

[Submitted by John Clement, a modeler in Houston, TX, in 2016. This short intervention can defuse stereotype threats and fixed intelligence paradigms. Feel free to modify it. John has data showing that emphasizing thinking skills as a goal causes improvements on the Lawson Classroom Test of Scientific Reasoning (CTSR) in the context of Modeling Instruction; and he has evidence that NOT emphasizing thinking skills causes gains to be very small. – Jane Jackson]

This reading is required for this course. To make sure that you have actually done the reading, you are required to turn in a short writing exercise about it, worth one homework grade. It will not be graded for grammar, punctuation or accuracy. It may be hand written, printed, or submitted electronically by e-mail. You will get full credit if it reflects the reading contents and is not a duplicate of another student's submission.

Reading S1: **Development of Thinking Skills**

There has long been a debate about talents and abilities. Some people think that talents are entirely inborn, or determined by the genes you get from your parents. Others think that talents are entirely the product of your training. In the middle of the 20th century most psychologists were saying that IQ was fixed when you were born and could not be changed. This opinion was reinforced by giving tests to children as they grew up, and results seemed to always place them in the same relative positions. Unfortunately they did not consider that the unchanged IQ scores might be caused by the similar schooling of the students.

Since that time scientists have found evidence that the brain is extremely plastic. It can rewire to suit various conditions, and individuals can acquire talents and abilities at all ages. While the ability to learn new concepts does decrease somewhat with age, it never goes away. There have been several dramatic demonstrations of this by researchers since the mid 20th century.

Reuven Feuerstein, an Israeli psychologist, works with students who have grown up in bad conditions. These are students who failed to achieve normal intelligence because of war, discrimination, or poverty. He took teenagers who had IQs as low as 65 and worked with them individually. They often had vocabularies of only a few hundred words and could neither read nor write. After treatment their IQ scores would be a normal 100 or sometimes superior. He went further by working with students at a boarding school for students who were 2 years behind in their schooling in the 1970s. The students were divided into 2 groups. One group was treated by Feuerstein, while the other was taught a teacher-designed enrichment course. When they reached 18 they were all tested for mandatory enlistment into the Israeli army. The Feuerstein-treated students showed normal intelligence while the other group was more than 20 points lower. The treatment had improved intelligence!

Michael Shayer and Philip Adey in England devised a special set of activities to be used in class in the 1980s. They used their lessons in middle schools where students scored lower on standardized tests. At the end of high school the students in these schools

scored higher by 20% in science, 19% in math, and 15% in English. Essentially the students became more intelligent so they could learn better.

Many other studies show that IQ and various thinking skills can improve. All of the methods for doing this rely on having students do the thinking. The teacher does very little lecturing. Students work together in groups to help one another understand how to do the “thinking” activities. The teacher generally asks questions rather than giving answers, and solicits answers from students. This style of teaching was invented by Socrates.

This style of education is very different from what most students have experienced, so they may find it stressful. It is like learning to navigate in new city. At first you are lost and confused. Then gradually you build up a mental map of nearby locations. With experience this mental map expands, and eventually you can navigate the whole city. You may need to learn how to use aids such as your smart phone to navigate to unfamiliar areas, but with practice that is not as necessary.

Sometimes you may be confused when tackling something completely new. The good news is that you can improve your ability to think. High school physics teachers have seen students improve their math SAT scores by 100 points!

This should not be surprising. When you exercise with weights your muscles build new cells and become larger. This takes time and can’t be done overnight. It may sometimes be uncomfortable. Improving intelligence and ability requires “brain exercise”. You literally grow new connections, but it also takes time.

Finally, consider how you might change your approach to learning. What would you do differently to improve your learning ability?

Writing: Write a letter to a friend to needs this information. It can be a real friend or an imaginary one, and you can use a made-up name. The letter is no more than one page. Remember this is not an English exercise, but please do not write it like short text messages. If I can’t read it, I can’t give you full credit.