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What Is the Thing Called "Humanistic Mathematics?"

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My purpose in this article is to deal with two different interpretations given to Humanistic Mathematics in educational systems and to present the systematic implementation of a program based on both of them in Israeli elementary schools.

"What is **the thing** called 'Humanistic Mathematics?'" The question was raised by Bill Rosenthal in the 1993 *Humanistic Mathematics Network Journal*, echoing the voices of many of my colleagues in mathematics teaching who persistently have posed it expecting that the answer will lead to a debate that will end with the conclusion that there is no such thing as "Humanistic Mathematics." The arguments presented have been: "all teaching is humanistic" or "there is no need for separatism" and "there is no humanistic mathematics." Bill Rosenthal presents the question not to throw us into a chaotic situation where confusion reigns, but to give us the feeling that dealing with mathematics humanistically is more than finding a definition. It means starting with clarifying "the meaning" and continues with delineation of actions for forthcoming directions of involvement in a new pedagogy. It is like participating, in what I call—a protest movement in pedagogy—devoted to sociocultural synthesis of knowledge; a paradigm based on the accumulation of differential experience and of humanization of education; a world view whose images are formed by inversion of the usual lenses.

The examination of the difference between "teaching mathematics" as it is commonly understood and "teaching mathematics from an humanistic viewpoint" gives us the possibility of exploring the fields of mathematics and humanism in a meaningful way for both. This possibility was elucidated by Marchisotto in 1992 when she stated two pedagogical goals taken from the conference at Harvey Mudd College held in 1986:

1) "**teaching mathematics humanistically** as altering the nature of the teaching and learning environment in a way that makes the learning situa-

tion meaningful and relevant to the people involved in it."

2) "**teaching humanistic mathematics** as reconstructing the curriculum and the discipline of mathematics itself."

The first goal refers to changes of the pedagogical focus and the culture of the mathematics lesson so that the personal characteristics of the pupil as well as the teacher's are taken into account in the teaching plan. It means that there should be clarified goals and methodology involving what is accessible, valuable and interesting to human beings in mathematics. The "whom are we teaching" is not less important than the "what are we teaching."

The second means that a serious curricular operation has to be undertaken in order to expose the substantial relations between mathematics, science, arts, geography, language, etc. This operation will prepare and organize topics linking the mysterious and the evident in the relation between mathematics and other disciplines. It doesn't mean that all of the mathematics will be taught connected to other subjects, it means that the relevant connections will be introduced as a regular part of the formal curriculum and not as an anomaly in it.

On behalf of the tendency to choose one of the interpretations and focus on it as a main axis of action, we decided to take a synergetic approach and question the possibilities of delineating a version of "humanistic mathematics" that embodies both definitions.

We attempted a non-Euclidean task, two parallel lines that have to meet in one point in order to answer, "What is **the thing** called 'humanistic mathematics?'" We could have used various approaches with intent of reaching convincing conclusions about the nature of teaching, mathematics and the environment. Yet, we preferred a more esoteric and risky approach, an

approach related to one of the basics of humanism: the faculty of exercising doubt in those situations where everything seems clear and certain. Questioning not for the sake of questioning, but for the purpose of using questions as keys to new, exciting and vast realms of knowledge that can be used to improve the quality of human life.

This point of view and the respect we have for the human being, stimulated us to get engaged in an "against the stream" educational venture which promised interesting and worthy challenges. We expected, in return, to get more acquainted with "the thing called humanistic mathematics."

On this basis we started to work in the year 1987 on the development of the "Teaching Mathematics with an Humanistic Approach" program in Israel. The program developed in Israel combines the two pedagogical definitions stated before in asymmetrical proportions. The main part of the program is conveyed to create a different culture in the classroom; the rest deals with the links between mathematics and other disciplines. Creating different mathematical activities in the classroom in correlation with a pupil's personal learning characteristics and developing interesting and supporting environmental situations lead to a refreshing attitude of teachers and pupils in respect to mathematics education.

The delineation of the program required the exploration of issues that dealt with five major categories of the questions which could take us one step forward in the route.

The questions can be organized in five categories: the Learner, the Mathematics, the Educational Environment, the Curriculum and the Teacher. The answers to the questions crystallized in the "Teaching Mathematics with a Humanistic Approach" program whose characteristics and dynamics mark a new focus in educational goals and their implementation. The following list presents some of the questions related to each of the categories:

THE LEARNER

The characteristics of the learner:

- What is his learning style?
- What is his cognitive style?
- What is his motivational style?

- What is his social style?
- What are his communications patterns?
- What are his mathematical abilities?
- What is his performance level?
- What are his physical abilities?
- What are his beliefs?

THE MATHEMATICS

The Mathematics that is being taught:

- Which mathematical ideas, skills, concepts have been chosen?
- What substantive part of the body of knowledge is being dealt with?
- What number systems, categories, lattices are being used?
- What claims, arguments and symbols are involved?
- What relation is there between the mathematical topic and other disciplines?
- Which mathematical structures and models are being dealt with?

THE EDUCATIONAL ENVIRONMENT

The organizational quality of the environment:

- How linear, systematic and organized is the learning setting?
- How much diversification of activities are present in the surroundings?
- How is the availability of activities securely established?
- Which kind of activities and tasks are offered to the different learners?
- Who is introducing the mathematics?
- How is time organized for different learners, activities and tasks?
- How is assessment incorporated with learning in a non-interfering way?
- How flexible and adaptable is the environment for learner's and teacher's needs?
- How is the contact with mathematics established?
- How much mathematical "doing" is possible?
- How do we assure that the mathematical aspects in arts, science, etc. are recognized by the learner?

THE CURRICULUM

The organization of a balanced curriculum:

- How much authentic and relevant problem solving is included?
- Which skills, principles and foundation elements are being included?
- Which type of analytical tasks are bound to be rel-

evant for different learners?
How are linking topics between disciplines included?
How is a mathematics approach supported?

THE TEACHER

The personal and professional characteristics of the teacher:

Who is the teacher?
What is the teacher's teaching style? Learning style?
What are the teacher's communication patterns?
What are the teacher's preferences in mathematical topics?
How does the teacher use analytical expertise in the classroom?
What is the teacher's planning style? (Linear, systematic, global, intuitive)
What is the teacher's working incentive? Motivational force?
How does the teacher relate to argument and logical debate?
What are the teacher's possibilities of developing empathy to learners?
How does the teacher assure personal growth in mathematical and pedagogical knowledge?
What are the teacher's educational beliefs?

Deliberately we used the term learner and not pupil in order to clarify that learning is taking place in more than one capacity, and that the pupil and the teacher are both involved in the same activity, each from different and similar angles and positions. The pupil is learning mathematics, learning about his learning processes and also about all that is going on; the teacher is learning how to use pedagogical skills in order to develop his pupil's learning.

Though the list was meant to be exhaustive, there is a big probability that more items can be added. Moreover, I have a fair suspicion that the location of some of the questions could be changed. The reader is invited to choose one of the questions and find other questions to which it is related. A thorough study will reveal that there is no question that stands by itself, in isolation; moreover, few are the questions that are not linked to **all** of the rest.

Using the questions as a dynamic pivot, experimenting and learning from the results of the hands-on work, we arrived at an integrated conception of a developing methodology which takes in account not only the two interpretations of Humanistic Mathematics stated above but also its implications for education in general.

Models for the development of differential planning and diagnostic sensitivity of teachers were created by the start-up staff. Courses for the preparation of teachers and instructors have been held continuously for the last six years, and tasks and activities for pupils are printed and distributed in order to support the ideas and ideals of the program.

With the support of the Ministry of Education, at the elementary and middle grades, the program expanded to kindergarten groups, in an outspreading, secure, step by step pace. Nowadays tens of schools and kindergartens in Israel are involved in different degrees

of accomplishment of the program. A small, but growing, "Center for the Instruction of Mathematics with a Humanistic Approach" gives support in three different fields of action: Training of Teachers, Development of Instructional Materials, and Evaluation Tools based on Personal Interaction.

Evaluation tools compatible to the ideological foundations of the program were required so as to avoid pedagogical dissonance. The LTM—Let's Talk Math—dynamic assessment for identification of mathematics' performance and abilities is being used as an inquiry evaluation tool. Based on a structured interview, the LTM provides information on the learning processes used by the pupil and a blueprint of his mathematical concept world. This information can be used in order to supply the proper environment in the mathematics class.

The classical triangular model for the training of teachers relating subject matter to the pupil and the teacher proved till now to be a very static and rigid one. We have added another vertex to the triangle: the human-



...learning is taking place in more than one capacity...the pupil and the teacher are both involved in the same activity

istic approach. This has made it a dynamic quadrilateral, able to move in different directions and still maintain its basic essence: the essence of education oriented to the search of beauty and knowledge in Mathematics and to the development of confidence and goodness in human beings. This, as far as I'm concerned, is **the thing** called "Humanistic Mathematics."

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"If we knew what we were doing, it would not be called research, would it?"

--Albert Einstein
