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A CASE STUDY OF ICT-ENRICHED SCHOOL ENVIRONMENT AT CRAMIM SCHOOL, RISHON LE-ZION, ISRAEL

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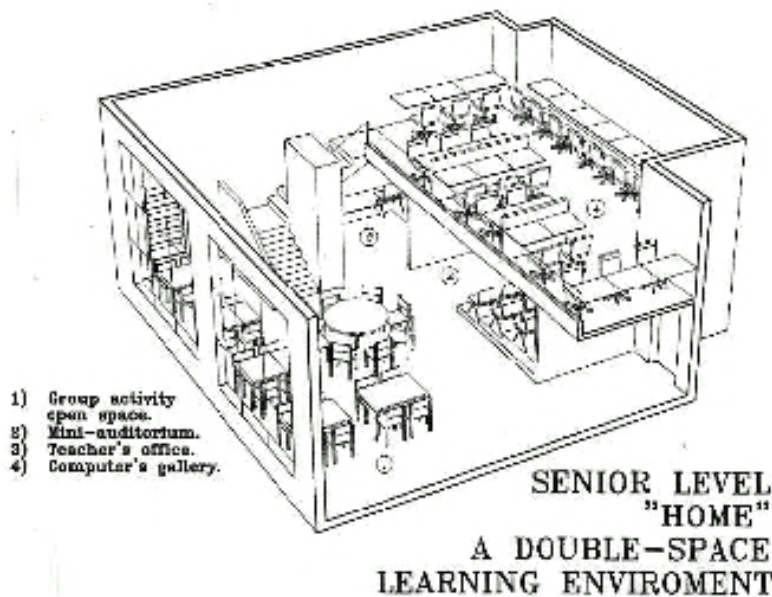
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OVERVIEW

Dad: I have a son in the 4th grade. I try to persuade him to eat corn flakes at a quarter to eight, and he tells me: I can t . He won t give up the beginning of the lesson.

Student: It s much more convenient (with computers). If you are punished to write 50 times something, you copy and paste-paste-paste, that way 50 times.

The above quotes are but an illustration of the extent to which students feel involved with their ICT-enriched school, and the extent to which ICT has in fact become part of the everyday activities of students and teachers in the school. In this report we depict the particular way ICT implementation in education has become an integral part of the functioning of a school that is unique in its educational doctrine.

Cramim is a suburban elementary school in a city of 200,000 residents in the center of Israel. The school, comprising of 5-year old (kindergarten) to 12 year old (6th grade) children, includes about 1,000 students and 55 staff members. There are 176 computers located in the school: in all classes, as well as in other learning spaces. The school receives children from the local neighborhood, consisting of middle class families.

The school, opened on September 1995, was planned and built according to an educational conception that views ICT as a means for empowering and redefining the relationship between students and knowledge, for facilitating learning skills acquisition, and improve academic achievement.

1) Group activity open space.
2) Mini-auditorium.
3) Teacher's office.
4) Computer's gallery.

SENIOR LEVEL "HOME"
A DOUBLE-SPACE LEARNING ENVIROMENT

The school is divided into homes (see diagram), which is a space in the size of two classrooms, usually containing about 75 students of double-age grades (kindergarten to 1st grade, 3rd to 4th grade, 5th to 6th grade), taught and administrated by a staff of 2-3 members. The school does not use a bell for signaling recesses or lesson beginnings.

In each house there are 3 studying environments: the open space teaching area, the computer gallery, and the mini-auditorium.

Professional teams (math, language skills, science and technology) adapt and apply national curricula according to school (students) needs: differential teaching, annual planning (twice a year) for two-grade students, and the implementation of ICT.

All of the teachers possess a laptop and a printer supplied by the school, are connected to the Internet, and a great part of the administrative issues are dealt with via e-mail.

The innovation of the school is in its holistic perception and assimilation of several components into Cramim School: The physical structure and organization (including interior design) supporting the pedagogical approach; professional teams develop and adapt curricula; the two-year houses; the implementation of ICT in almost all disciplines; a large variety of teaching and learning methods; an emphasis on self studying and student responsibility; the use of alternative assessment, such as portfolios and projects   all these are an integral part of and support the innovation.

In its 6th year, the school has presented several achievements: Cramim graduates reach higher achievements in middle school compared with graduates from other schools (coming from similar social-economic background); students love to attend school and are proud of it; parents appreciate the school's pedagogic standards; teachers are proud to belong to this school, and about half of them engage in extra training; the substitution rate of teachers is low (about 5% a year).

Computers are implemented in almost all subjects. Students engage in ICT work an average of an hour a day. Most of the communication between staff members is through e-mail, and all didactic materials are stored in electronic databases. Students are highly proficient in ICT skills (see Appendix 3). The school has a Website, containing information, homework, links, displays and a distance-learning unit.

The URL is: http://http://www.cramim.rishon.k12.il/.

All students gain from the innovative doctrine, although not equally. One of the fathers asserts that *using these methods, if you are a weak student, you are lost*. One of the mothers claims that *teachers adjust to students pace*.

The principal claims that *excellent students succeed anyway, regardless of teaching conditions... we do see ICT as helping students with difficulties, and with average students it enables them to express their uniqueness and their personal ways of expression. But for students with learning disabilities, it [ICT] is a great therapeutic tool*.

The academic advisor sees things differently: *...The marginal output of the top students is not very high... probably the marginal output of the weakest students as well. We don t reach them... but if the average students, about 40% of the school population, profit highly [from ICT implementation], this defines the impact of the school*.

THE PAST

In the beginning of the 90s, the Ministry of Education decided on the establishment of ten innovative models of schools throughout the country, among them Cramim. Cramim was founded as a result of three years of planning, and the cooperation between the Ministry of Education, the local municipality, and the Tel-Aviv University. The vision was developed by the school's academic counselor, David Chen, a professor from the Tel-Aviv University. According to this vision, ICT is a means of amplifying students capabilities of dealing with knowledge, and for supporting the high support - high demand approach. This means a demand for high achievements along with optimal conditions for learning. The academic advisor led the planning, implementation, and the foundation of the school, and supported it for 5 years dedicating to it an average of a day a week. The academic advisor's work received ample support from the city s mayor, the head of the municipal Education department, the school s supervisor (from the Ministry of Education), and a local steering committee. The school principal, chosen a year before the opening of the school and taking part in the recruiting of new teachers and the designing of innovative pedagogy, led the implementation of the vision.

The main obstacles were in the fields of pedagogy, organizational issues and infrastructure.

Pedagogical aspects

Lack of solid Educational Theory

The school had a clear vision of the importance of ICT as a means of facilitating learning processes. However, its implementation into the curricula and in the development of innovative teaching methods requires a clear educational theory. The academic advisor claims, *no one knows how to make the transition from a static and linear perception of curricula built on texts, into a digital, dynamic and divergent curricula* . For this reason, the task of developing and adapting curricula within this ICT-enriched environment is a complex one. The teachers find this task difficult to them, requiring support from sources outside the school. Since there are not too many experts in this developing field, the school has not found proper and comprehensive external supervision.

This situation has a number of consequences: on the one hand, teachers are required to invest long hours in developing concepts and material, and not all teams reach the same level of expertise, depending on the size of the team and their capability. On the other hand, within the advanced teams there are notable achievements, and their members become experts and are demanded beyond school boundaries.

Ethical dilemmas

The massive usage of computers in the school raised a number of problems, such as:

- **The boundaries of freedom** how (and if) to control surfing the Internet? How to keep track of students on the web?
- **Computer vandalism and its punishment** how to punish vandalism relating to ICT (considering the contribution of ICT to learning)?
- **Planning spontaneity** how to combine exact planning of learning activities with open opportunities.
- **The computer as a psychologist** how to lessen the status of the computer as an only friend, coming between the student and his friends.

The school deals with these issues through open discussion and ongoing learning.

Organizational aspects

Over-populated classrooms

The homes in the school were planned for 3 groups of 24 students each, administrated by 3 staff members. In actual fact, these houses contain 80 students, with only 2 teachers. This caused difficulties for staff members, who implement innovative methods in spite of the crowded houses. Teachers overcome these conditions by working in small groups and personal follow-up of students.

Difficulties in fitting in

The general and homogenous attitude of the school makes it difficult for newcomers (teachers and students) to join it. One of the 6th grade students, who joined the school a year ago, described: *When I arrived at this school and started working with computers, I was nervous, nervous... because all of a sudden a file had been erased, everything I did had been erased. But now, it s not at all like that* . One of the teachers remarked: *In my first and second year I did not implement ICT, although it was available offhand. I was deterred by it. Gradually, with the help of the staff, I began thinking* . Support of fellow teachers, openness and learning opportunities are solutions to these difficulties.

Supporting the innovation

The innovation in the school was supported by all factors involved. Still, two main obstacles aroused. One obstacle was the collision between bureaucracy principles and the innovative ideas, such as the need to act against uniform standards (e.g., a predefined equal number of computers for each school in the system) in this ICT enriched school. The other was commitment to research: the school offered a different educational model, but the Ministry of Education, which invested many resources in this innovative model, does not carry enough follow-up research. The creation of a learning center, which was approved lately, and the recruitment of research funds are the ways devised to deal with this issue.

Infrastructure Aspects

Upgrading equipment

According to the ICT coordinator, technology is being used to its full potential. However, because it s out-of-date (in the school's 6th year), it delays further developments such as distance learning. The principal asserts *The real meaning of using learning resources is for supporting dialog among groups of students, teachers and parents, in learning and in social activities* , which is nearly impossible with existing infrastructure. In addition, the uncertainty concerning infrastructure delays further development of curricula

based on innovative technology. The solution seems to be a multi-year upgrading program, funded by the Ministry of Education and the municipality. For the years 200-2001 additional 40 computers were promised to the school.

THE PRESENT

The Evaluation of Change

Patterns of transferring the innovation and ICT

The main idea of the school lies in the new relationship between students and knowledge via ICT. Therefore, ICT supports the innovation, and its transferability requires:

Teamwork: Development of learning activities and adapting curricula to the school needs obliges teachers to implement ICT in all subject matters. Teamwork is practiced in all subjects, but the level of achievements differ. In Cramim, Mathematics and humanistic (e.g., language, Bible, history, literature) teacher teams are the most advanced. Transfer among teams is achieved mainly through the sharing of a joint vision, and mutual learning, while each team develops and adapts new ideas to their particular subject matter.

Communication and Documentation: most of the communication between staff members is via e-mail and the school Website. The accessibility to information and the customary procedures enable daily updates, which are easy to follow. The principal says, that

At the end of each week, I send messages to the teachers, including reference to the past week and announcement concerning the following week, in which I embed ideological principles relating to the uniqueness of the school. Teachers are requested to open their mailboxes at least at the end of the week, preferably twice a week. They know that if they do not the will not be updated. This enables order in our work, and facilitates a culture of sharing, among all staff members, not only subgroups. At the middle of the week, by turn, each teacher e-mails a case report, and other teachers respond to the described event... The usage of e-mail enables documentation of processes within the school. It also offers transparency..: the teachers learn to know me better, and I also learn about different aspects concerning each teacher.

Knowledge System Expert (KSE): This staff member plays a key role in the school, as ICT expert and instructional advisor. The KSE's work with the teachers (in one-to-one as well as group instruction) made her a major factor for facilitating ideas and solutions among teachers, according to the needs of each staff member.

Staff development concerning ICT and the innovation

Staff development is based on two areas: mastery of ICT and development of learning activities according to students needs (ICT activities included). For ICT skills mastery, during the first 3 years the school staff received a 900-hour training (compared to 150 hours of training for ICT coordinators only, in other schools). The training included courses, private sessions, group sessions, and training within the school, adding up to a total of 2 hours a day. The result is that all teachers master ICT skills, and a third of them are experts on working in ICT enriched environments. New teachers are exposed to similar amounts of training. According to the KSE, *a teacher that enters the school could not function well or integrate if he or she do not use ICT* .

The pedagogical training is given to the staff as a whole, and to the subject matter groups according to their needs, supporting to their development processes. The principal, according to school goals, regulates personal training. In addition, the teachers share the knowledge and skills they have mastered with their peers.

Leadership of the innovation and ICT

The academic advisor and the school principal lead the innovation and ICT- implementation processes. The

academic advisor was the originator of the vision and the leader of the foundation of the school. He continues to write about the school, to conduct research and to spread the vision to other factors in the school surroundings. In addition, he supports the teachers in their personal growth and further academic studying plans.

The principal leads the translation of ideas into everyday practice and the staff teamwork in applying the vision. The KSE indicates that

The principal gives opportunities to all staff members to learn and grow. If the principal is willing to listen, to accept and to change things, the staff is also willing to do the same.

The connection between the innovation and ICT

ICT supports the innovation in a number of ways: first, enriching the variety of teaching methods and accommodating them to the students needs. As the Art teacher asserted:

some of the students do not feel comfortable working with certain materials, and they experienced a disconnection regarding art classes. Now they can join the lessons... that way there are much less discipline problems, and the students are much more satisfied.

Second, the motivation and academic challenge have grown. As the principal describes:

In all the plans we have thought about how the technological means can facilitate and improve learning, and how we can improve ICT skills, because there are no computer lessons in school. For example, how to implement Excel regarding arithmetic sequence, writing about leaders in the Bible using databases, and displaying information and knowledge using presentation software.

Third, connecting the staff to current reality. ICT enables teachers constant updating and a deep understanding of its the nature and significance in current times. As the principal asserts:

It s part of the sensation of teachers of their belonging to the 21st century, belonging to what exists in the high-tech industry... if you take away the computers, you create a cut-off from society and the surrounding in general.

Still, the innovation does not dependent totally and only on technology. The principal says:

... the computer widened the possibilities... but the computer itself will not make the change .

The KSE added:

If the computers were taken away, the school would not collapse. The teachers know how to cope with difficulties, and would have to define new goals to aspire.

Outcomes

Infrastructure

In the school there are 176 computers serving 1,000 students, 6 computers for administration, and 40 personal computers for teachers. All computers are connected to one network. This amount of computers is exceptional in comparison with other schools in Israel (5-8 students per computer in Cramim , compared to 14-18 computer defined by national standards).

In addition, the school has peripheral equipment that includes printers in every home , CD-ROM drives, a digital camera, a CD-R/W drive and scanners. Software includes: Office applications, drill and practice programs, simulations, educational games, Internet browsers, e-mail software, electronic encyclopedias, MBL, tutorials and statistics software. The Ministry of Education and the municipality fund all equipment. ICT infrastructure was an integral component of the planning and design of the school building, so the location of the computers and other technological facilities within the varied school dependencies were carefully planned ahead.

The usage of Internet and e-mail by teachers began as early as 1995, and by students by 1997. All 4th grade student use e-mail and the Internet. By the end of the 4th grade, a student in Cramim school communicates with teachers via electronic means, use e-mail for projects and use the Internet for searching databases. In addition, the students use all Office applications, simulations, creation software, applications for learning particular subject units and interactive encyclopedias. The students use computers on an average of one hour a day.

The school has a Website, containing general information, learning units, links to resources for teachers and students, assignments, learning materials, billboard messages, art exhibitions and distance learning units

Support is given according to needs by the KSE on a full time position, not typical of other elementary schools.

Since the opening of the school on September 1995, ICT has not been upgraded. Some of the teachers who received laptops and printers have acquired at their own expense updated models. According to the KSE, the aging of ICT delays the continuation of pedagogic development of the school.

Efficiency of the innovation and ICT

The implementation of ICT in teaching is practiced from kindergarten to 6th grade, during all school years and in all subjects (see Appendix 4). The computer is considered a means of developing deferential teaching and facilitating the responsibility and the independence of the students. Professional teams develop learning materials implementing ICT. Most teachers claim that this method demands more working hours, but that it does pay off.

Results are reflected in the satisfaction of students and parents, and in minor incidents of missing school or being late. Teachers and students take pride in the school. Professional pride of the teachers is noticeable, and there is relative stability of staff members (5% rotation rate). Teachers and students demonstrate high ICT competency (see appendix). Students are capable of using ICT at home. The atmosphere at the school is also a major factor in its success, as explained by one of the mothers:

 When I come here, immediately I feel a homelike atmosphere, a supportive atmosphere. The principal receives the students with a smile... all this is very important.

Academic Strictness

The main attitude of the school is to demand hard work and excellent achievements from the students, along with supporting them according to their needs. Results show success. The academic advisor quotes findings from a research on the school, according to which its main effect is on motivation, and through it on achievements. The research shows that in comparison with other elementary school graduates from the

neighborhood, the average grades of Cramim graduates in English, math, language skills and civics was higher. In the motivation questionnaire, it was found that the group of low-motivated students was smaller at Cramim (about 15%) than at other schools (about 30%), the average-motivated students was abut 55% at Cramim (about 40% in other schools), and there was no difference among highly motivated students.

Parents who compare achievements of their children learning in Cramim with those of their older siblings, who learned in other schools, acknowledge higher academic achievements as well. These high achievements are ascribed to all components of the school (staff, teaching methods), not only to the implementation of ICT.

The students themselves indicate better learning using ICT:

It s better, that s for sure. In my former school I wasn t anything special, and here I m a success. In the Internet there is more material, and that helps. Mostly I learn from others. The teacher gives us work, and others do marvelous things, so I ask them How do you do that? and I learn.

Equity

Most of the people interviewed agree as to the benefits of the new system for the Cramim students, however, not equally. Students claim that whoever doesn t have a computer at home (about 10%) are at a disadvantage, in spite of the possibility to stay at school beyond school hours, because *he can t go home early, and has to stay till 3 o clock* .

According to the academic advisor *There is a group of students that do not exactly enjoy the freedom and the autonomy. I don t think we have very good solutions as to how to go about them and how to handle them.* The principal adds: *... We do see how the computer helps students with difficulties, how it can be a tool for students with disabilities. For average children, the computer enables several ways of expressing one s differences.*

Among parents, some think, *The computer will leave some students behind, if they won t use computers wisely* , while others assert that *You teach according to a personal pace* , therefore, students are not lost.

The KSE adds that computers *Give equal opportunities for all students* , in spite of the fact that *students with high capabilities always profit more than those with lower abilities, regardless of computers. It has to do with the ability to learn, not to depend on he teacher.*

Implications

Acceptance of the innovation and ICT

The innovation and ICT implementation began at the same time, with the foundation of the school. During the first year the staff dealt with learning ICT and its implementation in teaching and in the new curricula, and since them an effort has been made to develop and improve this perception. *Those who did not agree with the innovation was free to go* , says the principal, meaning that joining the school staff was conditioned by accepting the innovation.

Hence, not all teachers respond to the innovation equally. Some invest long hours, and some less. Some are deterred during their reception, and some fit in right away. The drama teacher, for instance, is trying to save her territory *clean of computers, totally clean... only the human factor, without the interference of technology* . She stays in the school *because here they accept me, they give me space, they give me legitimization to do all these things... and because I like the staff.*

Transferability of the innovation and ICT

As to the question of transferability, there are a number of issues. First of all, as the principal phrased it

I don t think the innovation as a whole should be implemented, rather each school should decide what to

renew... if they want, what they want, and then to translate it to their own needs. But some things can be applied: learning in an ICT-saturated environment, formation of curricula using ICT, teamwork. From us you can receive guidance and the support required.

As for infrastructure, it is more difficult to duplicate, because of the high cost (1$ million in 1995). However, as the KSE put it *a lot of schools receive computers, but that doesn t mean that a change occurs in them... only if they form their dream, will they be able to reach somewhere*. The important component missing in most schools is a vision, or a whole pedagogic understanding. *No doubt that a lot of ideas within this school are in other schools as well*, says the academic advisor, *but I do not know many places with integration, an institutional point of view and long term support, like in this school, and these are its exclusiveness.*

Another meaningful component for transferring the innovation is, according to the academic advisor, the enormous amount of professional training. Training included all areas: curricula, pedagogy, technology, assessment, organizational structure and relationship with parents and the community. still, even if such training would take place, the academic advisor is not certain that *it would be enough to spread the innovation*.

Finally, the parents feel that the structure of the neighborhood is an important factor as well. A small and homogeneous neighborhood is a facilitating factor, as explained by one of the parents: In small neighborhoods, 1500 families, integration is better . One of the mothers added: *Most residents here are of the same social-economic class. I m not sure that in another place it will be the same.*

MAIN HYPOTHESES

The Role of Technology in the Innovation

Most of the evidence from Cramim school support the opposing hypotheses, stating that technology serves as an additional resource, not as a facilitator, and that the same forces that drive the innovation (the pedagogical vision) drive technology applications. The school has a vision known to all teachers, and parts of it are applicable without ICT (such as teamwork, differential teaching, and fostering an independent learner). Teachers feel that without ICT the school will not fall apart, but will find another vision. However, the accessibility of ICT, the pressure to use it, the massive training and the intensive implementation all indicate a great weight that technology had in facilitating and supporting the innovation.

Transferring the Innovation

The evidence supports the claim that technology works differently than traditional innovations, therefore creating different patterns of transference. In Cramim , *whoever didn t fit in the innovation was free to go*, according to the principal . This means that joining the school is a package deal, including the acceptance of the innovation. Therefore, the innovation was school wide, including teachers, students and parents at the same time. Differences among teachers resulted from their pace of adoption of the innovation, depending on difficulties in abandoning traditional patterns, fear of novelty and suspicion towards it. One of the mothers described:

In the first year I was very suspicious... watched and thought Wow! Doesn t the teacher miss anyone? When my child was in kindergarten, I thought Oh, this is innovative, experimental, and we re screwed , but I said Oh, well, what can you do, if he s so smart, he ll be smart anyhow . But when I saw that in kindergarten they already know how to read, I calmed down.

Implementation of ICT

The evidence at Cramim supports the argument that successful implementation of ICT depends mainly on staff capability to assimilate ICT in teaching and learning processes. The amount and variety of teacher training assured competency of staff regarding ICT implementation, aimed to benefit the most from it. In addition, the wide range usage of ICT in all subject matters, all grades and at all times made ICT a vital and essential means of learning. Students were lead by their teachers in an effort to improve their ICT skills, fostering wise usage of technology in pedagogical practices.

Digital Gap

It seems that the educational gaps between students from low and high-income families are not as wide as expected, since all students have equal accessibility to ICT. In addition, weak students, for example students with learning disabilities, have a personal program built especially for their needs. The neighborhood is homogeneous in its social and economic background, and 90% of the students have computers at home, therefore, they can also work at home, after school hours.

However, the general notion is that there is a growing gap between stronger and weaker students, due to better utilization of ICT by stronger students. The weak students need support and assistance, which is given in small amounts (considering the amount of 40 students per teacher). One of the fathers claimed:

If each teacher had 20 students instead of 40, it would have been beneficial for everyone. Not all students know how to use computers, but if the amount were altered [of students per teacher]*, no doubt it would have been helpful for everyone. But as things are, even if you try very hard, it s impossible.*

The meaning is, that the economical gap is not the cause of differences among students, but the gap in learning abilities, and these are not necessarily overlapping.

Academic Standards

In Cramim , ICT supported the high academic standards of the teachers and the school. The principal asserted:

The standard of demands is growing, because the computer enables to refer to formats of submission, aesthetics, richness of data resources, reference to the credibility of sources, pictures. This brings an improvement in the quality of submission and in the reference [to the products], which has a bearing on demands of greater depth. It is not enough that the page is aesthetic.

The opposite hypothesis is that ICT can bring about lowering of academic standards, due to waste of time surfing the web, which occupies staff and students. Teachers encompass this by directing students exactly and in accordance with educational goals.

IMPLICATIONS FOR THE FUTURE

In the six years of its existence, this school presents an innovative model for integrating pedagogy and technology. The wide usage of ICT in all subject matters, all the time, by all students (aged 5-12), together with a variety of teaching methods, referring to personal differences among students and staff teamwork in the development of curricula, all these have created a successful learning environment. This environment brings about high achievements, in addition to satisfaction among students, teachers and parents. Two questions accompany the school in stepping towards the future: will the innovation preserve itself, and how, if so, will the school influence its surroundings.

Stability of the Innovation

The innovation of the school depends on two main factors: the staff and school atmosphere within, and outside political support. It seems that from the teachers point of view, the school has arrived at a balance, based on teamwork, teacher training, ongoing learning and development of professional expertise. The evidence is the low rate of replacement of staff members, and their general feeling of content. It seems that the working norms have created a contexture of internal logic, that even replacements in administration staff will not necessarily affect it.

Regarding external support, the preservation of the innovation demands constant inflow of resources (e.g., upgrading of infrastructure, technical support, and pedagogical support). However, the exclusive support needed collides with the principle of standardization of resources[1] that characterize the whole educational system. As long as external support is available, the innovation will continue. The academic advisor explains:

This school is very different from the existing system, but is a part of it. I do not think it has the adequate support, and there is much wear of school staff. Every system eventually gravitates to the average, but we keep making efforts so that will not happen. As long as energies are invested, this will be an innovative school. But I do not delude myself... if you do not invest, the system steps towards chaos, and because order in this school is special, there is a problem. As of the present, the education system does not invest, support or renew to a satisfactory extent, as it should in an experiment. That is why I would say that I am skeptic.

Innovation as a Learning Model

The stability of the innovation depends on the extent in which the school becomes a learning model and a source of information for other schools. Two conditions are vital for the school to become a model: research and a system for spreading the accumulated knowledge.

Research: Research and documentation have been done by researchers at the Tel-Aviv University, but not as sufficient as it should be. The academic advisor claims:

A large part of the bureaucratic system thought that its job had been done in the mere decision to invest at the starting point. That was a mistake, because he educational system should follow the project throughout its course. I cannot say that the system is an intensive partner for learning and improving. We do make efforts, and there is a great deal of documentation for this project, but it is hard to say. There is also a great deal of interest in the school from the in-between level: principals, heads of education departments come and try to learn the system. There is a lot of interest from abroad. But to say tat the formal bodies and institutions learn, it s hard to tell, and I think it s a pity.

Transferring the Knowledge: In this year, the school opened a learning center supported by the ministry of education, destined for this purpose. In this center, teachers of the school teach different courses dealing with the pedagogy of the school, using the accumulated experience of Cramim . As phrased by the KSE:

One can learn from any one of the staff members working here. One can learn many things, especially about working in a new system with unfamiliar things, solutions for learning, for listening, for assessing and criticizing others, and an effort to understand teamwork, which is unusual.

Summing up the innovation, the components are connected to one another: for the innovation to continue, more resources are needed. To attain more resources, research is needed to display the uniqueness of the model and its outcomes, as well as a center for transferring the knowledge and experience. That way, everyone will benefit the school, the teachers, the research, other schools and the education system. The actualization of the vision depends on the extent by which long-term considerations will be heard by decision-makers.

APPENDIX 1: METHODOLOGY

Research Team: The research team included 3 researchers, which divided the data collection between them: Dr. Dorit Tubin   head of team, and Alona Forkosh-Baruch and Maya Chachashvili   team members. The interviews of the focus groups were held by teams of researchers, while the personal interviews were mostly held by one researcher. The observations were held either by pears of researchers, or by one researcher.

The Data: Data collection lasted between December 2000 to February 200. The chart below describes in detail all the data collected. All interviews were recorded and all observation details were written down. All data were transcribed into digital files and uploaded to the Israeli research Website, at http://muse.tau.ac.il/ict/. The average length of each interview was an hour and a half. The focus group interviews were even longer (an average of two hours). The observations lasted the length of the lesson, usually 45-50 minutes. According to the material collected, a data matrix was built, which served as a basis for the final report. The matrix and the report were written by the head of the research team, then reviewed by other team members.

Interview and Observation Chart for Cramim School
Dec. 2000-Feb. 2001

Research Tool/Action		Date and Hour	Name of Subject	Role of Subject
Phone contact with principal		27.11.2000		Principal
Pre-research meeting		11.12.2000	Yaffa Ben-Ami	
Administrator interview		11.2.2001	Prof. David Chen	Academic advisor and founder of the school
Principal interview		10.12.2000	Yaffa Ben-Ami	Principal
Principal questionnaire		12.1.2001		
coordinator interview		21.12.2000	Jennie Graiffer	Knowledge engineer
Coordinator questionnaire		22.2.2001		
Observations	1	21.1.01, 10:15	Sigalit Gabay	Language studies 5th-6th grades
	2	22.1.01, 10:15	Rachel Fillo	Mathematics 5th-6th grades
	3	28.1.01, 8:30	Sigalit Gabay	Joint subject 5th-6th grades
	4	22.2.01, 10:15	Sarit Brooks	Young division
Involved teachers focus group interview		14.1.2001	Sigalit Gabay, Sarit Brooks, Rachel Fillo	Art teacher
Uninvolved teacher interview		1.2.2001	Merav Yarkoni	Drama teacher
Uninvolved teacher interview		15.2.2001	Mira Shaked	
Involved students focus group interview		22.1.2001, 11:00	5th-6th grade students from Rachel Filo s class	House 12 students (5th-6th grade)
Parents focus group interview		19.2.2001		
Computer skills survey		8.1.2001	School teachers	
Documentation		School web site	http://www.cramim.rishon.k12.org.il/	

APPENDIX 2: TEACHERS COMPUTER SKILLS

Results of ICT Skills Survey among Teacher Population

Methodology

The questionnaire was handed out in the teachers room, and filled out by 10 out of 50 teachers on the school staff. Some answered immediately (8), and 2 handed it to the school secretary later on. The teachers who participated in the survey were classroom teachers and subject teachers, teaching all grades from kindergarten to 6th grade.

Results

There is connection between the feeling of ease of teachers while using the computer and the importance they ascribe to ICT skills. Most teachers feel comfortable regarding skills they find useful (apart from graphic software). The following chart (Figure 1) displays the answers of teachers regarding their feeling towards ICT and the importance they ascribe to the ICT skills.

Figure 1: Percentages of repliers of answer 1 (on 1-4 scale) regarding the feeling of comfort with ICT and extent of importance of ICT skills
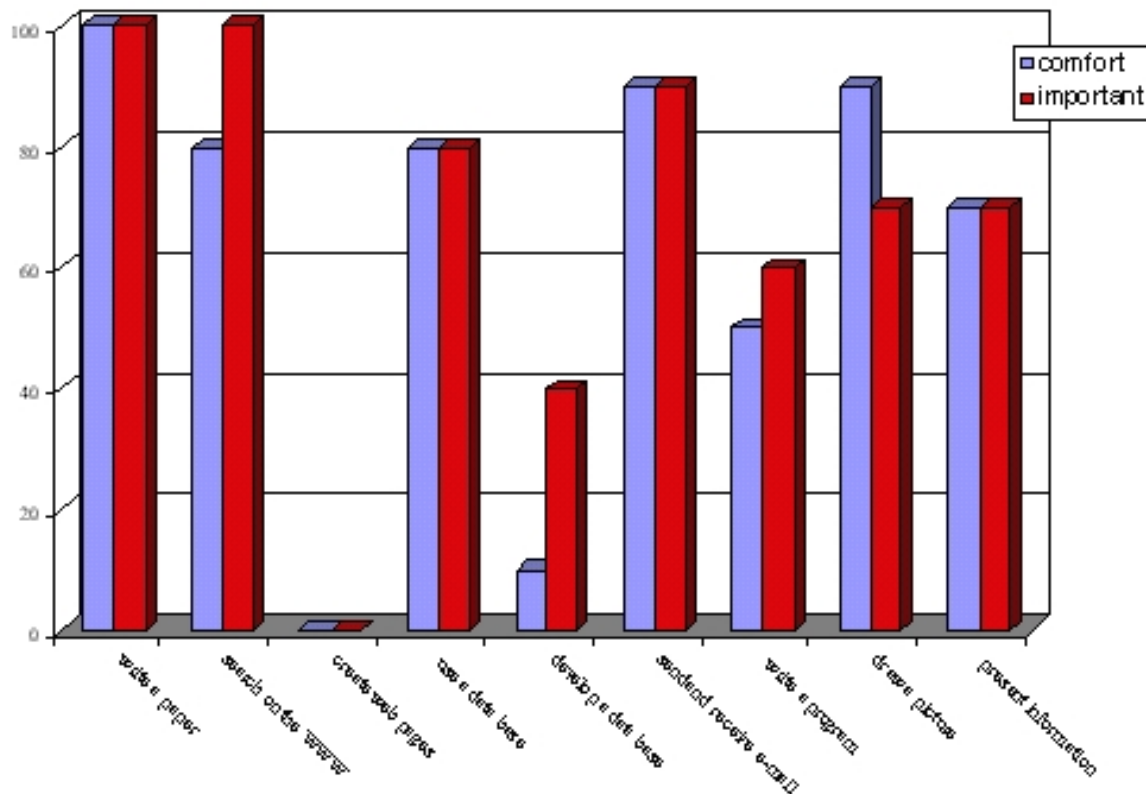
Analysis of the frequency in which students use ICT applications shows that the average usage lies between a few times a week (word processing) to once in a while (creating web pages). According to teachers reports, all applications are used in Cramim, most of them on a frequency of more than a few times a month. Data is displayed in Figure 2.

Figure 2: Average usage of computers on a scale of 1-5: 1   a few times a week, 2 - a few times a month, 3 once in a while, 4 - never
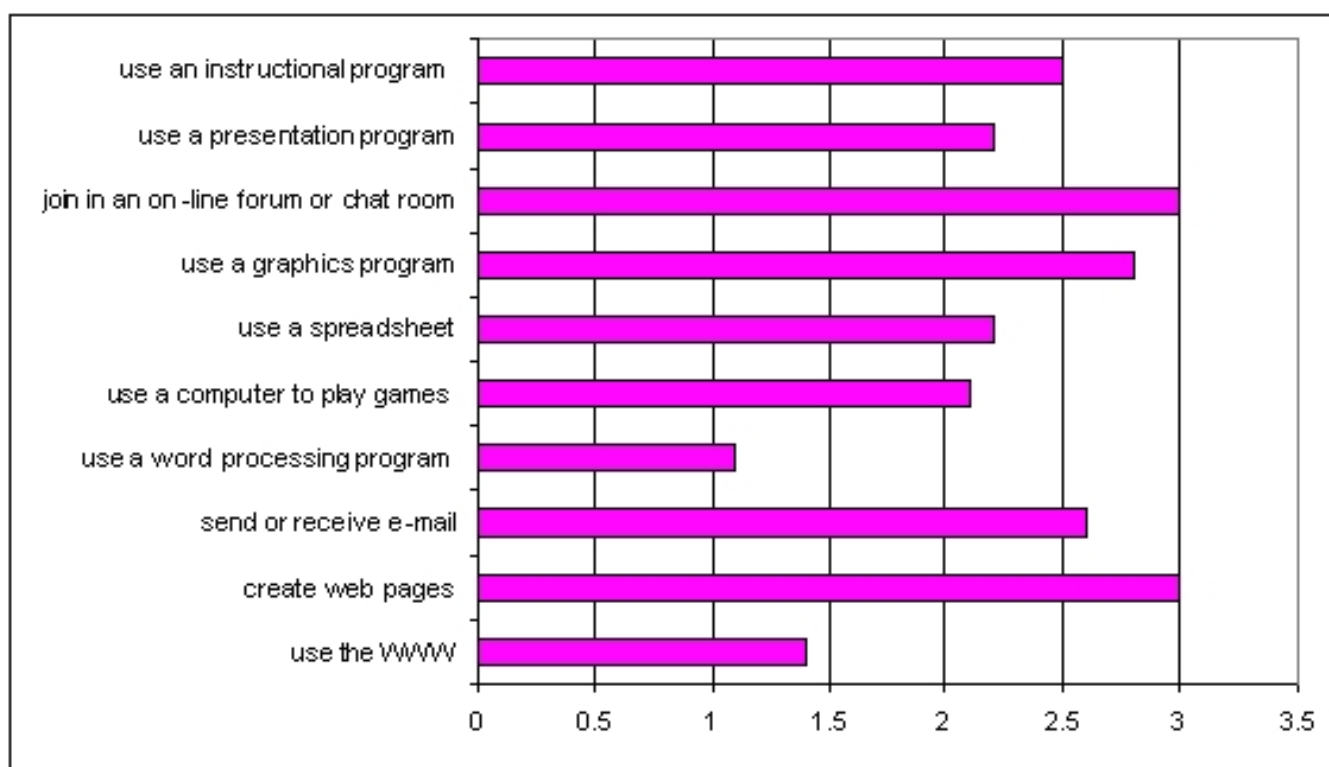
Teachers in Cramim define themselves as competent users of computers. Not one defines herself as weak in computer skills. The distribution of their answers is as follows:

		Good	Mediocre	Weak
30	How would you define your ability to use computers?	5	5	0

As for policy of ICT implementation in the last year, the distribution of answers indicates a reasonable rate of implementation in different areas:

		Yes	No
31	Had there been assessment of computer usage among students?	9	1
32	Can you create or alter a web site with one of the classes you teach?	3	7
33	Do you participate in a virtual course on the internet as a student or tutor?	6	4
34	Do you involve your students in collaborative learning on the Internet with students from other classes in other places?	6	4

Not all teachers answered the following questions, but it seems that computers are widely used for content learning and for doing individual projects. Distribution of answers is as follows:

		All of it	A large part	A small part	A minor part
35	What part of computer usage during the lesson is aimed directly at the lesson content?	2	3	2	
36	What part of the assignments is computer-related for individual usage?	1	7	1	

Teachers in Cramim report that certain limitations are imposed to students while surfing the web. The answers are as follows:

		No limitations	Some limitations	Distinct sites only
37	Do you assign your students to search the web? What is the degree of freedom you allow your students while doing so?	2	6	1

All teachers in Cramim use computers for teaching and additional work a few times a week. This finding supports the working culture of the school and the school vision.

		A few times a week	A few times a month	Once in a while	Never	I don t own a computer
38	Do you own a personal computer? How often do you use it for your work?	10				

In addition, teachers engage in collaborative learning to a large extent, as shown in the following results:

		Yes	No
39	Do you use technology to collaborate with other teachers? (professional chat rooms, forums etc.)	9	1

Results show that most teachers use e-mail to a great extent. The combination of the following item with the previous one indicates a wide usage of computers by teachers.

		More than 12	6-11	1-5	None
40	How many messages (average) do you send a week by e-mail?	3	1	4	2

The following data indicate that a large number of teachers can upgrade applications and develop databases, but less master hardware manipulation and the Internet.

How many of the following activities can you perform?

41	Altering hardware	3
42	Updating/upgrading applications, such as word processors, graphic software etc.	6
43	Restoration of files	3
44	Site construction	5
45	Developing databases	7

APPENDIX 3: ADDITIONAL EVIDENCE ON COMPUTER SKILL ABILITIES BY GRADUATES 2000

Table 1: Level of students' competence in ICT applications and tasks

|	**Competence**
Word	98%
Excel	75%
Power Point	95%
Scanner	43%
Computer communication	90%

Notes:

1. The data was gathered from 6th grade report cards.
2. The computer skills were taught throughout the school year according to curriculum and grade level requirements.
3. The skills were integrated into the different subjects.

APPENDIX 4: SAMPLES OF LEARNING ACTIVITIES

Example 1: Math Lesson in a grades 5th-6th house

36 students, which were divided into 2 groups, participated in the lesson: 19 in the computer gallery in the upper floor of the house , and 17 in the open space, on the ground floor of the house . The students received different assignments: one group on the ground floor inquired about the number of squares in a chessboard. Another group followed instructions in a quiz about characterizing numbers: amount of digits, position, relations between them etc., later on passing their characterization to a friend for evaluation.

In the gallery, 9 students are experiencing combinatorics, by research of the possibilities of combining different amounts of squares, with at least one joining side to one another. Students sat in pairs in front of the computers, and performed the assignment using the graphic functions of MS-Word. The sketch gives an example of possible outcomes.
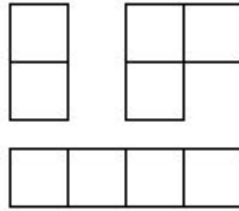
10 additional students worked in pairs solving a computerized work page on MS-Excel. The file included drill and practice in multiplication and division in decimals, with feedback according to right (very good) or wrong (try again) answers. The file was created by the teacher. During the 45-minute lesson, students worked mostly on their own, while the teacher went up and down the stairs, checking and assisting the various groups of students.

The atmosphere was clam and relaxed. 10 students worked in pairs with computers, and the rest worked alone. In the ground floor, students worked in groups that were composed of different and changing combinations. One student who worked by herself explained:

I like working alone without other kids. It helps me concentrate.

At the end of the lesson, the following goals were achieved: the students inquired about multi-squared combinations, practiced multiplication and division in decimals, and received computerized feedback for assessing their achievements. One of the groups found a formula for calculating the number of squares in a chessboard. Another group completed characterizing numbers, handing their results to their peers, going over their peer results and assessing them. Even those who had not completed their mission advanced in their assignments.

Examples of shapes that are multi-squares

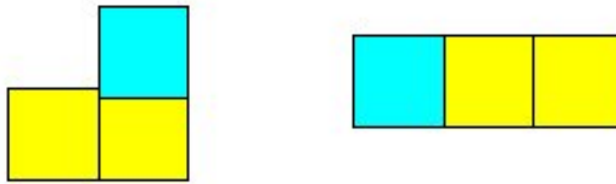Examples of shapes that are not multi-squares:
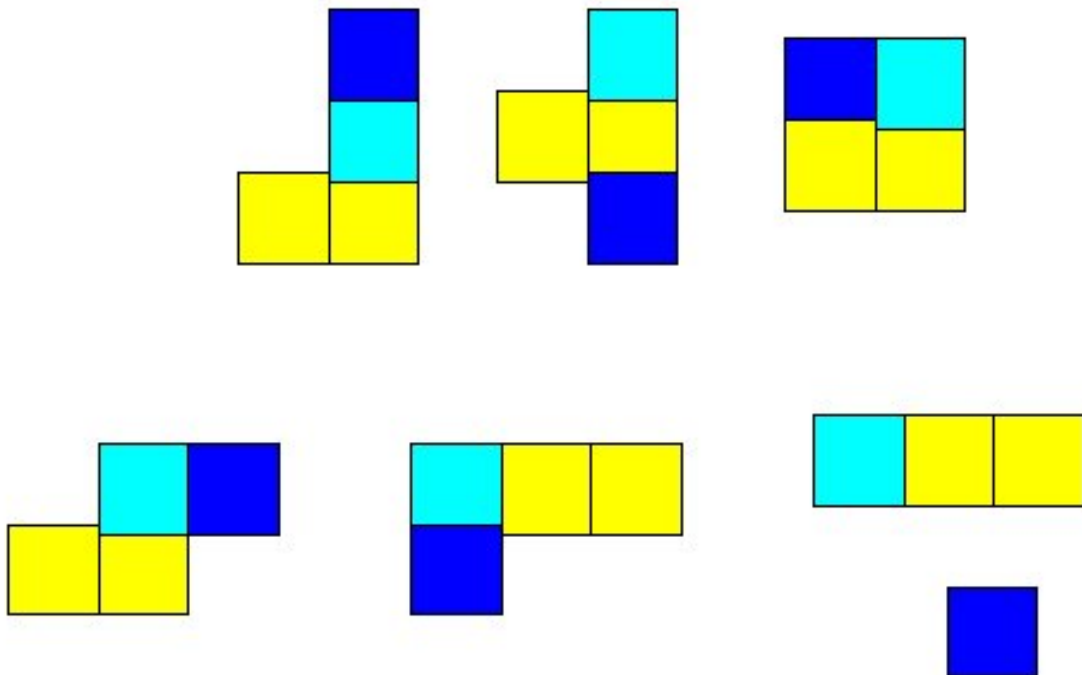
There is no overlapping in whole sides:

A multi-square combined of 2 squares: a 2 multi-square shape

A 3 multi-square shape

A 4 multi-square shape

Example 2: Math Assignments in Excel developed by the teachers

(See decimals.xls file)

Example 3: A flexible lesson comprising Bible, reading and Civics assignments (in the same time slot) in a grades 5th-6th house

The lesson opened with 5 minutes of handing out assignments to all 63 students in this house. After that, 21 students went up to the computer gallery, together with the teacher. All 13 computers were in use, and the students were working simultaneously on several assignments. Students working on reading assignments prepared using MS-Word a questionnaire *Myself as a Reader* . *The questions* , explained one of the students, *examine how one reads: how long, in what position, or if you would have liked to work in a book store*. The questionnaires will be handed out to all students, and every student will evaluate his fellow students.

In Bible lessons, 5th grade students work in pairs on a table of characteristics and actions of King Shaul. Some students use MS-Word, some use MS-Excel. Eventually the tables of all students will be transferred to one Excel file. In geometry, students are working on an assignment concerning overlapping of polygons, and in civics the assignment concerns politics.

The students are handed pages with a list of sites of the Knesset and the parties in Israel. Students work in pairs: they are assigned to visit different web sites and answer questions [the observation was carried out a couple of weeks before the special elections for prime minister in Israel]. That morning, the first lesson was devoted to the dangers of the Internet, following the murder on the previous day of a 16-year-old boy by a Palestinian girl and her friends. The initial contact between them began in a chat on the Internet, and then continued by e-mail, leading to a meeting between them and his brutal murder. The teacher explained:

I had to talk with them about the dangers of corresponding via the Internet. They should be careful about the information they pass on, because one can know quite a lot about them.

The atmosphere was pleasant and relaxed. The students worked according to a timetable, each knowing his or her deadlines. Assignments that are not completed in school will be completed at home, or on another flexible lesson. The students feel free to discuss issues with the teacher. For example, in the gallery the following conversation develops between the teacher and a student, relating to the amount of questions in his questionnaire:

Teacher: Think about what is your goal in these questions.

Student: To know if you read and when you read.

Teacher: I ll give you an example. One group asked If you receive a book as a gift, will you be happy? What does that tell about me as a reader?

Student: That if you re happy, it means that you like books.

Teacher: And another group asked If you go to the mall, do you go in a book store? What does that tell you?

Student B(joins the conversation): That he likes books, otherwise it doesn t interest him.

Teacher: I ll make it tougher for you. And if he goes into a bookstore to look at computer games? How will you know?

Student B: then I ll ask him if he goes in to read a book.

Teacher: That s right. The questions need to be focused...it doesn t matter how many questions, but that there will be sufficient information. And is it important that they [the questions] will be arranged somehow?

Student: First you have to ask if he or she like books, and then which books they like?

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[1] In Israel, all children aged 5-16 are obligated to enter school by law, and the state must supply schooling for all. There are no private schools in the country; therefore the educational system is public. The distribution of resources to schools is anchored in a set of regulations, rules and norms, which ensure egalitarian distribution.