**JUDY WOODRUFF:** One of the hottest issues in higher education these days is the recent explosion of free online courses. Universities are grappling with their impact on teaching and on liberal arts education.

NewsHour correspondent Spencer Michels has our story.

**WALTER SINNOTT-ARMSTRONG**, DukeUniversity: A discounting term, you mark with D. An evaluative the term, you mark with E.

**SPENCER MICHELS:** Tracy Lippincott, who works in a San Francisco bar, is taking a college course in her apartment online on how to reason and argue. The teacher is Walter Sinnott-Armstrong, professor of ethics at DukeUniversity in North Carolina, and the class is free.

**WALTER SINNOTT-ARMSTRONG**: So, how do you learn the technique? The answer is very simple. You practice, and then you practice again, and then you practice and practice and practice and practice.

**TRACY LIPPINCOTT**, online student: This class has these really short little lectures, which is great, because you can kind of watch one, and then think about it and react, and then you don't have to watch a whole hour, like you would in a class.

**SPENCER MICHELS: “**Think Again” is a class presented by a one-year-old for-profit startup called Coursera, currently the nation's largest provider of free online courses; 170,000 students from around the world have signed up for it.

The classes are called MOOCs, or massive open online courses, and they may be revolutionizing higher education.

Online learning is nothing new. Colleges have been offering classes, usually for a fee, and for credit for years. More than six million Americans are taking some type of online courses.

But MOOC courses are different. They're much bigger. They use new technology. They often feature well-known professors, and they don't cost anything.

Hundreds of these college-level courses are currently being offered over the Internet. More than two million students have enrolled in Coursera classes, though the completion rate is low.

Daphne Koller, a computer science professor at Stanford, is one of Coursera's founders.

**DAPHNE KOLLER**, Coursera: I think by opening up education for free to everyone around the world, we're going to turn education, high-quality education, from a privilege to a basic human right, so that anyone, no matter their social, economic or family circumstances, has access to the best education.

**SPENCER MICHELS:** Those lofty goals, the experience of teaching thousands of students, and the possibility of future profits, are what got these courses going.

Professors from top universities are signing up, even though they are not paid by the providers. Eventually, universities may share revenues they receive -- when there are revenues -- with the professors. And those star professors have inspired intense student interest in the courses, says Coursera's other co-founder, Andrew Ng.

**ANDREW NG,** Coursera: Most people today will never have access to a Princeton, Stanford, Cal Tech class.

But now, if you wake up tomorrow morning and you decide you want to take a Cal Tech class, you can -- you can just sign up for one, and it's free.

**SPENCER MICHELS:** Math teacher Salman Khan started providing free online classes in 2010 out of his house, arguing that new approaches to teaching were needed. He inspired Stanford professor Sebastian Thrun and colleague Peter Norvig to put a course on artificial intelligence online just last year.

**SEBASTIAN THRUN**, Udacity: And to our surprise, 160,000 students signed up. We managed to graduate 23,000 students at Stanford graduate-level quality in a specialized subject area called artificial intelligence, which means Peter and I taught more students than all the professors in the world combined in the same subject area.

**SPENCER MICHELS:** Were you amazed by this, or did you expect it?

**SEBASTIAN THRUN:** I was blown away, and it changed my life.

**SPENCER MICHELS:** After that success, Thrun founded Udacity, a fast- growing startup in Palo Alto, financed with venture capital money, offering classes in science, technology, engineering, and math.

Universities came on board, hoping to reach more students than they previously could and to improve instruction both on and off campus using online technology. Thrun says early results are promising.

**SEBASTIAN THRUN:** We have some data on how it works. For some of the classes, we have shown that the average point score of students taking those classes online is higher, significantly higher than taking it in the classroom. That's kind of mind-blowing.

**SPENCER MICHELS:** He says teachers are learning new strategies that are more effective than the traditional lecture.

**SEBASTIAN THRUN:** It's not my lecturing that changes the student, but it's the student exercise. So our courses feel very much like video games, where you're being bombarded with exercise after exercise after exercise. That's very different from the way I teach at Stanford, where I'm much more in a lecturing mode.

**SPENCER MICHELS:** At Coursera, Ng says online courses aren't dominated by a few aggressive students in a classroom.

**ANDREW NG:** On the online website, we have these things we call in-video quizzes, where the video pauses and a question pops up. Every single student sees the video pause. Every single student gets to attempt an answer, not just the one smart kid in the first row.

**DAPHNE KOLLER**: Every single instructor that has taught a course online has told us that it's changed profoundly the way they teach their on-campus students.

**SPENCER MICHELS:** The University of California at Berkeley has decided to partner with another MOOC provider called edX, a not-for-profit in Cambridge, Mass.

Computer science professor Armando Fox, who heads campus online learning, lectures about the beauty and joy of computing.

As he talks, with some visual aids, his lecture is taped by a technician, who will send it to edX, where it will be posted online, a free class that is identical to what his students at Berkeley are receiving.

**ARMANDO FOX**, University of California, Berkeley: This is an opportunity that I think none of us ever have seen before, where, you know, we can essentially teach the world. We had an e-mail from one student who lived in the Gaza Strip, and he was apologizing that his homeworks were always late because they only get six hours of electricity per day, and he was using some of that electricity budget to take our course. You know, as an instructor, I think there's no higher compliment than that.

**SPENCER MICHELS:** With on-campus students watching lectures and basic material online, MOOCs provide the opportunity for instructors to use class time for discussions and exercises, a so-called flipped classroom.

As a bonus, Fox says, the information students furnish when they take online courses is providing valuable data about learning.

**ARMANDO FOX**: With MOOCs, you know, with thousands of students taking a quiz, as instructors, we can now put some science into asking, which are the hardest quiz questions? Which questions will tell us who the superstar students might be?

**SPENCER MICHELS:** MOOC startups are still trying to figure out how to make money. Udacity is getting revenue from several companies like Google to provide specialized courses. Coursera is charging potential employers for providing names of high-scoring students.

And, eventually, students may pay for credits transferable to colleges. So far, students can earn only a certificate when they complete a course. Almost no colleges are giving credit for MOOCs, at least not yet.

At Stanford and other elite universities around the country, undergraduate tuition, plus room and board, runs about $54,000 a year. At Berkeley, a public university, it's around $30,000, depending on where you live. The big question is, what do you get for that that a free online course with a stellar professor wouldn't give you?

**SUSAN HOLMES**, Stanford University: I don't think that you can give a Stanford education online, in the same way as I don't think that Facebook gives you a social life.

**SPENCER MICHELS:** Susan Holmes is a professor of statistics at Stanford. She fears that budget-conscious colleges may use online education to replace instructors and save money.

**SUSAN HOLMES**: People will think it'll be much cheaper to hire people who aren't trained with Ph.D.s and to make the student watch courses, and use graduate students, or even undergraduates, as advisers.

**SPENCER MICHELS:** But even more important, Holmes is worried that MOOCs could damage a key university goal: providing a liberal arts education, where students learn to write and express themselves.

**SUSAN HOLMES**: And that is done with interaction with the students. The professors meet with the students, advise the students, and the students also have their colleagues to talk to, their peers.

**SPENCER MICHELS:** The difficulty of providing personal contact also concerns Coursera's founders, but they think they are addressing it with online study groups or forums.

**ANDREW NG**: Learning is social, and we learn best when we have classmates to discuss things with.

When you teach a class of 100,000 students, what that means is that, if there's a student thinking about some topic, no matter what time of day you're awake thinking about it, there will be someone in some time zone awake thinking about the same thing as you are. They can discuss it with you.

**SPENCER MICHELS:** Still, the problem of personal contact is getting lots of attention from students and from teachers.

**WALTER SINNOTT-ARMSTRONG**: We cannot answer e-mails from students, so please do not e-mail us individually. There will be discussion forums where you can go and talk to other students about the material in the course.

**TRACY LIPPINCOTT**: The thing that I really miss is actually personal contact with the professor. I like to be able to get personalized advice from the person who's in charge, and maybe just a little of like a thumbs-up, you know, just a little bit of positive reinforcement. But in terms of, like, between students, you can create that.

**SPENCER MICHELS:** In fact, Lippincott did create that, by organizing a recent meet-up for students taking the Think Again class at a trendy bar in San Francisco where she works. Anyone can attend.

**MAN**: Whenever you get into an argument, all you are doing is thinking about a rebuttal when the other person is talking. And it's not listening.

**WOMAN**: And what I'm trying to do now is actually think not of my argument, but the other people's arguments and say, OK, that -- you are convincing me, but that's not an argument.

**WOMAN**: I can't wait to be able to rip apart people I don't agree with.

(LAUGHTER)

**WOMAN:** You know, just like, oh, let me just show you where you are wrong in so many ways. I took a class in this.

(LAUGHTER)

**SPENCER MICHELS:** Some students taking MOOC classes are doing it just to learn. Others hope a certificate will help them get a job. Still others want to eventually get college credit.

Figuring out how to get colleges to accept MOOC classes for credit is a major thrust of the fast-growing, constantly changing online teaching industry right now.

**GWEN IFILL**: On our website, Spencer reports on how online educators monitor cheating. He also spoke with one computer science professor who uses Web tools to engage his students.