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Sincerely,

Cecilia d'Oliveira '77, SM '79
Executive Director
MIT OpenCourseWare

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Getting Serious about Video Games



A student playtesting a game.

You've been playing video games your whole life, all kinds of video games, and you've developed a pretty keen sense of what makes one game really fun and another not so much. There's this game you've had in mind of creating for quite some time, and now you've finally got the chance to make it a reality because you're an MIT student who's enrolled in [CMS.611J Creating Video Games](#).

There's just one catch, well, more than one. You can't possibly make the game just by yourself, so you have to work on a team with other people who have also played lots of video games, and they all have their own ideas for cool new video games. One student has impressive programming skills. One has none. One has lots of design experience. You only have a little . . . You have eight weeks to make the game, and oh, by the way, the instructors insist that the game not only has to function properly and be fun to play, but must meet the needs of a client. And that client wants the game for a very specific purpose: to help save the world! Good luck!

A Project-based Course . . .

This robust course, just published on OCW, is designed to help students meet this challenge. Over a series of [four projects](#), students build their teamwork and project management skills, starting with a paper prototype and moving on to increasingly more complex projects that culminate in the course finale, the humanitarian game that students create themselves from scratch.

With an Interactive Timeline . . .

The instructors, [Philip Tan](#), [Rik Eberhardt](#), [Sara Verrilli](#), and [Andrew Grant](#), have thought long and hard about how to get students to work together on a creative project. They share their reflections about the challenges of the course and how they teach the design process in video interviews in the [Instructor Insights](#) section of the course site's [This Course at MIT](#) page. An [interactive timeline](#) also on this page captures this iterative process across the semester, featuring video clips from class lectures and student presentations.

And Complete Video Lectures . . .

The [lecture videos](#) on the course site cover the entire gamut of topics, from prototyping and aesthetics to narrative and working with artists and sound designers. There are guest lectures by people from [Riot Games](#), [Access Games](#), [Fire Hose Games](#), and other game-making groups. The course's client, [Pablo Suarez of Red Cross / Red Crescent Climate Centre](#), discusses in a [video interview](#) the importance of creating games that are fun and engaging while at the same time addressing real-world problems.

And Student Games . . .

Responding to his humanitarian challenge, students taking the course created a variety of games. In one, players brainstorm new ideas and foster social understanding by [sharing word associations](#). In others, players must [identify the cause of an epidemic](#), [prevent the spread of cholera](#), [mitigate the effects of a heat wave](#), and [protect against rising ocean waves](#). Students who worked on the games reflect on their experiences in video interviews.

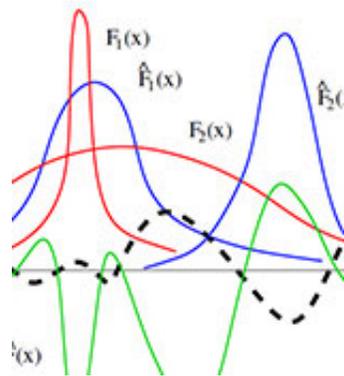
So Check It Out!

CMS.611J is one of the most innovative course sites on OCW. It contains a full cache of information and presents many different points of view. So if you want to power up and see how video games get created, or if you are interested in teaching how to make video games, this course can take you to the next level.

New Courses



[17.482 U.S. Military Power](#)



[18.409 Algorithmic Aspects of Machine Learning](#)

- [18.354J Nonlinear Dynamics II: Continuum Systems](#)
- [21G.052 French Film Classics](#)
- [21G.S01 Modern Mexico: Representations of Mexico City's Urban Life](#)
- [MAS.S66 Indistinguishable From... Magic as Interface, Technology, and Tradition](#)

Updated Courses



[2.29 Numerical Fluid Dynamics](#)

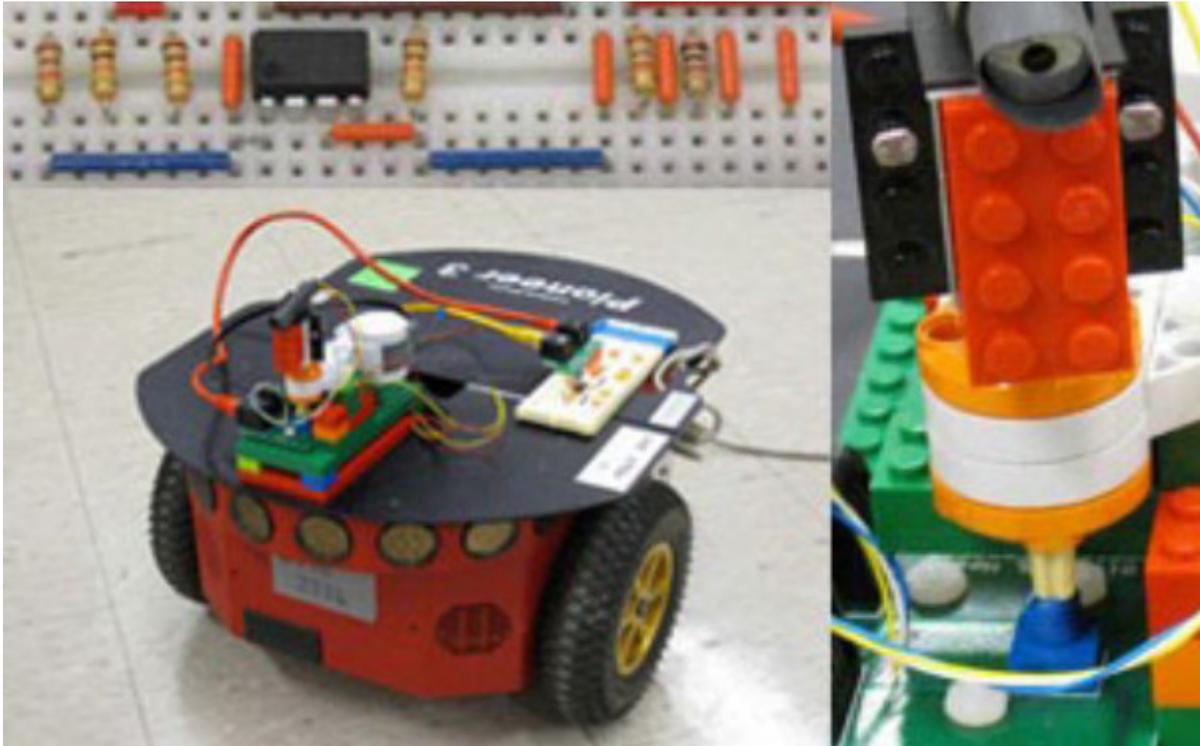


[24.244 Modal Logic](#)

- [18.385J Nonlinear Dynamics and Chaos](#)
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In the Circuits unit, students build a robot head that tracks the light. (Photographs by the course instructors.)

Hands-on, in Theory and Practice

6.01 Introduction to Electrical Engineering and Computer Science I is a signature MIT course. Substantial laboratory experiments with mobile robots provide an integrated hands-on introduction to electrical engineering and computer science. The OCW version, known as [6.01SC](#) (part of the [OCW Scholar](#) collection) has long been one of the most popular courses.

6.01 is also a signature instance of innovative teaching at MIT, with interactive lectures, an online tutor, and abundant feedback during the labs. Just added to the OCW [6.01SC](#) site, a new [This Course at MIT](#) page highlights the [teaching insights](#) of two of the course's lead instructors.

Practice-Theory-Practice

“Students prefer to sit quietly in the back of the classroom, take notes, go home, not

be bothered, and then study for exams. But there's really good evidence that that's not the way to optimize learning," observes Professor Dennis Freeman in [Shifting to a Practice-Theory-Practice Approach](#). "The [learning science] literature recommended showing students the problem and letting them work on it a bit, teaching them the related theory, and then letting them work the problem again."

In full form, "the problem" is how to program and modify a robot to do something useful.

Despite some initial pushback to this form of active learning, some two-thirds of MIT students take 6.01, and a substantial number of them do not major in electrical engineering and computer science (EECS). They take the course because they want to. Something must be going right.

As Professor Freeman says, "[Students] find out what programming is like. They find out what circuits are like. They find out what feedback is all about. They find out how an understanding of probability can make them better designers. They get a broad exposure to the field, informed by hands-on experience, and that makes [the course] very popular."

Flipping the Switch on Broadcast Lectures

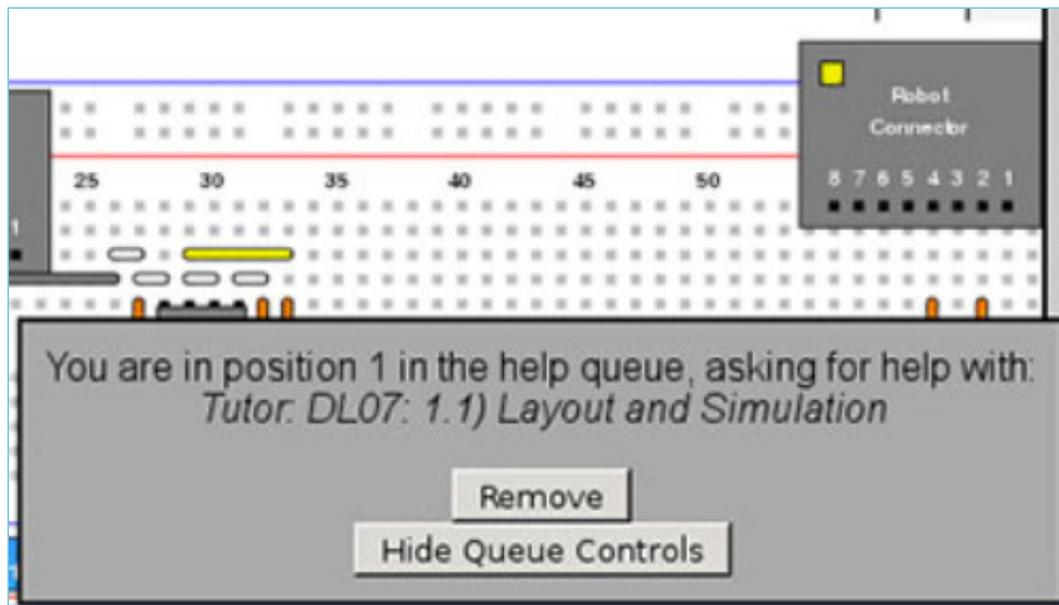
Popular is good, of course, but it can pose its own problem. How do you teach 200 to 500 students in this hands-on fashion?

First, as Professor Freeman explains, you jettison the "broadcast" model of lecturing. Sit-back-and-relax is not an option. Periodically during lecture, students get peppered with multiple-choice concept questions, and they are encouraged—one might even say, "incited"—to argue with each other about the answers. They prime themselves for class by completing assigned readings and writing short programs. They test the programs by running them through a sophisticated online tutor, which tells them whether their programs are set up right—or wrong. In this way, students develop the ability to assess their own skill and understanding.

Closing Feedback Circuits

Naturally in a hands-on robotics course, most of the learning happens in the lab. Working in teams, students are tasked with programming and redesigning robots. Needless to say, they have lots of questions, and the teaching staff is always available. "Students ask for help by putting themselves in our electronic help queue," says Professor Sanjoy Mahajan, a long-time champion of active, hands-on learning,

who has taught 6.01 in recent years. “The help queue is visible on screens to everyone, and any of the teaching staff can use their smartphones to ‘claim’ students in the queue . . . Many times we engage them in a dialogue about their work. We also check to see if something went wrong earlier in their lab work in order to make sure they aren’t headed down the wrong path or have misconceptions that need to be addressed.”



Individualized student view of the 6.01 Help Queue. The student sees his or her position in the help queue and the task with which he or she is seeking assistance.

The feedback doesn't stop here, however. Instructors also conduct “check-offs” at various points in the lab, asking students about key concepts. “We basically conduct a brief and informal oral exam with them,” notes Professor Mahajan.

Co-teaching Makes the Grade

He praises 6.01's collaborative teaching environment, in which the entire teaching staff meet together to do the work that will be featured in the upcoming lab. In this way, instructors can anticipate many student misconceptions, while supporting one another and sharing new ideas. He notes that this environment does not happen “automatically,” but is really “the result of faculty members actively creating a culture that supports co-teaching.”



Space X's Falcon 9 rocket takes off at Cape Canaveral on December 21, 2015. Image is in the public domain.

It's Pop Quiz time!

This week, the company SpaceX, founded by Tesla CEO Elon Musk, achieved what milestone?

- A. They were able to land their rocket, the Falcon 9, on the moon.
- B. It was the first time a blind astronaut piloted a rocket.
- C. SpaceX delivered Christmas presents to the International Space Station.
- D. It was the first time a large rocket delivered a spacecraft to orbit and returned

to Earth intact.

Answer: D

Check out all of the great courses on [Astronomy and Astrophysics](#) available at [Highlights for High School!](#)

MITx News



With the help of 6.001x, Matt Reimer developed a computer application that revolutionized his farm.

MITx MOOC helps a farmer develop an autonomous tractor app

Like most business owners, farmers are always seeking an edge to improve efficiency, productivity, and profitability. For grain producer Matt Reimer, the search for that edge drove him to [MITx on edX](#) — the massive open online courses (MOOCs) offered by MIT — and led him to develop a computer program that revolutionized his farm.

Reimer grew up on his family's farm in Manitoba, Canada, where work often starts at sunrise and continues late into the night. For several years, he's been looking into

ways of using remote-control technology to accelerate harvest production.

“We’ve had auto-steering tractors for a long time now, but that’s just the ability to drive straight up and down the field without input from the operator,” Reimer explains. “So if you can control the tractor’s wheels, it didn’t seem like a big stretch to control other functions. I thought, ‘Why can’t I just tell the tractor to go to a location and have it go there, without anybody in the cab?’”

Initially, Reimer didn’t know where to start. He stumbled across an open hardware platform and source code, tinkering with a drone autopilot program, but his progress soon stalled out. He simply needed more knowledge to make the system work. That’s when his brother, Jonathan, who graduated from MIT in 2012, told him about *MITx* on edX.

Reimer enrolled in [6.001x \(Introduction to Computer Science and Programming\)](#), taught by Professor [John Guttag](#), to gain a better understanding of the software needed to run the device as well as how to integrate the hardware on the farm’s tractor with the grain combine harvester.

“I got the tractor all hooked up, but I needed some way for the combine driver to interact with it,” he says. “The program allows the operator to just press a button and tell the tractor to come over, get underneath the auger, unload on the go, then turn around and stop.”

Reimer used what he learned online to develop a remote control application that worked flawlessly in the fields. In fact, during the recent harvest, the driverless tractor unloaded grain from the combine over 500 times, saving the farm an estimated \$5,000 or more this season. Plus, the worker responsible for driving the tractor in a straight line for hours on end was able to focus on other, more productive tasks on the farm.

The results speak for themselves, and people have noticed. Reimer has received quite a bit of interest in the technology and will soon be helping farmers in western Canada implement the system, with hopes to expand internationally in the future. While he will offer the software for free — much like the open source code he used to develop the program — Reimer will charge a fee for the integration, a complex task dependent on a range of variables.

And yet, with so much more to learn, Reimer will be heading back online.

“I’m really grateful to MIT and Professor Guttag because I would never have been

able to write that software if not for the programming course,” he says. “But I want to implement even more features so I’ll be getting back to it soon, and I plan to take the next course too.”

After all, a farmer’s work is never done.

Introduction to Computer Science and Programming Using Python (6.00.1x) starts again on January 13th. [Register now.](#)

Views From Our Supporters

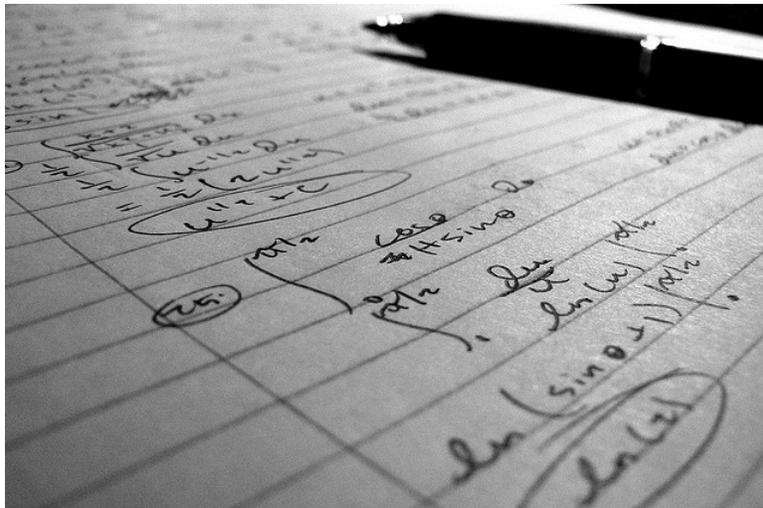


Image courtesy of [Akash Kataruka](#) on Flickr. License: CC BY-ND.

"I am using OCW (and edX) to refresh and expand my knowledge of several things I first learned many years ago in college.

I love the breadth and depth of the offerings that MIT has made available on both platforms.

I like that I can explore topics at my own pace and set how deeply I engage with each topic. The courses that I have explored (single variable and multi variable calculus, programming in python) have been very well done. The video lectures and recitations are clear, well-organized and informative. This, for me, is



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without a doubt the best way to review all this information.

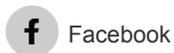
For many years I've wanted to revisit these topics and I haven't because I thought I'd have to drag out textbooks and work my way through the material that way. OCW has been such a pleasure. It is interesting and fun. I personally get a lot out of it.

Then when I think of what MIT OCW offers the world at large, I am amazed and grateful."

- Larissa, Independent Learner, USA

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