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Evolutionary Development of Our Brains and the Implications of this for Education, Pedagogy, and Didactics

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Review Article

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Abstract

How can we enhance student motivation in educational settings? How can we improve academic performance? Moreover, how can we foster greater mutual understanding among students to reduce disruptive and bullying behaviours?

This article examines recent scientific insights addressing these questions, particularly the critical role of brain functioning in learning processes. Furthermore, it explores how current educational paradigms contradict neurological functioning, consequently diminishing student motivation and performance while reducing mutual understanding and increasing the probability of undesirable behaviours such as bullying and interpersonal conflict.

These insights are grounded in a theoretical framework central to this article: Creative Action Methodology, abbreviated as CAM.

Beyond presenting these insights, this article addresses solutions. What interventions align better with neurological functioning? What impact do these interventions have on student motivation and performance? What effect do they have on mutual understanding?

The results of applying these solutions are primarily derived from three doctoral dissertations published in recent years. For these studies, researchers designed and tested CAM-based interventions to enhance student motivation and performance, as well as to promote mutual understanding.

In addition to these doctoral studies, this article incorporates over twenty smaller-scale investigations. These studies were predominantly conducted by primary school teachers and principals who designed and tested CAM-based solutions within their educational practice.

For practical reasons all the designs and tests of the researchers, school teachers and principals have been performed in the Netherlands.

The results of all these tests demonstrate that prevailing educational approaches fundamentally conflict with neurological functioning. When CAM-based solutions are designed and implemented, student motivation, academic performance, and mutual understanding increase significantly.

This reveals a particularly noteworthy finding. There exists a tendency to attribute poor outcomes to individual deficits, manifested in statements such as "She lacks motivation" or "He demonstrates self-centred behaviour." However, the collective body of research indicates that this is fundamentally a cultural phenomenon. By fundamentally reconceptualizing education; restructuring educational delivery accordingly; modifying pedagogical approaches; and aligning instruction with students' neurological functioning; student motivation, performance, and mutual understanding demonstrate significant improvement.

Keywords: Evolutionary Development; Brains; Education; Pedagogy; Didactics

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Abbreviations

RDD: Research Development Diffusion; CAM: Creative Action Methodology

Rationale

Do you accept the validity of social scientific research? Many distinguished scholars do not. They contend that social scientists perform work analogous to journalists, who examine events from particular perspectives and document their observations.

From their scholarly perspective, scientific validity requires satisfaction of the "predictability" criterion. Those who genuinely comprehend systemic functioning can generate predictions. They possess the capacity to predict "if we implement x, then y will occur."

Manzi articulates this limitation of social sciences as follows: "Science may someday allow us to predict human behaviour comprehensively and reliably. Until then, we need to keep stumbling forward with trial-and-error learning as best as we can" [1]. Or, as Mark Twain observed: "To predict is difficult, especially regarding the future."

This predictive limitation constitutes the impetus for this article. Examination of educational research in the Netherlands reveals that parental educational attainment has consistently been the strongest predictor of children's academic outcomes [2-4]. Parental education accounts for approximately 15 to 20 percent of the variance in students' Grade 8 standardized test performance. Conversely, IQ—which might reasonably be expected to serve as a robust indicator—accounts for only approximately 10 percent of variance in students' standardized test outcomes [5].

All other factors logically expected to demonstrate predictive utility, including pedagogical methodologies or educational models, exhibit even lower predictive validity than parental educational attainment or student IQ.

This predictive limitation extends beyond education to encompass all social scientific domains. To date, no researcher has successfully resolved any social phenomenon, such as suicide, stress, or interpersonal violence.

Recently, this situation has been transformed through development of Creative Action Methodology, abbreviated as CAM. Interventions designed according to this theoretical framework demonstrate predictive validity of approximately 50 percent [6,7]-substantially exceeding previous social scientific achievements. Student motivation, performance, and mutual understanding increase significantly through CAM application. This article aims to disseminate this development.

The Current System: The RDD Model and the Culture of Truth

In many countries knowledge transmission occurs via the RDD model (Research, Development, Diffusion) [8]. Universities conduct Research and Development, subsequently Disseminating this knowledge to practitioners. In the 1980s, with governmental support, the educational sciences discipline was established in the Netherlands. The objective? To enhance Dutch educational quality with the aid of this RDD model.

The application of the RDD model remains clearly evident in contemporary pedagogical practice. Knowledge developed at universities is transmitted to teacher training institutions. Teacher education students learn prescribed instructional methods, subsequently implementing them in secondary and primary education. Using their pedagogical training, they instruct students regarding gravity, slavery, mathematical problem-solving, essay composition, marketing plan development, stress management, stadium construction, child-rearing, and numerous other topics.

Reflective learning is not emphasized. Questions such as "What are potential limitations of gravitational theory?", "What alternative perspectives on slavery exist?", "Are alternative mathematical problem-solving approaches viable?" or "Can essays employ structural formats beyond introduction-body-conclusion?" receive minimal attention.

Consequently, a culture of truth predominates. Science establishes "truth," which is transmitted to educators, who subsequently teach students "what is true" and "prescribed methodologies."

As a result: the autonomy of teachers declines. Rather than independently or collaboratively determining student's needs, a different type of educators emerges. Educators who learn "how and what to teach" during their training and are "evaluated accordingly." Education primarily denotes: "To tell students the truth about the way the world functions and to prescribe the correct behaviour and approaches to solve issues".

Since the 1980s educational sciences program launch in the Netherlands, Dutch educational standards have progressively declined [9]. The NOS reported in 2018 [10]: "Dutch education is declining: standards have dropped for 20 years, says the education inspectorate".

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This decline is still going on. The education inspectorate of the Netherlands reported in 2024 [11]: "Increasing numbers of students demonstrate inadequate mastery of fundamental language, mathematics, and citizenship competencies." This raises the question: What explains this phenomenon?

Creative Action Methodology

Social scientific literature typically explains human behaviour through psychological and social factors, including IQ, social media influence, parental roles, et cetera. CAM explains human behaviour through biological foundations. More specifically: human behaviour is explained through evolutionary theory.

What does this unconventional theory entail? CAM posits that human brains evolved as creative problem-solving mechanisms. Who demonstrate optimal survival skills? Those demonstrating superior problem-solving capabilities.

For educational and developmental effectiveness, instruction must align with this creative neurological functioning. For example, by presenting students solutions for existing problems and stimulating the development of new creative solutions for these issues. For example, by engaging students with problems relevant to their daily experiences or interests. For example, by facilitating student reflection on existing and creatively generated solutions, enabling reasoned decision-making. For example, by incorporating game-based pedagogical approaches-replacing traditional mathematics instruction with activities such as darts.

When this alignment does not occur—when instruction contradicts naturally creative, problem-solving neurological functioning—cognitive "resistance" emerges: the motivation for learning and behavioural modification decrease [12-14].

You would expect that these innate creative and problem-solving capacities increase with age because "practice makes perfect". However, the inverse occurs. These innate capacities progressively diminish with age [15-17]. What explains this phenomenon?

The explanation lies in the previously discussed RDD model-based educational sciences program establishment. Consequently, a singular truth emerges: the truth developed in university educational sciences programs. Those who deviate face consequences: failure to complete teacher training or classification as inadequate educators. Consequently, there is no "practice makes perfect". The opposite is true.

But what occurs when prospective teachers are encouraged to implement Creative Action Methodology? What happens when they are asked to align instruction with neurological functioning, considering the specific student population? For example, when students are particularly young, or when the class includes numerous children with ADHD, et cetera.

And what happens to educators themselves? How do they experience transitioning from "implementing prescribed pedagogical approaches" to "autonomously designing instruction based on CAM, tailored to specific student populations"?

The following sections address both questions. First, CAM parameters are examined. These constitute guidelines provided to prospective teachers for lesson development, including their effects on student motivation and performance. Subsequently, teacher experiences are examined. What effects does CAM implementation have on educators?

CAM Effects on Students

When using CAM, instructional responsibility resides with educators [6,18,19]. They cultivate strong student relationships, thereby progressively deepening their understanding. Based on this knowledge, educators implement CAM parameters—guidelines applied when aligning instruction with students' experiential contexts. These parameters include:

Maximize conceptual thinking stimulation

Presentation of multiple perspectives stimulates students to reflect, devise creative solutions, and exercise autonomous decision-making.

Maximize engagement with practical problems students encounter in daily life

Presentation of multiple perspectives on practical problems from students' experiential contexts stimulates reflection, creative solution development, and autonomous decision-making.

Employ inquiry-based approaches maximally

Questioning stimulates students to reflect, devise creative solutions, and exercise autonomous decision-making.

Employ advisory-based approaches maximally

Multi-perspective explanations and advisory guidance facilitate knowledge transmission while stimulating autonomous student decision-making.

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Maximize dialogical engagement

Engaging in dialogue (including regarding teacher-provided explanations and advice) stimulates students to reflect, generate creative solutions, and exercise autonomous decision-making.

Maximize student autonomy in decision-making

Enabling autonomous student decision-making (by withholding evaluative judgments) enhances motivation for reflection and creative solution development.

Maximize student responsibility for their decisions

Making students accountable for their decisions and consequences enhances motivation for reflection and creative solution development.

Employ game-based approaches maximally

Develop instructional activities where students, for example, do not perceive themselves as learning mathematics or geographical nomenclature, but acquire these competencies through games such as darts and Stratego.

The educator directive states: "Implement CAM guidelines for your instructional group. This constitutes a relative rather than absolute objective. Specifically: Assess guideline feasibility within your specific student population. Modify instruction to the extent you consider feasible for your particular student group."

Educators were informed that while guidelines concern autonomy enhancement, boundaries must remain explicit for students. Profanity, physical aggression, bullying, or denigrating comments are prohibited. The guidelines establish frameworks permitting diverse behavioural and opinion expressions, while strictly enforcing framework boundaries.

In conducted experiments, prospective teachers modified their instructional approaches. Educators demonstrated need for collegial consultation, which proved supportive when organized.

De Vries's dissertation [14] examined the extent to which educators successfully implement CAM through information provision, coaching, and collegial consultation. It also examined CAM effects on students regarding:

- Student learning motivation
- Academic performance
- Oppositional classroom behaviour

De Vries hypothesized that as educators more effectively implement CAM, student motivation and academic performance significantly improve, while oppositional classroom behaviour simultaneously decreases significantly. These improvements occur because CAM better aligns with neurological functioning than conventional education.

This hypothesis received strong empirical confirmation. The extent of educator CAM implementation predicts approximately 50 percent of variance in student learning motivation, academic performance, and oppositional classroom behaviour—representing substantial advancement over previous research (see Section 1).

Van Melle's dissertation [13] demonstrates that improved educator CAM implementation corresponds with increased mutual understanding. His educational practice experiments show that mutual understanding among individuals from diverse cultural backgrounds increases significantly when educators effectively implement CAM. CAM demonstrates considerable efficacy in promoting integration and countering prejudice.

CAM Effects on Educators

Annema [19] describes the learning trajectory students experience when first encountering CAM during their graduation process. This trajectory is reflected in Figure 1.

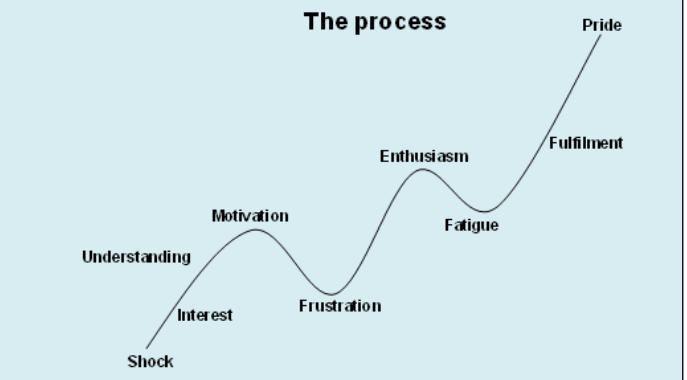


Figure 1: Process overview of CAM implementation with students.
Source: Annema (2009)

Students initially demonstrate enthusiasm while seeking solutions to selected practical problems, but subsequently experience cognitive dissonance. How can there suddenly not be a single correct answer, contrary to their educational conditioning and examination experience? How can educators suddenly acknowledge uncertainty regarding

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numerous problems?

Students then receive explanation that although social and economic scientists conduct extensive research, adequate solutions to most problems remain elusive. For addressing their current problem, utilizing scientific knowledge and experience proves beneficial. However, incorporating practitioner knowledge and experience is equally important—enabling autonomous (creative) solution development based on comprehensive knowledge and experience.

Student enthusiasm subsequently increases. Students consult diverse sources and generate numerous potential problem solutions. They simultaneously recognize their problem's complexity, producing some fatigue. However, upon devising a (creative) solution, enthusiasm increases substantially.

An identical learning trajectory occurs among educators when CAM-based management is implemented. The learning trajectory of educators at a large North Brabant primary school was documented by the education inspectorate [20]. This trajectory appears in Figure 2.



Figure 2: Process overview of CAM implementation with educators.
Source: Education Inspectorate (2019)

The trajectory initiates with an announcement by the director that educational improvement is achievable and that responsibility resides with educators. They are the experts who understand necessary classroom improvements and now possess autonomy to address this challenge independently.

This announcement substantially motivates educators toward instructional innovation, but implementation proves more challenging than anticipated. Why? Because educators are shown the value of educational scientific knowledge. Because they are asked to document others' practical experiences and learn that each situation requires different interventions. Because they recognize that intervention success also depends on implementation context. This problem complexity produces some fatigue. However, upon selecting specific educational improvement measures: self-efficacy, occupational satisfaction, and teaching motivation increase.

Buijsen [21] also documented CAM effects. His study demonstrates that CAM implementation produces:

- More open school climate. Greater inter-educator discourse emerges.
- Occasional educator departure. Why? Because some educators cannot manage autonomous instructional adaptation and resultant accountability for student outcomes.
- Reduced workload perception. Educators remain occupied, but autonomy alters this experience.
- Improved school climate. Enhanced educator autonomy and instructional accountability increase professional consultation.
- Increased occupational satisfaction. Enhanced personal responsibility primarily contributes to this outcome.
- Decreased educator sick leave.
- Self-selection effects. Autonomous, innovative educators demonstrate greater institutional retention than those experiencing discomfort with this approach.

Conclusions and Recommendation

All investigations demonstrate CAM's substantially positive effects on student motivation and academic performance. Student mutual understanding also increases, substantially reducing fighting, bullying, and interpersonal conflict probability.

School climates improve. Educators experience enhanced occupational satisfaction. Their sick leave decreases and they experience reduced workload perception.

These positive outcomes resulted from CAM implementation: the proposition that instructional effectiveness is determined

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by neurological functioning, with educator guidelines formulated accordingly. Educators operationalize these guidelines based on their specific student populations.

More research is needed. Especially about developing and testing a robust training program for executives and teachers.

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