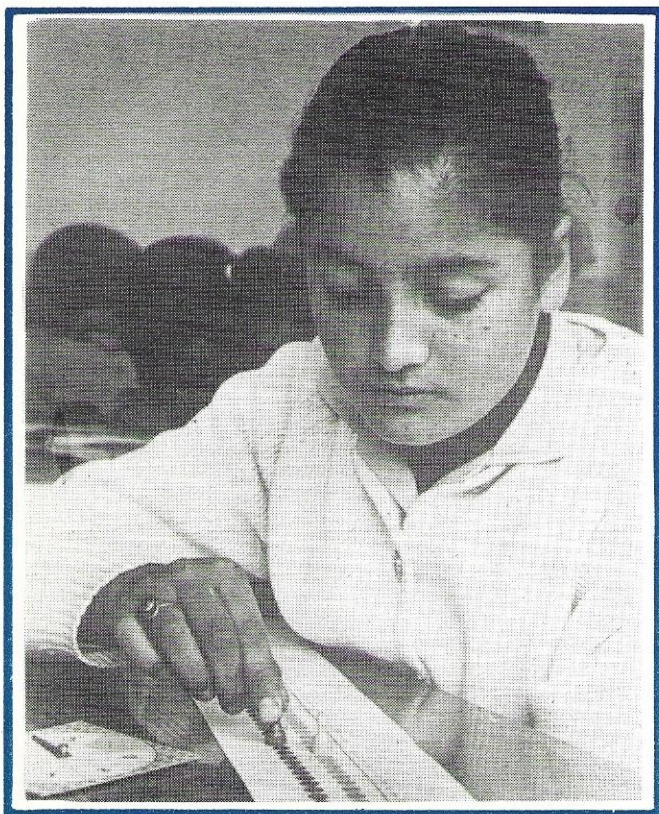


Math Project for Junior High School

"Rehovot Program"-a brief description



Science Teaching Department

Weizmann Institute - Rehovot

ISRAEL

Cover photos

Front cover: pupil in socially deprived school playing one of the mathematical games.

Back cover: teachers in an in-service course devoted to curriculum enrichment using the pocket calculator.

Photos on page 3 and 4

Project team members working with experimental materials in school.

INTRODUCTION

New math programs in Israel, as in most of the Western world, were guided by university scientists and mathematicians.

In Israel "New Math" started as an experiment in high school. The first such experiment (initiated by Prof. S.A. Amitsur) had a great influence on the development of new math programs in junior high school.

Twelve years ago a reform was started, under which the old system of 8 + 4 years began to be replaced by 6 years elementary school, 3 junior high and 3 high school. At present, about 60% of the school system has changed to the new system.

The change in the school system was an opportunity to introduce new math programs "by law." The mathematics group, in the Science Teaching Department, was formed to develop one of the two "official" junior high school curricula in mathematics and junior high schools may choose which of the two to follow.

Our program (the "Rehovot program") has been developed over the last 13 years and the members of the project team continue its development at the present time. The project team is also responsible for the many facets of its implementation, which gives the project a depth and breadth not often encountered. The "Rehovot program" is taken by most of the junior high schools. More recently many elementary schools, although still officially belonging to the old 8 + 4 system, chose to teach the program. As a consequence, more than half of the relevant age now take the "Rehovot program".

Our work is influenced by a sandwich effect: on one side we have the junior school (grades 1-6) and on the other the high school (grades 10-12). For junior school mathematics there is no central project and a multiplicity of curriculum materials, whereas for high school there is a central project but the new curriculum materials are not yet ready. So the new high school syllabus is not compulsory. If and when this material will be ready, every high school will have to teach the new program. Our situation in the middle of the sandwich is quite complex. Junior high school in Israel is comprehensive; that is, each school takes the whole population from its surrounding area (students from 3 - 5 elementary schools, in general, go to one junior high school). Academic high schools take only part of the population, the rest go to many kinds of vocational school, whose syllabus and materials are, in general, traditional. The resulting effect on us is briefly - that the mathematical entry behaviour of students coming to junior high school is extremely heterogeneous. We have to put them through a modern program and produce students, after three years, who can, at present time, cope with a relatively "old program" in their higher education, and, in the future if they are academically inclined, cope with a thoroughly modern program. In other words - "all things to all men".

The project team consists of some 25 - 30 people, most of them practising teachers working on the project part-time.

THE POPULATION

(i) Students

The junior high population is also socially and economically very heterogeneous and includes a large section which is officially defined, on the basis of socio-economic criteria (land of origin, parents' education, parents' occupation, number of people per room, ...) as SOCIALLY DEPRIVED.

There are socially deprived students in every school; their percentage of the whole school population varying from close to zero to 100%.

One of the slogans of "Reform I" was integration of the different sub-populations. In reality, the district defines the school population. In socially deprived districts we have socially deprived schools. We chose to call a school socially deprived if more than 70% of the population is socially deprived. Socially deprived schools tend to receive larger budgets than the rest.



(ii) Teachers

The second slogan of the Reform was the academisation of junior high school education, that is academically trained and specialist teachers from the beginning of grade 7.

In fact, there are still not enough academic teachers, and in many cases the junior high school teacher's training is confined to the teachers' college.

THE STRUCTURE OF THE PROGRAM

In each school (socially deprived or not) any two "regular classes" are divided into 3 streams for mathematics lessons. Mobility between streams is encouraged and takes place, mainly in Grade 7. It is interesting to note that 52% of all students learn in the A stream (the most able),



34% in the B-stream, and only 14% in the C-stream, which contradicts a widely held belief that the streaming system tends to push most students into the middle. These percentages are very much dependent on the percentage of socially deprived students in the school. Because of the streaming, our program consist of three parallel sets of material, designed for three ability levels.

PROGRAM IMPLEMENTATION

We regard our project as an "on going" task without any foreseeable terminal date. Therefore, we place considerable emphasis on creative implementation, in the belief that development without extensive implementation makes no sense. Reports from other countries show clearly that production of materials without long-term in-school implementation has a very limited impact.

Our concept of implementation is a wide one. By CURRICULUM IMPLEMENTATION we mean THE TOTALITY OF ACTIVITIES WHOSE PURPOSE IS THE TEACHING AND LEARNING OF THE CURRICULUM IN AN APPROPRIATE SPIRIT FROM THE POINT OF VIEW OF CONTENT, THE OVERALL OBJECTIVES, THE MEANS AND METHODS APPROPRIATE TO THE ABILITIES AND ATTITUDES OF THE TEACHER AND THE STUDENT POPULATION. About the only thing which this view of implementation leaves out is the writing of the texts in isolation from the school.

Our implementation activities include:

(i) Distribution

With the years we found that the most efficient and cheapest way to publish and distribute our materials is to do it ourselves. Therefore, in the department, there is a section

which consists of typists, graphic artists, clerical, sales and warehouse staff. We send books, journals, mathematical games etc. to teachers and students all over the country. The distribution system being in-house has links with the project team members and, hence, is responsive to individual teacher's needs and enquiries.

(ii) In-service teacher training

The project team runs regular in-service courses, whose length varies from one day to two weeks. The courses are in most cases directly related to the new and existing course materials, since many teachers lack the didactic and mathematical background to use the materials with any confidence.

Most of the courses are organised in the form of workshops. We think that in order to influence the teacher's classroom behaviour and to make him more responsive to the mathematical content, the available materials and the students, we have to allow him to experience the various teaching strategies, which we feel are desirable. Thus, in the workshops, the teachers play mathematical games or create games themselves, they work on mathematics projects, they study a topic using worksheets and create worksheets themselves, etc.

About 500 teachers attend the two week long summer vacation course. This is a very large number for a very small country but still not enough. One can still find teachers that have never taken part in any course - and seeing them in action there is no doubt that they could benefit.

(iii) Written teacher guidance

The project team produces an irregular newsletter, which appears 6 - 8 times during the school year. The newsletter, beside purely informative items, contains didactic topics directly related to the classroom.

We also publish a Hebrew language teachers' journal which appears three times a year. This journal plays the same role for Israeli teachers as the NCTM journals play for English speaking teachers, except that, because of the paucity of suitable background material in Hebrew, it is, for most teachers, the only professional literature available.

The project team also produces the usual written teacher guides to accompany all the student materials.

(iv) In-school guidance

A number of selected teachers in different areas of the country have a part-time appointment with the project team. Their work is to visit schools giving first aid on the spot, helping and advising on the syllabus and its teaching, and providing feedback to the center. It is worth noting that this implementation procedure is one which is faced with the necessity and the possibility of relating to the real teaching situation, and it is based on "one-to-one" guidance. The teacher-tutors also organise local mini-workshops whose purpose is similar to that of the one-day national workshops, but with special emphasis on immediate teaching needs.

RESEARCH AND EVALUATION

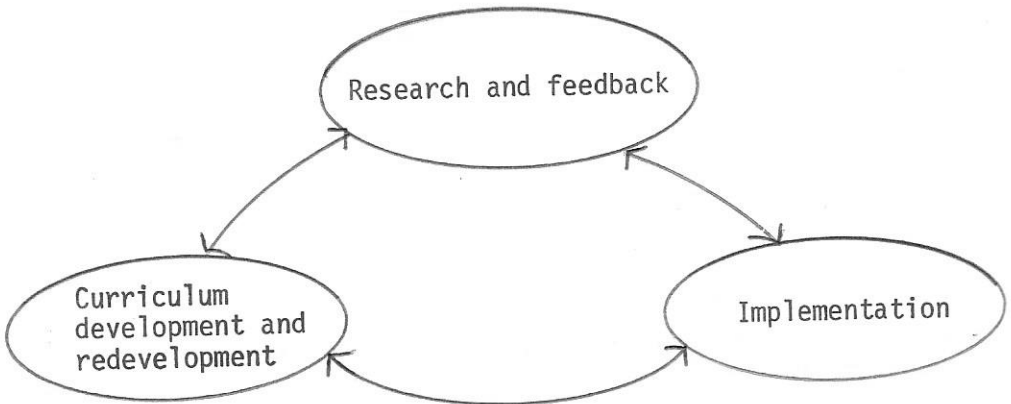
All the research and evaluation activities are organised as an integral part of the development and implementation activities and to influence their on-going design.

Types of activity currently in progress:

- (i) identifying needs and diagnosis of their causes;
- (ii) formative research as part of curriculum development;
- (iii) research into the processes of implementation and their effectiveness;
- (iv) follow-up and feedback surveys;
- (v) fundamental research.

CONCLUSION

The Rehovot math curriculum project is designed as a comprehensive long-term project with three major areas of activity, which are closely linked with each other.





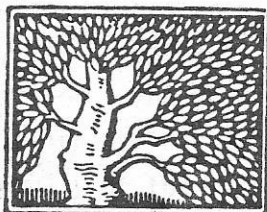
Math Project for Junior High School

Follow - up , Feedback and Research
within the Curriculum Project

Abstract of presentation to be given by

NURIT ZEHAVI

13.10 - 14.00 Thursday, 14 August



Science Teaching Department

Weizmann Institute - Rehovot

ISRAEL

Follow-up, Feedback and Research within the Curriculum Project

In-house evaluation is open to objection on the grounds that it may lack objectivity. The desire to make things look good, can cause bias in the collection and analysis of data and their interpretation. This objection is valid when the research is done for outside consumption; e.g. to justify a project to its financial backers or its prospective consumers. It is less likely to be valid where the purpose is not external justification. In our curriculum project research is an integral part of the overall strategy, designed to give us information by which we can continue and improve our development and implementation strategies. This implies an ongoing evaluation and long-term research strategies.

Types of research currently in progress:

- (1) identifying needs and diagnosis of their causes;
- (2) formative research as part of curriculum development;
- (3) research into the processes of implementation and their effectiveness;
- (4) follow-up and feedback surveys;
- (5) fundamental research.

In the presentation "Mathematics for the socially deprived" there are examples of needs assessment and the formative research of a remedial program. Within this area, we have also begun a comprehensive survey of the effectiveness of the implementation of the materials and some cognitive research.

In the presentation "Mathematical games within the curriculum" there are examples of formative research (testing the efficiency of new strategies for using games and new variations of a game, as well as the identification of the most suitable sub-population).

An example of research into the processes of implementation is a recent pilot study of the effectiveness of our teacher-tutor system. The object of this study was to determine the "needs" of the teacher as seen by himself. The results of the study have already had their effect on that part of our implementation procedures aimed at the teacher. This study will be discussed further as part of this presentation.

Another research study which will be discussed in detail in this presentation is an example of both fundamental research and implementational research. The study began as an implementational study of "Assignment Projects" which were developed to enhance the mathematical activity of grade 9 students. As part of the study, and in particular to study the process of classroom implementation, a taxonomy for organising students' answers related to the stated goals of the projects was constructed. In order to evaluate the outcomes, a pre-post "assignment test" also related to the goals, with the appropriate assessment tools was prepared.

Another research tool developed as part of this research study was a method of analysing tests using the teacher's prediction. The starting point of the method is subjective estimation by the teachers of the cognitive level and difficulty of the test items. Thus the teacher is

introduced as a variable into the testing procedure. Then the test is applied to the classes. The data for the three variables: actual success, teacher-assigned cognitive level and predicted difficulty is organised graphically for each class and each question. The graphic representation gives information which connects the three constituents: student, teacher, program. This information enables us to penetrate a little into the teaching/learning process. The analysis of one class over all the questions is a useful guide for teacher-tutors who visit the school. The analysis of one question over all classes provides information on problems connected with the teaching of a particular topic such as actual student difficulties versus teachers' prediction of student difficulties.

The two tools here developed did not previously exist within the battery of tools available to educational researchers and so represent examples of fundamental research within the curriculum development and implementation project.

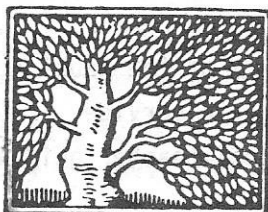
Math Project for Junior High School

Creative Implementation: an Ongoing Project

Abstract of presentation to be given by

SHLOMO VINNER

17.10 - 18.00 Tuesday, 12 August



Science Teaching Department
Weizmann Institute - Rehovot
ISRAEL

Creative Implementation - an Ongoing Project

To anyone who has read NACOME, it is clear that the state of curriculum implementation is not much better than that of the weather. Everybody talks about it but little, if anything is done about it. The Weizmann Institute junior high school math project is an attempt to do something about the weather. We believe that the project is relatively unique, perhaps because it can capitalise on the uniqueness of the educational situation in Israel, which has (1) a central obligatory syllabus imposed by the Ministry of Education. This implies (2) an obligation by the Ministry of Education to implement the curriculum. In addition there is also (3) a special commitment by the Government to the needs of the socially and culturally deprived children (who are mainly descended from refugees or immigrants from the Arab states and constitute some 60% of the relevant population).

Thus, we have an ongoing (rather than terminal) project which is some 12 years old now. This begins to be a relatively meaningful period for a curriculum implementation project, and makes implementation a "possible mission". Many curriculum development projects would seem to fail because, among other things, financial support is cut off immediately or soon after the textbooks are published and implementation activities are nominal. An indispensable factor in the implementation process is time used effectively and intensively.

Besides its inadequacy, the main deficiency of the usual curriculum implementation (teacher guides, in-service training courses, teacher centres, in-school teacher guidance)

is that it is directed at the teacher only, whereas its purpose is to influence the teacher-student interaction.

Further, in many projects, there is the implicit assumption that the learning materials exist as an unalterable ingredient within the implementation process, and that it is the job of the latter to make the learning materials "palatable".

Our approach to implementation is fundamentally different. The difference starts with the effort put into implementation- which now is some two thirds of the total project. Then there is the way learning materials (mainly the textbooks) are considered in the implementation process. They are not considered as unalterable, "eternal" elements with possible corrected editions. We believe that they should also be a subject of change closely linked with the whole implementation process. An implementation based on such an approach will be called by us creative implementation.

Once the basic curriculum materials were complete, our project team members began to intensify implementation. Within the process of creative implementation the team has produced numerous additional materials, such as worksheets, games, supplementary booklets, etc. Some are designed to provide a challenge for the better students, some to help the weak students and yet others enrichment or alternatives to chapters that, on implementation, proved to be imperfect.

These additional materials, together with the original textbooks, form a new "creature", different from the first curriculum materials and, because on the whole, they were created within, and as part of the implementation procedures, they are well along the road to being implemented as they

are created. All this ties in well with our general approach to curriculum development which is long-term and evolutionary.

Two facts may throw some light on the intensity of the implementation:

- (1) Our figure for in-service training per year is between 4000 and 5000 teacher man-days. To understand this figure one must take into account the size of the population; the whole relevant teacher population is about 2000.
- (2) 60% of the relevant population in Israel have adopted our program. Half of these are eligible for guidance. It turns out that among these almost 90% get meaningful guidance. A survey done in 1980 shows that the more guidance they receive the more they appreciate it and seem to benefit.

Hence there is some basis for believing that full implementation will be achieved one day.