

# COMPUTATIONAL THINKING WITH PROFESSOR OSMAN YAŞAR

## ACTIVITIES FOR STUDENTS

- 1.** Building blocks such as LEGO bricks can be a useful tool for introducing inductive and deductive thinking. For instance, encourage your students to:
  - Build something semi-specific from LEGO bricks, such as a building or animal (inductive thinking).
  - Then, ask them to make something more specific, such as a town hall or a giraffe, which will involve taking the model apart to access key bricks, and also keep some ideas from their original creation (deductive thinking).

This activity can be tailored to the lesson. For instance, for chemistry or biology, Molymod molecular model sets can be used to build biomolecules or simulate (destructive or constructive) chemical reactions.
- 2.** Introduce low-stakes quizzes that test knowledge that students were exposed to several months ago. This will involve effort in memory recall, which helps to strengthen learning. For instance:
  - Present students with a short test on a past topic. Encourage them to attempt the test from memory in the first instance. Once they have written or attempted answers for as many as they can, they can look back over their notes to find the answers.
  - In pairs, ask students to design short tests for one another, based on what they can remember from a past topic. Once they have completed each other's tests, allow students to discuss with one another what they could and couldn't remember, and share knowledge.



Osman and two teachers testifying in the United States Congress



Teachers and faculty members discussing a project



Osman with graduate students



### LESSON PLANS

To access free lesson plans relating to computational modelling and simulation technology (CMST):

1. Visit the SUNY Open Access Repository (SOAR): [soar.suny.edu](https://soar.suny.edu)
2. Type in 'lesson plans' in the search bar at the top and click on the 'return' (or 'search') key
3. In the menu bar, on the left, scroll down to 'Subject' and click on CMST
4. Choose from 309 lesson plans.

For example, there is a lesson on the mathematics of bungee jumping, where students create their own model of bungee jumping and analyse graphs that compare acceleration, distance and speed versus time.

### ITEST AND STELAR:

- Innovative Technology Experiences for Students and Teachers (ITEST) involves students in real experiments to develop their computational thinking skills and preparedness for STEM careers. They are supported by the STEM Learning and Research Center (STELAR): [stelar.edc.org](https://stelar.edc.org)
- Osman's latest project will advance the ITEST programme through the use of mobile apps for teachers to use in STEM lessons. Find out more: [stelar.edc.org/projects/20024/profile/making-it-stick-mobile-apps-pedagogically-support-retrieval-practices](https://stelar.edc.org/projects/20024/profile/making-it-stick-mobile-apps-pedagogically-support-retrieval-practices)
- A number of articles explaining computational thinking are available on the STELAR website. Find some here: [stelar.edc.org/projects/20024/related-content](https://stelar.edc.org/projects/20024/related-content)

### COMPUTATIONAL THINKING:

- Scratch is a free coding platform for students aged 8-16, which introduces the principles of coding alongside how to solve problems, design projects and communicate ideas: [scratch.mit.edu](https://scratch.mit.edu)
- The STEM Teacher Leadership Network is a new online learning community that provides resources, forums, and opportunities for teachers aiming to improve STEM teaching and learning: [stemtlnet.org](https://stemtlnet.org)

### COMPUTATIONAL MODELLING:

- The PhET Interactive Simulations project draws on extensive education research to create engaging, game-like simulations to help students learn key STEM topics: [phet.colorado.edu](https://phet.colorado.edu)
- The Concord Consortium has a range of innovative and free STEM learning resources, including simulated laboratories, data analysis platforms and novel probe software: [concord.org](https://concord.org)

### MEMORY RETRIEVAL:

- Retrieval Practice has books, free practice guides and teaching strategies that focus on memory retrieval techniques, drawing on nearly 100 years of cognitive research: [retrievalpractice.org](https://retrievalpractice.org)
- This video from Brainbook takes viewers through the fundamentals of memory retrieval: [www.youtube.com/watch?v=TXfVRs47EdM](https://www.youtube.com/watch?v=TXfVRs47EdM)