

Learning in the United States is in trouble. The world's most powerful nation trails far behind in education rankings. Nineteen countries and education systems scored higher than the United States in reading on the 2012 Program for International Student Assessment, or PISA, up from nine systems when the test was last administered in 2009. In mathematics, 29 nations and other jurisdictions outperformed the United States by a statistically significant margin, up from 23 three years ago. In science, 22 education systems scored above the U.S. average, up from 18 in 2009.

America spends a lot of money per student, the U.S. ranks fifth in spending per student. Only Austria, Luxembourg, Norway, and Switzerland spend more per student. To put this in context: the Slovak Republic, which scores similarly to the U.S., spends \$53,000 per student. The U.S. spends \$115,000. Shanghai came out with the No. 1 international ranking in the 2012 administration of PISA in math, reading and science. The math scores of students in Shanghai showed that they are "the equivalent of over two years of formal schooling ahead of those observed in Massachusetts, itself a strong-performing U.S. state," according to the study.

In response to poor test results the *Common Core State Standards* is an educational initiative in the United States that details what K-12 students should know in English language arts and mathematics at the end of each grade. Common Core seeks to establish consistent educational standards across the states as well as ensure that students graduating from high school are prepared to enter credit-bearing courses at two- or four-year college programs or enter the workforce. There is controversy and these standards have been criticized. Some parents have said that the new assessments are too difficult and are causing too much stress, leading to an aversion to school and an "opt-out movement" in which parents refuse to let their children take the tests. Some teachers say the idea that all students will learn the Core Standards is not realistic, and "one size does not fit all."

Each generation has new aspirations that shape the education in its time. Today many people are asking "What shall we teach children and to what end?" America is a large united country, whose citizens have great geographic mobility, and there must be uniformity among college, primary and high school curriculum; but at the same time the huge diversity of American communities and life makes some variety equally important. We live in an age of rapid technological advances, and growing societal difficulties, which make the question of what to teach even more complex. Environmental education, classes in ethics, and management of money are just some of the things which are now more pertinent than ever in the world.

Currently in the United States there is a debate on the need for greater education at the postsecondary, secondary and even primary school levels in STEM subjects. STEM is an acronym referring to the academic disciplines of science, technology, engineering, and mathematics. There is a fear that the future of the American and world economies may suffer

because there isn't enough emphasis placed on these subjects, as several years of specialized study in these areas are now required in many job fields. The need to compete in the modern global job market has a big influence on education at all levels.

There has always been a dualism in the American educational ideal, a striving for balance between what Benjamin Franklin referred to as the "useful" and the "ornamental." What was useful were skills of a specific kind, that enable one to do a specific job or occupation; and what was ornamental was having a general understanding, achieved through a knowledge of history and literature, which would enable one to better deal with the various affairs of life. As he put it in the mid-eighteenth century: "It would be well if they could be taught everything that is useful and everything that is ornamental: but art is long and their time is short. It is therefore proposed that they learn those things that likely to be most useful and ornamental."

The STEM subjects are often contrasted with the humanities. The humanities are academic disciplines that study human culture. They use methods that are primarily critical, or speculative, and have a significant historical element—as distinguished from the mainly empirical approaches of the natural (STEM) sciences. The humanities include ancient and modern languages, literature, philosophy, religion, and visual and performing arts such as music and theatre. The humanities that are also sometimes regarded as social sciences include history, anthropology, area studies, communication studies, cultural studies, law and linguistics. Through studying the humanities we reflect on the fundamental question: What does it mean to be human? Educators and students often need to make a choice between humanities and more "useful" or "professionally lucrative" fields, like science, technology, engineering, and mathematics.

The American Academy of Arts and Sciences put together a commission, and a subsequent congressional report, that acknowledges the critical importance of technical training but also asserts without equivocation that the study of the humanities and social sciences must remain central components of America's educational system at all levels. Both STEM subjects and humanities are critical to producing citizens who can participate effectively in our democratic society, become innovative leaders and benefit from the spiritual enrichment that the contemplation of ethics, morals, aesthetics and the great ideas over time can provide. More and more employers have expressed a preference for students who have received a broadly based education that has taught them to write well, think critically, research creatively and communicate easily; as opposed to a highly specialized education.

Whatever is taught, students necessarily have only a limited exposure to the materials they learn. They are only in school a limited number of hours each day, and they have other things that take up their time and mental resources. The question for educators is how can this limited exposure be made to count in their students thinking for the rest of their lives? The answer lies

in giving students an understanding of the fundamental structure of whatever subjects we choose to teach, so that they may use it in future novel occasions. This is the minimum requirement for using knowledge, for bringing it to bear on problems and events one encounters outside a classroom, or in classrooms one enters later in one's training. Knowledge is future oriented.

The first object of any act of learning, over and beyond the pleasure it may give, is that it should serve us in the future. Learning should not only take us somewhere; it should allow us later to go further, more easily. There are two ways in which learning serves the future. One is through specific applicability to tasks that are highly similar to those we originally learned to perform. For instance, if you learn how to hammer nails, you are better able to later learn how to hammer tacks. Psychologists refer to this phenomenon as specific transfer. The study of "transfer" is the study of the gain in mastery of other activities that one achieves from having mastered a particular learning task.

The second way learning serves the future is through what is called nonspecific or general transfer. In essence, it consists of learning initially not a skill but a general idea, which can then be used as a basis for recognizing subsequent problems as special cases of the idea originally mastered. With general transfer there may be little overlap between situations, that is the original and transfer settings are often not similar. Still, the tasks are conceptually similar (follow the same rule). For example, the knowledge and skills acquired in terms of addition and subtraction in mathematics in school may help a child in the acquisition of knowledge and skills regarding multiplication and division at a later point. There is a transfer of knowledge.

Specific transfer involves tasks that are perceptually similar, where the behavior is often triggered automatically. Some examples of specific vs. general transfer are as follows. Learning to drive a Toyota and then driving a Honda is an example of specific transfer (the skill of driving a car), while learning to drive a car and then learning to drive an airplane is an example of general transfer (piloting a vehicle being the general idea). Another example of specific transfer is being able to balance on a 4 inch beam to being able to balance on an elevated 4 inch beam, it is essentially the same task. Transfer from being able to balance on a low beam to being able to balance on a bicycle however is an example of general or nonspecific transfer.

General transfer is the type of transfer at the heart of the educational process - the continual broadening and deepening of knowledge in terms of basic and general ideas. With any subject it is important to start with the fundamentals, to learn the terms and vocabulary associated with it, so that you may have a solid foundation on which to build your knowledge so you can begin to answer the 'bigger questions'. Someone taking an introductory ethics class who learns the structural distinctions between teleological and deontological systems will be better

prepared to discuss the merits and faults of utilitarianism in the future. This type of learning is true of any discipline.

Studies have shown that massive general transfer can be achieved by appropriate learning, even to the degree that learning properly under optimum conditions leads one to “learn how to learn.” This means grasping the structure of a subject and understanding it in a way that permits many other things to be related to it meaningfully. To learn structure, in short, is to learn how things are related. These studies have stimulated a renewed interest in complex learning of a kind that one finds in schools, learning designed to produce general understanding of the structure of a subject matter. The teaching and learning of structure, rather than simply master of facts and techniques, is at the center of the classic problem of transfer.

We will discuss the importance of structure in the next class.