

compared to the control group. This research evidence strongly suggests that, at the very least, artistic endeavors that involve developing spatial navigation and learning instrumental music enhance the growth of brain structures in children and adults.

Why Don't Schools Engage in More Divergent Thinking?

Most students have experienced a school culture that is focused mainly on "getting the right answer and getting it quickly." Their in-class and standardized testing formats reinforce this approach to learning. They have had few opportunities past the primary grades to practice divergent thinking.

The current classroom is not designed to encourage divergent thinking or creativity.

After all, divergent activities generally take more time and are more demanding and time-consuming to evaluate. Frankly, many teachers themselves admit

that they have not had a lot of experience or training working with divergent strategies (Andiliou & Murphy, 2010; Kampylis, Berki, & Saariluoma, 2009). Consequently, most classroom teachers ask their students for focused attention to a whiteboard and to absorb information. In other words, the current classroom is not designed to encourage divergent thinking or creativity.

On those few occasions when students are challenged with a divergent task, they balk due to their lack of familiarity with this type of challenge. They quickly recognize that trying to solve the problem will take much more effort and time. Add to this situation another critically important factor called mind-set, one of the greatest barriers to student achievement and creativity.

Mind-Set: It Can Hinder or Improve Achievement

Mind-sets are those beliefs, assumptions, and expectations that guide how we behave and how we interact with others. These mind-sets start forming at an early age as we grow and interact with our parents, friends, and elements of our culture. Our brain stores summaries of those interactions in cerebral networks. New experiences strengthen and expand these networks. Eventually, they become so ingrained that we react almost reflexively when

"I'm studying the effects of negative reinforcement on ESP ability"

Dr Peter Venkman

STEAM = Science, Technology, Engineering, Arts, and Mathematics

effort

barrier

time

From STEM to STEAM

those similar situations arise again. For example, when we spot a dear friend, neural circuits fire in the emotional and motor areas of the brain causing us to spontaneously smile, extend our arms, and show warmth when we meet. On the other hand, different circuits fire in the presence of a demanding boss or bully, causing us to stiffen and display deference or anxiety.

Researchers who study mind-set suggest that at a young age we develop either a fixed or a growth mind-set about the origins of our ability and success (Dweck, 2006). Those who develop a fixed mind-set accept the premise that we are born either smart or not smart, either able or not able (see Figure 2.3). Although environments can contribute a bit to our ability, the genetic predisposition to be a good scientist or a poor one, a great baseball player or a mediocre one is so strong that it will determine whether an individual will do well in a given pursuit. A person with a fixed mind-set believes that the main predictor of success is *ability*.

By contrast, people who develop a growth (or fluid) mind-set operate from a fundamentally different perspective on ability and success. Growth-mind-set individuals believe that although genetics might frame a starting point in our development, it is really one's own determination and persistence that predicts success. A person with a growth mind-set believes that the main predictor of success is *effort*.

Most researchers believe that people are born with a growth mind-set. The human brain is designed to collect information from its environment and consolidate it so it can begin to make those decisions needed to keep its owner alive. Think of our ancestors on the African savannah. Many of the

ABILITY
EFFORT or

FLUID = FLOW

Which is your guide?

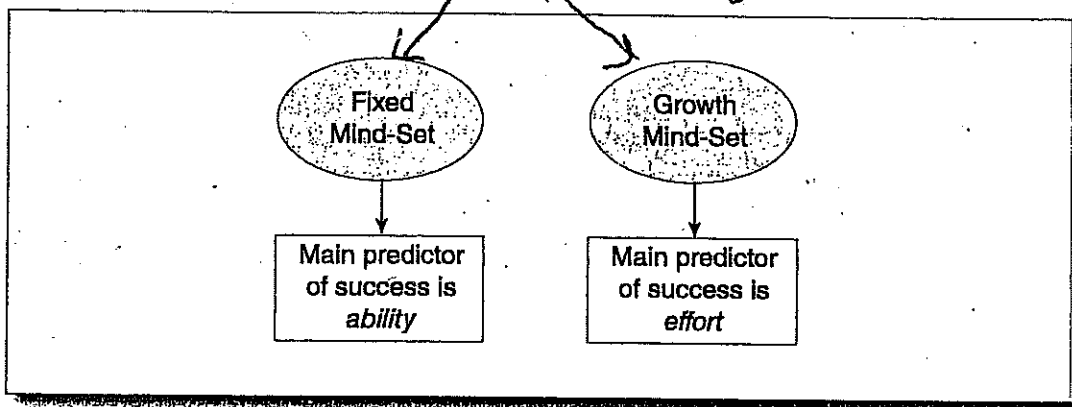


Figure 2.3 Fixed mind-sets focus on ability, while growth mind-sets focus on effort.

effort

ability

Indomitable spirit = effort

Which path? How do I? What type?

decisions they faced involved solving problems with more than one answer. Which path through the jungle is the safest? How do I avoid encountering animal predators or hostile tribes? What type of prey am I more likely to catch for food during the rainy season, and what is the best way to trap them? Individuals with superior divergent thinking skills and a growth mind-set were far more likely to survive than those without such skills and thus pass their genes on to their offspring.

This growth approach is evident in toddlers as they explore their toys and their world and work at trying to make sense out of it. So if you accept that we are born with a growth mind-set, why is it that so many school children display a fixed mind-set? What happens between birth and the early school years to cause this drastic change? Clearly, the attitudes and beliefs of the child's parents or caregivers continually convey both overt and subtle messages about ability that alter the mind-set as the child internalizes them. Teachers, too, can convey these messages—sometimes not so subtly.

Because mind-set is such a powerful and ingrained force, it is not surprising for students who hear they are "not smart" to see themselves that way, while students who hear that they *are* smart to see themselves that way as well. "Not smart" students attribute their lack of success to factors beyond their control, making statements such as, "Nobody in my family is good at science or math" or "I just don't have any talent as a musician." Often the

result is that these students give up in the face of difficulty—such as in a divergent thinking activity—because they believe the ability to do the work is simply not in them.

Even highly able students can suffer as well in a class where teachers put a premium on being smart rather than on working hard.

Ironically, even highly able students can suffer as well in a class where teachers put a premium on being smart rather than on working hard. These students conclude that smart is something they were born with. When they encounter work they cannot easily accomplish, it indicates that they are not smart after all, because smart people do not have to work hard and this task would require serious work. Often, then, the student will reject the challenge. In fact, bright students with a fixed mind-set will often select easier tasks within a class and opt to take easier classes. They reject feedback on their work as negative judgment and work for grades rather than for the sake of learning, because it is the grade that signals smartness and success.

Teachers with a growth mind-set believe that most students can learn most things if they will exert the necessary effort. Students working with

reject the challenge
or
rise to the challenge?

Bees and divergent mind set

Waggle Dancing bees

Which path?

negative reinforcement

stay put

CHOOSE

WINGS OF DESIRE movie - Rilke

Slime and GB

Don't slime yourself!

VIP

- growth-mind-set teachers recognize that they should celebrate effort, not genetics, and that they can have an impact on their own success. They develop a sense of self-efficacy as learners and are more likely than fixed-mind-set peers to learn for the sake of learning, to persist in the face of difficulty, and to see feedback as a mechanism for continued improvement. Developing a growth mind-set is important to both teacher and student success.

① learn... ② persist... ③ see feedback...

Changing One's Mind-Set in STEM and the Arts

How?

Students with a fixed mind-set in STEM areas will be reluctant to attempt challenging activities because of fear of failure, especially if they have a teacher with a fixed mind-set. Yet there is ample research evidence to show that, thanks to the brain's plasticity, teachers and students can change their mind-set from fixed to growth when in an environment that is challenging, rewarding, and motivating (Dweck, 2006). This is more likely to happen in classrooms where the following occurs (Sousa & Tomlinson, 2011):

- A teacher connects with each student and indicates a belief in that student's value and potential.
- Each student in the class must have consistent responsibilities for successful operation of the class.
- Students learn to work with increasing independence and self-awareness as learners.
- Students need to be partners in the belief that every student in the class can and will succeed with the most essential content.
- A major goal for the classroom is students competing against themselves rather than against one another. That is, student growth is an expectation for success.
- The teacher plans for challenging the high-end students and differentiates instruction to support virtually all students in achieving those goals.
- All students work at tasks that are equally interesting, appealing, and important—all of which require high levels of reasoning.

Interest in Music and Art Increases in High School

A review of the previously given elements shows that a key force in

Several studies have found that high school students who get involved with arts-related activities are more motivated to go to school and less likely to drop out.

Stands With A Fist → how did she get her name?
Dances With Wolves