

Concentrated Reinforcement Lessons (CoReL) **Madeleine J. Long**

The American Association for the Advancement of Science

CoReL was created by Reuven Feuerstein to prepare under-schooled Ethiopian immigrant students for successful integration into Israeli mainstream classrooms. Feuerstein is a leading cognitive psychologist, apprentice of Karl Jaspers, Carl Jung, Andrey Rey and Jean Piaget, and supporter of Lev Vygotsky's work. He based CoReL on the tradition of socio-psychological theory and research on the differential effects of culture and cultural deprivation (devaluation of a minority culture) on the development of children's learning abilities and cognitive functions. The concept for CoReL was developed within the context of two decades of experiences with under-schooled immigrant children from North Africa and the former Soviet Union. The Israeli experience made obvious an interesting—and hopeful—juxtaposition of factors. On the one hand, it was clear that without special attention and preparation these groups would perform poorly on language and academic skills tests. On the other hand, the same groups would often show unexpected strength in specific tests of cognitive abilities, and would almost always show normal learning propensities.

CoReL was created in Israel to provide the conditions for a rapid integration of culturally- different immigrant students from Ethiopia into the regular educational system. CoReL was expected to make it possible for culturally different students, who are often unable to reveal their true learning potential in standard psycho-educational assessments, to demonstrate their abilities, and thus avoid being misjudged and tracked into inappropriate educational environments. CoReL operated through a process of:

- Identifying the learning abilities of the new immigrant children and building an intervention system for their successful transition into the mainstream.
- Preventing mis-diagnosis which often leads to low expectations and placements in limited education environments.
- Providing a limited-time intervention program of intensive basic skills and Feuerstein's Instrumental Enrichment (FIE) classes.

Feuerstein described CoReL in terms of six distinctive characteristics:

- Provisional Character
Since CoReL was a springboard and instrument for re-integration into regular classrooms, the time the student spent in it was limited to 4-9 months. This arrangement required assessments every 3 months to determine student readiness for re-integration into mainstream classrooms.
- Shared awareness of the process, goals and principles
Teachers, principals, parents, and students were made aware of the program's goals, process goals, and progress since it was incumbent upon them to work together closely.
- Content of the Activity (tools for coping)
Content was focused on the development of learning skills and thinking strategies. CoReL's primary goal was to build various concepts, skills and strategies, those tools which enable students to develop and cope independently and successfully in class; it was not designed as a method for transmitting knowledge except indirectly. CoReL's focus was on three areas: spoken and written language, mathematics, and thinking and problem solving.
- High Intensity
The CoReL program attempted to ensure that students acquired the ability to learn quickly, accurately, and effortlessly.
- Varied Teaching Methods
CoReL used a variety of teaching methods including small group and individual approaches.
- School Involvement
The school as a whole was involved in the CoReL activities. Inherent contradictions among views about students with learning difficulties, and associated resistance, had to be overcome. It was critically important that the regular classroom teacher worked closely and cooperatively with the CoReL teacher in order to integrate students back into the mainstream. Additionally, it was important that principals and parents were involved in facilitating the process.

CoReL was implemented and studied (1997-99) in 15 Israeli public schools with 666 recently -arrived Ethiopian immigrant students by a team of cognitive scientists and educators at the International Center

for the Enhancement of Learning Potential and the Israeli Ministry of Education. The underpinnings of this short-term, transitional intervention, designed to develop learning, permit successful mainstreaming, and help prevent indiscriminate placement of students in inappropriate settings such as special education, have been well supported by effective school reform research.

Learning abilities were assessed dynamically for the CoReL program through the use of the Learning Propensity Assessment Device (LPAD). The LPAD tests, teaches, and retests, and yields an informative Student Learning Profile (SLP) that was used to help organize CoReL students, all of whom exhibited deficient basic skills. The students were grouped, based on LPAD assessments, into one of five profile categories. Students in three of these groups, which accounted for 96% of the participants, were assigned to CoReL for 15-20 hours per week, during these times they were absent from their regular classes. Academic performance and student progress in their CoReL classes were the primary factors in the determination of the length of the intervention for each student.

The Learning Propensity Assessment Device (LPAD) was chosen as the optimal tool for psycho-educational assessment because it de-emphasizes acquired knowledge and skills in favor of assessing the ability to learn new and unfamiliar material. The LPAD battery of tests target cognitive functions related to perception, attention, memory, problem-solving, and logical reasoning. The LPAD is different from typical psychometric tests in other ways as well. For example, it includes mediated learning of specifically designed variations on the Raven's Matrices. A pre- post-test comparison using the Raven's allows the assessment of learning abilities. Studies have shown improvement of about 3% in the performance measures of students who are exposed to the Raven's a second time, while improvement as a result of mediation can reach as much as 67% in the LPAD context. The same results apply to other tests adapted for LPAD use.

As in previous studies, data from the LPAD indicated that the initial cognitive performance of new immigrant students was both quantitatively and qualitatively different from the Israeli norm for the same age students, and for younger ages as well. Data also indicated that as a result of CoReL the majority of new immigrant students reached the same academic levels as the Israeli age norm and could be successfully integrated into mainstream education.

The CoReL Curriculum

The CoReL curriculum consisted of three components: instrumental enrichment (IE), language literacy, and mathematics. The three were taught with the same cognitive focus and using the same pedagogy. Topics were bridged across the three areas by teachers experienced in cognitive enrichment and content. Instrumental enrichment and language literacy each encompassed approximately five periods a week, and mathematics ten periods.

a. Instrumental Enrichment

The IE program was designed to help students develop the skills necessary for independent thinking, problem solving, and success in school. It is built on the belief that intelligence is dynamic and modifiable, that all students will learn how to learn if conditions are appropriate, and that supposed limits to learning are more apparent than real. It supports the belief that all students can learn.

IE maintains that learning problems can be eliminated through the development of certain cognitive abilities that include:

- Orientation in space and time
- Inferring from and analyzing data
- Recording and organizing data
- Representing information in various forms (graphs, signs, symbols, etc.)
- Comparing and classifying
- Planning
- Formulating and testing hypotheses
- Reasoning inductively and deductively
- Communicating clearly and precisely

IE is organized into 14 "instruments" or sets of activities whose purpose is to facilitate development of the cognitive functions. The instruments contain activities that reinforce cognitive abilities in a cyclical manner as they become increasingly complex and abstract. As students perform the activities, they develop principles, strategies, specific rules, and attitudes that enable them to handle tasks thoroughly and

efficiently. These activities are used as springboards for bridging to various personal situations as well as to specific content areas, which in this case, was mathematics.

Arthur K. Ellis classifies research studies about educational innovations in three levels: pure basic or theory building research; empirical research; and program evaluation. In contrast with other programs that aim at similar outcomes, Ellis concluded that IE is the only one that has been researched on all three levels (Ellis, 2001) and has shown enhancement of students' learning and thinking abilities (Ellis, 2001; Mayer, 2000). The program has been effective with diverse student populations including 7th grade, Phoenix, Arizona immigrant students from Mexico and Central America. In this study the experimental group outperformed the control group on all seven California Test of Basic Studies (CTBS) subtests, gains that were found to be statistically significant in six. Similar results are reported about students' gains on other teacher-made tests (Hannel & Hannel, 1983)

b. Mathematics

The intent of the intervention was to enable students to perform at grade level in mathematics in a relatively short period of time. As a result, the mathematics class focused on developing deficient skills and background knowledge areas while, by the end of the agreed upon period, bringing the subjects to the same point as their grade-level peers. Although the content was selected from the school district's curriculum, it was also influenced by the assessment of specific learning abilities and actual performance in mathematics and was reflected in the subsequent Individual Education Plans (IEP) developed for each student. Mathematics textbooks and other materials were selected by the school staff and advisors. The curriculum was integrated around key mathematics concepts and such cognitive behaviors as systematic observation, precise and organized information gathering, sorting, classifying, and estimating and predicting. It emphasized multiple representations, visual modeling, and diverse applications, including real-world applications of mathematical concepts. It was accompanied by periodic mastery assignments that permitted the teacher to evaluate student progress.

c. Language Literacy

Here too, IEPs were developed for each student, and were based upon the LPAD results and performance levels in English. The students were organized into groups with similar characteristics which enabled the language literacy program to be responsive to specific language development needs. Since the literacy classes pervaded mathematics and IE, (just as mathematics pervaded IE) they actually extended beyond the 5 formal periods per week. The course emphasized analysis, cross-referencing, and using context to figure out words and their meanings. It developed strategies such as mapping and writing that also support thinking, and employed carefully selected print material rich in content, and frequently related to mathematical ideas of interest to middle school students. Classroom activities included reading, writing, conversation, problem solving, and frequent use of new vocabulary, some of which was related to mathematics. CoReL teachers worked together to develop a list of critical vocabulary for participants, as well as graphic organizers and visuals to support learning.

The CoReL Team

A team approach was important for the delivery of CoReL. Members of the team included the: (1) school principal who decided upon the appropriate structure for the CoReL group and created motivation for success among students; (2) coordinator who assisted in forming CoReL groups and managed the process; (3) CoReL teachers who were the best, most professional, and most industrious ones in the school; (4) regular classroom teachers who worked cooperatively with the CoReL teachers and were prepared to accept the students back when they were ready for re-integration; (5) educational counselor or school psychologist who assisted in forming the CoReL groups and in the re-integration of CoReL students; and (6) supervisors and advisors who followed and facilitated the IE learning, and assisted in creating IE bridges to other school subjects. .

Results CoReL data indicates that:

- Ninety-four percent of the students were fully integrated into regular classes within a nine month period: 47% after 4 months; 18% after 6 months; and 29% after 9 months with limited, prescribed assistance. Only 4% failed to secure recommendation for re-integration into the mainstream.
- The subjects showed exceptional and unexpectedly high spatial abilities.

- The majority of the students had sufficiently high learning potentials as measured by the LPAD to allow them to become integrated into regular classes if they received intensive cognitive training during the first year of their schooling.
- Mediation led to reduced variance in the students' post-test LPAD performance; students who were low performers at first improved the most.
- There was no relationship between pre-test performance and "learning ability" as indicated by pre-post LPAD gains.
- The academic improvement as measured by tests of "Basic Math" and "Intermediary Math" as reported for 240 4-6 grade students was 30% and 40% respectively.
- More than 50% of the teachers reported that they did not anticipate future problems regarding CoReL students' mathematics achievement after reintegration into the mainstream. (Only 20% reported the same about writing skills.

CoReL involved a form of ability grouping, but safeguarded against tracking students, the most negative outcome of ability grouping, by insisting upon re-integration into regular classrooms in relatively short and agreed-upon time frames, as well as by building resilience, the ability to face failure and emerge willing to try again, to "bounce back" from adversity.

From what is known thus far, it seems that CoReL has a high probability of success with other under-schooled, academically struggling immigrant groups, in settings very different from those found in Israel. The Sicily Conference should provide an excellent forum for discussion of CoReL in terms of its approach to dealing with students at risk of failure and future actions that can be taken to consider program transfer and research.

Avenues for Research

Research that addresses fundamental behavioral, cognitive, affective, and social aspects of mathematics learning among immigrant populations would allow those who wish to adapt CoReL for use in other circumstances to examine and reflect upon such possibilities. The research could involve: (1) examining fundamental questions about the relationships between affective, cognitive, and socio-cultural factors that influence the mathematics education of school-age immigrants; (2) understanding conditions and pedagogies under which increasing numbers of learners master advanced science and mathematics; (3) identifying factors that enable access, participation, persistence, and diversity in the Science, Mathematics, Engineering, and Technology (SMET) enterprise; and (4) identifying factors that could be helpful in the design of interventions.

One way to validate encouraging research is through replication and study of an intervention model that itself deals with immigrant students. CoReL replication would be especially advantageous since the original study is brief and self-contained, follows principles of effective programs, and was performed by an interdisciplinary team of educators, psychologists, and mathematicians. The replication would allow those involved to go beyond the original study by testing: (1) questions related to the modifiability of specific cognitive functions and perceptions held by other immigrant groups; (2) the utility of dynamic [as contrasted with static] assessment that goes beyond manifest performance and focuses on change for development of cost-effective intervention programs; (3) the nature and impact of changing self-perceptions in and between teachers and students; (4) the effects of the CoReL model on school culture; and (5) particular connections between CoReL, IE, and mathematics teaching and learning.