Science of Learning

Instructional Effectiveness	X	Learning Effectiveness	=	Academic Success
Curricula		Homelife--stress/trauma		
Teacher effectiveness		Social emotional skills		
Learning environment		Background knowledge		
		Cognitive skills		

Differences in Learning Outcomes

Why does one student succeed while another fails in the same classroom, using the same curriculum, being taught by the same teacher?

It is possible that a teacher can impact outcomes due to individual student biases

But this possible bias is not sufficient to explain the widespread inequities in educational outcomes

Since outcomes are not primarily driven by differences in instruction in each classroom, differences in learning effectiveness may explain the inequities.

Different outcomes from one classroom or school to another may be impacted by instructional differences but are also likely impacted by differences in learning effectiveness.

Instructional Effectiveness

There are three major categories that impact instructional effectiveness:

- Curricula
- Teacher effectiveness
- Learning environment

Curricula

- Content
- Materials
- Strategies
- Organizational structure; how the material is presented

Teacher effectiveness

- Background
- Level of education/training
- Experience
- Mindset
- Style
- Degree of connection/relationship with students

Learning Environment

- Safety
- Size of classroom and school
- Degree of bullying
- School spirit
- Student engagement
- Discipline
- Quality of infrastructure/degree of comfort
- Quality of support materials (labs, etc.)

Learning Effectiveness

There are four major elements that impact individual student learning success:

- Homelife
- Social emotional skills
- Cognitive processing skills
- Background knowledge and experience

Homelife

- Stress and trauma
- Family attitude and support for education
- Cumulative impact of life experiences
- Relationship stability
- Housing security
- Nutrition
- Sleep
- Access to resources

Social Emotional Skills

- Mindset: Fixed vs. Growth
- Self-esteem
- Self-regulation
- Persistence
- Resilience
- Executive function

Cognitive Processing Skills

- The brain takes in sensory inputs and makes sense of the world and guides how an individual interacts with their environment
- Example foundational cognitive skills
  - Memory
  - Processing speed
  - Attention
  - Auditory processing
  - Visual processing
  - Logic and reasoning

Background knowledge and experience

- Every life experience, even starting in the womb, helps to shape the neural networks that build each individual's brain
- Even negative experiences have their place to paint a more complete picture of the world and to help build resilience, but not too much
- The broader the background knowledge, the better prepared a student is to understand and learn

Summary

- Instruction matters
  - But when some students succeed while others fail in the same classroom, other factors need to be considered
- Learning effectiveness matters as much as instruction
  - In many cases, factors that impact learning are more relevant to academic success
- Broader education success depends upon considering both factors