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R & D in education - the case of the laboratory school

R & D IN EDUCATION – THE CASE OF THE LABORATORY SCHOOL

David Chen, Dorit Tubin, Nir Chen, Yafa Ben-Ami

THE LABORATORY SCHOOL – THEORETICAL VIEW

David Chen

The educational enterprise is one of the largest social organizations on earth. It encompasses about 50 million teachers, over a billion students, with teaching and learning in quite a universal mode called schooling. Knowledge, time and space are harnessed in a standardized pattern expecting an output of school graduates ready to be full participants in society, culture and the economy. Yet, at the entry of the third millennium, education has universally failed to come even close to fulfill its promises. Two major strategies can be utilized for change:

The Strategy of Trial and Error Here the common practice is to produce a new plan, either by administration or by politicians on a committee, and then to apply it directly in the field. In the realm of education this is the common change practice, despite its universal failure throughout the 20th century.

The Strategy of Research and Development (R&D) This is the change strategy, which evolved during the scientific rational era and is preferred by industrial, health, and agricultural organizations. In principle, this strategy calls for theoretical knowledge base, substantiated by empirical research, the development of working models of the innovative ideas through experimentation and the dissemination of the innovation. This is the strategy that brought man to the moon, deciphered the human genome and reasonably caters for the growing population.

We would like to suggest that education should shift from trial and error change strategies to R&D strategies. Four major requirements are necessary: a new theoretical foundation for education based on scientific understandings of human development and learning; an investment in educational research in the order of magnitude of 2-3 percent of the national expenditure in education (instead of the current 0.1 percent); the establishment of 'development' institutions aimed to design, explore and evaluate new models for schooling; the establishment of diffusion mechanisms for successful working models.

We will present a 12-year experiment in educational innovation based on the R&D strategy and encompassing a new theory, development of a working model, research and evaluation and the initiation of dissemination.

THE LABORATORY SCHOOL – AN ARCHITECTURAL VIEW

Nir Chen

Architects are sometimes like explorers studying unfamiliar territories, terra incognito, using their knowledge and intuitions, and projecting their own culture in order to understand the local culture. Their understanding is by definition different from the locals, and at the same time limited, yet they can offer a different perspective.

The world of education is an attractive territory for me, mostly, because there are no answers to the issues concerning the dissemination of human knowledge. Yet the search for these answers is of utmost importance for our civilization.

Architecture is the art of the concrete and its daily practice is of consolidation and narrowing down. Often, the educational process, confronts the architectural planning process by maximizing choices for the learner and providing a wide array of objectives. The confrontation of the architecture and education disciplines provides an enriching experience for the participants in the decision-making process whereby pedagogical objectives comply with a static framework that enables a wide and dynamic range of possibilities.

The design process of the Cramim School, explored different ways of applying innovative pedagogical ideas. A major challenge was the design of an innovative learning space. The standard classroom is a rectangular space 7 x 7m2. These dimensions are a function of 4 rows of tables facing the blackboard and the teacher. This configuration sets the principle of hierarchy and authority. The communication in such configuration is supposed to be unidirectional – teacher to student.

The fact that the introduction of alternative pedagogies failed to have an impact on the learning space is amazing. In fact, the effort to exercise alternative teaching and learning modes has created much dissonance. The innovative design of the learning space in Cramim provides a whole range of options to organize learning. Within the home space one has a central site encouraging cooperative learning and whole class gathering. A mini-auditorium is meant to enable frontal teaching, presentation and group seminars. Last, but not least, is a gallery that serves as the "computer garden" for e-learning for both children and teachers. The highly differentiated space conforms with the educational objective of providing for the diversity of the learners.

THE LABORATORY SCHOOL – PEDAGOGICAL IMPLICATIONS

Yafa Ben-Ami

Our basic assumption is that the school building should comply with its educational program. The school architecture should cater to the basic educational concepts underlying the innovative design and yet allow several degrees of freedom for the school staff to make changes in time. There must be a continuous dialogue between the pedagogy and the school design.

One should remember that the experimental design is the result of innovative pedagogy. It provides both opportunities and constraints requiring a firm look. What's new in an innovative pedagogy-based school? "Cramim" is an experimental elementary school designed and constructed on the basis of a program conceived by a committee including academics, educators, policy makers and an architect. The school is experimental in the sense that research and evaluation were part and parcel of the implementation. The school has emerged as a "learning organization" implicating a system approach in its design as well as in its function. The underlying philosophical principles at the school are the centrality of the individual child, and the richness of human diversity. The basic organizational unit is "home".

"Home" is a differentiated learning space comprising about 75 students (of two age groups) and two master teachers. The individual learner is the basic operating unit at the home. The changes at the "home" are:

- from focus on class to individual

- from teacher to team teaching

- from integrated curriculum to disciplinary specialization

- from static to flexible organizational mode

- from isolated to integrated ICT learning environments

- from standardized to adaptive pedagogy

These pedagogical innovations are represented in the school learning environments, using multimedia knowledge representations:

- Visual, symbolic, real world (concrete) and acoustical;

- The ICT infrastructure is integrated in all learning spaces allowing free access for all;

- Flexible teaching and learning in terms of time, space, curriculum, teaching mode and resources;

- Encouragement of autonomous and creative learners;

- Enhancement of cooperation and communication among students and teachers

The overall flexibility of the school design allows differentiation in providing an answer to individual differences, thus optimizing learning efficiency and maintaining a humanistic and just institution.

THE LABORATORY SCHOOL – RESEARCH EVIDENCE

Dorit Tubin

The success of the experimental school is evident in three main areas of schooling: student achievements, teacher development and the community support.

Student achievements: educational achievements of all graduates of the experimental school (excellent, average and slow) show an advantage in comparison to those of a regular school in most of the variables measured: test results (Mathematics, English, Geography, Hebrew), skills (Conceptual mapping, Knowledge management, Graph comprehension, Reading comprehension, Computer literacy), self-efficacy, and motivation. The student achievements at the national level were found to be above the average of schools of the same group of reference.

Teacher development: during the nine years of operation (the school opened in 1995) the teachers progressed in several areas: computer literacy expanded due to intensive training and personal computers provided by the school; by the first year all the 27 teachers operated computers, preparing teaching materials, and using e-mail. New teachers caught up and surpassed this level, especially in the area of ICT-based practices.

Professionalism – teachers became experts in integrating ICT into their subject matter and additionally 30% of the teachers got instructors' positions out of the school. Another 30% of the teachers continued studying for a masters' degree.

Teamwork - the teachers excelled in teamwork, working together for curriculum development and "Home" management.

Community support: at the national level, the school was chosen as one of ten innovative schools in Israel, which successfully implemented innovative pedagogy using ICT and school system changes. At the municipal level, some of the experimental school's standards such as learning space (instead of the traditional classroom) were duplicated in another eight new schools. At the neighborhood level, the school gained the support and legitimacy of the parents.

The price paid: the efforts and resources needed for the experimental school included: foundation budget for the special building and the ICT infrastructure (an additional of about 10%); Additional roles of the knowledge engineer, librarian and computer technician; Academic advising for one day a week, five years and further; and accountability efforts like providing evidence for success, open door policy for the parents and decision making transparency.