The Brain Basis for Integrated Social, Emotional, and Academic Development

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How emotions and social relationships drive learning

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### **ASPEN INSTITUTE**



- International Non-Profit Think Tank
- Have seminars, policy, conferences etc..
- The Commission's members are leaders from education, research, policy, business, and the military

### This report

They set up a commission for Social, Emotional, and Academic Development with the aim of re-envisioning what constitutes success in our schools

Scientific evidence demonstrates that social, emotional, and academic development are interconnected in the learning process. 66 We know from human history and the latest learning science that success comes from the combination of academic knowledge and the ability to work with others. We need public education to reflect this."

 Former Aspen Institute President and CEO, WALTER ISAACSON



The Commission draws on research and promising practices to identify specific action steps that will help shape and sustain a new era of education that reflects what we know about how learning happens.

### Layout

- Brain development supports learning, and vice versa.
- Genes and Epigenetics
- The brain development depends on social experience.
- Sensitive periods in brain development align with opportunities for learning and needed supports.
- Educational Implications

## Brain development supports learning, and vice versa

- Brain development -> the generation, pruning, and reorganization of neural connections to form brain networks that reflect a person's experiences and help him or her adapt to the world in which they live.
  - Just as a garden grows differently in different climates and with different plants, styles of gardening, and use, a person's brain develops differently depending on age, predispositions, priorities, experiences, and environment.



## Brain development supports learning and vice versa

- When given adequate opportunity, support, and encouragement, children naturally think, feel emotions, and engage with their social and physical worlds. And these patterns of thoughts, feelings, and engagement organize brain development over time and in age-specific ways, influencing growth, intelligence, and health into the future
  - When given adequate opportunity, plants naturally grow through various developmentally appropriate phases. However, the particular characteristics of a garden reflect the age and types of the plants and a combination of geography, climate, soil quality, care etc



# Genes and Epigenetics and Environment contribute to brain development.

- Genes 'underspecify our development' they are not sufficient to build a person: we must have adequate opportunity to interact with others and to *learn*.
- Epigenetics: the genome is dynamic and changes in response to environmental cues.
- Healthy human environments vary BUT a seriously impoverished environment compromises brain development and the learning
- Though differences in individuals' intelligence are heritable in optimal learning environments, in sub-optimal environments, measures of environmental quality and learning opportunities overwhelmingly swamp the predictive power of genes.



The genetic code is like a gardener's seeds and instruction manual The epigenetic forces provide the supports and triggers that open and close pages of the manual, and even reorder, copy, and delete pages, telling the gardener whether, when, where, and how to plant/care for/prune various seeds given dynamic environmental conditions.

# The brain development that supports learning depends on social experience

- Individuals co-regulate each other's physiology, which means that the quality of a person's relationships and social interactions shapes their development and health, both of the body and of the brain.
  - Infants' prenatal brain development is impacted by maternal stress, which is in turn related to toddler behavior, and child temperament and learning.
  - The brains of children and adolescents who experience persistent adversity respond by strengthening circuits that promote aggressive and anxious tendencies at the expense of circuits for cognition, reasoning, and memory.
  - Individuals who experience early adversity are more likely to develop health problems, including mental health disorders such as addiction, anxiety, and depression, and physical health problems, such as heart disease, obesity, and cancer.
  - Connections between social and physical maturation are also seen in less extreme conditions: toddlers with poor attachment to caregivers undergo puberty earlier
  - Stress shortens the window of increased neural plasticity and growth in adolescence, and predicts earlier sexual maturity and worse psychosocial outcomes, with implications for risky decisions that influence educational outcomes.

#### INFANCY

- Infants come into the world with a basic ability to
  - Basic regulation (e.g breathing, eating, and maintaining a steady body temperature)
  - interact with objects and people (eye contact, listening, grasping, mirroring, vocalizing etc)
- Given their stage of brain development, infants thrive with stability and routine.
- Healthy early care environments feature small ratios of children to adults maximising interpersonal interactions for physical comfort, safety and communication. As well as regular feeding and good nutrition, sleep, and physical activities, such as sitting, rolling, crawling etc





EARLY CHILDHOOD:

- In early childhood, the brain regions that control sensory, motor, language, spatial, and visual functions are maturing. This brain development coincides with children learning to coordinate their reflexes to form goal-directed actions (e.g ride a wheeled toy).
- Productive early childhood education settings offer rich environments with materials to manipulate (e.g. a sand table, water table, blocks, movement and play).
- Songs, stories, and conversations in these settings model and support the development of language;
- music, dance, and games develop movement and a sense of timing and sequence;
- drawing, painting, playing, and building with manipulatives develop small motor and hand-eye coordination.

#### MIDDLE-LATE CHILDHOOD

- Development of PFC and integration of information gathered from different senses and sources are maturing.
- Start to develop concepts, 'formal knowledge' of the physical, cognitive, social, and emotional world and self.
- Children's learning involves gradually internalizing and reproducing the patterns, procedures, and beliefs they are exposed to at school, at home, and in the community.
- Structured opportunities to teach and learn from others; to explore, discover, and invent; and to test out the predictive power of their reasoning and calculations, help children construct a sense of scholarly and personal agency.
- Self regulation creating goals, managing relationships with peers through sports teams and music ensembles, and also by informal opportunities for self-direction





#### EARLY-MIDDLE ADOLESCENCE:

- Adolescence is a period of social, emotional, and cognitive growth and plasticity
- Maturation of emotion and reward-related structures leads to heightened sensitivity to social information. The frontal lobes, involved in higher order thinking, begin a protracted period of intense development increasing the strength of connectivity to subcortical regions
- Adolescents' optimal development is enabled by
  - helping adolescents build constructive, prosocial connections, perspectivetaking, and meaning- making.
  - explore possible social identities, interests, beliefs, and values
  - Support critical thinking/ problem-solving/planning
  - Develop tight relationships with family, peers, and reliable adults
  - physical activity, nutrition, and sleep are particularly important in adolescence, as these buffer the effects of stress on the brain and improve well-being, emotion regulation, cognition, and decision-making.

#### LATE ADOLESCENCE-EARLY ADULTHOOD:

- Increases in neural "cross-talk" between regions further apart in the brain, especially those involved in higher-level cognition and cultural values, emotions, and beliefs. This supports more sophisticated reasoning, reflection and other complex metacognition.
- Opportunities to engage deeply with scholarly ideas, apply their emerging skills to real-world problems, and to build strong, appropriate peer and adult relationships
- Productive educational settings in late adolescence and early adulthood
  - strong relationships with advisors, mentors, and teachers
  - examine ideas from many perspectives
  - symbolic thinking, logic, and metaphor, as well as other tools, to deeply explore meaning.



#### MIDDLE-LATER ADULTHOOD:

- Though the brain is considered to have reached maturity by middle adulthood, new neurons continue to form in the brain during adulthood in response to new experiences, but this growth can be inhibited by stress, chronic sleep disruption, or dietary deficiencies.
- Physical and mental activity, as well as social relationships, support adults' brain functioning and help buffer against potential age-related cognitive decline
- Productive educational opportunities for adults build on what we know about adult learning.



#### FIGURE 1 The Stages of Brain Development and Associated Learning Opportunities



EARLY CHILDHOOD: Sensory and motor regions are becoming more efficient and interconnected. These include regions involved in speaking, listening, and understanding language and social communication; feeling and perceiving emotions; manipulating objects to learn simple concepts; and understanding time and sequence.



MIDDLE TO LATE CHILDHOOD: Association brain regions are especially developing-bringing together information from different senses and sources to help build conceptual understanding across social, emotional, and cognitive contexts.



EARLY TO MIDDLE ADOLESCENCE: Regions involved in emotional reward, sensitivity to social reputation, and higher-order thinking are maturing, allowing new capacities for emotional regulation, in-depth interests, identity development, long-term planning, and abstract thinking.







### **Necessary stuff**

#### **SLEEP/REST:**

• Both physical and mental health, and the ability to think well, depend on getting an adequate amount of quality sleep. Sleep is fundamental for neural plasticity and the consolidation of memories, as well as for removing toxic proteins that build up in the brain over waking hours. Sleep deprivation effects mood, emotion regulation, memory, cognition, creativity etc.

#### NUTRITION AND LOW EXPOSURE TO TOXINS:

• Adequate nutrition and absence of toxins, especially in children. Deficiencies in nutrients or exposure to toxins (e.g. air pollution or alcohol) have been found to compromise brain development,

#### PHYSICAL ACTIVITY, EXERCISE, GREEN SPACE:

• Research suggests that physical activity is highly beneficial for cognitive development, and that its beneficial effects are strengthened with the availability of green (natural) space.

#### EMOTIONAL WELL-BEING, SOCIAL RELATIONSHIPS, AND SAFETY/BELONGING:

• Emotional well-being promotes health, brain development, and optimal learning, while chronic and excessive stress and loneliness are toxic to brain development.

#### **CULTURAL WELL-BEING:**

Broader roles, group affiliations, and identities that situate a person within a group and provide a sense of shared history, values, lifestyle, and purpose. However, when individuals from privileged groups stereotype, marginalize, or oppress members of stigmatized groups, this impacts cognition, health, well-being etc.

- 1. They place the learner's emotional and social experience at the forefront.
- School structures support
  - personalization,
  - small group of students are supported by a single advisor over multiple years,
- Teachers actively help students develop positive academic identities by
  - communicating their interest and belief in the competence of students
  - Supporting those who may be threatened by stereotyping
  - scaffolding
- Students engage in tasks as scientists, mathematicians, writers, social scientists, and artists, taking on these scholarly roles and identities while learning disciplinary concepts, skills, and modes of inquiry.

#### 2. They support age-appropriate exploration and discovery.

- Learning environments should be
  - age-appropriate
  - support exploration and discovery, followed by reflection and discussion for deeper understanding. They
  - support self-monitoring their own learning
- Concretely teachers construct enquires (i.e. explore questions using scholarly tools and processes—to figure out how something works, why a phenomenon is as it appears, how to find a solution to a problem, or what will happen if something is done in a particular way)
- Inquiry coupled with direct instruction and opportunities for peer learning/teaching.

#### 3. They support flexible and efficient thinking.

- Productive learning environments attend to the trade-off between plasticity and efficiency in brain development, strategically offering activities that encourage flexible thinking along with those that encourage mastery of necessary building-block skills and knowledge.
- Old argument about learning facts vs learning thinking skills based on misconception that "basic" skills have to precede complex thinking and reasoning, which is not consistent with current models of brain network development.
- Good educational practice allows students to develop conceptual understanding, basic knowledge and hands-on experience simultaneously so they can shift flexibly between exploration, reflection, and practice.

#### 4. They help students acquire habits of mind and character

- Productive learning environments help students acquire *habits of mind* that facilitate acquisition of age-appropriate knowledge and skills, reasoning, and ethical reflectiveness.
- Habits of mind include:
  - curiosity,
  - awareness of one's own understanding
  - Persistence
  - empathy etc
- Teachers engage students in extended tasks that incorporate students' interests and choices, and require planning and follow through. Tasks requires students to explain their thinking, gain feedback from one another, and revise their work.
- Stronger achievement occurs when these tasks are undertaken in a cooperative classroom with individual and collective learning goals, rather than in a competitive setting.
- Cooperation can support more ethical and empathetic behavior

### Conclusions

- The science on how the brain develops helps explain why young people's social, emotional, and academic development are intertwined.
- In addition to basic physiological needs like nutrition and sleep, brain development requires social relationships, emotional experiences, and cognitive resources, which ready the brain to take advantage of learning opportunities.
- Educators to attend to the development of the whole child in context, and to the need for aligned partnerships throughout the community that can support children's and their families' health and well-being.
- Educating the whole child is not just a luxury for those with the opportunity and the means, or a remediation strategy for the underprivileged or underperforming. It is a necessity for all children.

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