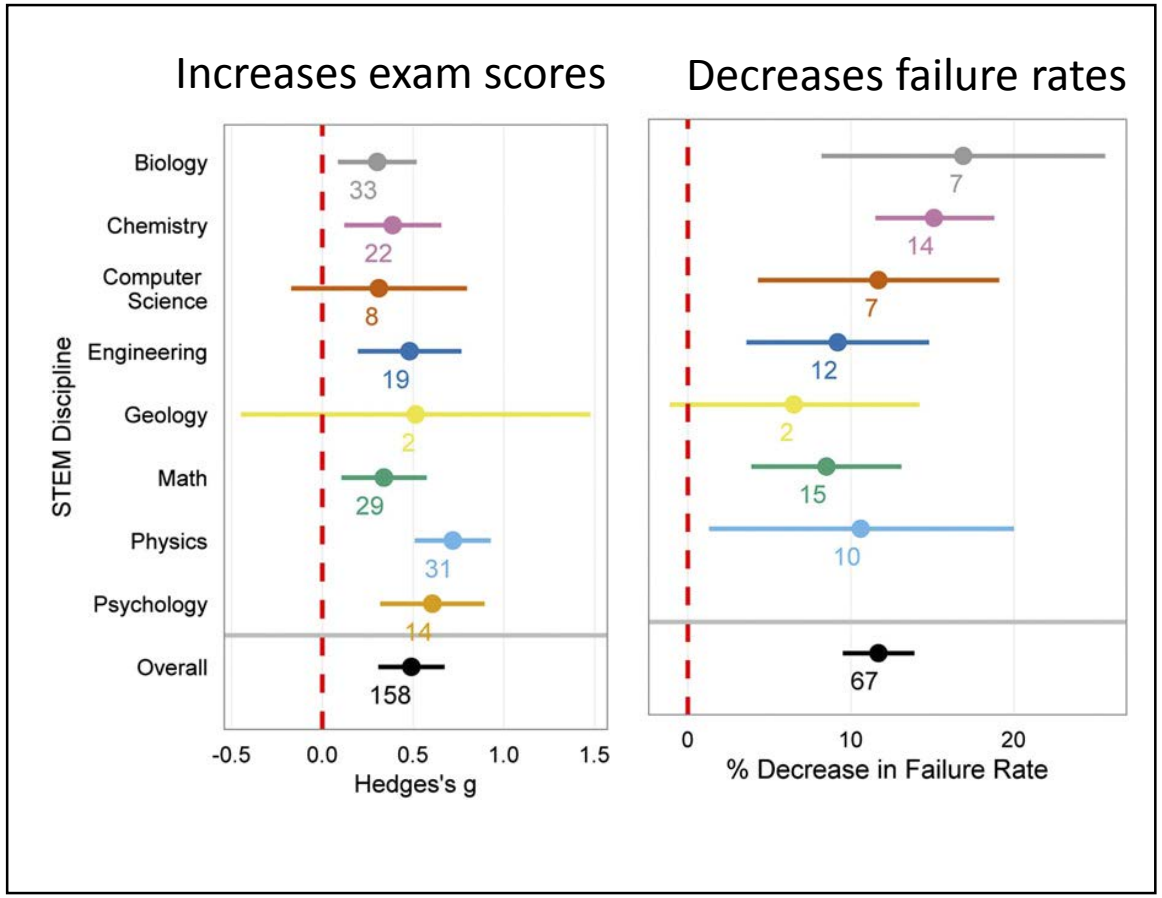
Basics

Active learning increases exam scores and decreases failure rates



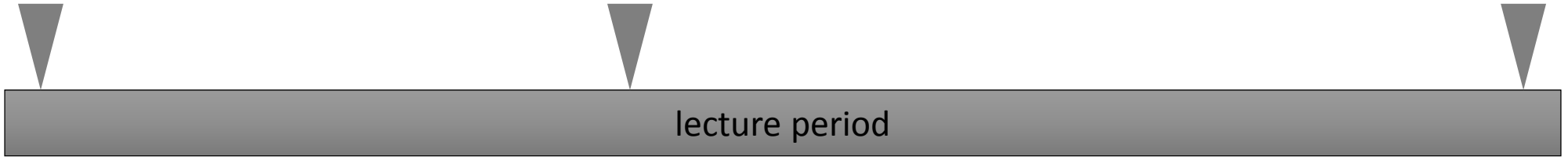
Freeman *et al.* PNAS 2014

Basics

Did you understand the pre-class reading assignment?

Did the first half of lecture make sense?

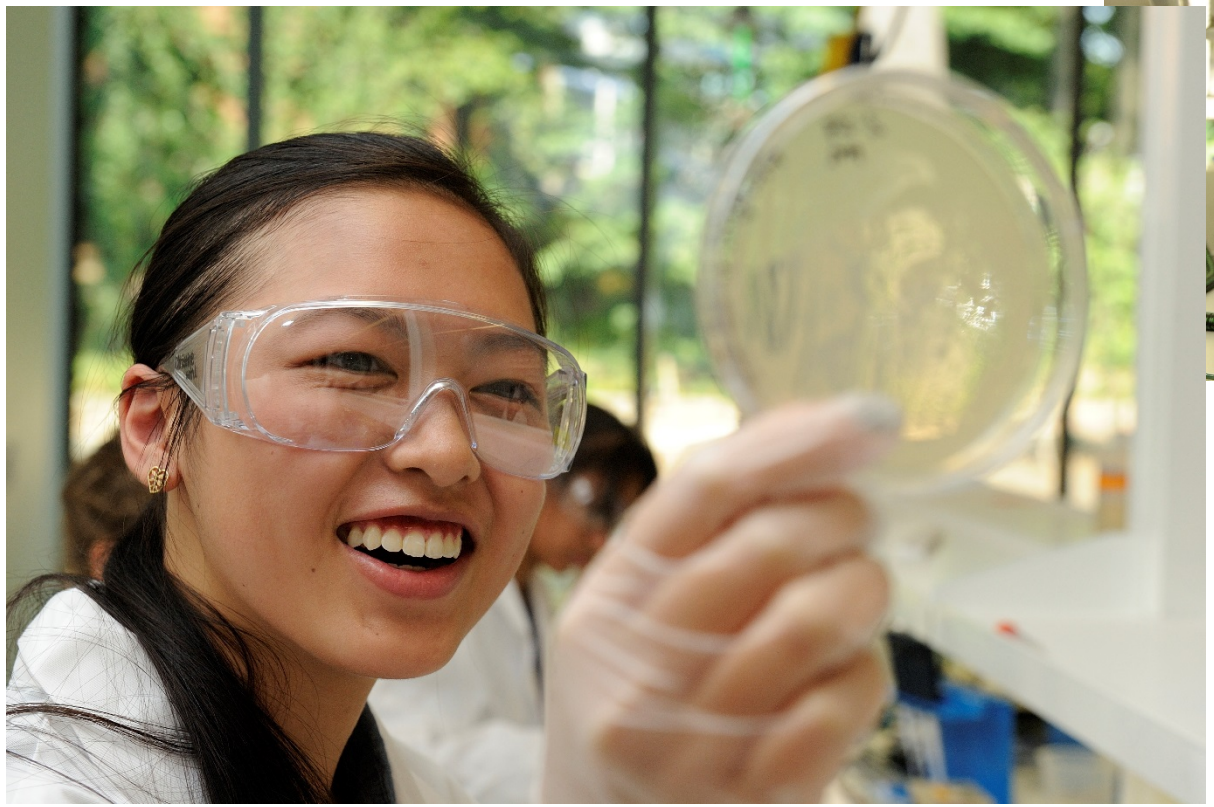
How does today's topic connect to previous topics?



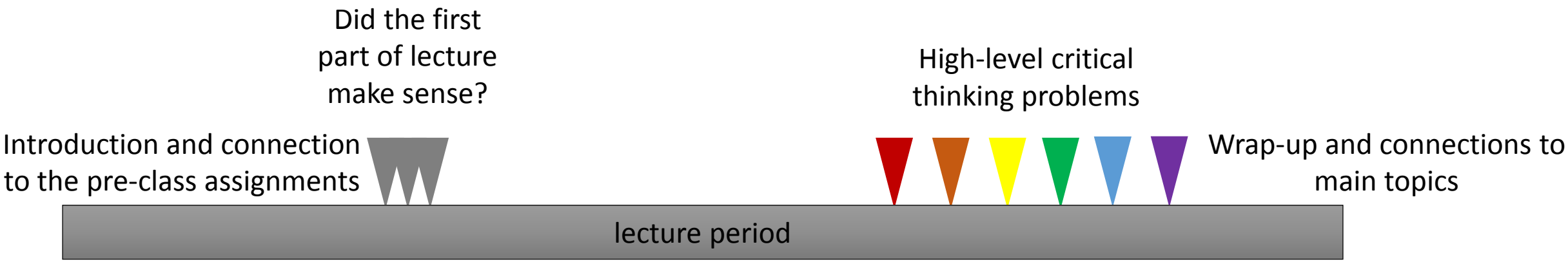
motivate student engagement
incentivize attendance
wake up/reset the attention span clock
place today's topic in the bigger picture

Beyond

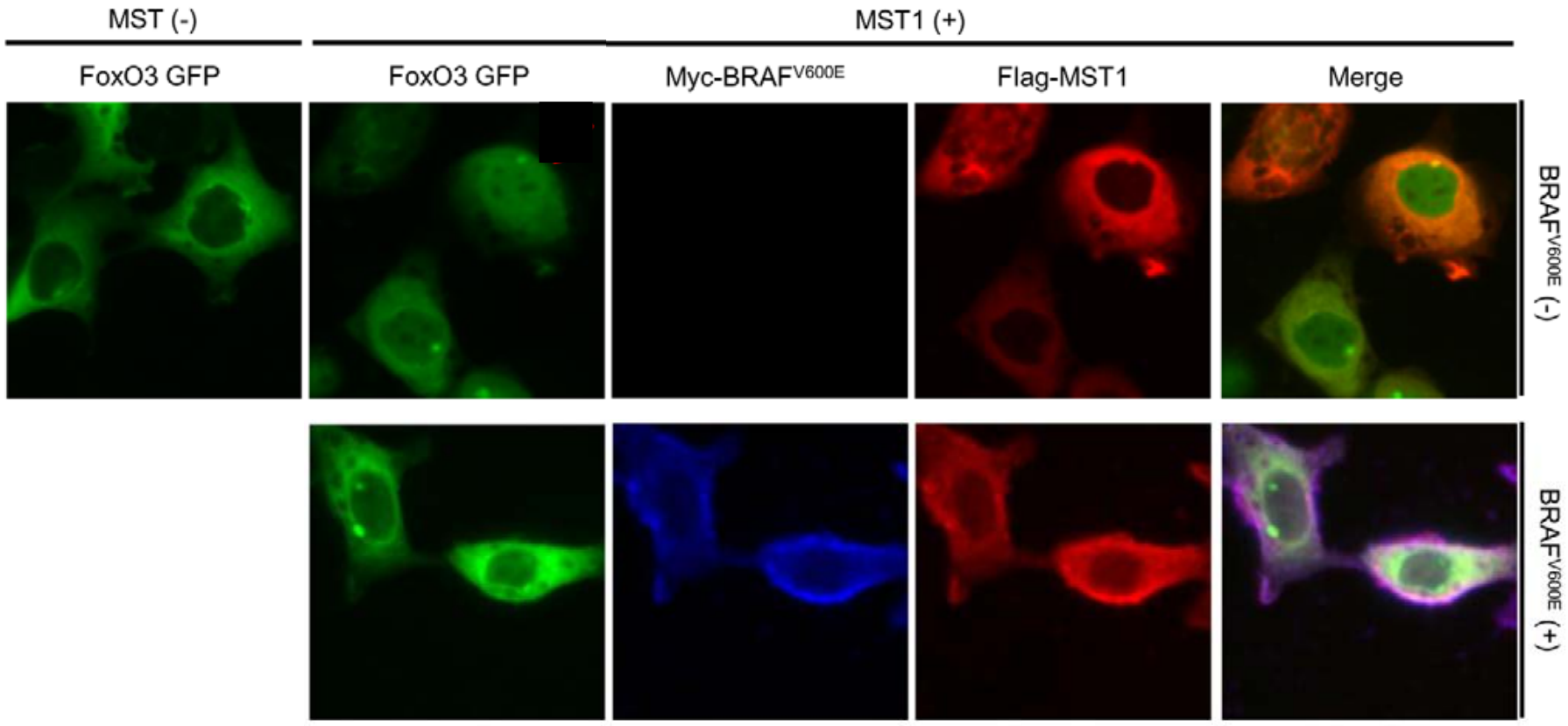
Understand how biological systems function
Critically evaluate existing data and interpretations
Create new knowledge



Beyond

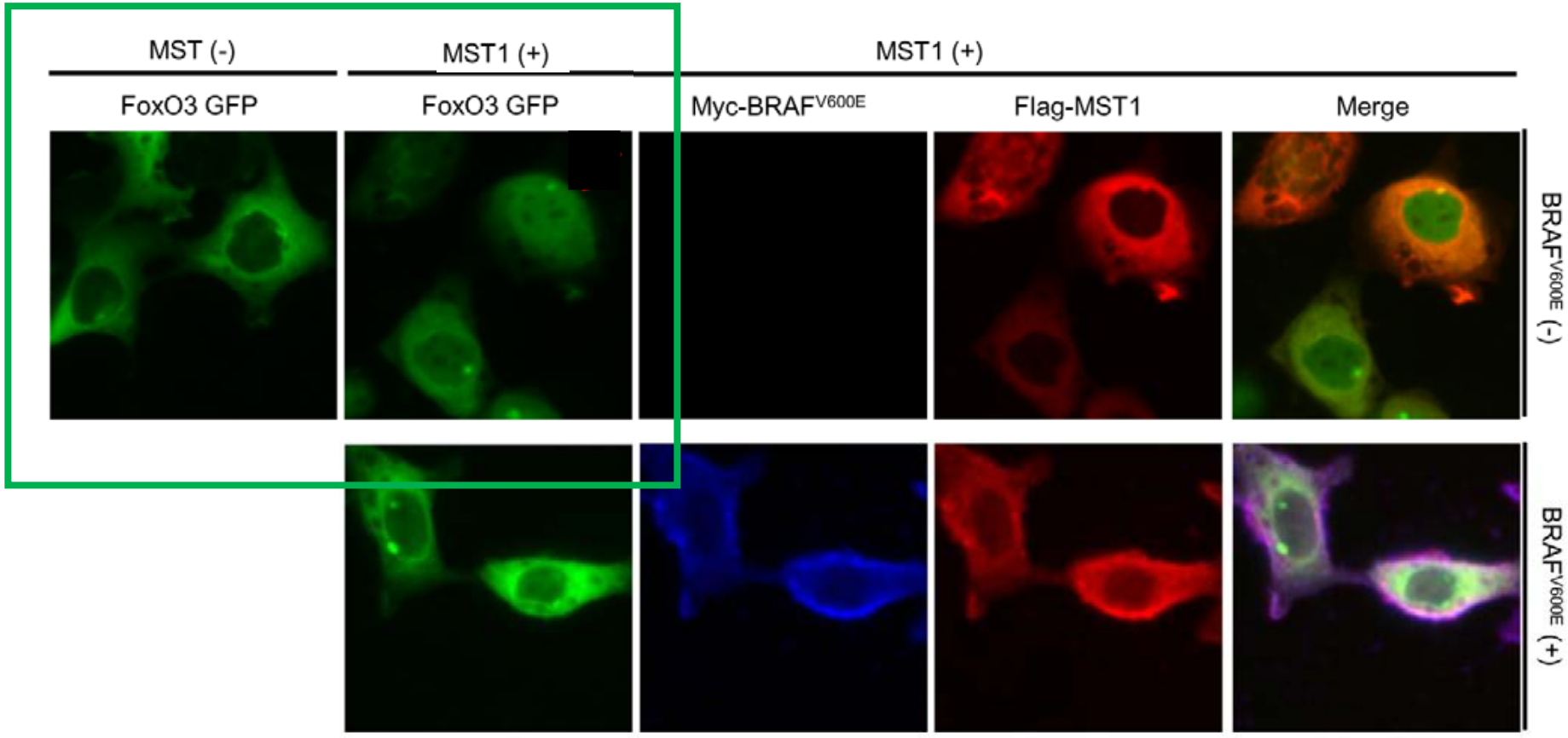

Did the first part of lecture make sense?
High-level critical thinking problems
Introduction and connection to the pre-class assignments
Wrap-up and connections to main topics
lecture period

Example From Cell Biology



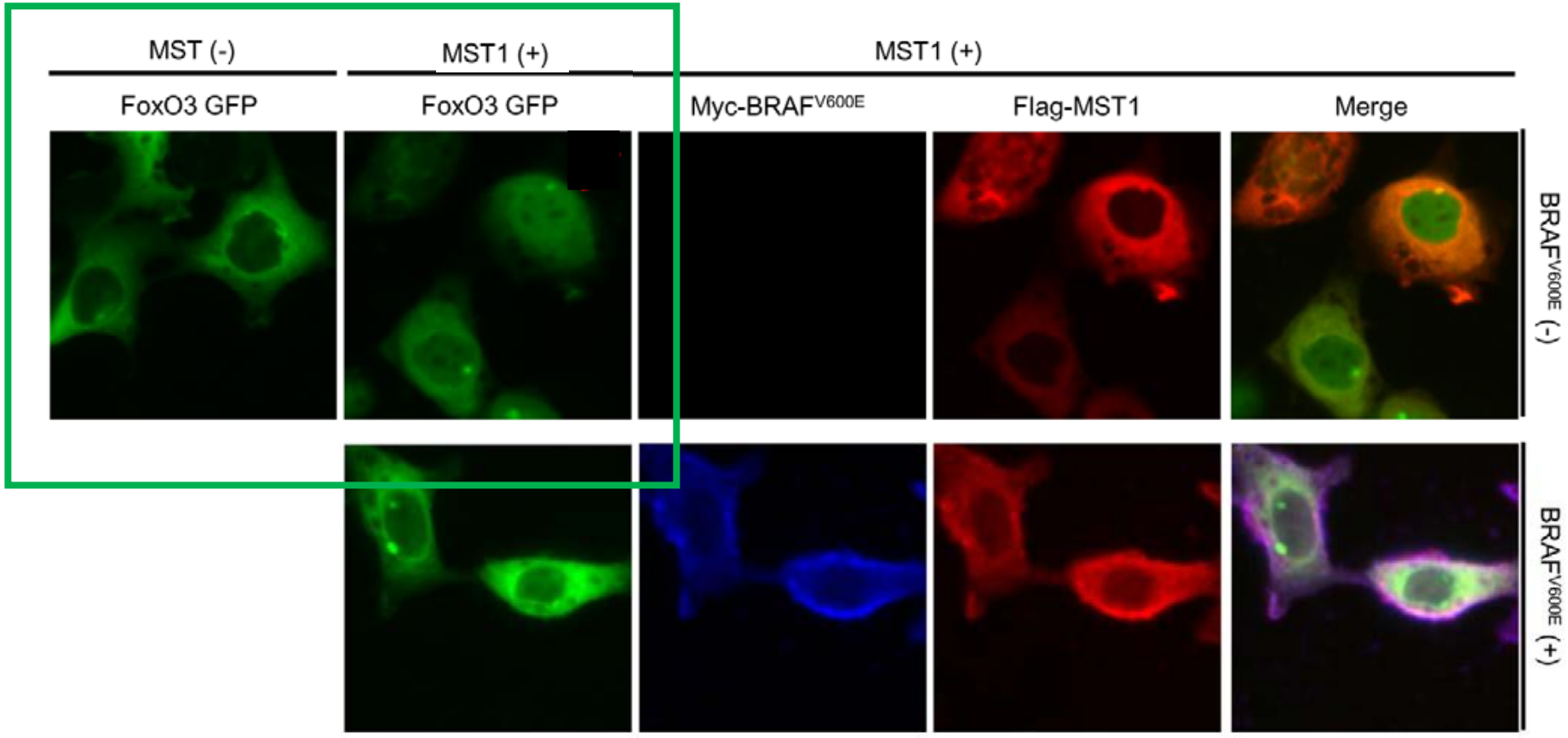
Question 1:
What type of experiment is shown here?
What do we know about these cells based on this type of experiment?

Example From Cell Biology



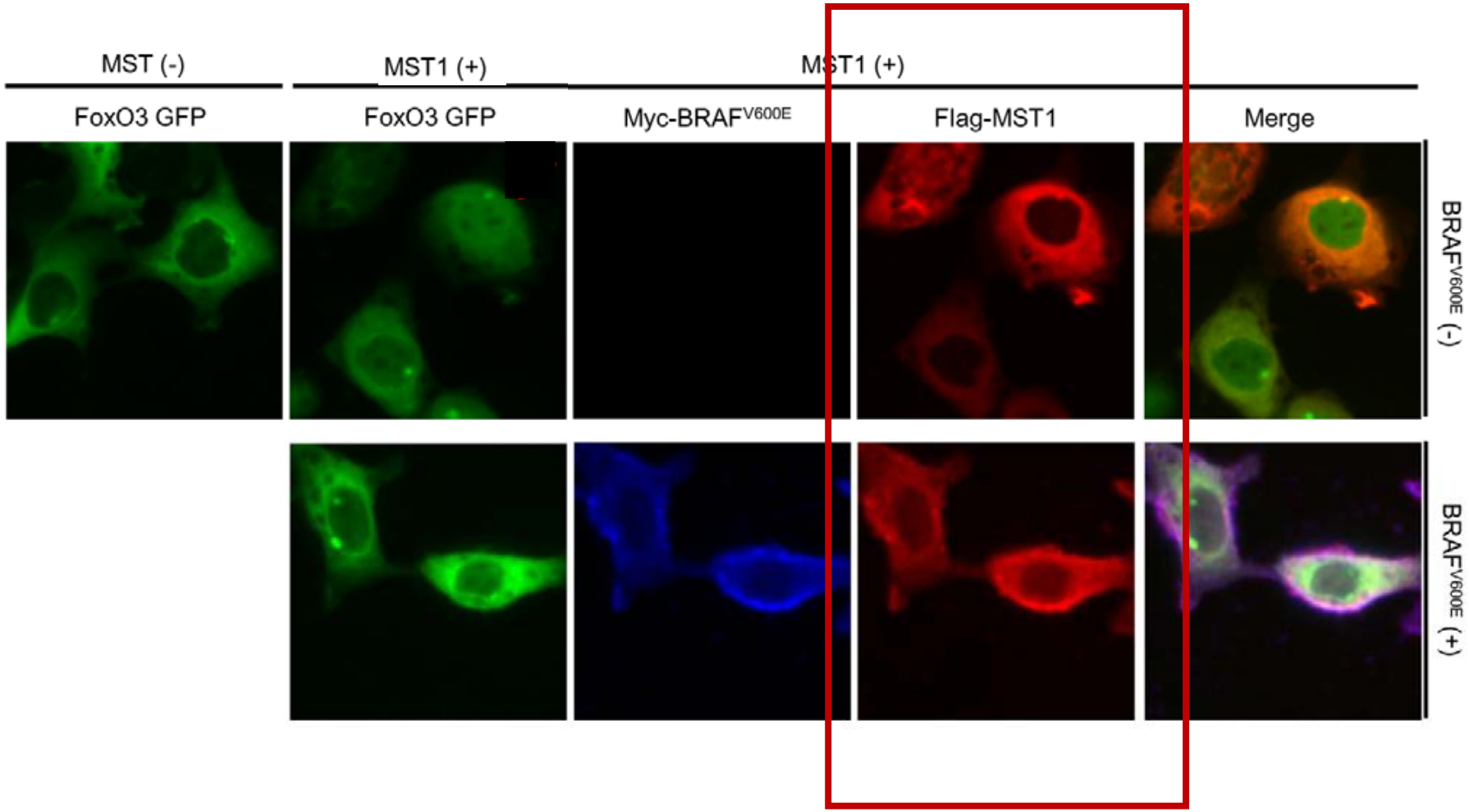
Question 2:
What differences are seen here?

Example From Cell Biology



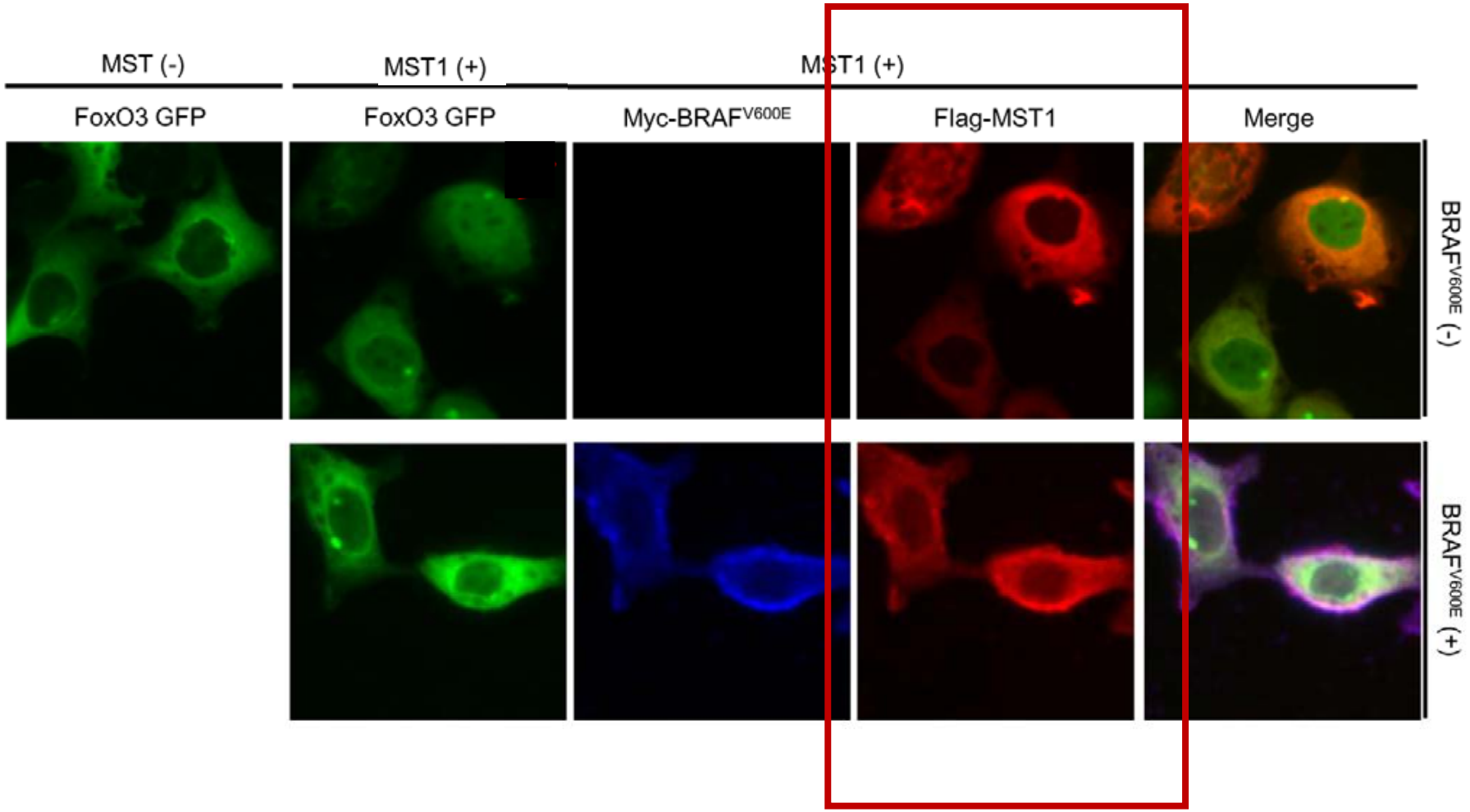
Question 3:
Predict how MST1 affects FoxO3 location.

Example From Cell Biology



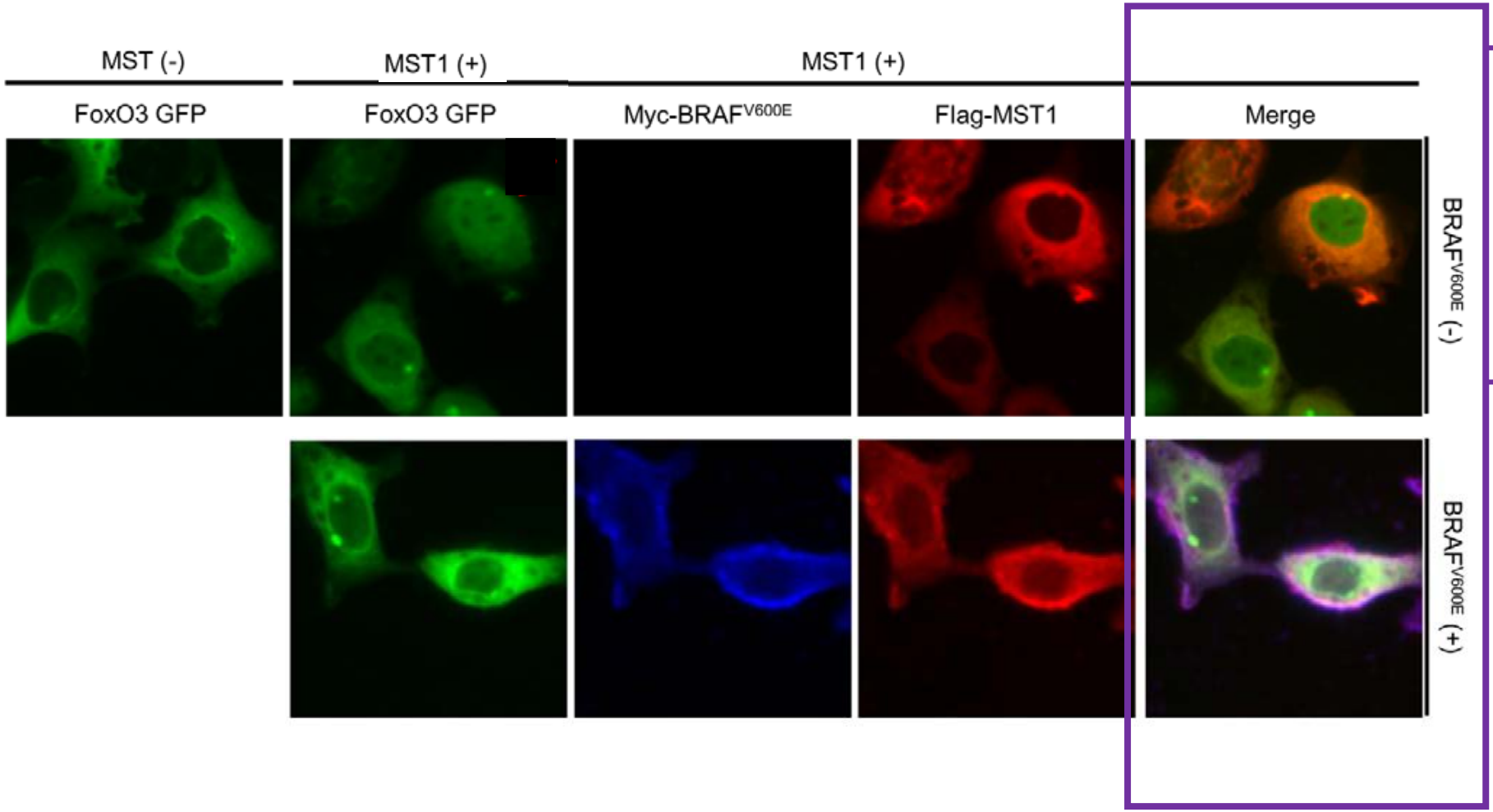
Question 4:
What differences do you see here?

Example From Cell Biology



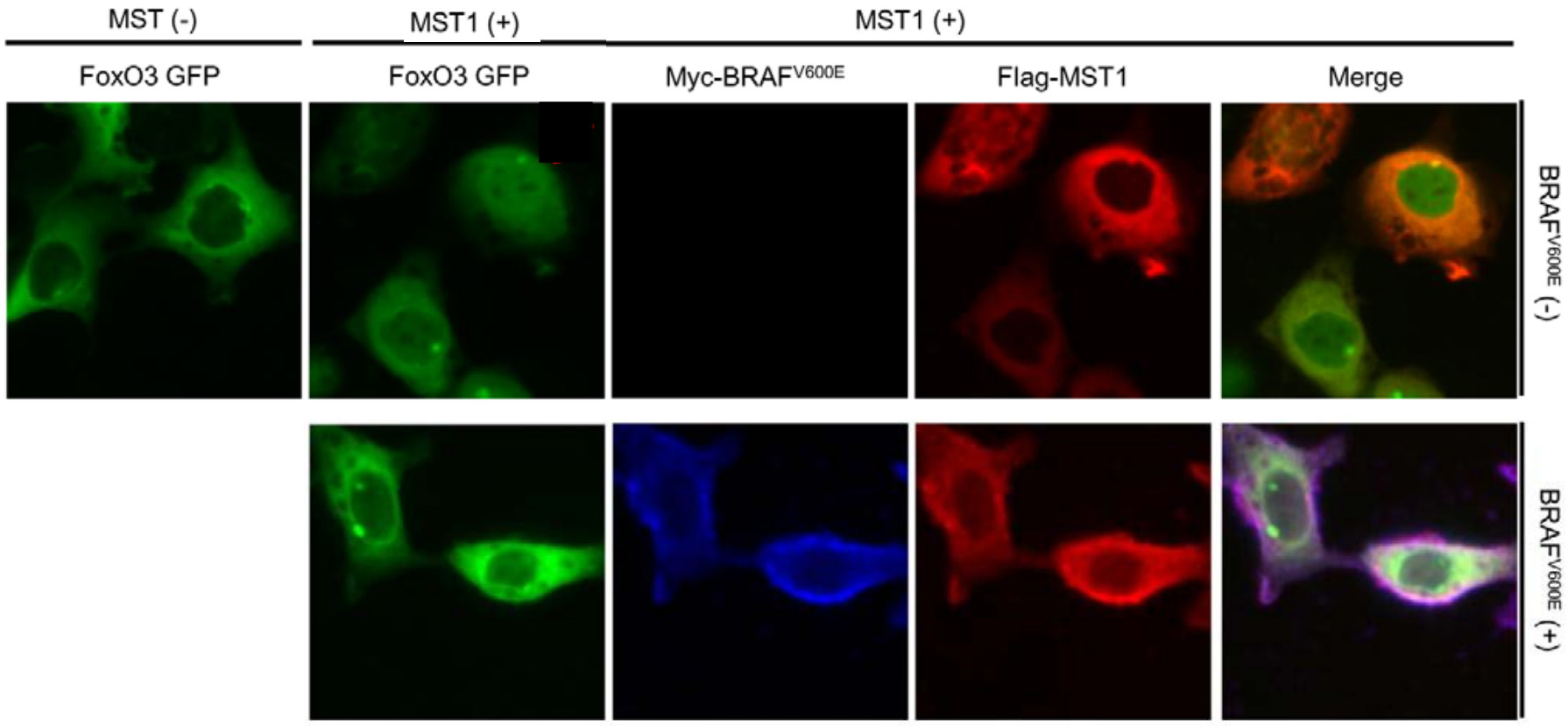
Question 5:
How does the answer to question 3 affect your predictions from question 2?

Example From Cell Biology



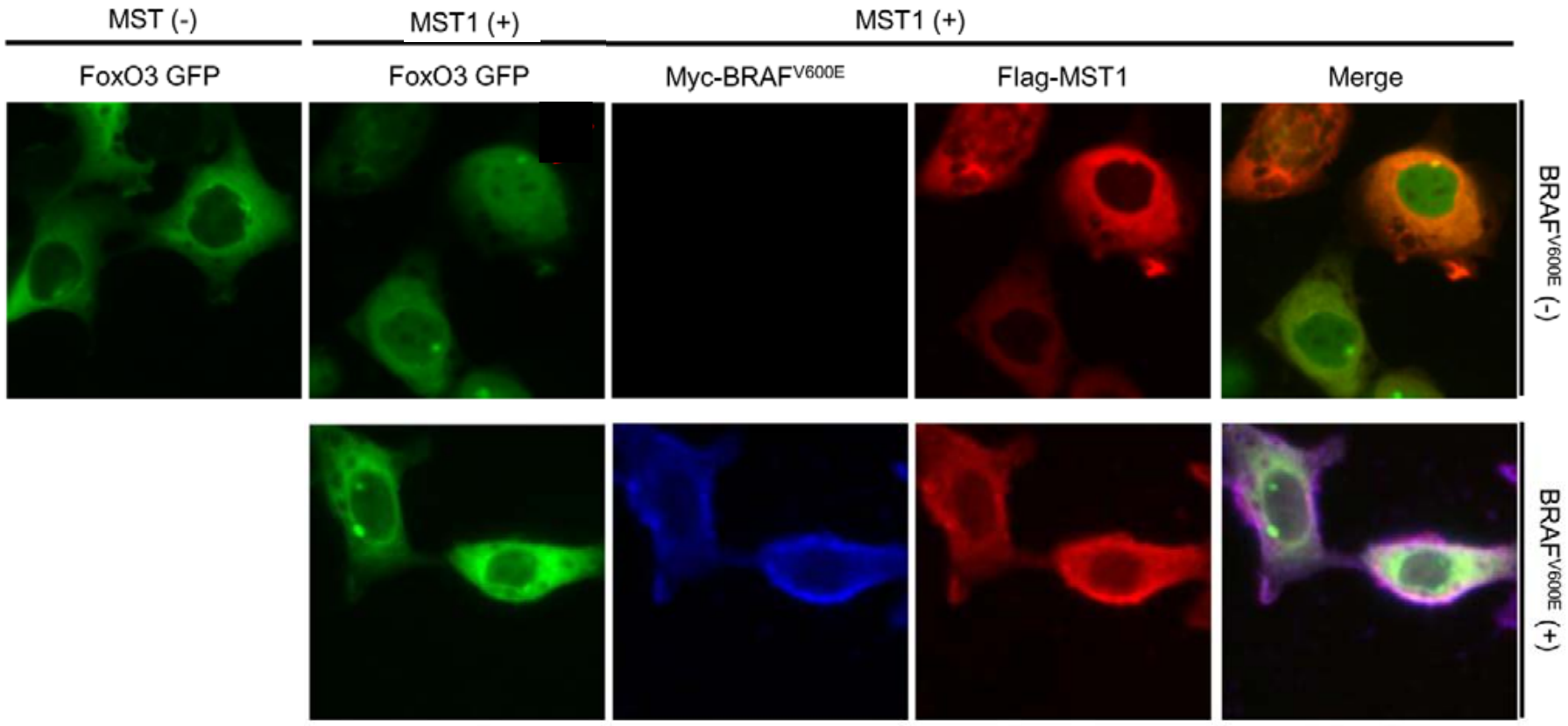
Question 6:
Is the FoxO3 protein (green) different in the top and bottom panels?

Example From Cell Biology



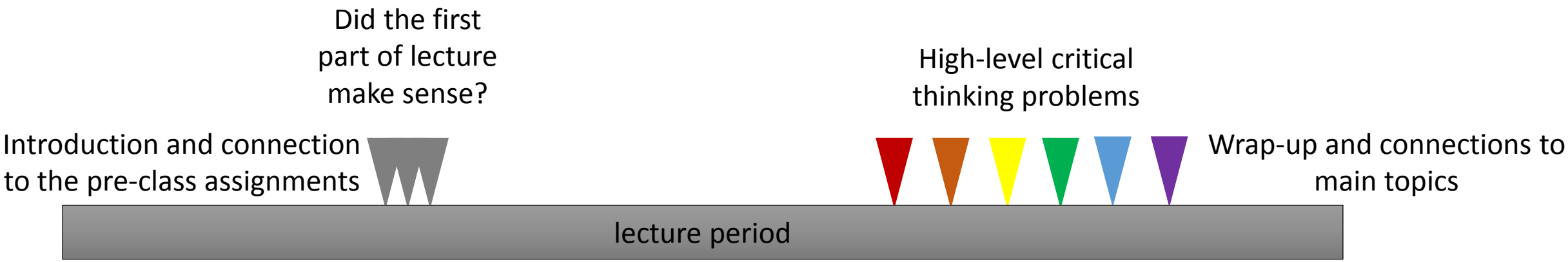
Question 7:
How can we put these three proteins together in a model?

Example From Cell Biology



Question 8:
How can we put these three proteins together in a model that includes disease development?

Beyond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Lessons Learned and Other Notes

- Using class time to let students answer questions is worthwhile
- Get student buy-in by explaining the purpose and motivation behind the questions
  - Mimicks the type of thinking and problem solving required on exams
  - Practice articulating answers to a peer or to the class
- Breaking questions down into digestible pieces is helpful to students and informative to the instructor
  - Motivates student engagement with pre-class material, incentivizes attendance, breaks up a long lecture
  - Apply basic understanding to real-world situations, requires critical thinking, prepares students to perform these tasks independently