

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.

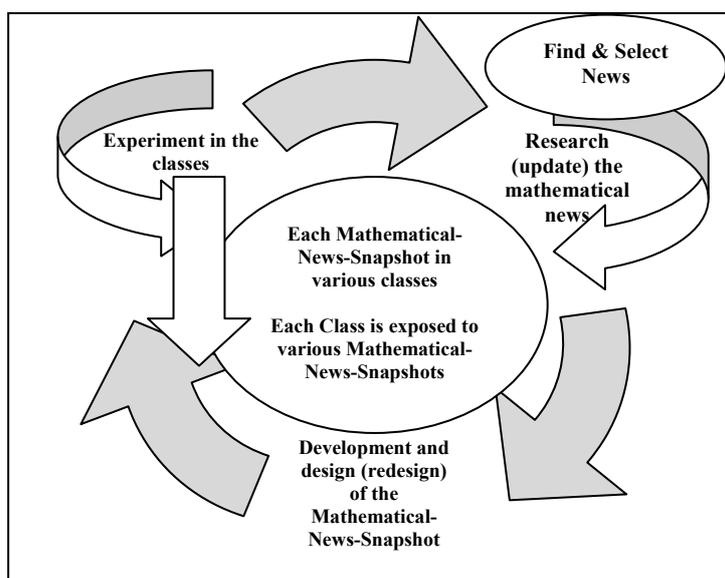


Figure 1. The Various Cycles of the Action-Research

Table 1. The Data Collection Procedures by the Study Objectives

Data Collection Procedures	<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> In all classes, mainly after an MNS	<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
Study Objectives						
The Impact of the Exposure to Contemporary-Mathematics on Students' Perceptions						
Cognitive and Social-Culture Impacts on the Students Exposed to MNSs						
The impact on teachers' as long-life-learners, and as representatives of knowledge						

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 10th 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
Innovations in Mathematics	11 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>	2 No because <i>"It takes many years so for ages there will be no innovations new things"</i>	3 No answer or Do Not know	4 Yes because: " <i>The world changes and renews all the time</i> "	5 Yes because: " <i>New discoveries in mathematics happen all the time</i> "	25
Creativity in mathematics	13 Not at all: <i>"How come mathematics is so closed?"</i>	2 No I can't be: <i>"I am not good enough"</i>	3 Did not answer	3 Yes <i>"When something can be proved in many ways"</i>	4 Yes <i>"Sometimes but I need the basis of the mathematical knowledge first"</i>	25
Interest in mathematics	11 Nothing <i>"It is entirely not but we must learn it"</i>	12 Such as: Geometry (7/12) and Algebra (5/12)	0 Did not answer	2 Yes <i>"If I understand it intrigues me"</i>	0	25
	35	16	6	9	9	75

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

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

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