CTE Instructional Strategies: Tech Literacy

Rebecca P. Calvert, Facilitator
Division of Language Arts/Reading
Curriculum Support Specialist

Cynthia Guillama
Division of Career and Technical Education
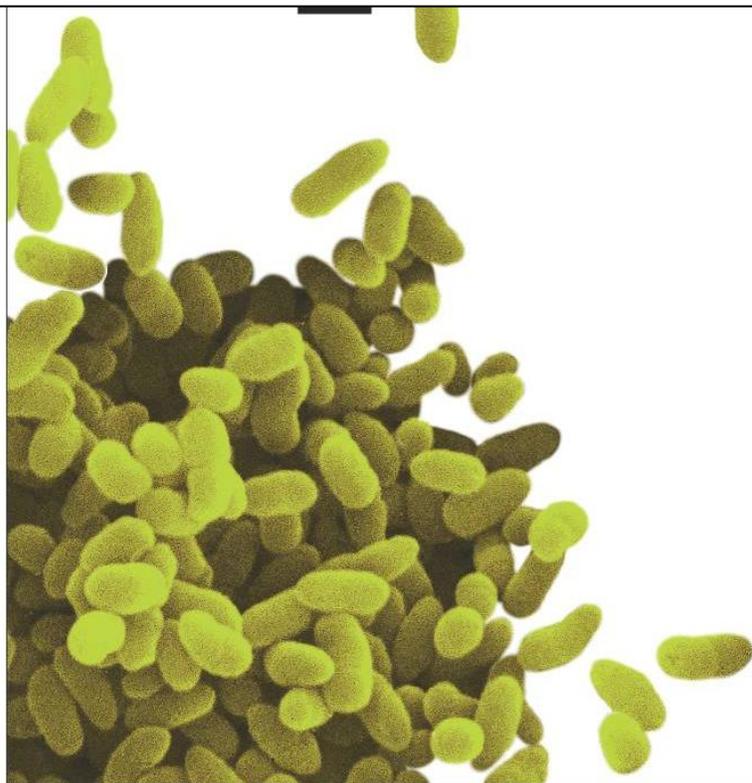Curriculum Support Specialist, Special Populations

Career Technical Education

December 6, 2012

Strong new bacteria defy our best drugs. They attack us in our homes and hospitals. Here's how we can help stop them.

By Katharine Greider

**Klebsiella pneumoniae bacteria is highly reesistant to antibiotics n .**

When it comes to infectious bacteria, it's us versus them: survival of the fittest. Unfortunately, human activities have helped create some bacteria that are very fit indeed. These so-called superbugs have adapted to and survived the most powerful weapons we have to combat them—antibiotic drugs.

The problem isn't confined to hospitals. Garden-variety infections of the ear, urinary tract, skin and lungs are increasingly taking stubborn forms that require more antibiotics or a combination of drugs to cure. Age-old afflictions such as gonorrhea and tuberculosis—curable for the first time in the 20th century thanks to antibiotics—are getting harder and harder to treat. New strains of one of the most well-known superbugs, MRSA—methicillin-resistant *Staphylococcus* aureus—are increasingly attacking healthy people outside health care facilities, causing mostly nasty and sometimes invasive skin infections, but also aggressive pneumonias.

Meanwhile, certain bacteria that tend to cause bloodstream and other infections in vulnerable hospitalized patients—bugs with exotic names like *Acinetobacter baumannii* and *Klebsiella* pneumoniae—are becoming more lethal, impervious to most or even all of the antibiotics in physicians' tool kits. "For these cases," says Brad Spell-berg, M.D., of the University of California, Los Angeles David Geffen School of Medicine, "we're back to dancing around a bubbling cauldron while rubbing two chicken bones together." Such "pan-resistant" bacteria are still the exception, but they vividly illustrate what's at stake in attempts to stem the proliferation of drug-resistant bacteria. The latest figures from the U.S. Centers for Disease Control and Prevention (CDC) show that just one of these superbugs, MRSA, caused serious infections in some 82,042 Americans in 2010, killing 11,478. Older people are especially vulnerable if they contract a superbug.

How have humans let the bugs get stronger? By saturating our environment with antibiotics, the very miracle drugs we created to fight bacterial infection. Some 7 million pounds of antibiotics are sold for human use each year, while 29 million pounds are sold for use in animals, mostly food animals. This, many experts argue, represents gross overuse of the drugs, and only makes it less likely they'll work when we need them most.
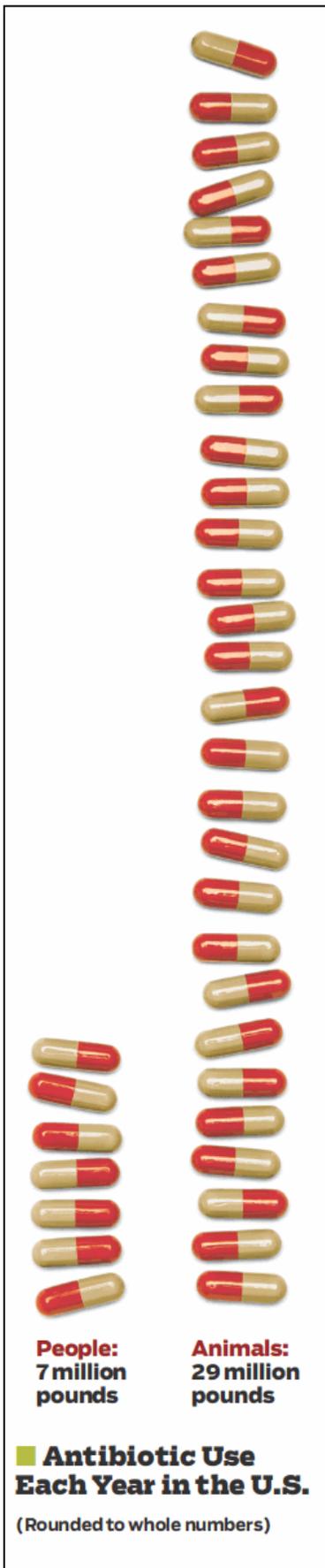
Bacteria exist in teeming numbers, reproduce rapidly, and can pass genetic traits—including resistance to antibiotics—not only to succeeding generations but also to other bacteria in their environment. The more bacteria encounter an antibiotic, the more readily they spawn hardier versions of themselves capable of overcoming the drug.

Inappropriate prescriptions for coughs and colds represent "the number one problem area," says Ralph Gonzales, M.D., who researches antibiotic use at the University of California, San Francisco. "Respiratory infections account for 60 or 70 percent of all antibiotics prescribed in the outpatient setting," he says. "At best, one in five of those infections needs antibiotics." The great majority are due to viruses, not bacteria. Antibiotics have absolutely no effect on viruses. Some patients want an antibiotic even if there's only a small chance it will help, and studies show doctors often acquiesce. Then, rather than take the full course of antibiotics as prescribed, some save pills to use later or share. This may allow germs to persist, develop resistance and come roaring back. "You don't want to take antibiotics without a physician's advice," says Stuart Levy, M.D., director of the Center for Adaptation Genetics and Drug Resistance at Tufts University.

"Don't stockpile them. Don't beg for them. You don't take antibiotics for the common cold."

Taking antibiotics—whether necessary or not—affects the individual and, potentially, others in the community. It changes the mix of microorganisms living in the gut and on the skin, killing sensitive bacteria and giving drug-resistant germs a chance to take hold. For example, research suggests that taking commonly prescribed antibiotics increases a person's own risk of harboring or being infected with MRSA. Recent or current treatment with antibiotics is the single biggest risk factor for infection with *Clostridium* difficile—C. diff—drug-resistant bacteria found mostly in health care facilities that can cause severe diarrhea. Conservative estimates link this bacteria to at least 14,000 American deaths a year.

Like any bacteria, resistant bugs can also be passed to household members and others. One study found that family members of an individual taking antibiotics for acne were more likely to have drug-resistant acne germs on their skin.

The CDC estimates that in hospitals, nearly half of all antibiotic prescriptions are inappropriate. "Antibiotics are sometimes given when they are not needed—for example, sometimes patients are admitted to the hospital with a diagnosis of pneumonia and started on antibiotics, but it turns out they have heart failure," according to Arjun Srinivasan, M.D., medical director of the CDC's Get Smart for Healthcare educational program on antibiotic use.

Many hospitals have implemented "stewardship" programs to cut inappropriate antibiotic use and reduce drug-resistant bacteria in the hospital. Studies show well-run programs can have a real effect.

Human medicine isn't the only area where antibiotics are too liberally applied. Many cattle, pigs and poultry are given antibiotics, not just to treat illnesses but also to prevent the spread of disease when large populations are kept in confined spaces, and, most controversially, to promote faster growth.

Often these drugs are the same as or very similar to those used to treat people. "It isn't the people or the animals that become drug-resistant," says Gail Hansen, a veterinarian and senior officer of the Pew Campaign on Human Health and Industrial Farming. "It's the bacteria. And we're sharing the bacteria."

One way of sharing the superbugs is by eating contaminated meat. Last year, 136 people in 34 states got sick and one person died after eating ground turkey carrying a strain of salmonella resistant to multiple antibiotics. Farms themselves may also spread the bacteria. Most of the bacteria end up outside the animal, as "poop," Hansen says. "Where does that poop go? It goes in the water. It goes into the soil. The soil dries and it gets aerosolized. Everybody's downwind or downstream from someone else. There's also person-to-animal contact, so farmers and workers and their families can be exposed. It gets all over pretty fast."

It's not clear how much agriculture contributes to antibiotic resistance. But the U.S. Food and Drug Administration recently issued new guidelines that call for a halt to "production uses" of antibiotics in food animals—to enhance growth, for example. Increasingly, experts in antibiotic resistance see the problem as one that's multifaceted, global—and growing. "Resistance is produced and amplified by the misuse of antibiotics," says Levy. "There are lives being lost. And the solution is to get … antibiotics out of the environment as best we can."

Protect Yourself

1 Make sure your doctor knows you want an antibiotic only if it's absolutely necessary. Don't insist on antibiotics for colds or flus.
2 When prescribed an antibiotic, take all the pills, even if you feel better. Don't share or save antibiotics.
3 Consider buying meat raised without antibiotics. Most experts agree using fewer antibiotics will slow the emergence of resistant germs.
4 Wash your hands frequently; plain soap and water are just as effective as antibacterial soaps. Widespread use of those cleansers in healthy households might actually promote the development of resistant bacteria.
5 Cook meat thoroughly, and wash hands, tools and surfaces after handling raw meat.

An 'arms race' in visual experience

Bryan Alexander

James Cameron's outlook: 'It's incumbent on us to keep the cinemas as vibrant as possible.' (Photo: Neale Haynes, Getty Images for USA TODAY)

September 14. 2012
SANTA MONICA, Calif. -- Long live the movie theater.

Filmmaker James Cameron believes the cinema experience will not only survive but thrive for the next 30 years and beyond -- despite worries about the movie industry's health.

"There will always be a need to gather in a dark room as a group for these social experiences -- checking your emotional dipstick to make sure your oil levels are OK," says Cameron, 58. "If you laugh when everyone else laughs, or if you cry when everyone else cries, then you're OK."

But he believes the struggle to keep the movie theater alive is very real.

"There's an arms race between seeing movies on the big screen vs. the accessibility and immediacy of (home and) mobile platforms," Cameron says. "It's incumbent on us to keep the cinemas as vibrant as possible."

Cameron has proven his theater pulling power with the two box-office champs of all time, 2009's Avatar and 1997's Titanic. He foresees enhancements that could include wider screens to intensify the experience.

"It could wrap around and fill your view. Right now, we're asked to look through a rectangle and imagine a world. I think we'll lose that rectangle."

The step beyond that could be eyeglasses that beam lasers directly into the viewers' retinas to make moviegoers feel as though they are part of the dramatic environment.

"There might be a certain amount of interactivity, so when you look around, it creates that image wherever you look," Cameron says. He concedes it is far off: "You're talking Jetsons here."

Cameron, whose use of 3-D in Avatar changed the course of filmmaking, believes that the added dimension will become dominant and that 2-D movies will become a rarity.

"The 2-D movie is going to be like the black-and-white TV show," he says. "You don't see much of that these days. You may see (2-D) in cinemas as a nostalgic art form."

The added dimension also will rule over home television ("it will revolutionize broadcasting") and mobile devices. "It's going to be about getting (the mobile-device 3-D) up to the level of the movie theater, which it will."

Cameron also expects further implementation of performance-capture used for the Na'vi people in Avatar.

"As the cost of generating (a computer graphic) world at photo-realistic levels of detail comes down, which it will eventually, then you are certainly going to see more of that."

The director, the subject of a 2009 biography, The Futurist, does not foresee other revolutionary technology that will change movie-watching.

"If I can imagine it, I'm building it," he vows. "Dude, what do you think I've been doing for the last 25 years?"

His bullishness about cinema's future is tempered only by his concern for the world's future: "We need to get our game face on when it comes to dealing with the myriad global problems coming toward us, or the future might be a hand-cranked 16mm projector on a sheet in the desert."

Revolution ahead in prevention, treatment

Dan Vergano

Francis Collins, director of the NIH, predicts prevention and treatment based on understanding of the individual patient. (Photo: Jack Gruber, USA TODAY)

- NIH's Francis Collins sees precision medicine.

September 14. 2012

BETHESDA, Md. -- You'll still get sick, still see a doctor and probably still dread hospital food.

But much else in medicine will look different 30 years from now, says Francis Collins, director of the National Institutes of Health. That includes "breathtaking" advances in understanding disease, improvements in technologies and in shifting medicine from treatment to prevention. The fundamental relationship between patient and doctor will evolve over the next three decades.

What else will we see? "Precision medicine, precise choices about prevention and treatment that are based on understanding of the individual patient," says Collins, 62, who now leads the federal biomedical research agency with its annual budget of $31 billion, the place where the science behind tomorrow's medicine first appears. "We will have a strategy for this patient we know will work. And we will know how we are going to do it."

An Institute of Medicine report last year called for ending the century-old practice of doctors diagnosing disease primarily by signs and symptoms and instead retooling medicine into a practice based on genetic and biochemical specifics of ailments.

"That means for cancer patients, no more one-size-fits-all chemotherapy but a treatment targeted to the genetic characteristics of their tumors," Collins says. This is already happening for one type of lung cancer, in which a drug was shown to help the 10% of patients with the right genetic mutations that made their tumors receptive to treatment.

In his lab on NIH's sprawling 322-acre campus, Collins holds up a computer-chip device the size of a quarter that fits into a gene-sequencing machine. It's capable of mapping your genes, "for about $7,000." A decade ago, machines the size of refrigerators were yoked together to produce the first sequence of the human genome, or genetic blueprint, a project Collins headed that cost roughly $4.56 billion in today's dollars. By 2042, he suggests, every baby's genome probably will be recorded at birth, which will provide the starting point for lifelong medical treatment.

Even without gene sequencing, "technology will drive a lot of the advances," Collins says, including:

Stem cells. Doctors will grow replacement tissues from a patient's own cells to treat diseases such as Parkinson's or liver failure or diabetes. The newly grown cells might replace dying ones in a failing organ.

Brain implants and prostheses. Advances in connecting nerves and brain signals to bionic prostheses promise to help paralyzed patients. Implants that connect brain cells to electronic devices would let them control robotic arms and legs.

Health apps. Gadgets today can record calories, count footsteps and send heart rates to doctors. In 30 years, clothing-embedded sensors may track every breath or test your blood for genetic markers of cancer.

"I hope there will be a big shift in the direction of prevention," Collins says. "So much of what we are currently seeing as far as human suffering and misery comes from diseases that should have been preventable but were not."

To that end, Collins predicts that medical training will change, producing doctors who are better tuned in to the latest advances in research. A discipline of "preventionist" health providers may be the front-line physician for most people, helping you stay healthy before disease strikes.

"We will still need people to take responsibility for their own health," Collins says, pointing to the risks posed by smoking and obesity. "We will still age -- I'm sorry if you thought we would have a fountain of youth by then. We'll need to work on that."

Healthier, higher-tech cooking

Bruce HorovitzShare

"You'll be able to walk in, talk to the appliance, and it will do whatever you ask it to do," Cat Cora says. (Photo: Robert Hanashiro, USA TODAY)

- Celebrity chef Cat Cora predicts smarter appliances.

SANTA BARBARA, Calif. -- Food won't just feed you in 30 years. It will make you feel better and have less junk in it. It will be purchased without having to push a cart up and down the aisles of a supermarket. At home, food will be prepared on a foolproof, fully computerized appliance that will do virtually anything you ask it to do. That's right: You'll speak to your appliances.

Oh, and producing food will be easier on the Earth, too.

So says Cat Cora, the celebrity chef who is the only female Iron Chef on Food Network's Iron Chef America and was recently the first woman to be inducted into the American Academy of Chefs Culinary Hall of Fame.

Among her projections about what people will eat and how they'll cook and produce food 30 years from now:

In every house, a computerized kitchen. Say goodbye to the multitude of gadgets and appliances -- from blenders to microwaves to refrigerators -- you now have in your kitchen. A single, ultra-computerized device will replace them all. It will juice, cool, cook and freeze, Cora, 45, predicts. "You'll be able to walk in, talk to the appliance, and it will do whatever you ask it to do." Everything in the kitchen will be voice-activated, she says. Ask for a bowl of hot tomato soup, and presto! It will appear.

In every kitchen, robots and avatars. People will no longer be able to claim they're lousy cooks. Android robots will do most of the work. "Technology will take over the kitchen," Cora says. "Even if you can't boil water, your personal avatar -- which will look like you -- will walk you through all of the steps."

Restaurants will be fewer -- and splashier. Because cooking at home will be simpler, the restaurant business will decline, and eating out will be more for celebrating special occasions. Restaurants increasingly will be vehicles for entertainment and no longer places to simply sit and eat. Oh, and waiters and waitresses will mostly disappear --replaced by computerized, order-taking devices.

Junk food will reinvent itself. Fast food, at least as we know it, will no longer be a majority, but a minority. Major chains will have to adjust to selling better-quality and more nutritional foods. "Either McDonald's will adjust, or it will go by the wayside," Cora says. "We are an intelligent, highly capable country; therefore, we know our health and our planet rely on seasonal, local and sustainable foods."

Supermarkets will do it all for shoppers. The grocery store will do most of your shopping for you. Computerized shopping carts and special high-speed conveyor belts will fetch products. You'll simply tap or plug in what you want to a computerized attachment to your cart.

Breakfast, lunch and dinner all will change. The first meal of the day still will be all about convenience and on-the-go eating, but it will be much more focused on healthy ingredients. Lunch still will be quick but very different in quality from current standards. For example, burgers will be super-lean and low in fat with whole-grain buns; fries (often made with sweet potatoes) will be baked, and salads will be mostly local and sustainable. Dinner increasingly will be eaten at home, because it will be so nutritious and simple to prepare.

Snacks won't be so salty. Junky snacks such as high-fat, high-preservative chips will largely disappear, replaced by fresher, healthier snacks that enjoy long shelf lives because of advances in packaging technology. "Our palates will evolve away from salty snacks with layers of fat," Cora says. Signs of this already are evident, she says, with Frito-Lay now selling Baked Doritos, and kitchen appliances now available that fry french fries via air-fryers and dry-fryers.

Foodies will rule. People who never had an interest in cooking will become foodies. Technology, after all, will make it much

easier to become a foodie. "Foodies will go from minority to majority," Cora says.

Ordering space food. Scientists will figure out how to grow food in space. "This is an obsession for me," says Cora, who says she had spoken with NASA officials about developing simple recipes for past space shuttle flights. In the future, Cora says, a hydroponic technology probably will be used to grow plants in space -- such as for a mission to Mars. "It would be very exciting," she says, "to explore foods that can possibly be grown in space."

Mother Earth may yet win out. The food we eat will be mostly organic and sustainably grown, and most of the packaging will be recyclable. "People will have the peace of mind that what they eat is good for themselves -- and the planet."

MEALS WILL STAY CLOSE TO HOME
Three things Cora says won't change 30 years out:
Sunday suppers
o   Sunday is the only day that a majority of Americans count on as their day off. It is the one day that always will be a time for family and friends to gather.
Demand for locally farmed foods
o   Food grown by area farmers will continue to be a priority as more Americans become food-savvy. Because the next generation is so eco-friendly, producers of locally farmed foods will thrive.
Cooking at home
o The home-cooked meal will become more commonplace. As technology evolves in the kitchen, at-home cooking also will be easier than ever.

Creator of Twitter sees blur of change

by Jon Swartz, USA TODAY
September 14, 2012

SAN FRANCISCO -- In creating Twitter, Jack Dorsey changed the world of communication. In founding the company Square, he is redefining mobile payments. Yet one of Silicon Valley's brightest stars says he believes the future is all about the past.

"Consider history," Dorsey says in his soft-spoken, low-key manner. "Every technology was invented for one purpose: Enable humans to take actions faster."

Motioning toward a photo of the Golden Gate Bridge, and invoking the power of plumbing in the world-domination plans of the Roman Empire, the 35-year-old Dorsey says water-supply systems played a pivotal role in letting Julius Caesar and others expand their empire.

Prognosticating the future of technology is nearly impossible in five years, let alone 30, he says.
Just 30 years ago, the Internet, PCs and smartphones were mere glimmers in the eyes of scientists. Cable TV was in its infancy. Music and movies were on albums, cassettes and videotape. Few could foresee how comprehensively the Web, smartphones and tablets would change the world.

Looking forward, personal technology will infuse nearly every facet of American consumer life: retail, transportation, education -- you name it, Dorsey and others say. The impact will be so far and wide that it might be taken for granted as daily life.

The full force of tech will be all around us in the form of a growing cashless society, where most transactions are done with smartphones; same-day delivery of goods ordered online or at bricks-and-mortar retailers; the elimination of PCs in favor of smartphones and tablets; robots in all forms; the proliferation of data through cloud computing; and more. Change will be rapid and seamless.

Ubiquitous technology will continue to blend into the American consciousness, to the point where it will be rarely noticed â?? unless it doesn't work. "I bet you only notice (an electrical outlet) when I point it out or it doesn't work," Dorsey says.

About the only thing that can blunt tech's influence is distrust in its mind-shifting change. That is anathema to Old World, empire-building thinking -- particularly in industries where change in infrastructure and the use of tech is pricey, Dorsey says.

Attitude, not technology, colors people's fears about too much data floating in the clouds and coursing over the Internet. "I'm a big believer in serendipity," he says. "The need to know bubbles up."
"Kids become masters of technology and learn from it," Dorsey says. Adopters of Twitter have turned it into a tool to "take the pulse of the planet."

From where will future tech spring forth? Dorsey says the San Francisco Bay Area will still be tech's mecca: "California has always had the Go West, can-do spirit of the Gold Rush, Hollywood and Silicon Valley."

A world where grades will be left behind

Mary Beth Marklein,

- Stanford research professor sees free learning.

September 14. 2012

PALO ALTO, Calif. -- About a mile from the main quad at Stanford University, one of the nation's bastions of exclusive and expensive higher education, a street-level office building across the street from an Olive Garden houses the makings of an up-and-coming contender.

In this version of education, learning will be free and available to anyone who wants it while operating like a whimsical playground: No one is late for class, failure is not an option, and a lesson looks something like *Angry Birds*, the physics-based puzzle game that has been downloaded more than 1 billion times.

"You want learning to be as much fun as it is to play a video game," says Sebastian Thrun, a Google vice president and Stanford research professor best known for his role in building Google's driverless car.

Thrun, 45, is seated in a cramped, soundproof studio at Udacity, the education company he founded in January after teaching a free online artificial-intelligence course that drew more than 160,000 students. So profound was the experience that he announced he could no longer teach in a traditional Stanford classroom.

"I feel like there's a red pill and a blue pill," he famously told an audience in January at the Digital-Life-Design conference in Munich. "And you can take the blue pill and go back to your classroom and lecture your 20 students. But I've taken the red pill, and I've seen Wonderland."

Now, Udacity is one of a rush of online start-ups he oversees. The vision across these ventures: Develop a catalog of free online courses taught by star professors from around the world.

In this windowless room, producers create cool special effects, and video cameras capture tight shots of an instructor's hand as it writes diagrams and figures on a white board. In the next room, a dozen or so of Thrun's staff of twentysomethings are at their computers designing and assembling courses such as the just-launched Making Math Matter, in which students rescue the Apollo 13 astronauts, stop the spread of epidemics and fight forest fires.

Thrun's Udacity is neither the first nor last high-tech experiment seeking to revolutionize education, an industry that many critics agree is stuck in the last century and in dire need of an overhaul.

His friend Sal Kahn has inspired a growing number of schools across the country to "flip" their classrooms, having students study videos at night and complete homework in classrooms by day. Charter schools in Chicago and New York City have created a curriculum built around game-playing. Across Silicon Valley, start-ups such as New Charter University and UniversityNow aim to make an online college education as affordable as a cellphone bill.

How, exactly, will education look in 30 years? "I wish I had a crystal ball," Thrun says. But technology is enabling educators -- not to mention Silicon Valley entrepreneurs -- to personalize education and scale it up:

Classes will involve a sequence of increasingly more challenging exercises and quizzes aimed at helping students master a particular concept or skill.

A single class might enroll tens, if not hundreds, of thousands of students, but "there will be no more one-size-fits-all," Thrun says. "Education will respond to you."

Grades -- what Thrun calls "the failure of the education system" -- won't exist. Rather, students will take as much or as little time as they need to demonstrate mastery of a particular skill or concept.

Instruction will be free, but related services might involve a fee. Among those are certification and exams, which will be conducted separately from the learning process.

Thrun says he's not planning a funeral for brick-and-mortar schools and colleges. Case in point: As film-making grew more sophisticated, did it spell the end of live theater? No, Thrun notes. Nor does film try to -- and this is key -- replicate live theater. Rather, movies became a different form of entertainment, one that could accommodate massively large audiences at relatively low prices.

Just as film enabled people all over the world to access movies, the Internet will democratize education, which today reaches a tiny fraction of those who yearn to learn, Thrun says. His vision of the future, he says, offers "a message of hope, of aspiration -- not of destruction."

Creating Real-World Writers

Purpose	Possible Writing Topics
Express and reflect	The writer . . . . . . expresses or reflects on his or her own life and experiences. . . . often looks backward in order to look forward.
Inform and explain	The writer . . . . . . states a main point and purpose. . . . tries to present the information in a surprising way.

Evaluate and judge	The writer . . .
	 . . . focuses on the worth of person, object, idea, or other
	    phenomenon.
	 . . . usually specifies the criteria to the object being seen as
	    "good" or "bad."

Inquire and explore	The writer . . . . . . wrestles with a question or problem. . . . hooks with the problem and lets the reader watch them wrestle with it.
Analyze and interpret	The writer . . . . . . seeks to analyze and interpret phenomena that are difficult to understand or explain.
Take a stand/Propose a solution	The writer . . . . . . seeks to persuade audiences to accept a particular position on a controversial issue. . . . describes the problem, proposes a solution, and provides justification.

Adapted from Bean, Chappell, and Gillam (2003).

Purpose	Possible Writing Topics
Express and reflect	
Inform and explain	
Evaluate and judge	
Inquire and explore	
Analyze and interpret	
Take a stand/Propose a solution	