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# Diversity and School Reform

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## ABSTRACT

*For the past century, school reform has centered around political solutions. Numerous attempts have been made to improve the education of youth. The advent of neuroscience research has given educators new ways of examining conditions affecting school achievement. The list of these conditions is large. Communities seeking to improve schools need to examine biological factors which may impinge on school success.*

## INTRODUCTION

Justifiably, members of Congress, state legislators, school board members, school patrons and education officials are striving for improved student achievement. At the state and local level, school expenditures constitute the largest piece of the budget. It is understandable that the tax-paying public holds school personnel responsible for a satisfactory return on their hard-earned tax dollar! Despite dozens of school reform initiatives over the past 100 years, school performance remains the same. In some cases, data shows school performance declining.

As George W. Bush begins his presidency, he is sponsoring a major bipartisan campaign to provide new initiatives aimed at consolidating existing federal aid and introducing new concepts supporting better school programs. While the new proposals appear to hold promise, are the new efforts based on policy or science?

Among students that cause teachers great concern are those labeled "learning disabled." In the U.S. this number is reaching 3,000,000. In Idaho, over 28,000 youngsters qualify for Special Education programs. This figure represents 11% of the school population. Laws make teaching special children a priority. Again, are efforts to improve the education of these children and others based on policy or science?

The numbers of students with learning disabilities are growing. The problem is costly and school officials must be accountable. Currently about 60% of all youth graduate from high school. It is not surprising that decision makers are unhappy with school reports showing poor performance. What are the underlying causes of school failure? Brain research is beginning to reveal observations which appear to have relevance to school improvement and that need to be discussed among the executive branches of government.

To what extent do students with learning disabilities contribute to failing grades given to schools whose test scores don't measure up to expected standards? There is no reliable, agreed-upon strategy for remediation that works for all children. For the past century, the educational psychologists and special educators have shared their research information. Currently a growing number of neuroscientists are sharing their findings. Too little communication occurs between the two camps. The argument is filled with self-righteous assurance that each has the best answer. The truth is that both can profit from observations made by the other.

Teachers realize that both environmental experiences and genetic predisposition guide development. Other biological factors may impinge on the fragile brain. Since humans are

altricial—requiring over 20 years to fully develop—the biological factors affecting human performance are numerous. Listed below are some of the biological considerations that legislative leaders should be conversant with as they contemplate school reform initiatives. It should be plain to all that community reform is called for with many of the factors listed.

### VARIABLES ADVERSELY AFFECTING SCHOOL ACHIEVEMENT

- Elevated lead levels. Lead poisoning in childhood is a chronic disease that follows long-term exposure. Symptoms of lead levels that are too high include anorexia, apathy, anemia, hyperirritability, clumsiness, loss of developing motor skills, and nausea.
- Insults to the embryo during the first trimester of life after conception. Drugs, alcohol, trauma, psychological stressors, or disease can cause elevated cortisol and testosterone that, according to Dr. Norman Geschwind, will cause the cerebral hemispheres to grow asymmetrically. Depending on when the insult occurs, the result may be the cause of over 30 brain variations that could affect achievement.
- Insufficient fetal and postnatal nutrition. Low birth weight babies are often those whose mothers failed to receive prenatal counseling. Diet must be adequate to provide necessary vitamins, minerals, carbohydrates, proteins, fats, and oxygen to the fetus. Alcohol insults are producing youngsters with Fetal Alcohol Syndrome, which causes irreparable damage to the child.
- Caffeine. Caffeinated drinks and chocolate are responsible for a variety of disturbances that may affect schoolwork. Fatigue, depression, irritability, sleep disturbances, and reduction of cerebral blood flow are the results of caffeine consumption among youthful consumers. Caffeine is found in schools and as little as 100 milligrams (amount found in two cola drinks) can cause significant decreases in recall and reasoning.
- Sleep/wake cycles. There is wide variability in sleep/wake cycles among individual children. In northern latitudes, some individuals do not get enough sunlight to generate serotonin, resulting in a condition known as Seasonal Affective Disorder. The condition results in depression and lethargy.
- Variation in attention. The neurochemicals that regulate our bodies can be grouped into two categories: those that are excitatory, and those that are inhibitory. Too much or too little of either (for example, too much gamma amino butyric acid will cause lethargy; too much serotonin will cause excitability or attention problems) can produce behaviors in students that are troublesome for teachers.
- Variation in maturation. Brain growth generally alternates with body growth. There may be wide variation in the ages of the children in a typical classroom; not all children are experiencing growth in the same way. Teachers should conduct a survey to determine those who may be ahead or behind in brain growth. Generally, students learn best during periods of rapid brain growth in the frontal cortex.
- Individual mental uniqueness. The idea that the cerebral cortex is composed of many patches of cells called modularities is one of the most significant findings of contemporary neuroscience. The frontal modularities are subsystems that serve as our language, art, music, mathematics, memory, and physical centers. The patches may be vastly unique in each individual. Likewise the combination of all of the variations in modularity size gives us our unique mental makeup. Howard Gardner has synthesized this idea as multiple intelligences.
- Experience base. When an individual experiences an event, physical changes take place in the affected modularity. The brain actually changes at the cellular level. Since every person experiences events uniquely, every person has a different brain. If the brain is not affected at the right time, there may be a loss of certain abilities.
- Asymmetry of the thalamus. Norman Geschwind has posited the causes of cortical asymmetry. Another phenomenon is asymmetry of the thalamus—the structure known as the brain's brain. The connections for sight (lateral geniculate nucleus) and hearing (me-

dial geniculate nucleus) have been identified. Dyslexic individuals are observed to show that there is asymmetry present when images are taken of this portion of the limbic brain.

- Diet. The brain weighs about 350 grams at birth. Through the addition of cell extensions, blood vessels, and attendant glia cells, the brain grows four times in size. The essential growth and performance chemicals must be added daily throughout life to keep the brain functioning properly. Fat is needed to coat all of the nerve cells and extensions. Carbohydrates are required for cell energy. Proteins are needed to serve as the basic building blocks of the neurotransmitters that allow the cells to function. The protein building blocks are amino acids and eleven are needed daily. The acronym PVT. TIM T. HALL reminds us of the essential eleven: proline, valine, tyrosine, tryptophan, isoleucine, methionine, threonine, histadine, alanine, lysine, and leucine.

### CONCLUSION

The Idaho school population is approaching one quarter million children. Of this number over 11% are referred to as Special Education eligible. Three plus percent are gifted, and six and two-thirds percent have limited English proficiency. Over seven percent drop out of school.

A review of any community suggests that the educational underpinnings of the population do not reflect the success of formal schooling. Too few adults read for pleasure or information, the arts are neglected, diets are in shambles. Per-

haps school reform needs to begin with citizens and the environments they provide their children at home.

What would a standardized test designed for high school juniors reveal if it was administered to legislative critics, who often fail to nourish schools through fiscal support? Likewise, how would our schools be different if every patron contributed \$208.00 per year to a local school? That's exactly the amount Idaho teachers spend of their own money each year.

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