AEB 4931: Advanced Agricultural Microeconomics
Spring 2017

Instructor Information:
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Office Hours: Tuesdays 10:30-11:30 AM, Wednesdays 3:00-4:00 PM in 1183 MCCA

Course Logistics:
Tuesdays 8:30 – 10:25
Thursdays 9:35 – 10:25
Final Exam: Wednesday, April 26. 5:30 – 7:30PM
Classroom: McCarty B 3124

Course Description:
This course introduces students to a variety of topics in microeconomic theory including consumer and producer theory, uncertainty, game theory, asymmetric information, externalities, and public goods. We will use both mathematical and graphical methods to illustrate concepts, and we will use games, activities, and experiments in class to further develop concepts.

Course Objectives:
By the end of this course, each student should be able to do the following:
1) Calculate and discuss a consumer's utility-maximizing consumption of two goods.
2) Calculate and discuss a producer's cost-minimizing use of two inputs.
3) Aggregate individual demand and supply to create market demand and supply curves.
4) Analyze trade using an Edgeworth box.
5) Determine the outcomes of strategic interactions using game theory.
6) Apply course material to real world problems.

Required Knowledge:
Students are expected to know how to graph basic equations and take derivatives. If this knowledge has gotten rusty, it is the student's responsibility to re-learn these skills.

Recommended Textbooks:
This course makes use of material from two textbooks. The first provides a better discussion of the intuition behind course material. The second provides more in-depth mathematical analysis. I recommend purchasing the second book if you plan on going to graduate school. Both books are available on reserve at Library West. All editions contain the same core material, but differ in the application topics.

1. Nicholson, W. and C. Snyder. *Intermediate Microeconomics and Its Applications.* Any edition. Cengage Learning.

2. Nicholson, W. *Microeconomic Theory: Basic Principles and Extensions.* Any edition. South-western, Thomson or Cengage Learning

UF Grading Policy:
The University's current grading policy uses the following letter grade to grade points conversion:
A = 4.0, A- = 3.67, B+ = 3.33, B = 3.0, B- = 2.67, C+ = 2.33, C = 2.0, C- = 1.67, D+ = 1.33, D = 1.0, D- = 0.67, E = 0.

Course Grade and Assignments:
Your grade will be determined by

- four of five problem sets (20% in total, 5% each)
- one writing assignment (10%)
- Three in-class application activities (15% in total, 5% each)
- Three exams (45% in total, 15% each)
- Effort (10%)

Letter grades will be assigned as follows:

A = 93 and higher	C = 73 – 76
A- = 90 – 92	C- = 70 – 72
B+ = 87 – 89	D+ = 67 – 69
B = 83 – 86	D = 63 – 66
B- = 80 – 82	D- = 60 – 62
C+ = 77 – 79	E = less than 60

Problem Sets:
There will be a total of 5 problem sets. Your lowest score will be dropped. The remaining four problem set grades will each count for 5% of your grade, making problem sets 20% of your grade in total. Students are encouraged to discuss problems with others but you are expected to write up your own assignments. Please write on your assignment the names of students with whom you discussed the assignment. Writing up assignments individually implies that assignments or any portion of the assignments will not be identical. Late problem sets will not be accepted. Make-up work for missed problem sets will not be given.

Writing Assignment:
The best way to learn economic theory is to apply it. For your writing assignment, you will pick one interesting economic question and use the material we will learn this semester to answer that question. Assignments should be 3 – 5 pages in length, double-spaced with 12-point font and 1-inch margins. Assignments are due at the start of the last day of class, but students are strongly encouraged to be thinking about questions throughout the semester. Assignments will be graded based on the quality of the question (Is it interesting? Will

people care about this question?), and on the quality of economic thought used to answer the question. Please see the attached *New York Times* article for assignment inspiration.

In-Class Application Activities:
In lieu of a review session before each exam, we will have in-class application activities. These activities will utilize topics related to UF's Field and Fork Program (http://fieldandfork.ufl.edu/) to explore how we can use microeconomics to tackle problems in our own local food systems, while simultaneously reviewing course material. You will be put in groups of 3-4 students and will be graded on individual effort as well as the group's answers. If a serious, unforeseen, and documentable situation arises that prevents a student from participating in any of these assignments, the average of the other 2 application grades will be entered for the missed application grade.

Exams:
There will be three exams covering portions of the course material. The third exam will occur during the scheduled final exam period. There will be no make-up exams. If a serious, unforeseen, and documentable situation arises that prevents a student from taking any of the 3 exams, the average of the other 2 exams will be entered for the missed exam.

Effort:

"Continuous effort - not strength or intelligence - is the key to unlocking our potential."
- Winston Churchill

This portion of the grade used to be titled "participation." After researching about the effects of rewarding the learning process instead of rewarding learning outcomes, I have changed this to "effort." Please see the attached article for more information on this line of research. You will be rewarded for demonstrating effort in this class. Effort includes, but is not limited to, the following:

- Attendance: Attending class and actively participating in activities, asking questions, and providing comments and insight regarding course material are the basis of the learning process.
- Arriving on time: I realize the class is early, but late arrivals impede your learning process as well as the learning process of your classmates. Tardiness will result in lowered effort scores, with the penalty increasing with each day of tardiness.
- Engagement: Use of cell phones, laptops for non-noting takes purposes, etc. during class interferes with your learning process and will result in lowered effort scores.
- Time and energy spent on assignments and exams: Assignments and exams are meant to be learning experiences. There is little learning benefit from

rushing through them at the last minute. Rushed, sloppy, and/or "bare bones" answers demonstrate a lack of effort.

- Utilizing office hours for additional help or clarification: Most students will face at least some material that they do not immediately understand. Following up with questions during office hours is a great way to gain a better understanding.

Every day you will receive an effort score. If there is an assignment due on that day, the effort demonstrated on that assignment will contribute to that day's effort score. The lowest three effort scores will be dropped and the remaining scores will be averaged. Effort makes up 10% of the grade, so the average points on the 10-point scale will be the number of points contributing to your overall grade.

Academic Honesty:
Any student found to be in violation of the Student Honor Code will receive, as a minimum penalty, a grade of "0" on the assignment or exam. Students may also be asked to attend seminars on ethical decision making and/or avoiding plagiarism.

Attendance:
Attendance counts towards your effort grade, so students are strongly encouraged to attend class. If circumstances cause an extended absence from class, please come talk to me in advance.

Course Outline:

I. Introduction
    1. Math Review (Chapter 1 Appendix)
II. Consumer Theory
    2. Utility and Choice (Chapter 2)
    3. Demand Curves (Chapter 3)
III. Producer Theory
    4. Production (Chapter 6)
    5. Costs (Chapter 7)
    6. Profit Maximization and Supply (Chapter 8)
    7. Perfect Competition (Chapter 9)
IV. General Equilibrium
    8. General Equilibrium (Chapter 10, pp. 361 – 364)
V. Special Topics (We will likely not cover all of these in their entirety.)
    9. Monopoly (Chapter 11)
    10. Uncertainty (Chapter 4, all but pp. 159-162)
    11. Game Theory (Chapter 5)
    12. Imperfect Competition (Chapter 12 through p. 421)
    13. Asymmetric Information (Chapter 15)
    14. Externalities and Public Goods (Chapter 16)

University Policies

Academic Honesty:
As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*" You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment.*"

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php.

Software Use:
All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources
Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575,* **www.counseling.ufl.edu/cwc/**
  - Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Training Programs
  - Community Provider Database
- *Career Resource Center,* First Floor JWRU, 392-1601, **www.crc.ufl.edu/**

Students with Disabilities Act

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

0001 Reid Hall, 352-392-8565, **www.dso.ufl.edu/drc/**

Tentative Schedule of Assignments and Exams
Dates subject to change based on progression through material.

	Week	Mon	Tues	Wed	Thurs	Fri
Jan.	1	2	3	4	5 1st Class	6
	2	9	10	11	12 PS 1 Given	13
	3	16	17	18	19 PS 1 Due	20
	4	23	24	25	26 PS 2 Given	27
Feb.	5	30	31 Consumer Theory Activity	1	2 PS 2 Due	3
	6	6	7 Exam 1	8	9	10
	7	13	14	15	16 PS 3 Given	17
	8	20	21	22	23 PS 3 Due	24
Mar.	9	27	28	1	2 PS 4 Given	3
	10-break	6	7	8	9	10
	11	13	14 Producer Theory Activity	15	16 PS 4 Due	17
	12	20	21 Exam 2	22	23	24
	13	27	28	29	30	31
Apr.	14	3	4	5	6 PS 5 Given	7
	15	10	11	12	13 PS 5 Due	14
	16	17	18 Writing Assignment Due Final Topics Activity	19	20	21
	17	24	25	26 Exam 3	27	28

*Exam 3 is scheduled for 5:30 – 7:30PM

The New York Times nytimes.com THE SESSIONS NOW PLAYING

September 29, 2005

Students Discover Economics in Its Natural State

By ROBERT H. FRANK

WHY do the keypad buttons on drive-up cash machines have Braille dots? It is an interesting question, since the patrons of these machines are almost always drivers, none of whom are blind. The answer, according to my former student Bill Tjoa, is that because A.T.M. producers make keypads with Braille dots for their walk-up machines anyway, it is cheaper to make all machines the same way. The alternative, after all, would be to hold two separate inventories and make sure that each machine went to the right destination. If the Braille dots caused trouble for sighted users, the extra expense might be justified. But they do not.

Mr. Tjoa's question was the title of one of two short papers he submitted in response to what I call the "economic naturalist" writing assignment in my introductory economics course. The specific assignment is "to use a principle, or principles, discussed in the course to pose and answer an interesting question about some pattern of events or behavior that you personally have observed."

"Your space limit is 500 words," the assignment continues. "Many excellent papers are significantly shorter than that. Please do not lard your essay with complex terminology. Imagine yourself talking to a relative who has never had a course in economics. The best papers are ones that would be clearly intelligible to such a person, and typically these papers do not use any algebra or graphs."

Over the years, my students have posed and answered literally thousands of fascinating questions. My favorite was submitted by Jennifer Dulski, who asked, "Why do brides often spend thousands of dollars on wedding dresses they will never wear again, while grooms often rent cheap tuxedos, even though they will attend many formal social events in the future?"

Decades ago, when I first started teaching introductory economics, it never would have occurred to me to give an assignment like this. The idea grew out of my participation in an early pilot program in Writing in the Disciplines, a new pedagogical movement that promises to revolutionize the learning process at every level. The aim of the program, which was sponsored by the John S. and James L. Knight Foundation, was to encourage students to write about concepts they were grappling with in the various disciplines.

The initiative was inspired by the discovery that there is no better way to master an idea than to write about it. Although the human brain is remarkably flexible, learning theorists now recognize that it is far better able to absorb information in some forms than others. Thus, according to the psychologist Jerome Bruner, children "turn things into stories, and when they try to make sense of their life they use the storied version of their experience as the basis for further reflection." He went on, "If they don't catch something in a narrative structure, it doesn't get remembered very well, and it doesn't seem to be accessible for further kinds of mulling over." Even well into adulthood, we find it easier to process information in narrative form than in more abstract forms like equations and graphs. Most effective of all are narratives that we construct ourselves.

The economic-naturalist writing assignment plays to this strength. Learning economics is like learning a language. Real progress in both cases comes only from speaking. The economic-naturalist papers induce students to search out interesting economic stories in the world around them. When they find one, their first impulse is to tell others about it. They are also quick to recount interesting economic stories they hear from classmates. And with each retelling, they become more fluent in the underlying ideas.

Many students struggle to come up with an interesting question for their first paper. But by the time the second paper comes due, the more common difficulty is choosing which of several interesting questions to pursue.

The paper is not a complete substitute for the traditional syllabus. But the lasting impact of the course comes mainly from the papers. When students come back to visit during class reunions, the equations and graphs long since forgotten, we almost always end up talking about the questions they have posed and answered during the intervening years.

To answer her question about wedding dresses, Ms. Dulski argued that because most brides wish to make a fashion statement on their wedding day, a rental company would have to carry a huge stock of distinctive gowns - perhaps 40 or 50 in each size. Each garment would thus be rented only infrequently, perhaps just once every four or five years. So the company would have to charge a rental fee greater than the purchase price of the garment just to cover its costs. In contrast, because grooms are willing to settle for a standard style, a rental company can serve this market with an inventory of only two or three tuxedos in each size. Each suit can thus be rented several times a year, enabling a rental fee that is only a fraction of its purchase price.

Daniel Boorstin, the former librarian of Congress, used to rise at 5 each morning and write for two hours before going into the office. "I write to discover what I think," he explained. "After all, the bars aren't open that early." Mr. Boorstin's morning sessions were even more valuable than he realized. Writing not only clarifies what you already know; it is also an astonishingly effective way to learn something new.

Robert H. Frank has been teaching introductory economics at Cornell University since 1972. He is the co-author, with Ben Bernanke, of "Principles of Microeconomics."

http://www.nytimes.com/2005/09/29/business/29scene.html

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http://www.ascd.org/publications/educational-leadership/oct07/vol65/num02/The-Perils-and-Promises-of-Praise.aspx

The Perils and Promises of Praise

Carol S. Dweck

The wrong kind of praise creates self-defeating behavior. The right kind motivates students to learn.

We often hear these days that we've produced a generation of young people who can't get through the day without an award. They expect success because they're special, not because they've worked hard.

Is this true? Have we inadvertently done something to hold back our students?

I think educators commonly hold two beliefs that do just that. Many believe that (1) praising students' intelligence builds their confidence and motivation to learn, and (2) students' inherent intelligence is the major cause of their achievement in school. Our research has shown that the first belief is false and that the second can be harmful—even for the most competent students.

As a psychologist, I have studied student motivation for more than 35 years. My graduate students and I have looked at thousands of children, asking why some enjoy learning, even when it's hard, and why they are resilient in the face of obstacles. We have learned a great deal. Research shows us how to praise students in ways that yield motivation and resilience. In addition, specific interventions can reverse a student's slide into failure during the vulnerable period of adolescence.

Fixed or Malleable?

Praise is intricately connected to how students view their intelligence. Some students believe that their intellectual ability is a fixed trait. They have a certain amount of intelligence, and that's that. Students with this fixed mind-set become excessively concerned with how smart they are, seeking tasks that will prove their intelligence and avoiding ones that might not (Dweck, 1999, 2006). The desire to learn takes a backseat.

Other students believe that their intellectual ability is something they can develop through effort and education. They don't necessarily believe that anyone can become an Einstein or a Mozart, but they do understand that even Einstein and Mozart had to put in years of effort to become who they were. When students believe that they can develop their intelligence,

they focus on doing just that. Not worrying about how smart they will appear, they take on challenges and stick to them (Dweck, 1999, 2006).

More and more research in psychology and neuroscience supports the growth mind-set. We are discovering that the brain has more plasticity over time than we ever imagined (Doidge, 2007); that fundamental aspects of intelligence can be enhanced through learning (Sternberg, 2005); and that dedication and persistence in the face of obstacles are key ingredients in outstanding achievement (Ericsson, Charness, Feltovich, & Hoffman, 2006).

Alfred Binet (1909/1973), the inventor of the IQ test, had a strong growth mind-set. He believed that education could transform the basic capacity to learn. Far from intending to measure fixed intelligence, he meant his test to be a tool for identifying students who were not profiting from the public school curriculum so that other courses of study could be devised to foster their intellectual growth.

The Two Faces of Effort

The fixed and growth mind-sets create two different psychological worlds. In the fixed mind-set, students care first and foremost about how they'll be judged: smart or not smart. Repeatedly, students with this mind-set reject opportunities to learn if they might make mistakes (Hong, Chiu, Dweck, Lin, & Wan, 1999; Mueller & Dweck, 1998). When they do make mistakes or reveal deficiencies, rather than correct them, they try to hide them (Nussbaum & Dweck, 2007).

They are also afraid of effort because effort makes them feel dumb. They believe that if you have the ability, you shouldn't need effort (Blackwell, Trzesniewski, & Dweck, 2007), that ability should bring success all by itself. This is one of the worst beliefs that students can hold. It can cause many bright students to stop working in school when the curriculum becomes challenging.

Finally, students in the fixed mind-set don't recover well from setbacks. When they hit a setback in school, they *decrease* their efforts and consider cheating (Blackwell et al., 2007). The idea of fixed intelligence does not offer them viable ways to improve.

Let's get inside the head of a student with a fixed mind-set as he sits in his classroom, confronted with algebra for the first time. Up until then, he has breezed through math. Even when he barely paid attention in class and skimped on his homework, he always got *A*s. But this is different. It's hard. The student feels anxious and thinks, "What if I'm not as good at math as I thought? What if other kids understand it and I don't?" At some level, he realizes that he has two choices: try hard, or turn off. His interest in math begins to wane, and his attention wanders. He tells himself, "Who cares about this stuff? It's for nerds. I could do it if I wanted to, but it's so boring. You don't see CEOs and sports stars solving for *x* and *y*."

By contrast, in the growth mind-set, students care about learning. When they make a mistake or exhibit a deficiency, they correct it (Blackwell et al., 2007; Nussbaum & Dweck, 2007). For them, effort is a *positive* thing: It ignites their intelligence and causes it to grow. In the face of failure, these students escalate their efforts and look for new learning strategies.

Let's look at another student—one who has a growth mind-set—having her first encounter with algebra. She finds it new, hard, and confusing, unlike anything else she has ever learned. But she's determined to understand it. She listens to everything the teacher says, asks the teacher questions after class, and takes her textbook home and reads the chapter over twice. As she begins to get it, she feels exhilarated. A new world of math opens up for her.

It is not surprising, then, that when we have followed students over challenging school transitions or courses, we find that those with growth mind-sets outperform their classmates with fixed mind-sets—even when they entered with equal skills and knowledge. A growth mind-set fosters the growth of ability over time (Blackwell et al., 2007; Mangels, Butterfield, Lamb, Good, & Dweck, 2006; see also Grant & Dweck, 2003).

The Effects of Praise

Many educators have hoped to maximize students' confidence in their abilities, their enjoyment of learning, and their ability to thrive in school by praising their intelligence. We've studied the effects of this kind of praise in children as young as 4 years old and as old as adolescence, in students in inner-city and rural settings, and in students of different ethnicities—and we've consistently found the same thing (Cimpian, Arce, Markman, & Dweck, 2007; Kamins & Dweck, 1999; Mueller & Dweck, 1998): Praising students' intelligence gives them a short burst of pride, followed by a long string of negative consequences.

In many of our studies (see Mueller & Dweck, 1998), 5th grade students worked on a task, and after the first set of problems, the teacher praised some of them for their intelligence ("You must be smart at these problems") and others for their effort ("You must have worked hard at these problems"). We then assessed the students' mind-sets. In one study, we asked students to agree or disagree with mind-set statements, such as, "Your intelligence is something basic about you that you can't really change." Students praised for intelligence agreed with statements like these more than students praised for effort did. In another study, we asked students to define intelligence. Students praised for intelligence made significantly more references to innate, fixed capacity, whereas the students praised for effort made more references to skills, knowledge, and areas they could change through effort and learning. Thus, we found that praise for intelligence tended to put students in a fixed mind-set (intelligence is fixed, and you have it), whereas praise for effort tended to put them in a growth mind-set (you're developing these skills because you're working hard).

We then offered students a chance to work on either a challenging task that they could learn from or an easy one that ensured error-free performance. Most of those praised for

intelligence wanted the easy task, whereas most of those praised for effort wanted the challenging task and the opportunity to learn.

Next, the students worked on some challenging problems. As a group, students who had been praised for their intelligence *lost* their confidence in their ability and their enjoyment of the task as soon as they began to struggle with the problem. If success meant they were smart, then struggling meant they were not. The whole point of intelligence praise is to boost confidence and motivation, but both were gone in a flash. Only the effort-praised kids remained, on the whole, confident and eager.

When the problems were made somewhat easier again, students praised for intelligence did poorly, having lost their confidence and motivation. As a group, they did worse than they had done initially on these same types of problems. The students praised for effort showed excellent performance and continued to improve.

Finally, when asked to report their scores (anonymously), almost 40 percent of the intelligence-praised students lied. Apparently, their egos were so wrapped up in their performance that they couldn't admit mistakes. Only about 10 percent of the effort-praised students saw fit to falsify their results.

Praising students for their intelligence, then, hands them not motivation and resilience but a fixed mind-set with all its vulnerability. In contrast, effort or "process" praise (praise for engagement, perseverance, strategies, improvement, and the like) fosters hardy motivation. It tells students what they've done to be successful and what they need to do to be successful again in the future. Process praise sounds like this:

- You really studied for your English test, and your improvement shows it. You read the material over several times, outlined it, and tested yourself on it. That really worked!
- I like the way you tried all kinds of strategies on that math problem until you finally got it.
- It was a long, hard assignment, but you stuck to it and got it done. You stayed at your desk, kept up your concentration, and kept working. That's great!
- I like that you took on that challenging project for your science class. It will take a lot of work—doing the research, designing the machine, buying the parts, and building it. You're going to learn a lot of great things.

What about a student who gets an *A* without trying? I would say, "All right, that was too easy for you. Let's do something more challenging that you can learn from." We don't want to make something done quickly and easily the basis for our admiration.

What about a student who works hard and *doesn't* do well? I would say, "I liked the effort you put in. Let's work together some more and figure out what you don't understand." Process praise keeps students focused, not on something called ability that they may or may

not have and that magically creates success or failure, but on processes they can all engage in to learn.

Motivated to Learn

Finding that a growth mind-set creates motivation and resilience—and leads to higher achievement—we sought to develop an intervention that would teach this mind-set to students. We decided to aim our intervention at students who were making the transition to 7th grade because this is a time of great vulnerability. School often gets more difficult in 7th grade, grading becomes more stringent, and the environment becomes more impersonal. Many students take stock of themselves and their intellectual abilities at this time and decide whether they want to be involved with school. Not surprisingly, it is often a time of disengagement and plunging achievement.

We performed our intervention in a New York City junior high school in which many students were struggling with the transition and were showing plummeting grades. If students learned a growth mind-set, we reasoned, they might be able to meet this challenge with increased, rather than decreased, effort. We therefore developed an eight-session workshop in which both the control group and the growth-mind-set group learned study skills, time management techniques, and memory strategies (Blackwell et al., 2007). However, in the growth-mind-set intervention, students also learned about their brains and what they could do to make their intelligence grow.

They learned that the brain is like a muscle—the more they exercise it, the stronger it becomes. They learned that every time they try hard and learn something new, their brain forms new connections that, over time, make them smarter. They learned that intellectual development is not the natural unfolding of intelligence, but rather the formation of new connections brought about through effort and learning.

Students were riveted by this information. The idea that their intellectual growth was largely in their hands fascinated them. In fact, even the most disruptive students suddenly sat still and took notice, with the most unruly boy of the lot looking up at us and saying, "You mean I don't have to be dumb?"

Indeed, the growth-mind-set message appeared to unleash students' motivation. Although both groups had experienced a steep decline in their math grades during their first months of junior high, those receiving the growth-mind-set intervention showed a significant rebound. Their math grades improved. Those in the control group, despite their excellent study skills intervention, continued their decline.

What's more, the teachers—who were unaware that the intervention workshops differed—singled out three times as many students in the growth-mindset intervention as showing marked changes in motivation. These students had a heightened desire to work hard and learn. One striking example was the boy who thought he was dumb. Before this experience,

he had never put in any extra effort and often didn't turn his homework in on time. As a result of the training, he worked for hours one evening to finish an assignment early so that his teacher could review it and give him a chance to revise it. He earned a *B*+ on the assignment (he had been getting *C*s and lower previously).

Other researchers have obtained similar findings with a growth-mind-set intervention. Working with junior high school students, Good, Aronson, and Inzlicht (2003) found an increase in math and English achievement test scores; working with college students, Aronson, Fried, and Good (2002) found an increase in students' valuing of academics, their enjoyment of schoolwork, and their grade point averages.

To facilitate delivery of the growth-mind-set workshop to students, we developed an interactive computer-based version of the intervention called *Brainology*. Students work through six modules, learning about the brain, visiting virtual brain labs, doing virtual brain experiments, seeing how the brain changes with learning, and learning how they can make their brains work better and grow smarter.

We tested our initial version in 20 New York City schools, with encouraging results. Almost all students (anonymously polled) reported changes in their study habits and motivation to learn resulting directly from their learning of the growth mind-set. One student noted that as a result of the animation she had seen about the brain, she could actually "picture the neurons growing bigger as they make more connections." One student referred to the value of effort: "If you do not give up and you keep studying, you can find your way through."

Adolescents often see school as a place where they perform for teachers who then judge them. The growth mind-set changes that perspective and makes school a place where students vigorously engage in learning for their own benefit.

Going Forward

Our research shows that educators cannot hand students confidence on a silver platter by praising their intelligence. Instead, we can help them gain the tools they need to maintain their confidence in learning by keeping them focused on the *process* of achievement.

Maybe we have produced a generation of students who are more dependent, fragile, and entitled than previous generations. If so, it's time for us to adopt a growth mind-set and learn from our mistakes. It's time to deliver interventions that will truly boost students' motivation, resilience, and learning.

References

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