A Neuroscience-Informed Approach to Learning & Curriculum Reform

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Abstract

Educational systems continue to grapple with rising complexity, yet many reforms remain misaligned with how the human brain learns. This paper presents a neuroscience-informed framework for curriculum reform, integrating research on neuroplasticity, executive function, and nervous system regulation with principles of instructional design and educational policy.

The proposed model reconceptualizes curriculum as a living ecosystem rather than a static document. It emphasizes depth over breadth, aligning with cognitive science to reduce curricular overload while fostering meaningful, transferable learning. By explicitly supporting executive function and metacognition, often invisible yet critical drivers of equity and performance, educators can better address the diverse needs of learners. Central to this approach is the recognition that connection precedes cognition: when students and teachers experience psychological safety, stress regulation, and relational trust, motivation and memory are significantly enhanced. Drawing on international case studies and backward design principles (UbD), this paper highlights how desirable difficulty, sustainable pacing, and regulation strategies can transform both classroom practice and system-level reform. The paper further addresses the dangers of reform fatigue, advocating for mutual adaptation between innovation and local context to ensure fidelity without overwhelming educators. Ultimately, this work invites a paradigm shift: education as a neurobiologically aligned ecosystem where sustainable reform honours both student diversity and teacher well-being, cultivating resilience and capacity for an unpredictable future.

Keywords: Backward-Design; Curriculum-Reform; Deep-Learning; Executive-Function; Psychological-Safety