

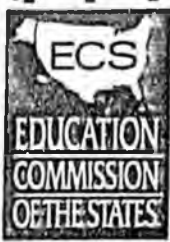
PRESENT.:

EARLY

CHILDHOOD

BRAIN

DEVELOP...



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The mission of the Education Commission of the States is to help state leaders develop and carry out policies that promote improved performance of the education system as reflected in increased learning by all citizens.

TO: ECS Commissioners

FROM: Frank Newman

DATE: December 5, 1997

SUBJECT: The Implications For Education Policy That Flow From the New Neurological Research.

Recently, ECS and the Dana Foundation brought together neurological scientists, cognitive psychologists, education researchers and policymakers to address the implications for education policy of the new research about how the brain and central nervous system develop. The report [Bridging the Gap Between Neuroscience and Education](#) summarized that meeting. Subsequently, we have been meeting with policymakers, state by state, to explore how this research could be put to use. The following are some observations and a first effort to define the areas where education policy will be affected.

What does the new research tell us?

- ◆ Contrary to the widely held view in education, infants are not born with their brain and central nervous system hard-wired, nor can their intelligence be described by a pre-set I.Q. arranged along a bell-curve. About one-third of the wiring of the brain is completed by birth. Each infant has a huge number of potential synapses (brain connections) that can be made — more than can ever be used. Then, based on the experience the infant encounters, the brain begins the process of forming the synapses for language acquisition, vision, feeling, etc. The brain at birth is not a computer waiting to be filled with more and more information. It is, rather, a partially completed computer. The experiences the child encounters both help build the brain and fill it with information.

Depending on the quality and quantity of experience or stimulation that an infant undergoes, more or less effective brain connections are made. At a relatively early age, the opportunity to make brain connections begins to diminish as the brain prunes the potential connections that are not needed. In most people, more than half of the potential brain connections are never made. Genetics are important, but experiences set the formation and scope of the brain and the central nervous system. As Ron Kotulak, the Pulitzer Prize winning author of [Inside the Brain](#), put it "genes...establish the framework of the brain but then the environment takes over..."

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- ♦ Stimulation is essential. A stimulating environment can be created by reading to the infant, talking to the infant, singing to the infant, playing with the infant, etc. This has a significant impact. With rich stimulation more synapses are connected. With a sterile environment far less are connected. This has a major effect on the cognitive capacity of the infant and ultimately, its intelligence. By skillful stimulation, it is possible to improve an infant's capacity to learn by a significant amount.
- ♦ Early experience matters the most. One can always learn to use the brain better, but expanding the number of synapses is harder and harder. By age 6 months, the opportunity for making some brain connections has past. Even age 3 or 4 is late for many things, including the connections used in language acquisition. There are windows of opportunity associated with the chance to make certain kinds of brain connections (e.g. language or vision). While there is still the chance to make more brain connections or to elaborate the neural connections outside these windows, it takes enormously more work. The capacity for language acquisition is developed early. This is even more the case in the case of vision; synaptic connections come very early and once that window is past, synapses cannot be made for this purpose. Use it or lose it.
- ♦ Repetition helps. Reading the same book over and over again, speaking to a child repeatedly, singing the same songs matters. Repetition allows recognition by the child of the patterns of language. The child is building the connections and the understandings that set the basis for language.
- ♦ External influences can also damage the brain and central nervous system during their development and therefore, reduce the cognitive ability or the I.Q. of the infant. In pregnancy this includes smoking, drugs, alcohol, sexually transmitted disease, malnutrition and pre-term birth. In early infancy it includes lead poisoning, malnutrition and child abuse. These can result in losses up to ten or twelve I.Q. points among otherwise normal infants and substantially more in infants with serious disabilities such as fetal alcohol syndrome.
- ♦ Potentially the most important finding is that scientists have learned a great deal and still see much to learn from brain scans that diagnose malfunctioning of the brain with such problems as difficulty in learning to read. They are also creating new modes of treatment for such conditions — modes that offer the opportunity to avoid learning disabilities by action taken during the early years of life.
- ♦ Perhaps the most substantial — and still experimental — finding is that scientists can now identify the type of intelligence (i.e. Howard Gardner) being used by a child to solve problems. Over the next decade, there is the possibility that they will be able to suggest techniques by which we can help students learn to use differing and multiple types of intelligence.

Clearly the goal is to encourage those conditions that help insure that each child develops its intellectual capacity to the fullest.

Where can state policy could make a difference?

- ◆ States and school districts need to disseminate information to the public about the development of the brain and the growth and stimulation of intellect and personality to parents and professionals.
- ◆ States and districts can organize efforts to stop the damage to infant cognitive capacity from preventable causes.
- ◆ States can help create or support skillful programs that encourage families to stimulate every infant. These help the most when there is a focus on those infants least likely to receive the optimal stimulation, most often children in poverty. There are already a number of such programs that are often state-supported such as Parents As Teachers, Healthy Start, HIPPI, or Success By Six.
- ◆ States need to address how to improve the quality of those who provide day-care or even Head Start. While it is now clear that these people are in a position to substantially influence the intellectual development of the young, they are often our least well educated and trained people.
- ◆ States need to consider whether they should continue to build down from kindergarten by adding 4 year old kindergarten as well as Early Head Start, or whether they should build up from the first year, now that it is clear that the first year is by far the most important, or both.
- ◆ Education systems need to begin to think about transforming their approach to learning. For example, brain research has a great deal to add to the phonics/whole language debate, as well as a growing array of pedagogical issues.
- ◆ Schools need to teach young students (middle school) about brain development and biology so that they understand the urgency of these issues.
- ◆ Teacher education and professional development programs need to be reshaped, as well as teacher certification, in light of these advances.
- ◆ Parent/teacher collaboration is even more important than had been realized. Policies that encourage parental involvement need strengthening.

- ◆ Probably the most powerful issue that states need to consider is the transformation of their approach to special education. The emphasis needs to shift to prevention. Can early analysis of children and new techniques train children so that they do not end up in special education? Should states shift resources to much earlier periods of life? Must all special education staff be re-trained?
- ◆ States need to re-examine who has the responsibility for the early years of an infant's life — the responsibility beyond that of the family. The Department of Education is responsible for those in kindergarten and beyond. In the federal government, HHS is responsible for Head Start and this is true for many state agencies as well. Who, then, is responsible for the intellectual development in first years of life?
- ◆ These findings raise question of the re-allocation of resources even beyond the re-allocation necessary in special education.

As exciting as the implications of these research breakthroughs are, there is a disturbing side. As the realization of the importance of early stimulation — and avoiding damaging the intellectual development in pregnancy and birth — spreads, middle class parents will be the ones to get the word and respond. But it is children in poverty neighborhoods who suffer disproportionate intellectual damage in birth and early infancy, and who are likely to get the least stimulation early in life. Children from poverty families are more likely to be in day care settings with the least well trained care givers.

Consequently, an essential policy goal must be to enhance the intellectual start in life of those most at risk. ECS has been working with a set of states to help urban school systems improve. Nothing would help these schools succeed as much as a determined effort to raise the cognitive capacity of those children most at risk in their first years, so that children arrive at the schoolhouse door ready to learn.

There are other dangers as well. As the discussion about this research spreads in the popular media, there will be, typically, proposals for simplistic or overdone solutions. Stimulation is important, but it needs to be appropriate, caring stimulation.

Also, since the allocation of resources is involved, there is the danger of competition rather than cooperation among organizations and agencies.

The research is still so new and the development of policy so early that the most effective ways to address each of these issues are still unclear. What is already clear is that these issues will need to be addressed.