

Cognitive Enrichment: An Imperative for 21st Century Education

A Position Paper

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The problem

The celebrated educational philosophies of the day and our current education practices are incongruent. While the importance of high-levels of learning and reasoning abilities is central in the national dialogue about global competence and 21st Century skills, our education practices remain largely impassive to the *development* of such skills. The striking disparities in student learning and reasoning abilities are indeed already documented at the nation's preschools (National Academy of Sciences, 2003)¹, but the persistence of achievement gaps over the following school years point to the magnitude of a problem schools must solve. If we are to be successful, the practices of teacher preparation and professional development must re-focus on the *development* in students of high-levels of learning and reasoning abilities, and school leaders must urgently seek effective research based programs that can help. In the following pages I will address what we consider to be high-level learning and reasoning skills, what we believe can be done immediately to that end in terms of teacher preparation and professional development, how we think we can do it, and what we believe is needed for a sustainable and scalable reform.

The transcending target of educational activities ought to be fixed on cultivating learning dispositions

We believe that a high-level of learning and reasoning ability is a product of at list five human dispositions:

- a) **Effective learning and academic achievement is a function of cognitive efficiency:**

¹ National Academy of Sciences (2003) Executive Summary. From *Neurons to Neighborhoods: The Science of early childhood development*. www.nas.edu

In reading this article, you exercise not only your ability to read, but also your ability to gather information at the proper level of precision, understand and define the relevant problems in and about this article, locate and focus on the relevant information, produce a whole picture from the pieces you read, and relate what you understand to your own experiences, etc. You must have acquired not only the skill of reading, but all the cognitive functions that are involved in the process of understanding. In fact, while the formal learning of academic skills such as reading is properly “schooled,” the *formal learning of the underlying cognitive functions is not*. You are among the lucky individuals who had opportunities in your formative years to develop a great deal of such cognitive functions *independently of your school experiences*. However, the opportunities to develop such cognitive functions that way are becoming increasingly scarcely in the busy 21st century, where parents, often single parents, work outside their home, children grow up alone trying to make sense of a world that is far more challenging than it has been for previous generations. We believe that this reality may present a more plausible explanation to the epidemic proportions of various learning disabilities in the western-world, and to the preponderance of such conditions among the poor, than new viral infections or other new bio-environmental conditions.

We argue that enhancing the new generation’s education to meet the 21st Century challenges is not just a matter of supplementing the school programs with new contents, technologies, rigorous assessment methods, art experiences, physical and social activities, or behavior management techniques. Rather, we believe it is imperative that we supplement the education program with a focused cognitive enrichment component.

b) Effective academic experiences involve abstract thinking.

We often witness the great efforts made in new education programs and practices in to shape students’ learning experiences through concrete “hands-on” activities. Even if such effort show immediate results of some sort, they do not necessarily offer opportunities to “stretch” students’ minds to the point that they learn to generalize, analyze, formalize, induce ideas, conceptualize, categorize, find patterns etc.. Enhancing the students’ ability to meet the 21st Century challenges cannot be limited to providing students with *more* manipulatives, ready-made organizers, and easy access to technology. Rather, to develop students’ abstract thinking we must engage them from the primary grades with

opportunities to learn how to compare by multiple criteria of their choice, categorize into multiple classes and categories as they deem critical for a particular purpose. They must learn to induce rules for the aggregation and segregation of objects and events, and argue and use the principles of logic to buttress arguments. We argue this can be achieved in the most prudent, economical way when teachers follow a well organized and systematically progressive format of cognitive enrichment activities that aim at the development of abstract thinking.

c) Academic achievement is associated with intrinsic motivation

It has been abundantly documented that there is a high correlation not only between achievement and intrinsic motivation to learn, but also between intrinsic motivation to learn and successful career development, job satisfaction, even happiness. Yet, the practices of the past century, predicated upon the behaviorist tradition, that emphasize the motivation to achieve over the motivation to engage in challenging academic tasks for the “fun of it” still dominate the reality in typical schools. We all know that the level of the intrinsic motivation to learn is highest in preschools, before children come to school, and it deteriorates from there on. We believe that this state of affairs is largely attributable to the growing experience of *failure to meet the academic learning challenges*. It implies that if we want to develop intrinsic motivation, we must start with the enhancement of students’ *cognitive capacity* to meet the challenges – and we must do so from the outset, as they enter our education institutions. We therefore advocate for cognitive enrichment from the preschool level throughout.

d) Academic achievement is associated with students’ active participation (learning)

A quick glance at a typical classroom reveals the diversity of students’ engagement. Some students are not at all engaged in the learning process, some raise their hands completing for their teachers’ attention. However, more importantly, rarely do students *ask* “Why?” questions. If student learning is to be intrinsically motivated, and if it is to lead not only to the accumulation of information (knowledge) but to life-long learning, than this classroom reality must change. We must teach students that they can question the validity of the information they encounter, and they can generate new and valuable ideas and make their unique contribution to the learning process. We all agree that must

prepare students who are well educated to seek and generate ideas, communicate effectively, listen critically to peers, and be constructively critical even of their teachers' arguments – for the 21st century... We, at iRi, believe that with a well structured and sequenced cognitive enrichment program that is engaging, content independent (extracurricular), and rich with discussion, teachers have the best opportunity to develop and cultivate in students the habits of active participation. We have seen that such classroom culture of active participation in learning turns eventually into a personal student trait.

e) Insight is a key learning disposition

What do you the reader do when you failed to reach a goal, or failed to solve a problem? Do you “move on” attempting another solution without reflecting upon failure and without learning from it? When you succeed beyond your own expectation, do you not wonder what to attribute your success to, so that you can repeat your experience of success? You do! You are successful today because you have learned from your experiences! Now consider for example our typical math lessons, where every student knows when they err and every teacher knows their students' errors. Indeed, the errors are typically acknowledged and the correct alternatives are more often than in other academic subject classes proposed by successful solvers. However, almost by rule there is no reflection over the errors: How were they committed? Was the error rooted in a misconception, or was it a particular kind of a processing or “careless error? What should be done to prevent it in the future? Now think: How likely is it that if errors are not treated this way in the classroom, under teacher supervision, students will who committed them will always reflect these questions constructively at home? Our point is not just that this type of reflective practices will improve math, or any other subject instruction. We argue that reflection upon past experiences is necessary in a productive life in the 21st century, more than ever before.

The foundation and model for such reflective practices can be set in a cognitive enrichment program where the “authorities” for the judgment of execution are reserved for the students themselves, not imposed by the teachers who students perceive as the ultimate “knower.”

We strongly believe that if as a society we accept the premise that learning dispositions can be enhanced, than in the 21st century schools *must* “step up to the plate” and offer children not only new cognitive challenges, but cognitive enrichment programs that enable them to meet the challenges of learning and developing competitive skills.

Investment in cognitive based professional development for teachers is key

We follow Reuven Feuerstein’s theory of mediated learning that is founded upon cross-cultural anthropological research on cognitive modification and the implied practices of mediated learning (the interested reader will find the theory elaborated extensively elsewhere²). Suffice it here to mention the major contrast Feuerstein draws between mediated to non-mediated learning practices.

Although less prevalent, mediated learning experiences that target the enhancement of cognitive abilities represent more intense learning experiences than non-mediated learning, Such experiences are always systematic, well organized and carefully articulated by a mediator’s (parent, teacher) intention that the learning will transcend a given content and context and produce an insight that has lasting transferable effects. The more prevalent non-mediated learning experience is characterized as an interaction that targets the acquisition of facts and models of behavior, and does not deliberately but rather randomly and episodically addresses the underlying cognitive processes.

Preparing teachers as *mediators* implies:

1. Acquisition of an ability to analyze the cognitive challenges in learning tasks and assess students’ performance in terms of cognitive processes and affective dispositions according to a well defined conceptual framework. Table I below provides a brief example of some of these functions and their relevance across the curriculum.
2. Acquisition of a skill-set of instructional practices, including effective questioning that target processes of thinking, careful attention and response to student processing errors, and excellent classroom management skills.
3. Availability of and training to use a well organized, systematic and progressive cognitive enrichment program.

² MLE.....

Over two-three years of engagement with Feuerstein’s Instrumental Enrichment program teachers acquire these skills and do learn a successful model of mediation. However, teachers also need help understanding the fundamental concepts they teach in the respective content areas; and they need help guiding their students in integrating the concepts they learn into the broader curriculum.

Feuerstein’s work has generated many research studies and university programs that prepare educators world-wide, and the evidence of its success points to the fact that education can indeed respond to the 21st century challenges by taking on the responsibility for improving educators’ ability to mediate and facilitate cognitive and affective development in students, starting at the preschool practices.

Table 1: Cognitive functions that are targeted by FIE and are critical to the learning of mathematics, science and language arts concepts and skills.

FIE	Mathematics	Science	Language arts
Record, organize	Record, organize, measure	Gather, identify, record, and measure.	Inquire, identify, organize, and take notes.
Compare, classify, represent, analyze.	Connect, represent, analyze, compare, and order.	Compare, classify, arrange. Order, sequence.	Compare classify, arrange, analyze.
Select relevant information	Select relevant information	Select relevant information.	Select relevant information.
Register time, space.	Register time, space	Register time, space.	Register time, space
Infer, plan, formulate and test hypotheses	Conjecture, invent and problem-solve.	Form and test hypotheses.	Identify cause and effect. Trace the development of a plot
Relate cause and effect, reason inductively.	Employ logic and reason	Conclude, extrapolate, infer. Predict, transfer, and generalize.	Reason, assess, and conclude. Anticipate.
Communicate clearly and precisely	Communicate clearly and precisely	Report effectively	Clarify, explain, summarize.

Feuerstein's Instrumental Enrichment (FIE) Program

Feuerstein's Instrumental Enrichment Program is designed to address the five learning dispositions alluded to earlier. The interested reader will find an extensive discussion of the program elsewhere.³ We strongly believe that the unique features of FIE as an extracurricular-cognitive-enrichment program can be attributed to three important factors:

- a. It is based on a strong professional development component.
- b. Unlike the school curricula that typically follow the internal structures of the academic disciplines and adhere to rigid instructional schedules, FIE is extracurricular and thus free of such constraints to facilitate a wide range of cognitive competencies and feelings of competence progressively, with enough non-mundane repetitions.
- c. Unlike the academic learning that is confined to the disciplinary contexts and that is not readily transferable, the extracurricular and interdisciplinary nature of FIE allows the development of dispositions that are "detached from, and independent of, the extrinsic need [the nature of the task] that initially produced [them]"³.

FIE as a school reform model

Systemic reform is a comprehensive, coordinated change in a system's essential components. It is not an end-in-itself, but rather, a process that modifies the system in an irreversible way. Indeed, it has been demonstrated that when applied systemically FIE produces in school systems not only achievement gains and improved teachers' beliefs and optimism about student learning, but the following larger effects:

1. A cultural shift of focus to student learning and thinking
2. A shared vision among the school staff that all students should reach higher levels of achievements
3. A collaboration among special and regular classroom teachers
4. A collaboration among school psychologists, social workers, teachers, and parents
5. Improved abilities to teach diverse populations
6. Reduced "special education" programming

On the one hand, decades of experience with FIE in this country attest to the great potential of the FIE program. On the other hand, the history shows all too frequently that implementation

³ FIE book....

initiatives are not maintained due the system's frequent leadership shifts coupled with the extracurricular nature of the program that renders it "optional" in the new leaders' perception. Before analyzing this issue, let us examine the great potential of FIE.

Worldwide evidence on the effects of FIE on students' academic achievement

Feuerstein's Instrumental Enrichment (FIE) targets the enhancement of students' cognitive abilities. It is not subject-matter specific.⁴ Its effect on academic achievement must be regarded with caution. Measures that presuppose the existence of prerequisite content knowledge and disregard student motivation—especially in academic areas where students have previously had a long history of failure—and/or ignore the quality of teaching inevitably underestimate the program's effects. Where FIE studies show meaningful academic gains, one must extrapolate the greater potency of this program. A very large body of research and evaluation of FIE in terms of academic achievements confirms:

- 1) FIE may result in the enhancement of academic achievement in every academic area.
- 2) The larger academic-achievement gains are reported where the program is taught by teachers who are trained to see the connection of the specific academic curricula with FIE.
- 3) The program is effective with various student populations.
- 4) The academic gains from the program are larger than those produced by the typical remedial classes.
- 5) The longer and more complete the FIE intervention, the more general the effects.

With such an impressive record, why are there problems with its sustainability and scalability?

The program's sustainability

Initiating FIE is a challenge that requires commitment at the highest level of the system:

- 1) The success of FIE depends on the quality of teaching. It therefore requires the provision of appropriate training (15 days) and coaching over an extended period of 2-3 years.

⁴ For the reason, see Feuerstein's discussion in L. Idol and Jones B. Fly, eds., *Educational Values and Cognitive Instruction: Implications for Reform* (Hinsdale N.J.: Lawrence Erlbaum Associates, 1991), 164–66.

- 2) The initial phases of implementation require the preparation of a select core group of teachers that in time lead the rest in the successful use of the program and assure the program's sustainability. False start may not be recoverable.
- 3) At the middle schools FIE requires the scheduling of three extracurricular periods of instruction over 3 years. Finding time in the schedule for an extracurricular program like FIE requires that the leaders find creative solutions.
- 4) The program materials are disposable. Therefore, a sustained budget is required to cover the expense of material.
- 5) The program leadership must be informed and guided by data and progress reports. Failure of the school leaders to establish an effective monitoring function is detrimental in the long term.

Over three successful years of implementation, the level of commitment to maintain the program is usually high enough at every level in the system to sustain the program.

The program's scalability

The scalability of FIE is two-dimensional: *Expansion* for the benefit of more students, and *extension* in terms of incorporating the program's philosophy across the curriculum:

- 1) For expansion, the system must build the capacity to train new FIE teachers. The program leaders must identify its most outstanding FIE teachers as possible candidates for preparation as FIE trainers who will assume the role of coaches, and eventually trainers.
- 2) Extension of the program philosophy that emphasizes process over product orientated instruction across the curriculum depends on the involvement of a critical mass of FIE teachers and on peer and team collaborative efforts. After three years of professional development FIE teachers are generally eager and able to analyze the curriculum and student learning problems in terms of cognitive processes. With the right leaderships these teachers can be organized in subject matter teams and assigned to study and share issues.

We did not wake up one morning and discovered that life in the 21st century is different. We have experienced great changes in the human condition throughout our own lifetime. At the dawn of the 20th century we received hard confirmation from brain research that the human cognition is modifiable. We can prepare our young for the great challenges ahead – if we work at it!