

Executive Function and Active Engagement in Playful Learning: Approaches to Increase Self-Regulation and Outcomes for Children, Kindergarten – Grade 1





1. Executive function (EF) skills **really, really** matter
2. Children learn through purposeful play; engaging in social skills and cognitive rigor, while addressing standards
3. Children need to predict and plan
4. Agency matters – choice and control

Core Executive Functions

- **Inhibitory control of actions and attention**
 - self-control or discipline – physical, emotional (response inhibition)
 - selective or sustained attention (despite frustration or boredom)
- **Working memory**
 - holding information in mind & working with it
- **Cognitive flexibility**
 - thinking “outside the box”
 - adapt to different rules
 - problem-solving
 - Creativity



<https://developingchild.harvard.edu/guide/a-guide-to-executive-function/>

Specialized cognitive skills, primarily in the frontal lobe of the brain which work together to regulate, recall, and plan a person's actions. These skills help a child:

- remember and follow multiple-step instructions;
- avoid distractions and impulsive responses;
- adjust when rules or instructions change;
- keep trying after an initial failure;
- persevere and try different solutions;
- organize and manage projects and long-term assignments.

Executive Functions Deficits in Kindergarten Predict Repeated Academic Difficulties Across Elementary School

Regardless of race, income and early childhood academic abilities, the researchers found that kids who had executive function problems were more likely to struggle academically in subsequent years. This study saw stronger causal links between executive function and academic performance than previous studies had.

11,000 kindergarten students from 2010 onward through third grade

Paul Morgan, co-author Penn State

<https://hechingerreport.org/does-a-lack-of-executive-function-explain-why-some-kids-fall-way-behind-in-school/>



The Relationship Between Executive Functions and Academic Performance in Primary Education: Review and Meta-Analysis

“The review reveals **a good predictive power of executive functions in the primary education stage, and it is even higher at the early ages, indicating its great significance in describing future performance.** The study also revealed the competencies and specific aspects of the executive functions that affect the way in which its components intervene in the academic area, demonstrating the mediating effect of variables such as physical fitness, motor skills, and memory processes.”

Front. Psychol., 11 Jul 2019 <https://doi.org/10.3389/fpsyg.2019.01582>

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Executive Function Buffers the Association between Early Math and Later Academic Skills

“EF at age 5 strongly predicts 5th grade academic skills..

Results from the present investigation make a strong case for the importance of early skills. **Beyond math and reading, there should be a focus in early childhood education on the development of EF, as EF fosters the development of high level math and reading in late elementary school, and may even serve as a mechanism by which children can catch up to their high achieving peers.** N=1292 participants

Front. Psychol., 30 May 2017

| <https://doi.org/10.3389/fpsyg.2017.00869>

Andrew D. Ribner, Michael T. Willoughby and Clancy B. Blair

Findings from Massachusetts kindergartens in 29 districts confirmed the positive impact of specific strategies to address executive function embedded in language, literacy, mathematics and science learning.

Positive impact to:

- working memory
- reasoning ability
- mathematics
- control of attention
- **levels of cortisol**

Reading and vocabulary at the end of kindergarten increased into first grade.

A number of effects were largest in high poverty schools. (Blair and Raver, 2014)

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0112393>

Executive Function: Implications for Education

Authors : Philip David Zelazo, Clancy B. Blair, Michael T. Willoughby

National Center for Education Research (NCER) Meredith Larson
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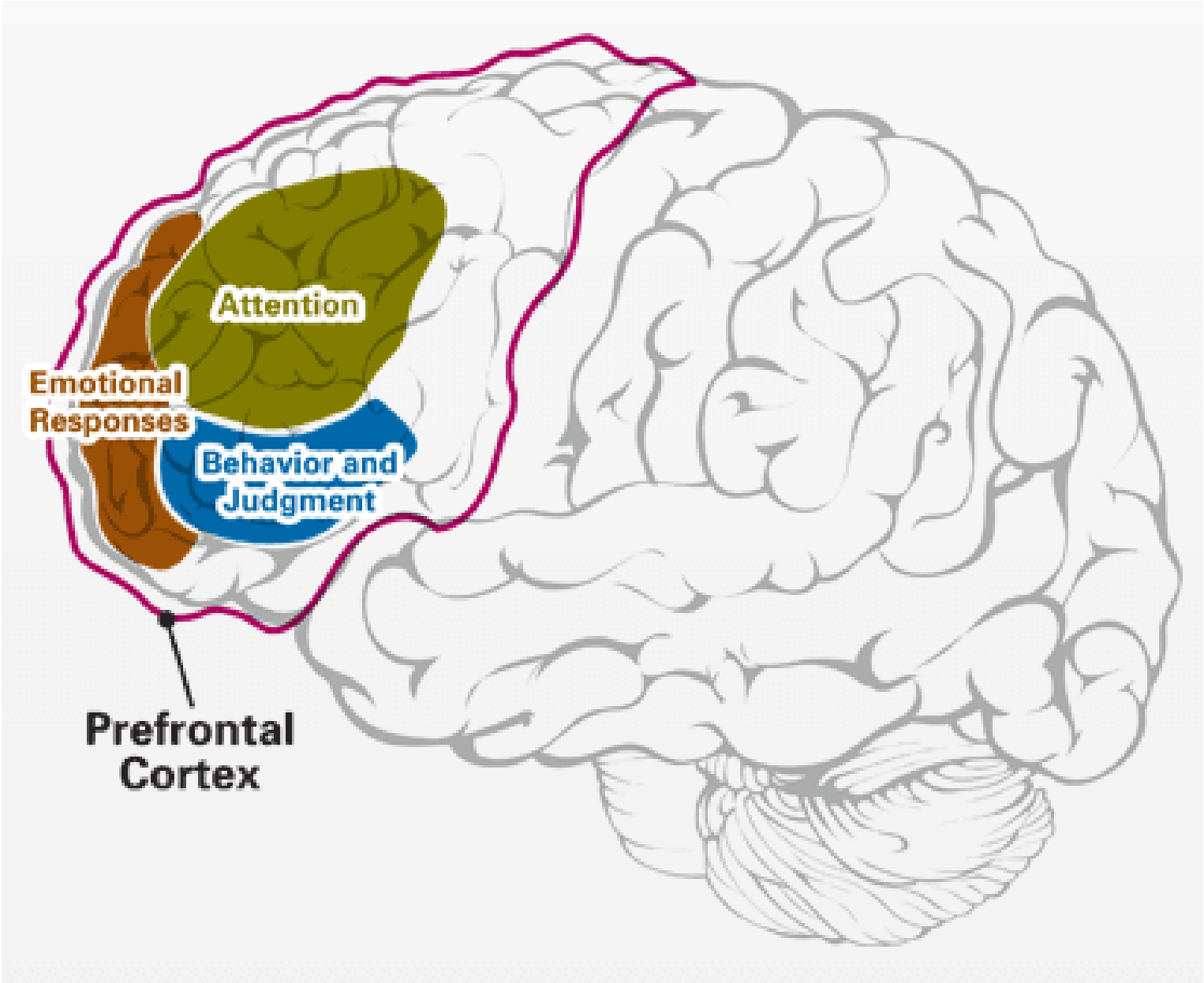
NCER 2017-2000 U.S. DEPARTMENT OF EDUCATION

<https://ies.ed.gov/ncer/pubs/20172000/pdf/20172000.pdf>

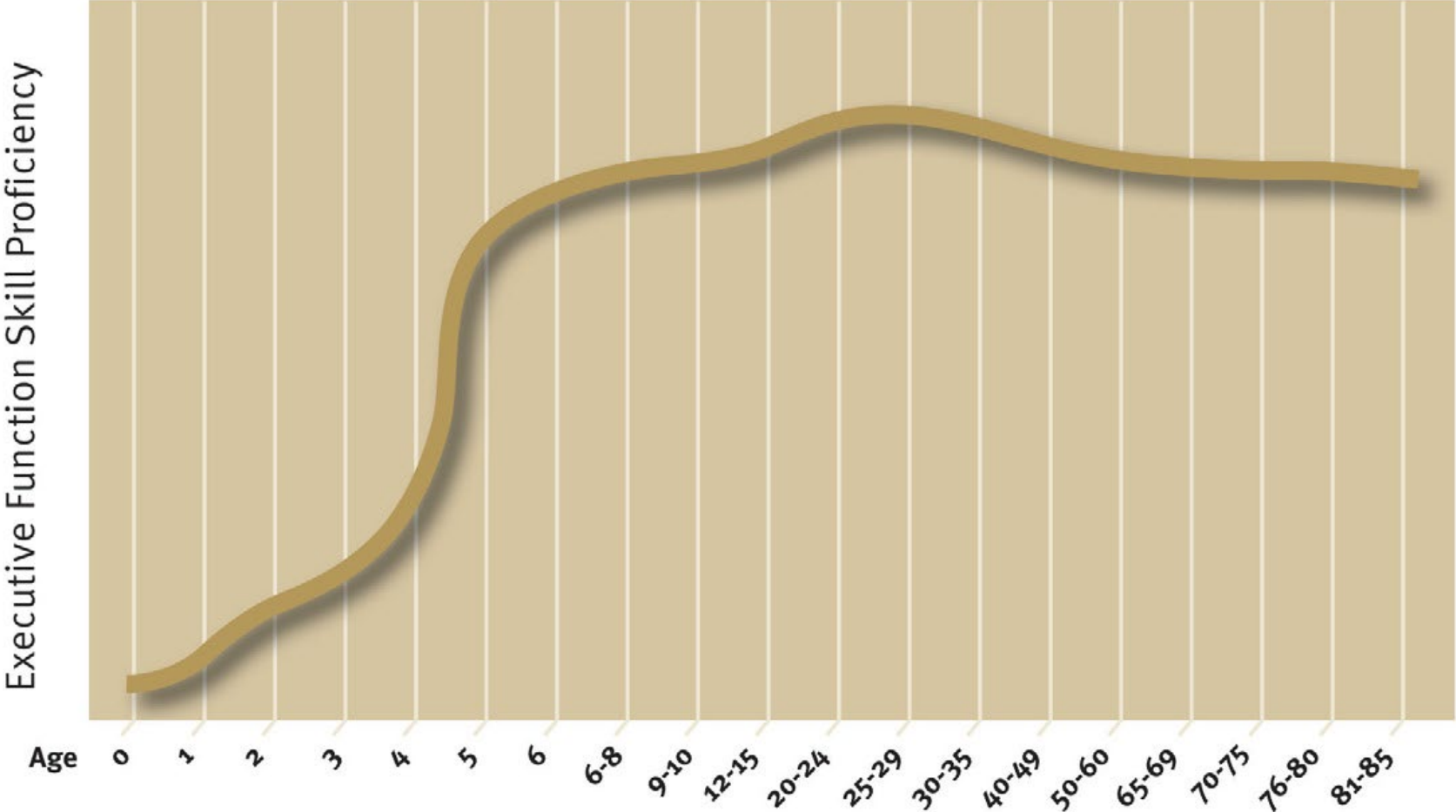
The CASEL Framework



<https://casel.org/>



Executive Function Skills Build Into the Early Adult Years



Source: Weintraub et al. (Submitted for Publication)

Building the Brain's Air Traffic Control System, How Early Experience Shape Executive Functioning, Working Paper 11, Harvard University, Center on the Developing Child, 2011.

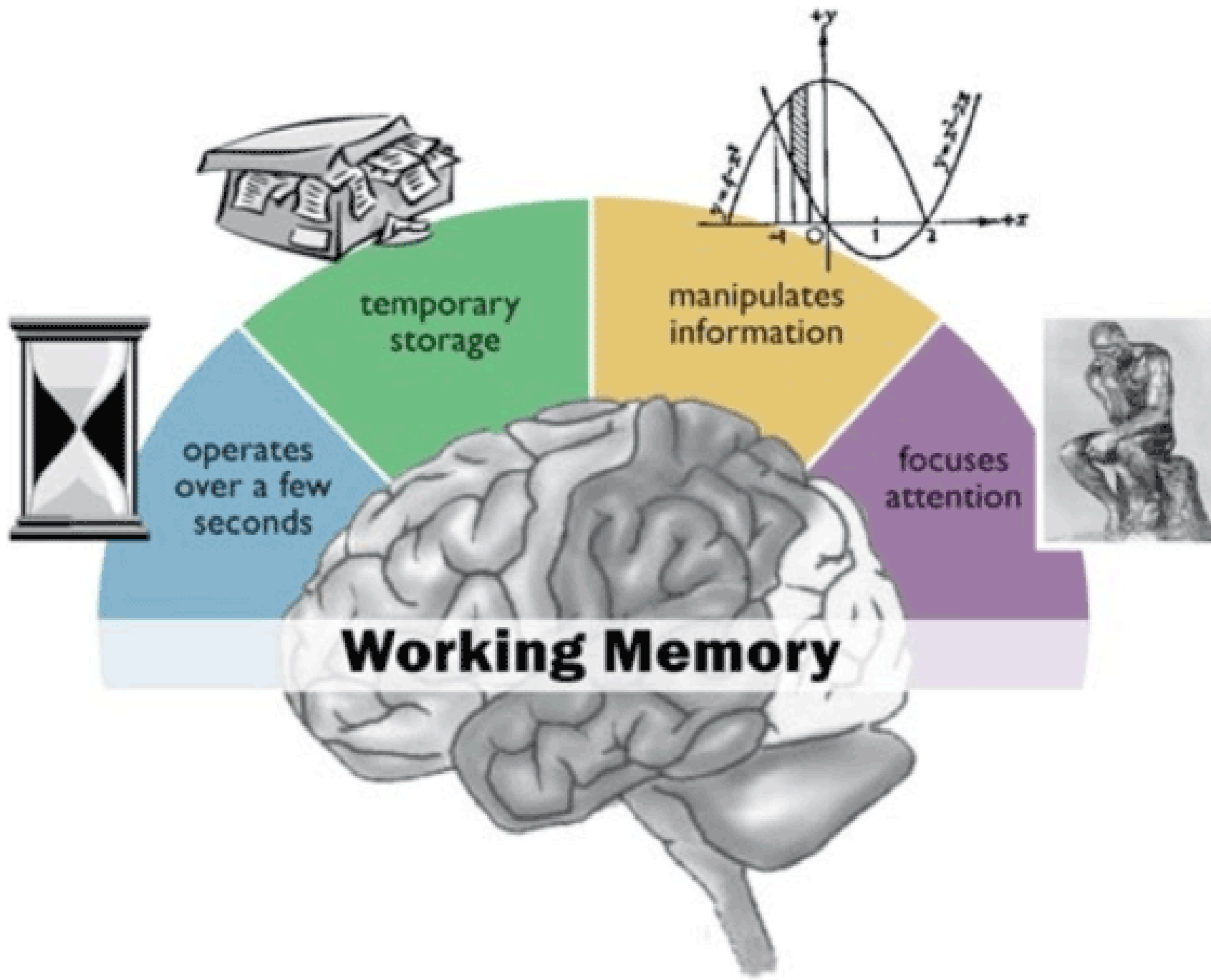
A Closer Look at Executive Functions: Inhibitory Control

1. Actions (self-control)

- Controlling emotions like anxiety or temper when you don't get your way or what you want
- Being able to stop and think before you act.
- Acting appropriately when tempted to do otherwise.

2. Attention

- Paying attention despite distractions.
- Staying on task even when bored or delaying gratification.



Working Memory



MENTAL
STICKY
NOTES

- Holding information in mind and being able to perform (complex) tasks
- Revise information while you are using it
- Being able to reflect on one's thinking
- Weighing two different strategies for the same situation so you can weigh and consider them
- Taking more than one perspective at a time
- Adults 4 (7+/- 2) items; young children '2ish'

Memory games

- Matching
- Concept relay games
- I have, who has
- Simon says



Early Executive Functioning:

Cognitive Flexibility

The
Anonymous
OT

- Flexibly adjusting thinking, actions, and mental effort to changing demands of the situation
- Problem-solving
- Understanding and being able to follow through with different rules
- Intentionally investing more mental effort in tasks that are difficult
- Creativity

First the Attention Filter

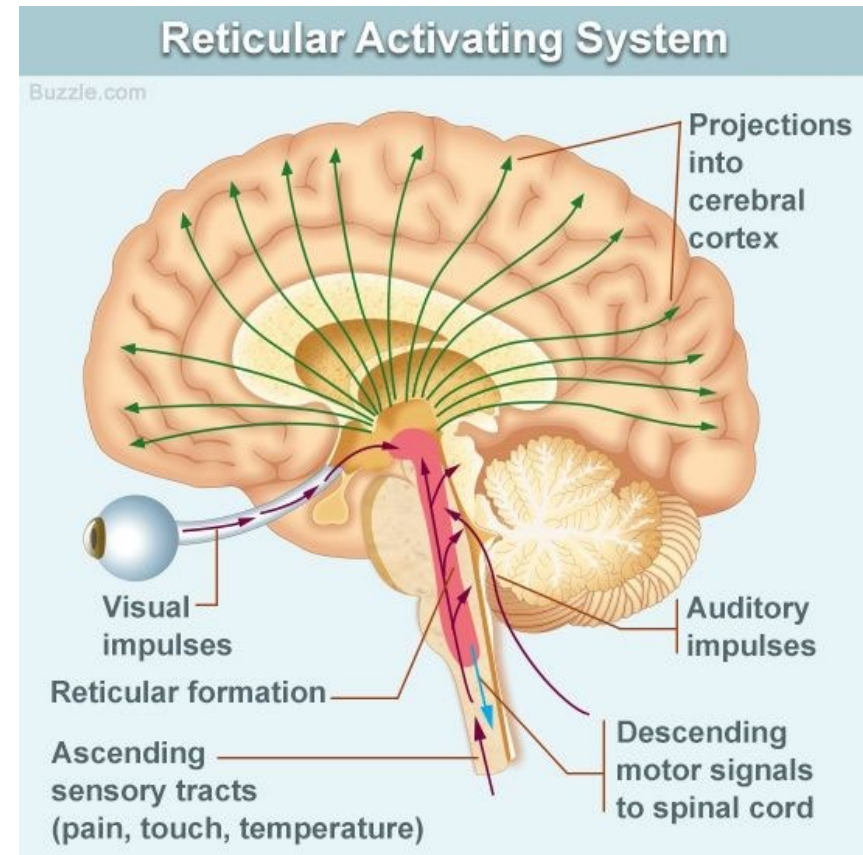
Filters all incoming sensory stimuli and makes the decision what to attend to or ignore.

Novelty and curiosity are prioritized.

“the hook”

Perceived threat receives the highest priority.

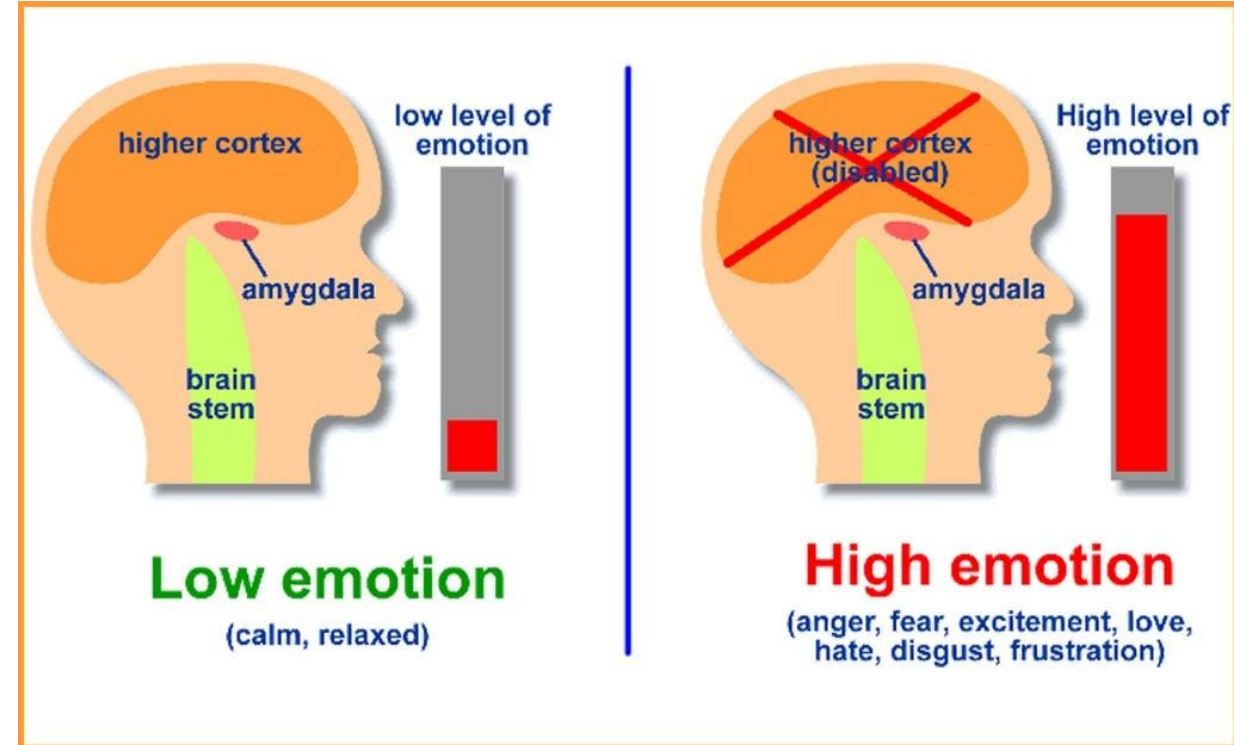
Willis 2017



Next the Emotional Switching Station

For information to pass through, brain cannot be in a high state of stress. Importance of positive climate for risk taking.

If stress, directed to lower brain, an involuntary – flight, fight or freeze response will occur.

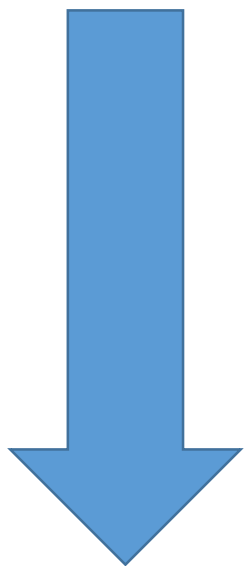


Common set of factors that predispose children to positive outcomes in the face of significant adversity

- facilitating supportive adult-child relationships;
- building a sense of self-efficacy and perceived control (agency);
- providing opportunities to strengthen adaptive skills and self-regulatory capacities;
- mobilizing sources of faith, hope, and cultural traditions.
- <https://developingchild.harvard.edu/science/key-concepts/resilience/>



- The brain needs to predict and plan to organize thoughts and behaviors.
- Knowing a plan and being able to predict what will happen can help to reduce anxiety.



- Adult regulation
 - Co-regulation
- Other regulation
- Self-regulation

- Use of Mediators



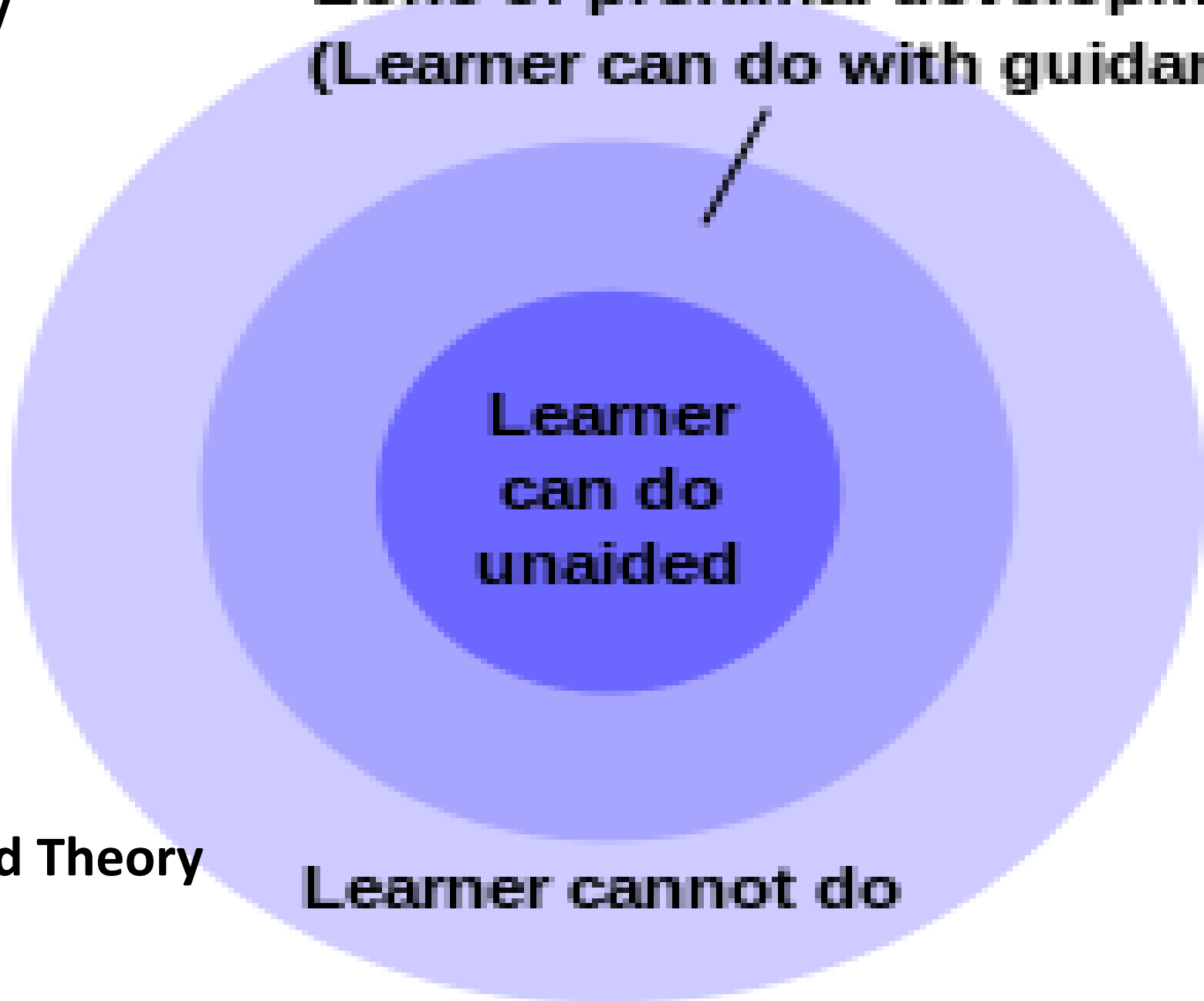
Lev Vygotsky

**Zone of proximal development
(Learner can do with guidance)**

**Learner
can do
unaided**

**Cognitive Load Theory
Sweller**

Learner cannot do



Organizing the Classroom

The Role of Visual Mediators and Visual Distractions

- **Classroom environment**
- **Classroom rules that are actionable**
- **Daily Schedule** – posted with each activity
use of small group and learning centers
- **Linear calendar**
- **Who chooses (goes) first**
- **Activity management**

Daily Schedule



Arrival



Breakfast



Morning Meeting



Indoor/outdoor Centers



Largemotor



Lunch



Rest time



Snack



Largemotor



Dismissal

Daily Schedule

Key Ideas

- ❖ BIG
- ❖ Paired with an icon or picture
- ❖ Flipped over or with a clip

Daily Schedule

Arrival

Breakfast



Guided Reading



Daily Five Centers



Lunch



Recess



Writer's Workshop



P.E.



Calendar



Math



Snack



Dramatic Play



Stations



Pack Up



Dismissal

Linear calendar



Who Chooses First? Use for play choices, etc.

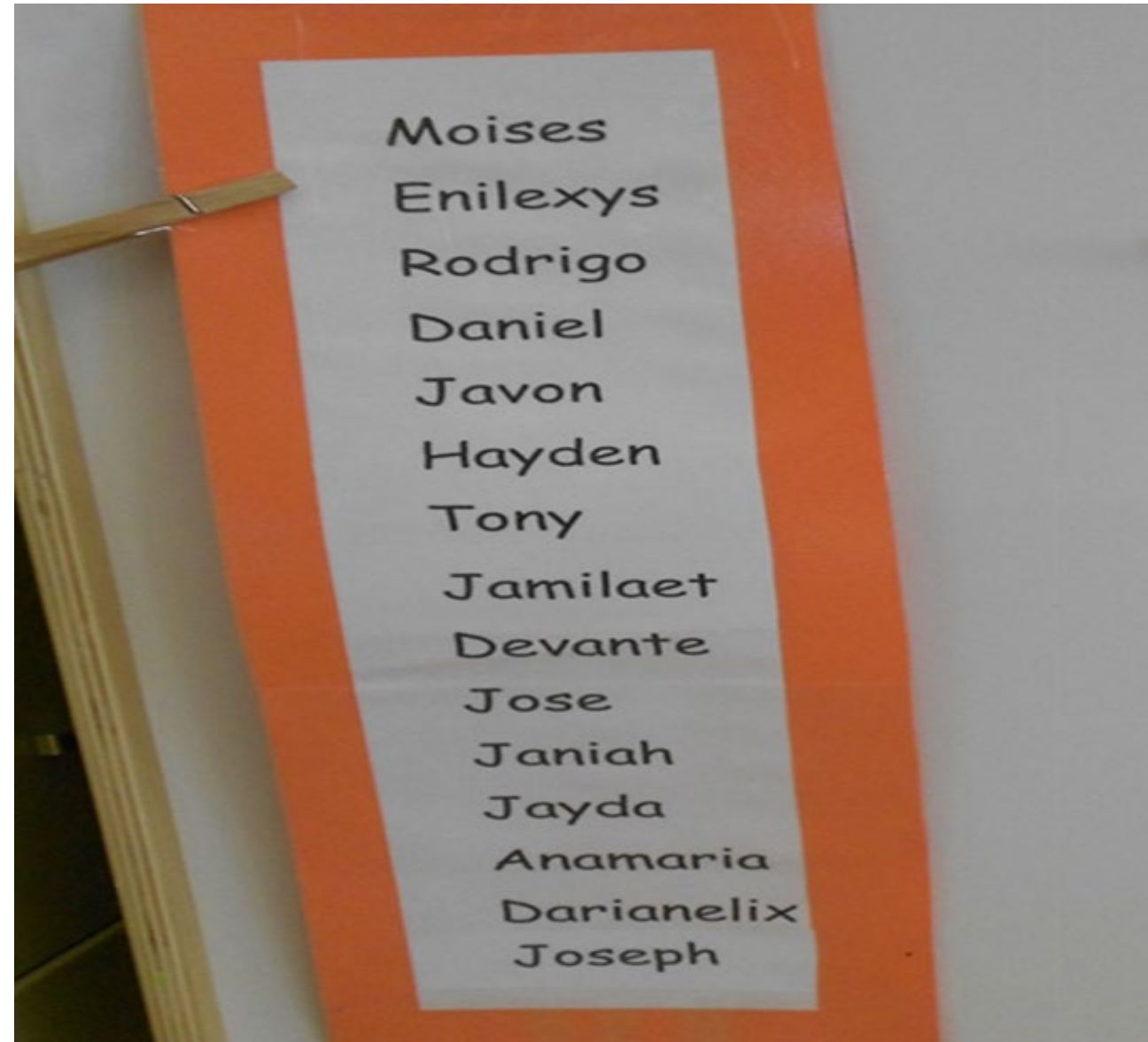
A list of the names of the children in the class:

The clip indicates whose turn it is to choose a center or activity first.

Each day the clip moves down to the next child.

Children learn to anticipate when it is their turn to go first.

Children go first because it is her/his turn.



Activity management: Visual mediator for choices



Sustaining attention and engagement

- Choice - agency
- Novelty (pattern change) correlates with attention
- Curiosity
- Prediction
- Personal relevance
- Appropriate risk or challenge
- Instruction planned with inquiry and discovery can stand alone to captivate and sustain attention
- **Dopamine (enjoyment with risk-taking) release sustains interest and perseverance, increases creativity, curiosity and motivation**

Making learning stick – Long term memory

- Curiosity and interest
- Practice new learning over time
- Practice and reflect
- Extend and apply

Memory storage vs memory retrieval

<https://www.mcrel.org/a-three-step-guide-to-making-student-learning-stick/>

A False Dichotomy



Academics



PLAYFUL

LEARNING

Purposeful or intentional play, guided discovery, playful learning is NOT:

Indoor recess

Release at the end of the day
because children
have worked so hard



Academics

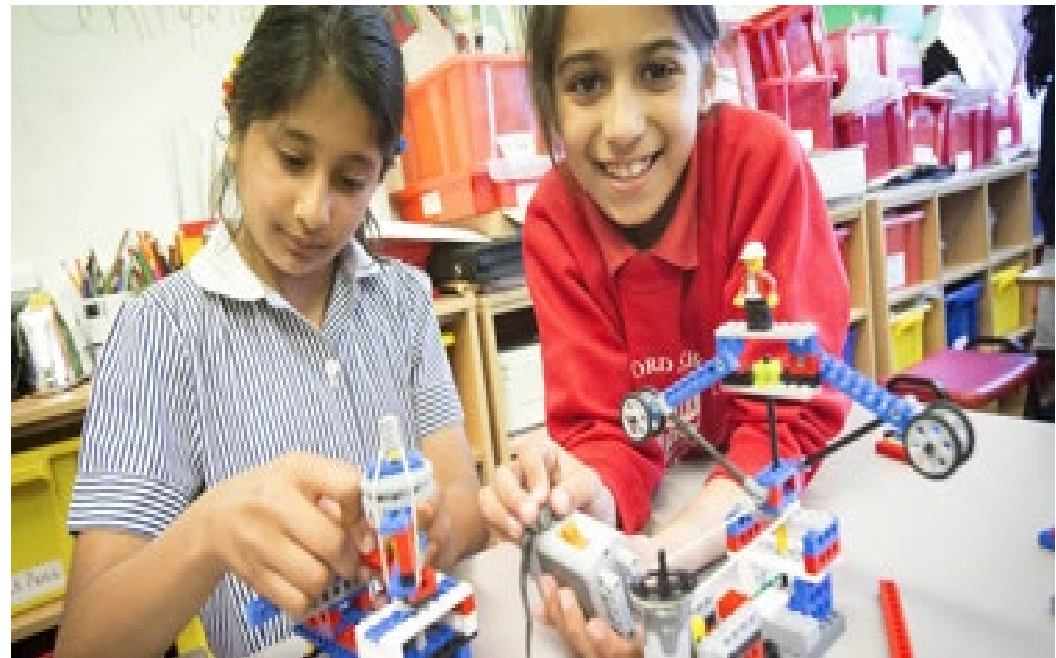
The content and skills are the concrete items that students need to know, understand and do.

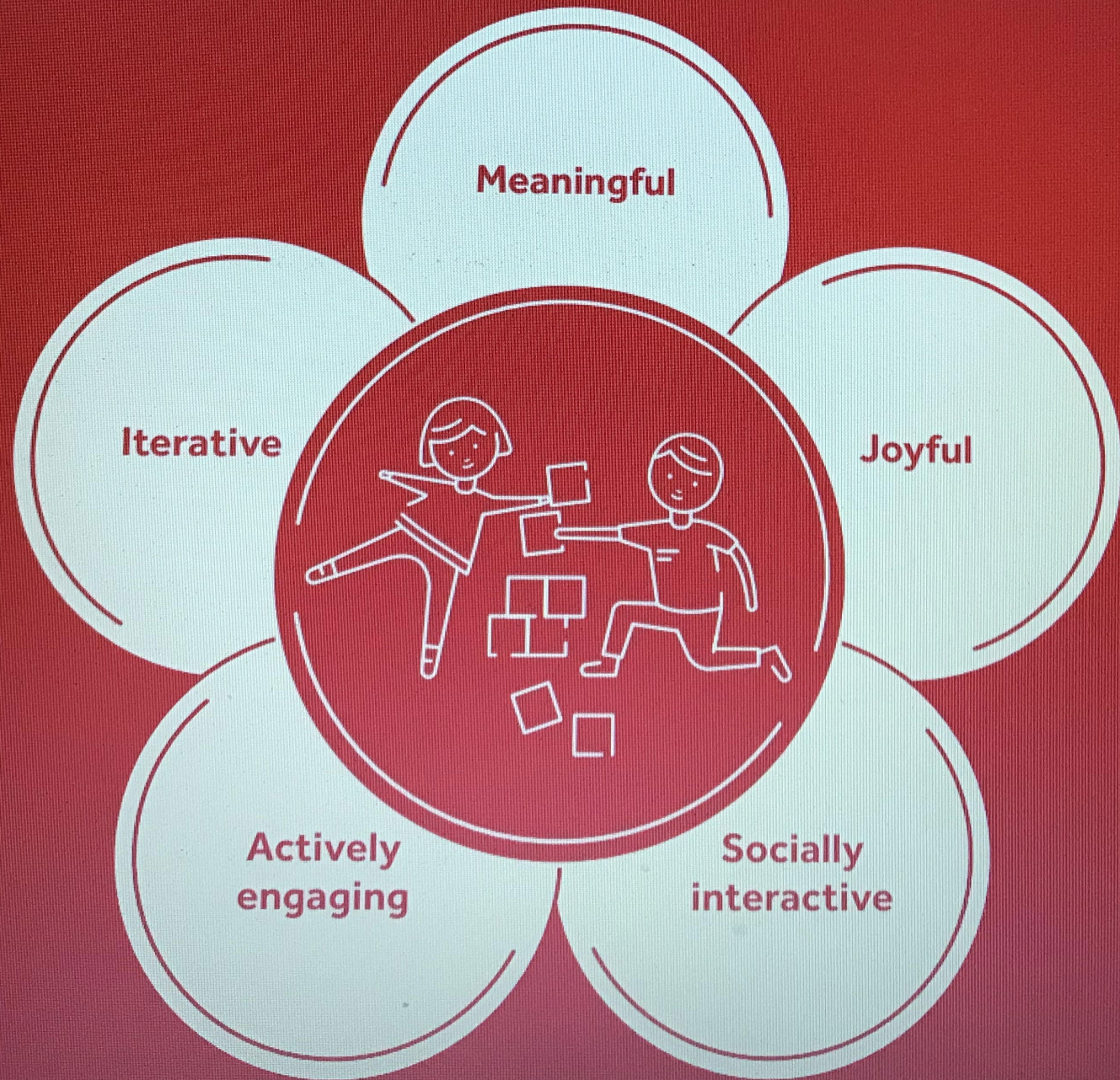
“When academic content is integrated, students explore a concept or skill repeatedly through the day in different ways and through various lenses, allowing for broader application of the individual skills and a greater conceptual understanding of the world.”

Literacy Now



Longitudinal research has demonstrated that children who are educated in play-based environments have the added advantage of being strong problem solvers, more flexible thinkers and better at collaboration. (Miller and Almon, 2009)





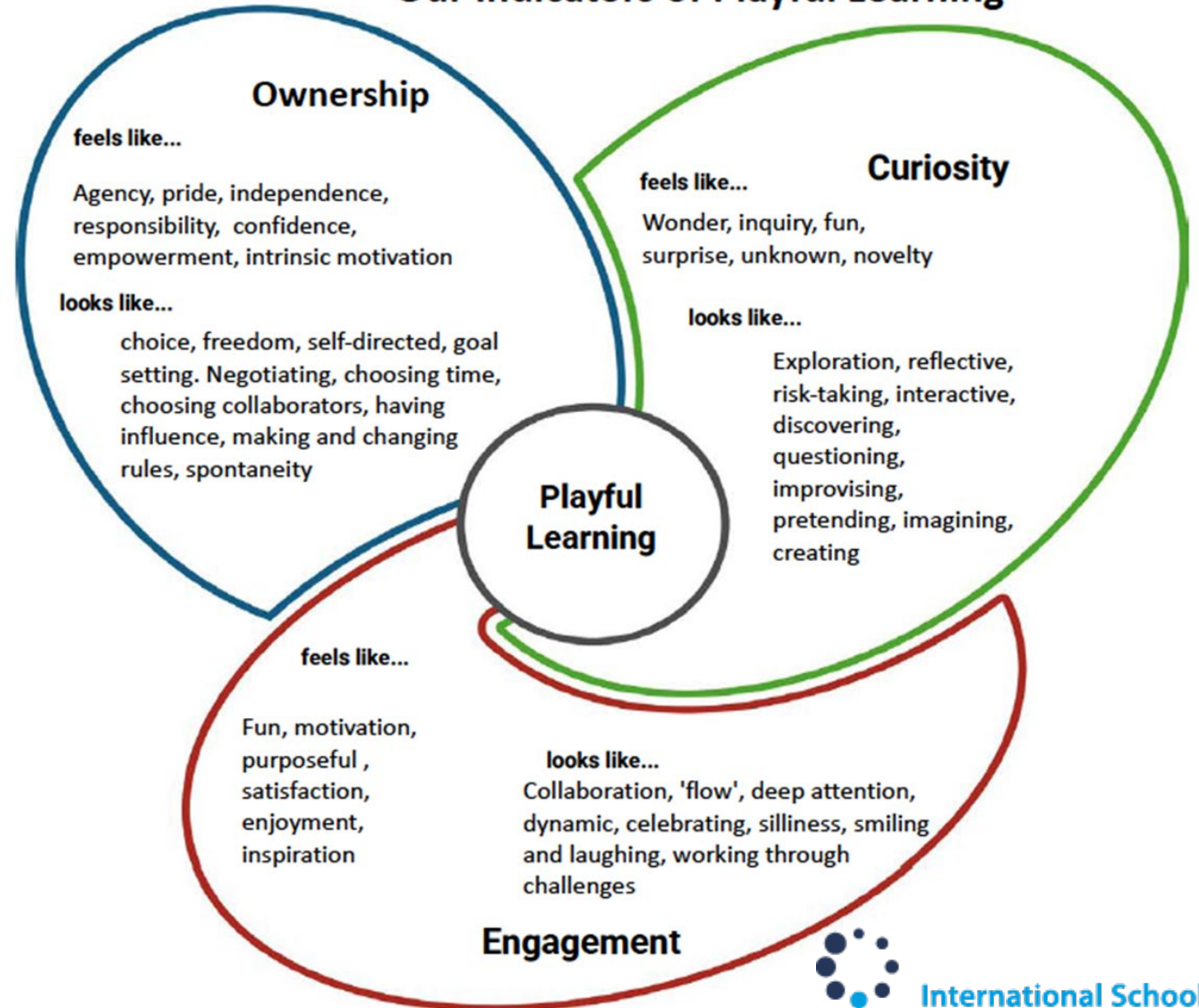
The LEGO™ Foundation

<https://learningthroughplay.com/explore-the-research/the-scientific-case-for-learning-through-play/>

Pedagogy of Play
 Cultivating school cultures that
 value and support learning
 through play

<https://pz.harvard.edu/projects/pedagogy-of-play>

Our Indicators of Playful Learning



Purposeful play: Provocation, challenge, problem to solve

- Helps to give children ideas
- Guides discovery
- Sustains attention to task
- Allows for different approaches and solutions
- Addresses standards

Learning Scenario

- Starts with a big idea
- Tied to standards and curriculum
- Draws from what children know and what questions that they have
- Builds background knowledge and context
- Builds social interaction and cooperative work

**“SCIENTISTS HAVE RECENTLY
DETERMINED THAT IT TAKES
APPROXIMATELY 400
REPETITIONS TO CREATE A NEW
SYNAPSE IN THE BRAIN –
UNLESS IT IS DONE WITH PLAY,
IN WHICH CASE, IT TAKES BETWEEN
10 AND 20 REPETITIONS!”**

- DR. KARYN PURVIS

“What we process we learn.”

Peter Doolittle, Professor of Education, Virginia Tech

https://www.ted.com/talks/peter_doolittle_how_your_working_memory_makes_sense_of_the_world?language=en