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Two Cultures, One Profession A Cultural Encounter in Mathematics Education between the Former Soviet Union (FSU) and Israel

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Introduction.

"Why Learn Math? Because it Organizes Our Minds!" was a quote hanging in Lena's math class in Ukraine before she immigrated to Israel in 1995. She told us about it, recalling wistfully, yet with pride, that she yearns for order, clarity, and a sense of belonging. The quote is attributed to the famous eighteenth century Russian mathematician, scientist, poet, and linguistics reformer Mikhail Lomonosov (1711-1765).

Lomonosov's inspiring message resounds far beyond mathematics. The importance of "order" in life as stemming from mathematics is part of an ongoing cultural legacy.

The Soviet government placed mathematics on the highest pedestal. Teachers and educators regarded math and science as vital tools in developing "upbringing" (*vospitanie* - in Russian, *éducation* - in French, *Erziehung* - in German) (Muckle, 1988), and saw themselves as agents of the mathematics culture in the Soviet Union.

When Lena and many other Soviet immigrants arrived in Israel they suddenly found themselves in a strange culture based on entirely different value systems.

Conventional wisdom in international research community of mathematics education has long claimed that an inseparable link exists between mathematics education and values, culture, and society. (Bishop, 1988 & Amit, 2000) Certainly the main theme of CIEAEM 57 conference - "Changes in Society: A Challenge for Mathematics Education" - testifies to this view. However in general society math is perceived as a neutral discipline, void of cultural affinity. It is commonly thought that mathematics can easily be transferred from one country to another, or from one culture to another, without undue crisis or conflict. **This perception, however, was found to be far from the truth.**

This paper deals with the cultural encounter in mathematics education as experienced by mathematics teachers, all recent immigrants from the FSU, who successfully integrated into the Israeli educational system. Five case studies will be described in detail, and findings collected from other immigrant and Israeli teachers and immigrant students will be presented.

Background.

During the 1990s nearly 900,000 immigrants from the FSU came to Israel – a fifteen percent addition to the country's population of six million. Many of the new arrivals had academic degrees in science, engineering, medicine, and music. Israel was prepared to make a tremendous effort to ensure that this flood of highly professional immigrants would be absorbed smoothly and productively.

On the assumption that math was "a neutral, non-ideological discipline, that is, "a field of study that lacked values or cultural affinity," thousands of immigrant teachers, as well as engineers, successfully passed teacher retraining programs in order to facilitate their adjustment to the new society and its school system.



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The halo surrounding Soviet mathematicians contributed to the immigrant teachers’ heady self-confidence and the expectation that their adjustment into the education system would be immediate. **This presumption proved to be partially mistaken.**

Over a decade has passed since then, and we are now able to observe and re-assess the **absorption process** from the perspective of **mutual** influences on mathematics education in Israel.

The dilemma of the immigrant teacher.

In an enculturation system, the teacher is, by definition, the guardian of the culture and the disseminator of values. Herein lies the dramatic dilemma surrounding immigrant teachers: which culture and which values should they transmit – the old ones that they were brought up on, lived by and respected, or the new ones that they feel somewhat alienated from? We may also ask how this dichotomy will be “played out”? Research literature on immigrant teachers is “rare...perhaps because the phenomenon itself tends to go against the grain: teachers are seen, at least partially, as messengers of the culture.” (Elbaz-Luwisch, 2002) .

In the absorption process of FSU math teachers, a great dissonance exists between their confidence in their undeniably successful pedagogical heritage of the FSU, and the immigrant teachers’ need to prove the same success in their new country. This dissonance has created cracks not only in the immigrant culture, but also in Israel’s mathematical-educational culture.

For a decade the authors of this study have been observing the absorption process among immigrant teacher from two perspectives: One, from that of a veteran Israeli teacher at a school where FSU immigrant teachers and students were absorbed the other perspective is that of the Ministry of Education’s mathematics supervisor.

Research

The research aim.

Our research goal has been to identify the differences between two mathematics education cultures - that of the FSU until the early 90’s, and that of Israel from the 1990s to 2005 - as perceived by new immigrant math teachers.

The method.

Data was collected through personal interviews with five teachers from the FSU, class observations, open discussion with native Israeli teachers and students, and videotaped sessions.

Interviewees' profiles:

Teacher's first name	Education	Experience in the FSU	Experienace in Israel
Lena	B.Sc in Mathematics and Physics	Taught mathematics and physics in Ukraine for fifteen years. Was a school's vice president	Teaching in Israel since 1997
Irena	M.Sc. in Math and computer sciences	taught in Ukraine for two years	teaching in Israel since 1993
Olga	M.Sc. in Math	taught in a technologi-	Teaching in Israel

		cal college in Kyr-gyzstan for about fifteen years	since 1995
Leonid	M.A. in Math and Computer Sciences	Taught in Moscow for 8 years	Immigrated to Israel in 1990, teaching since 1999
Tamara	Phd. in Math	Taught in Uzbekistan for 22 years	Teaching in Israel since 1990

All five interviewees had undergone one-year teachers’ retraining and certification.

In the first stage of the interviews we asked general fact-finding questions in order to obtain a clear picture of the structure, principles, and assumptions that the Soviet Union’s education system was built on. Based on this information we tried to critically dissect the general concept of “cultural differences”, understand the “day-to-day” reality that the teacher came from and compare it with the Israeli reality.

We organized all our findings in detailed data tables (that can't be presented here due to "space shortage").

"Math is the number one key to better life"

The immigrant teachers’ view of mathematics education.

An analysis of the interviews and other data shows that two mathematics education cultures exist, each basically different the other. Both approaches reflect the general culture and educational-pedagogical perception of math instruction in each country – FSU and Israel.

The FSU Educational Culture	The Israeli Educational Culture
Highly centralized everyday life	Autonomy and individuality is encouraged
Rigid educational approach	Respect between teacher and pupils is emphasized
Authoritative society	Non-authoritative society
Uniformity - Relinquishing choice	Choice is encouraged
Emphasizing order, discipline, strict supervision, consistent follow-up	Autonomy and individuality is encouraged
Emphasising competitiveness and encouragement of excellence	A culture of equality
Restriction of freedom of speech	Freedom of speech

In the FSU the teaching profession was held in respect. Education was considered a goal of it's own right, as well as " a key to a better way of life, higher social position and larger income".

As for Math : it was considered "the number one key to success". The state and society gave math, science, and technology the highest priority, and provided enough resources to attain this goal. In Israel : officials and agents of culture ballyhoo the priority of math and science studies, but when it comes to the practical realization of this statement, in terms of the centrality of math and the granting special resources, Israel lags far behind the FSU.

Free the teacher from being free.

In the FSU, the state decides all aspects of the educational curriculum, whereas in Israel the approach resembles a “free market”. Israel's open approach in which the teacher or school decides on the teaching material and textbooks is diametrically opposite that of the Soviet Union where everything was decided by the central government. Moreover, even the choice of teaching method and personal experience of the Israeli teacher was completely antithetical to the message of the USSR Academy of Pedagogical Sciences (APN) that was the authorized body for research and applied education in the Soviet Union. This institution explicitly stated:

“Research into the new methods . . . frees teachers from repeated trial and error, from discovering what science already knows, and applying ideas that are unrealistic for the ordinary school.” (Autotov, P.R., Babansky, Yu.K. in Dunston J., Suddaby A., 1992. p.9)

In other words, the system “freed the teacher” from the need to be liberated, ambitious, and independent.

Evaluation and supervision.

In the FSU every lesson contained an element of testing. The student was tested by his teacher and the teacher was “tested” by different leveled supervisors attending his lessons.

The approach is illustrated in the method of annual achievement evaluations made by external bodies with predetermined standards and that were distributed to the teachers at the beginning of the school year. The exams left no room for choice, and the scores determined how well students and teachers had accomplished their tasks. In Israel, on the other hand, the teacher and school wrote up an evaluation, after having provided the pupils with large doses of choice. External testing did not exist until the completion of high school when it appeared in pre-matriculation exams.

Autonomy vs. authority.

Another obstacle that teachers who came from a centralized authoritative culture faced was the difficulty in accepting conceptual autonomy, the investigative approach, and the **constructivist theory**, that were so widespread in Israel during the 1990s, as a basis for mathematics education. As one of the teachers said: “There we knew how to teach properly and we succeeded at it; we knew what was best for [the students] . . . Student cannot discover math rules on their own . . . Why should they have to? We can teach them the correct ones . . . Why does a student have to find . . . what is wrong with a good explanation?”

Who are the partners?

We learned from immigrant teachers that they found it hard and sometimes even humiliating, to accept the involvement in and occasional criticism of their teaching performance by parents and students, as is common in Western countries.

Language.

Some of the immigrant teachers had to alter their basic methods of instruction because of language problems. For example, teachers with highly developed verbal skills in their native language, which they used for in-depth explanations, gave up in trying applying this method in the multi-cultural classrooms in Israel. Instead, they employed graphs or symbols.

Hard work vs. hard thinking.

The Algebra case.

$$\left(\frac{a}{3(a^2+1)^{1/2}} - (2a^2+1+a\sqrt{4a^2+3})^{1/2} \cdot (2a^2+3+a\sqrt{4a^2+3})^{-1/2}\right)^2$$

On university entrance exams in Russia there was the above question, that asks the pupil to simplify a complex algebraic expression, but Israeli high school grads have never seen such an expression.

The way immigrant teachers perceive algebraic manipulation goes along with the goals of algebra study, see, Muckle, J.Y., *A Guide to the Soviet Curriculum; What the Russian Child is Taught in School*, (1988).

The meta-goal of algebra teaching in the Former Soviet Union is “to **raise the level of the pupils’ calculatory culture** (Muckle, J.Y., 1988, p. 51).

These goals are entirely different from the declared goals in the vast parts of the West. For example, the NCTM’s standards for algebra are: Understanding patterns, relations, and functions. Representing and analyzing mathematical situations by using algebraic symbols. Using mathematical models to represent and understand quantitative relationships.

NCTM, (2000), p. 37 ff.

Homework.

The emphasis on hard work is expressed also in the extreme importance given to homework by the teachers who immigrated from FSU to Israel. They treat homework almost as a "sacred task".

These differences go beyond the debate over pedagogical approaches and emphases. They are strongly rooted in the values and pragmatic reality of the Former Soviet Union.

At the ethical level:

1. Hard work was an important value in the Soviet regime.

“Soviets hold that complex calculations inculcate **good habits of hard work**” (Muckle, J.Y., 1988, p. 58)

2. Algebraic skills demand very little independent creative thinking, values disapproved of by the Soviet regime. This approach came to tangible expression in the conflict between the pedagogical goal to develop independent thinking habits and the rigid political system that demanded obedience to and preservation of the status quo.

On the pedagogic-pragmatic level : Immigrant teachers have an ingrained belief, probably imbued from the pragmatism of the Soviet regime, that a problem’s solution must be “a product” a final or numerical result or an algebraic expression and not only part of a “process”: “The [students] are like engineers who know how to design things but not how to actually build them.”

What do we teach Math for?

Trying to understand the encounter we interviewed Gershon . Gershon is an experienced Israeli teacher in a school where new immigrant teachers also teach. He stressed some very main points (in his view):

1. The development of critical thinking in mathematics serves as a tool for critical thinking in life, need to be inculcated at an early age when the child’s thinking patterns are developing and being shaped .
2. Critical understanding and thinking are not the exclusive birthrights of the intellectual elite, but belong to everyone. His quest for equality influences his perception of mathematics teaching.
3. Math is mainly a tool used for developing logical and critical thinking thinking.

The transformation immigrant teachers undergo:

The final question we asked the immigrant interviewees was whether their teaching experience in Israel had changed their views on the aims of mathematics education and the ways of teaching it? Replies varied from a teacher who claimed that no change had taken place in his personal view of Math teaching, to a teacher who claimed that her outlook swung around "180 degrees". Most answers were rather complex and sometimes confused.

In order to analyze the answers and to understand the absorption process for immigrant mathematics teachers, we used Berry’s model (1990, 2005) that deals with immigrant social absorption. Berry coined the term *acculturation strategies*. (Berry, 1992)

His definition: “When there is a reasonable correspondence between an individual’s preference, and the activities he engages in, these ways of living may be termed *acculturation strategies*".

Berry constructed a model that divides acculturation strategies into four categories according to **the attitude toward the target culture** and **the attitude to the culture of origin** .

The following are the four categories: Integration: acceptance of the target culture along with retention of the culture of origin, separation: rejection of the target culture along with attachment to the culture of origin, assimilation: acceptance of the target culture along with rejection of the culture of origin, marginalization: rejection of the target culture and the culture of origin. We analyzed the teachers' answers according to these categories. We could recognize that the same person had attitudes that fitted to more than one category. We'll give just a few examples:

Assimilation:

Teacher’s statement: “There we were forbidden to budge from the study program. Even if they [the authorities] admitted that our suggestions were good, they said that it made no difference. ‘This [the official way] is how we expect things to be done!’ In Israel teachers have more leeway to realize their creative capacity.”

Marginalization:

One of the teachers retreats into a "bubble" in the field of mathematics (not involved in any of school life)

Integration:

A teacher spent many lessons “pounding” the algebra’s technical skill into the pupils’ heads according to the Soviet method, then returned to the problems and dealt with them at a deeper, more complex cognitive level.

An encounter.

The significance of the Israeli experience is the fact that a cultural encounter took place. It was a two directional process. The uniqueness of the process stems from the fact that for the first time the changes were motivated by teachers and their teaching practices, rather than by politicians, market forces, industrialists, or researchers. (Amit & Fried, 2002)

Changes in the Israeli Math education culture:

The evaluation system:

First the evaluation of pupils' achievement has become more centralized and institutionalized, taking place under the auspices of the Ministry of Education.

Excellence and Equity :

Another welcome influence of the FSU immigrant culture on Israel's mathematics educational culture has been the legitimization of the striving for excellence. In many schools groups of “math speakers” have been set up under the experienced tutelage of FSU immigrant teachers. Israel’s most successful “promoting excellence” program to date has been a math club called “Kidumatica – For the Advancement of Mathematics Excellence in the Negev.” “Kidumatica” was established at the Ben-Gurion University of the Negev on the initiative of one of this study’s authors. The program is designed for young students with a high cognitive potential, many of whom come from lower socio-economic strata. The math club’s main aim is to enhance mathematical reasoning, logic skills, and a scientific orientation, and to develop creativity and multi-directional thinking for solving unconventional problems. Most of “Kidumatica’s” teachers are immigrant mathematicians who derive immense satisfaction from this work, claiming that it’s “like breathing here with the oxygen-rich air from there.” “Kidumatica’s” successful pooling of key elements from both the Israeli and Soviet mathematics education cultures proves that ideological fusion or integration is possible. On the one hand, “Kidumatica” addresses Israel’s social need to provide equal opportunity to diverse populations; on the other hand, it advances excellence in mathematics in the Soviet spirit.

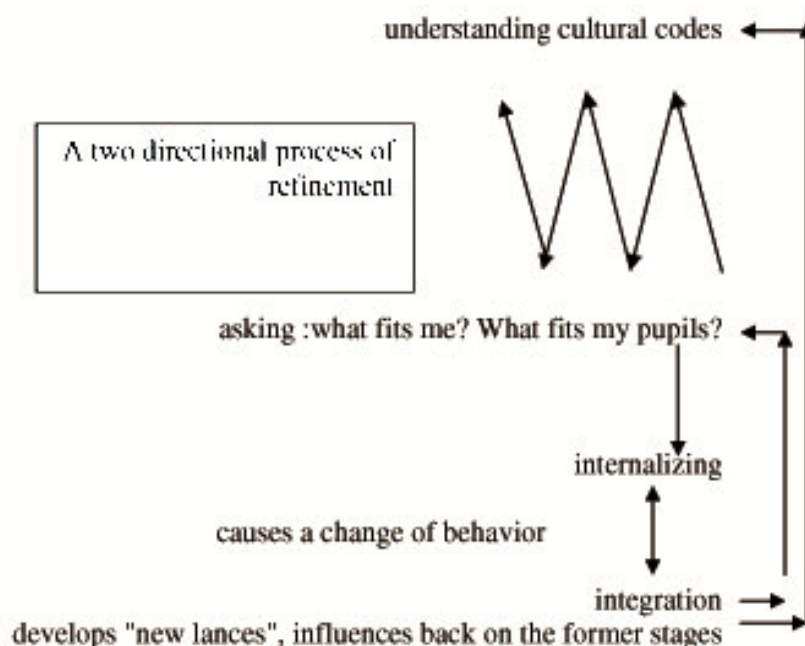
Conclusions and Closing Remarks

The purpose of this study was to identify differences between two mathematics education cultures as perceived by FSU math teachers who recently immigrated to Israel, and to understand what transpired in the cultural encounter. The differences between the mathematics cultures may be found in the differences between the two societies and their educational systems. FSU teachers left a society based on hierarchy, uniformity and discipline to one that encourages equality, diversity, choice, and autonomy. They left a culture with a centralized educational sys-

tem that promotes the teacher’s status, individual excellence and competitiveness, and directs enormous resources to education. They came to an educational system that permits teachers and pupils a generous degree of autonomy; appreciates diversity in teaching methods; and channels much fewer resources to mathematics education.

From a retrospective view of the absorption process (Berger, 2003), we can conclude that the teachers in this study now understand the codes of Israel’s educational culture even though they have not necessarily decided to act according to them. They are, however, able to evaluate and, to a certain degree, internalize them. While these teachers have not really “fit in,” they are, however, **negotiating new codes** and creating a math-education sub-culture. The nature of this new culture requires further research.

The process can be described as following:



With populations migrating from country to country in changing societies, Israel may be a case study for building a model for mathematics education in a multi-cultural, immigrant-filled society. Such a model must be based on underlying principles such as: respect for differences and diversity; the desire to expand cooperation and responsibility; an interest in cross-cultural dialogue; and the willingness to create mutual systematic patterns for positive cultural encounters.

This last principle is of paramount importance. When the absorbing group is dominant, the less dominant group should have the opportunity to present and explain its values so that a profitable synthesis between the two cultures may ensue.

As for the absorbing population in Israel, the cultural encounter has been productive and challenging and has forced “us” to reexamine our value system, reevaluate basic axioms in our mathematics education system, and take an honest and critical look at our cherished educational “truths” in light of those that the immigrant teachers have brought with them. Then, we had to candidly, courageously, and without authoritativeness decide which “truths” were pertinent and viable, and where changes would have to be introduced.

In mathematics and science teaching there is a supplementary value to the cross-cultural encounter and conjuncture.

Teachers of mathematics and science may further reduce authoritativeness and dogmatism by adopting a humanistic approach toward teaching, by educating toward openness and conceptual flexibility, and by developing human rationalism and critical reasoning.

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