

## Channels to Contemporary Mathematical Resources (Poster)

**Batya Amit**

Technion – Israel Institute of Technology  
batyaamit@gmail.com

### **Abstract**

The ultimate goal of this study is to decrease as much as possible the gap between the ever-growing nature-of-mathematics and the stagnated nature of school-curriculum by exposing students to the state-of-the-art in the rapidly growing area of mathematics.

One would assume that today's technology and the communication breakthroughs it offers ought to naturally decrease such a gap. Surprisingly it is not the case: The availability and the accessibility of information are not sufficient. The profusion of mathematical-news does not find its way to the mathematics curricula, to teachers, even more so to students.

Opening channels to contemporary-mathematics by interweaving mathematical-news in high-school mathematics lessons is the solution presented in this paper.

The study took place as an action-research in one high-school in Israel. The data collection was mainly qualitative including open-questionnaires, interviews, focus-groups, field-diaries and observations. Preliminary results point out on an impact in several aspects: on students' perceptions of the nature-of-mathematics, on students' as learners, and on the culture of the mathematical-class. Acquiring the habit of continuous self-updating, mainly by intelligent-surfing, revealing the state-of-the-art in mathematics, beyond the classroom- is a mutual point to students and to teachers, each in their own pace. This paper focuses on the impact on students' perceptions of the nature-of-mathematics.

**Keywords:** Contemporary-Mathematics, Mathematical-news, Attitudes-Towards-Mathematics, Intelligent-Surfing.

### **Introduction**

One of the most intriguing challenges adults face in modern human society is life-long-learning and keeping updated with multitude innovations. Preparing high-school students for these challenges is a central aim of modern educational systems. Integrating contemporary-knowledge in various school disciplines into the curriculum is most likely to provide school-leaving youngsters with open horizons, while placing teachers in a well-deserved position of representatives of human frontier knowledge, and furthermore, motivate their students to consider their future as contributors to the on-going development of human-knowledge.

As a case study towards reaching these goals, we chose mathematics - a highly prolific domain, a typical on-going creation of human brain, with a rich variety of connections and applications to science, technology, arts and humanities as well. Introducing high-school students to contemporary-mathematics on a regular basis has been the corner-stone for our design of an experimental-intervention, employing integrating Mathematical-News-Snapshots throughout the

teaching of ordinary curriculum, as the pedagogical instrument. Mathematical-News-Snapshots (abb. MNSs) is defined (Amit and Movshovitz-Hadar, 2009) as an intermezzo with three characteristics: (i) a new mathematical result published in the professional literature in the past 30 years; (ii) a 15-20 minutes exposition focusing on the news, elaborating on its history, the main ideas and the people involved in its creation, while (iii) taking into account the limited background-knowledge students possess, preferably linked to some topic in the curriculum.

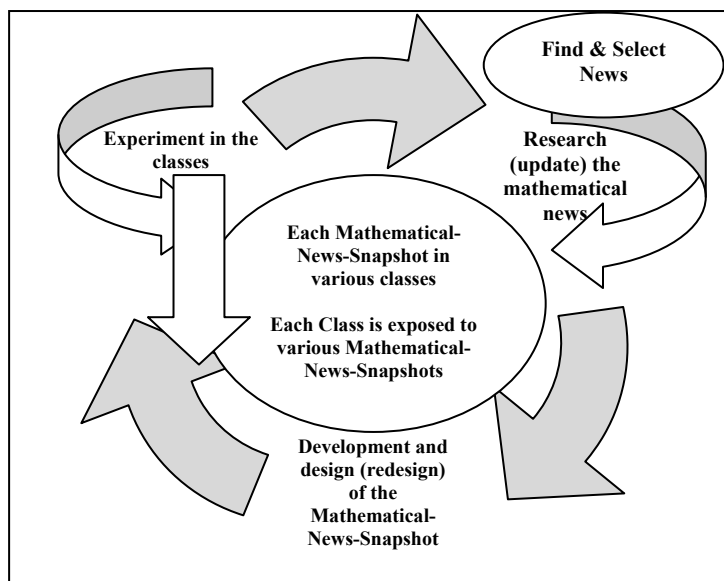
This study strives to establish a method for exposing high-school-students to the state-of-the-art in the rapidly growing area of mathematics, which is "an ocean" of new mathematical theorems (Sevryuk, 2006).

## Objectives

The study faced three main objectives, in the present paper we shall relate to the first objective: The Impact of the exposure to contemporary-mathematics on students' perceptions of mathematics as an on-going creative domain.













## The Study

Within the framework of an action-research a collection of Mathematical-News-Snapshots (e.g. A Google-based snapshot following Berman and Shaked-Monderer, 2009) was developed and empirically tested, interweaving them once a fortnight in the ordinary implementation of the mathematics-curriculum. For the flow of the action-research, see fig.1 below.



**Figure 1. The Various Cycles of the Action-Research**

**Table 1. The Data Collection Procedures by the Study Objectives**

<b>Data Collection Procedures</b>	<i>Open-Questionnaire</i>  (Pre & Post) Experimental & Control Groups (30 items in each Questionnaire)	<i>Field-Diaries</i>  Teacher-Researcher Diaries in 2 out of 3 classes	<i>Focus-Groups-Discussions</i> <b>In all classes, mainly after an MNS</b>	<i>Observations</i>  Researcher's Observations in one class, during every MNS	<i>Personal-Interviews</i>  10 students from each of the 3 classes, each 3 times during the year	<i>Personal-Interviews</i>  One experimental-teacher several times during the year
<b>Study Objectives</b>						
<b>The Impact of the Exposure to Contemporary-Mathematics on Students' Perceptions</b>						
<b>Cognitive and Social-Culture Impacts on the Students Exposed to MNSs</b>						
<b>The impact on teachers' as long-life-learners, and as representatives of knowledge</b>						

### Preliminary Results

As presented above (table 1), one of the data-collection-mechanisms was an open-questionnaire in which the students' described their attitudes, feelings and opinions towards 30 issues that touch upon mathematics and learning-mathematics. For results from a 10<sup>th</sup> grade-cohort to 3 issues: Innovations in mathematics, Creativity in mathematics, and Interest in mathematics – See tables 2 & 3, following. For preliminary results from another grade-cohort – See: Amit et al., 2009.

Table 2. Distribution of Students Responses to 3 issues- before the exposure

Students' Responses Issue	(i) Strongly negative attitudes	(ii) Negative attitudes	(iii) Neutral attitudes	(iv) Positive attitudes	(v) Strongly positive attitudes	Total
<b>Innovations in Mathematics</b>	<b>11</b> No <i>"It is obvious that there are no innovations", "It is an ancient field", "Obvious I knew it", "It is a stagnated field"</i>	<b>2</b> No because <i>"It takes many years so for ages there will be no innovations new things"</i>	<b>3</b> No answer or Do Not know	<b>4</b> Yes because: " <i>The world changes and renews all the time</i> "	<b>5</b> Yes because: " <i>New discoveries in mathematics happen all the time</i> "	<b>25</b>
<b>Creativity in mathematics</b>	<b>13</b> Not at all: <i>"How come mathematics is so closed?"</i>	<b>2</b> No I can't be: <i>"I am not good enough"</i>	<b>3</b> Did not answer	<b>3</b> Yes <i>"When something can be proved in many ways"</i>	<b>4</b> Yes <i>"Sometimes but I need the basis of the mathematical knowledge first"</i>	<b>25</b>
<b>Interest in mathematics</b>	<b>11</b> Nothing <i>"It is entirely not but we must learn it"</i>	<b>12</b> Such as: Geometry (7/12) and Algebra (5/12)	<b>0</b> Did not answer	<b>2</b> Yes <i>"If I understand it intrigues me"</i>	<b>0</b>	<b>25</b>
	<b>35</b>	<b>16</b>	<b>6</b>	<b>9</b>	<b>9</b>	<b>75</b>

**Table 3. Distribution of Students Responses to three issues- *after* the exposure**

Students' Responses Issue	(i)	(ii)	(iii)	(iv)	(v)	Total
<b>Innovations in Mathematics</b>	<b>3</b> No	<b>4</b> No <i>"because it is very difficult to discover new things"</i>	<b>5</b> Did not answer	<b>1</b> Yes	<b>12</b> Yes because: <i>"Research in Maths is going-on new results are published all the time"</i>	<b>25</b>
<b>Creativity in mathematics</b>	<b>4</b> Not at all: <i>"How come mathematics is so closed?", "Everything is calculations and not art", "Dry and boring"</i>	<b>1</b> No because: <i>"I am not good enough"</i>	<b>5</b> Did not answer	<b>8</b> Yes <i>"Maybe I must think of an example"</i>	<b>7</b> Yes <i>"Has research that demands creativity", ".. imagination and deep thought is need- that is creativity"</i>	<b>25</b>
<b>Interest in mathematics</b>	<b>4</b> Nothing <i>"It is not interesting but we must learn it"</i>	<b>1</b> Such as: Geometry (4/8) and Algebra (4/8)	<b>5</b> Did not answer	<b>8</b> Yes	<b>7</b> Yes Especially: <i>"The news"(4/7), "The surprises within the news", "The mathematical way"</i>	<b>25</b>
	<b>11</b>	<b>6</b>	<b>5</b>	<b>17</b>	<b>26</b>	<b>75</b>

### Bibliography

Amit, B., Movshovitz-Hadar, N., Berman, A. (accepted 2009, in press): "Exposure to Mathematics in the Making – Interweaving Math-News-Snapshots in the Teaching of High-School Mathematics". In Victor Katz, Constantinos Tzanakis (Eds.) *Recent Developments on Introducing a Historical Dimension in Mathematics Education*. A Collective Volume proposal, to be published by MAA-The Mathematical Association of America, 2010.

Amit, B. & Movshovitz-Hadar, N. (2009). "Bringing Progress into the Classroom-Opening a Window to Contemporary Knowledge". A paper presented by B. Amit at, and an abstract published in Huber S.G. (Ed.) *The proceeding of the SLS 2009 - School Leadership Symposium*, Sept 3-5 2009, University of Teacher Education of Central Switzerland, Zug, Switzerland.

[http://www.schulleitungssymposium.net/2009/pdf/parallelprogramm\\_EN/SLS-2009-Amit.pdf](http://www.schulleitungssymposium.net/2009/pdf/parallelprogramm_EN/SLS-2009-Amit.pdf)

- Berman, A. & Shaked-Monderer, N. (2009). "Nonnegative Matrices and Digraphs", in: Meyers, R. A, Editor-in-chief 2009 *Encyclopaedia of Complexity and Systems Science*, ISBN: 978-0-387-75888-6.
- Movshovitz-Hadar, N. (2008). "Today's news are Tomorrow's history - Interweaving mathematical news in teaching high-school math". In: Barbin, E., Stehlikova, N., Tzanakis C. (2008). (eds.) *History and Epistemology in Mathematics Education: Proceedings of the fifth European Summer University*, Ch.3.12, pp.535-546, Vydavatelsky Press, Prague 2008, ISBN 978-8086843-19-3.
- Sevryuk, M. B. (2006). "Vladimir Arnold (ed.) Arnold's problems" in Book Reviews: *The Bulletin of the American Mathematical Society*, January 2006 issue. <http://www.ams.org/bull/2006-43-01/S0273-0979-05-01069-4/S0273-0979-05-01069-4.pdf>