ICMT2014 SYMPOSIUM

TEACHERS EDITING TEXTBOOKS: WHAT? WHY? HOW?

Presenters:
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Discussants:
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July 29th, 2014
Southampton, UK

Symposium focus

What might be gained and what is entailed in providing teachers with the opportunity to edit the textbooks they use in class?

Symposium structure

- The M-TET (**M**ath **T**eachers **E**dit **T**extbooks) project
  Ruhama Even and Michal Ayalon
- A mathematician's point of view
  Edriss S. Titi
- Changes suggested by teachers to a textbook
  Shai Olsher and Ruhama Even
- Commentary
  Charalambos Charalambous
- Discussion

Teachers editing textbooks: Transforming conventional connections among teachers, curriculum developers, mathematicians, and researchers

Ruhama Even and Michal Ayalon

Weizmann Institute of Science

Conventional connections between teachers and curriculum developers

Unidirectional and limited

- Teachers enact curriculum and use curriculum materials (textbooks) prepared by curriculum developers.
- Curriculum developers → Teachers.

Teachers → Curriculum developers?

- Aspirations about desired textbooks.
- Adjustments made to textbooks based on:
  - teaching experiences,
  - knowledge and beliefs about mathematics,
  - knowledge and beliefs about teaching and learning mathematics.
- Acquaintance with:
  - the system in which they teach,
  - their own students.

Conventional connections between teachers and mathematicians

Limited

- During teacher preparation stage.
- Prospective teachers study advanced mathematics in courses taught by mathematicians.

Expanded connections between teachers and mathematicians?

- Throughout the years of teaching.
- Teachers consult with mathematicians about the mathematics they teach in class.

Goal of the M-TET* project

To examine how the conventional connections among teachers, curriculum developers, mathematicians, and researchers in mathematics education might be transformed into multi-directional and more productive ones,

while contributing to professional development and building of a professional community of teachers.

*M-TET = **M**athematics **T**eachers **E**dit **T**extbooks

M-TET* project*

Teachers are invited to:

- collaborate in editing the textbooks they use in their classes,
- produce, as group products, wiki-based revised textbooks,
- while consulting with mathematicians, textbook authors, and researchers in mathematics education.

*The project is part of the Rothschild-Weizmann Program for Excellence in Science Teaching, supported in part by the Caesarea Edmond Benjamin de Rothschild Foundation.

The technological platform

- We use, with some modifications, the MediaWiki platform and Wikibook templates for constructing the project website.
- The project website serves as an online platform for collaborative work on a common database (i.e., a textbook) and for discussions in a forum-like fashion.

Content | Talk | Edit | View History | Delete | Move | Protect | Follow

Integrated Mathematics

Navigation

- Main Page
- Current events
- Recent changes
- Integrated Mathematics wikibook
- Regular weekly activity
- Math consultation
- Technical Support
- Community portal
- Random page
- Help

Search

Page | Search

Practice Zone

- Sandbox

Toolbox

- What links here
- Related changes
- Upload file
- Special pages
- Print version
- Permanent link

Free Drawing Tool

Click to draw a figure using the mouse

Mathematics for grade 7 – *The Rehovot program* [edit]

Table of contents that includes the unit topics.

The Mathematics group of the Science Teaching department at the Weizmann Institute of Science has begun developing a new 7th grade mathematics textbook – the Rehovot curriculum program.

Principles

- **Alignment with the new curriculum**

The guiding principles of the development of the Rehovot curriculum program are aligned with the goals, content, and topic sequencing of the new junior-high school mathematics curriculum, which will be published in its final version by the Israeli Ministry of Education, in the near future.

- **Integrating topics**

The topics to be studied appear in the book in a way that is suitable for spiral and integrative teaching, in line with the curriculum guidelines. This kind of teaching is based on integrating mathematical concepts and topics within a certain domain and with other mathematical domains, and on students' experiencing situations and phenomena that signify connections between mathematical domains and other disciplines. According to this approach, making connections amongst the numerical, algebraic and geometric domains is especially important, but each of the three has its own special roles.

- The numerical domain is intended for developing quantitative reasoning and number sense, for strengthening and broadening the knowledge of the number world, and for attaining mastery in numerical algorithms and computation skills.
- The algebraic domain is intended for becoming acquainted with situations and phenomena of change within and outside mathe-

Integrated Mathematics

Work format

- On-going distance work.
- Monthly face-to-face meetings.

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- Monthly face-to-face meetings.

On-going distance work

- Textbook editing.
- Reacting to other participants' suggestions.
- Discussions of mathematical and pedagogical issues.
- Mathematician, textbook authors, math ed. researchers available for consultation.
- Continuous technical support.

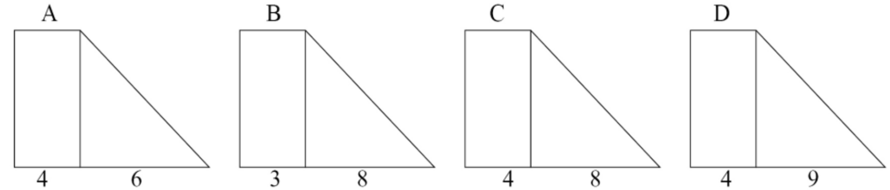
Examples of Distance Work

7th grade textbook

Task #6 was added

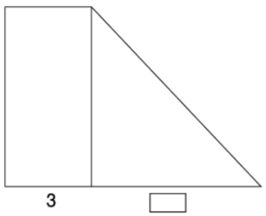
“I added an additional task following question 5 because in question 5 the students solve several examples regarding which of the figures has a larger area… so I thought to add a generalization question, where the side of the rectangle is x.”

5. a. Determine, in each drawing, which has a greater area, the rectangle or the triangle. Explain. (The drawings are not to scale)



b. In the following drawing, it is known that the area of the rectangle is equal to the area of the triangle.

What is the length of the edge marked with a box? Explain how you found it.

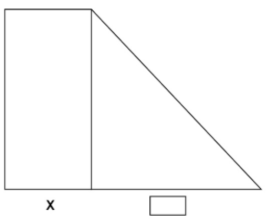


6. One of the edges of the rectangle is marked with an X (see drawing). Write an expression for the length of the edge marked with a box so that:

a. The area of the triangle will be greater than the area of the rectangle?

b. The area of the triangle will be smaller than the area of the rectangle?

c. The area of the triangle will be equal to the area of the rectangle?



Task phrasing changed

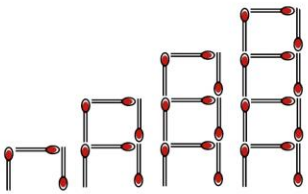
A teacher added an organizational table (the second table).

Lesson 1. Building with matches

Finding the rule of a series of match structures and building an algebraic expression

Constructing "buildings" from matches.
In a one-story building – three matches
In a two-story building – six matches
In a three-story building – nine matches

Let us find the connection between the number of stories and the number of matches.



1. a. How many matches are required for constructing a 5-story building? 11-story building? How did you find the number of matches?

b. How many matches are required to build a 100-story building? Explain.

c. Complete the table.

Number of matches	Number of stories
	4
	7
30	
	23

d. Yuval has 51 matches, Maayan has 61 matches, Shaked has 71 matches, and Omer has 72 matches. Each of them is trying to construct a building that is as tall as possible. Who will not have any matches left? Explain.

Childrens' names	Number of matches	Number of stories	Matches left
Yuval			
Maayan			
Shaked			
Omer			

e. Noa constructed a building from the matches she had. She had two matches left. Give an example for the number of matches that Noa had.

f. To construct an x-story building ,$3x$ matches are required. How many matches are required for constructing an a-story building?
A building requires $3b$ matches to be built. How many stories does it have?

“Like” responses from two teachers (on a discussion page)

T1 Correction after a lesson in question 1 part d, I added a table- T1 19:26, 6 November 2010 (UTC) I added another column to the table: number of matches

T1 - T1 19:24, 9 Novmber 2010 (UTC) Correction after a lesson

T2 says: Like

T3 21:09, 4 December 2010 (UTC) says: Like

5 teachers debate the structure of a certain textbook unit (on a discussion page)

Exercises 9 12, 13 & 14 provide practice for lesson 4 so they should be moved into lesson 4. T1 21:47, 20 December 2010 (UTC)

I think the exercises are in their correct place. Exercise 9 in the original book provides practice of fractions in algebraic expressions. Same goes for exercises 12, 13, & 14. Lesson 4 deals with substitutions, simplifying algebraic expressions with fractions and review of the whole unit.-- T2 13:41, 28 December 2010 (UTC)

T3 15:37, 28 December 2010 (UTC) says: Like

In my opinion lessons 2, 3, 4 can be learned together, there is no need for a lesson for each of them, therefore the order of the exercises does not matter. -- T4 00:58, 2 January 2011 (UTC)

It is not possible, when considering the length of the lesson to teach those lessons together. Each of these lessons «takes» a whole period, and if there is any time left one could integrate the assignment collection during the lesson. OUT T2 13:48, 2 January 2011 (UTC):Correction after a lesson

I agree with T1 about the place of exercises 9, 12, 13, 14 (especially 9, and then you need to change its part a, since it is the same exercise from lesson 4). I also agree with T2 that it is impossible to teach lessons 2 - 4 in one period due to lack of time. OUT T5 19:25, 5 January 2011 (UTC):Correction after a lesson

Work format

- On-going distance work.
- Monthly face-to-face meetings.

Monthly face-to-face meetings

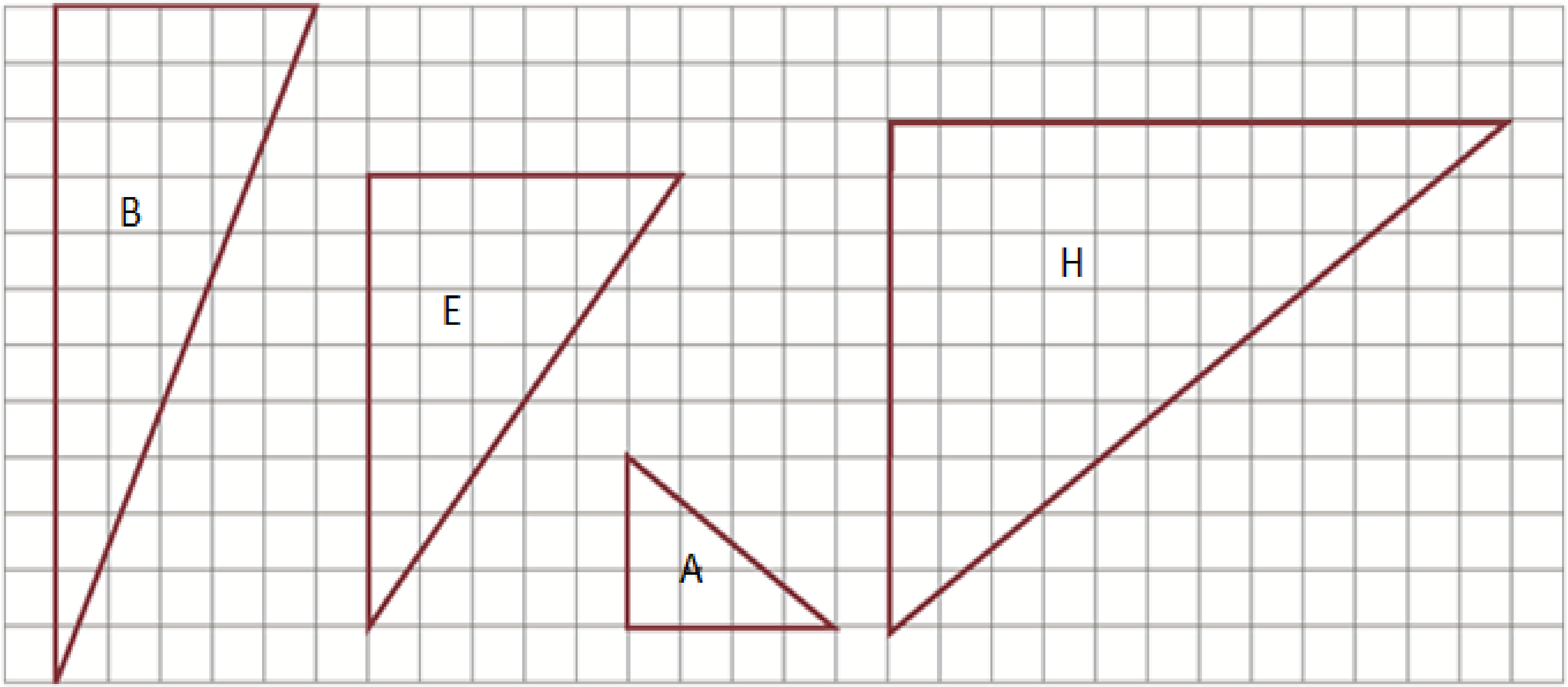
- Collaborative work on textbook editing.
- Instruction on the technological tool.
- Discussions of mathematical and pedagogical issues.
- Discussions of community working norms.
- Semi-structured discussions with the mathematician, the textbook authors, and other experts (2nd year on).
- Carefully planned address of important issues related to the teachers' work (2nd year on).

Two illustrations of the interactive editing work (8th grade textbook)

Illustration #1:
Textbook's introduction to Pythagorean Theorem

Textbook’s introduction to Pythagorean Theorem

- Find the lengths of the sides of the triangles by measuring them.



Textbook's introduction to Pythagorean Theorem

Complete the table and find connections between the legs and the hypotenuse

triangle	short leg (a)	long leg (b)	hypotenuse (c)
A			
B			
C	7	24	25
D	9	40	41
E			
F	12	35	37
G	20	21	29
H	9	12	15

Textbook’s introduction to Pythagorean Theorem

Udi claims:

“The square of the length of the short leg equals the sum of the long leg and the hypotenuse, like this: $a^2 = b+c$.”

Is Udi right?

Textbook's introduction to Pythagorean Theorem

$$a^2 = b+c?$$

triangle	short leg (a)	long leg (b)	hypotenuse (c)
A	3	4	5
B	5	12	13
C	7	24	25
D	9	40	41
E	6	8	10
F	12	35	37
G	20	21	29
H	9	12	15

Textbook's introduction to Pythagorean Theorem

$$a^2 = b+c?$$

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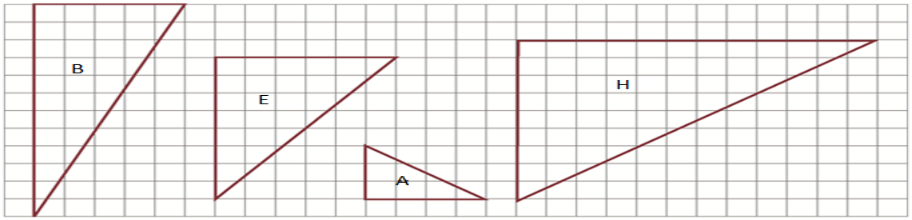
Textbook’s introduction to Pythagorean Theorem

Exercise in editing

- What do you think about this part of the textbook?
- Suggest any modifications you wish
- Work in pairs/triples

Textbook's introduction to Pythagorean Theorem

Find the lengths of the sides by measuring



Complete the table, find connections

triangle	short leg (a)	long leg (b)	hypotenuse (c)
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C	7	24	25
D	9	40	41
E	6	8	10
F	12	35	37
G	20	21	29
H	9	12	15

Udi claims: $a^2 = b+c$.

Is Udi right?

Later in the lesson: Presentation of the Pythagorean Theorem; illustrating it with few examples; stating that the theorem is always true for right triangles.

Discussion among the teachers

- Two main issues:
  1. The lesson opens with a false statement.
  2. The textbook justifies the Pythagorean Theorem relying on a few examples.

Discussion among the teachers

- Two main issues:
  1. **The lesson opens with a false statement.**
  2. The textbook justifies the Pythagorean Theorem relying on a few examples only.

Discussion among the teachers

Issue #1: The lesson opens with a false statement

Two contrasting approaches:

1. Revise the textbook and start with a correct phrasing of the Pythagorean Theorem. Only later give examples that suit different relationships as well.
2. Do not revise the textbook because one way to deal with mistakes is to purposely start with experiencing an examination of a false statement that appears to be true.

Consulting the author of the textbook unit

Issue #1: The lesson opens with a false statement

- Teachers presented their dilemma.
- Author’s rationale:
  - Create a feeling of surprise that the Pythagorean Theorem is true.
  - Build a need to find a way to prove it.
- Teachers accepted it and decided not to revise the introduction to the topic.

Part of the conversation with the author

Teacher A: I'm afraid that the error [the incorrect formula] will stick to the students.

Teacher B: Why? We need to put the mistakes on the table… It creates a conflict. It requires them to think critically.

Teacher C: It's not good to start a new subject with a mistake.

…

Teacher A: It is too similar to the Pythagorean formula and it's confusing.

Part of the conversation with the author (cont.)

Author: The idea is to illustrate that you cannot generalize or reach conclusions based on examples. The Pythagorean Theorem is a surprising theorem. But it won't be surprising if we just introduce it in class. Therefore, this is a wonderful opportunity to make students evaluate another formula that works in some cases and suddenly doesn’t work, to create a need for a different sort of justification, not generalization from examples.

…

Teacher C: I agree. This really is a wonderful opportunity.

Discussion among the teachers

- Two main issues:
  1. The lesson opens with a false statement.
  2. **The textbook justifies the Pythagorean Theorem relying on a few examples.**

Discussion among the teachers

Issue #2: The textbook justifies the Theorem relying on a few examples

- The problem –

  The textbook is inconsistence in promoting the idea that it is impossible to reach conclusions based on examples.

- Do not have a clear idea of how to deal with it.

Consulting the author of the textbook unit

Issue #2: The textbook justifies the Theorem relying on a few examples

- Teachers presented their problem.
- Teachers' idea –

  Add a proof to the Pythagorean Theorem.
- Author embraced it.

Part of the conversation with the author

…

Teacher D: I still have a problem. The goal is to prevent reaching conclusions based on examples. We first show them that it's prohibited and then that it's okay. What do we show them?

Teacher E: Why, then, isn't a proof added, even a visual one?

…

Author: Concerning what you said (turning to Teacher D), you're right…. I think we should include a proof…. Perhaps if we publish another edition we will include a proof – maybe the visual side of it. To have a justification for why the theorem is true.

Follow-up discussion among the teachers

- Uncertainty –

  Which proof would better fit the current learning stage? (e.g., based on geometrical statements, visual)

Consulting the mathematician

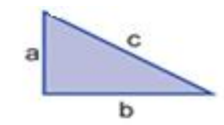
- Shares the teachers' dissatisfaction: "More and more examples do not convince or prove… It is against mathematical thinking".

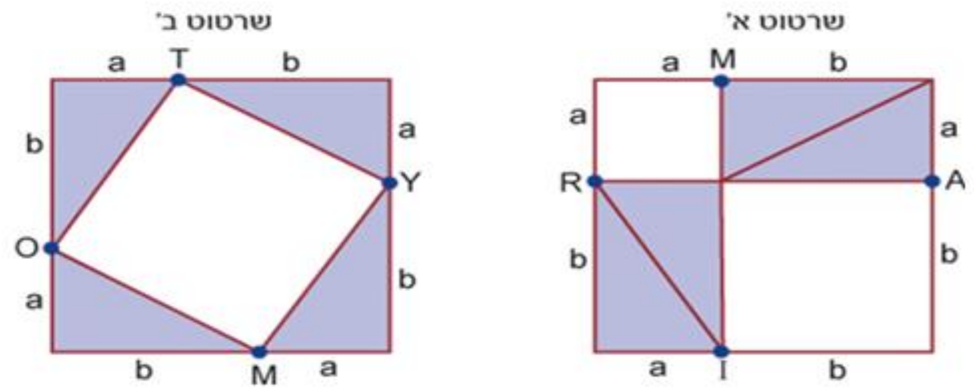
- Leaves the decision whether to add a proof, and of which kind, to the teachers, who are "the experts on pedagogy".

- In case no proof is added, he recommends adding a comment in the textbook that a complete proof will be presented in future learning.

Teachers' decision

- To add:
  - Geometrical proof





  - Link to an applet that illustrates the Pythagorean Theorem (by dragging and filling in the squares) to use at classes where the presentation of a geometrical proof is too difficult.

Illustration #2:
Textbook's introduction to Ratio

Textbook's introduction to Ratio

- First lesson in the 8th grade textbook

Discussion among the teachers

- Classroom experience –

  A student said: “The ratio between the number of red beads and the number of white beads in a necklace is 4”

- Uncertainty –

  Can a ratio be referred to as a number?

Consulting the mathematician

Dear Professor Edriss Titi,

Can a ratio be treated as a number in itself? For example, if the ratio is 4:1, can we also say that the ratio is 4, or should we consist on that the ratio is between (at least) two objects?

Thanks.

Part of the mathematician's response

Dear all, here is my answer to your question:

1. The ratio is always between two quantities, and one should think of the ratio as a new quantity.

2. Now how do I distinguish between a quantity and a number? For me a quantity might have units, while a number does not have units.

3. For example, if a car with constant speed passes a distance of 35km in one hour, then the ratio of distance that this car passes to time is 35:1. An alternative way to write this ratio is as the quantity 35 km/hour. The ratio of a distance to time, which is the speed, is a new quantity and it has its own units. So, it is NOT just a number...

4. Note that each time I write the ratio as a quantity I have to add the units. This is an important issue to keep in mind, and a good habit to get the students used to it…

Teachers’ decision

- To add ratio-related tasks including quantities with different units of measure (e.g., ratio between the cost of a necklace and the number of beads in it).

- To emphasize in the textbook the importance of adding the units of measure when writing the ratio.

Characteristics of the M-TET work environment

Goal of the M-TET* project

To examine how the conventional connections among teachers, curriculum developers, mathematicians, and researchers in mathematics education might be transformed into multi-directional and more productive ones,

while contributing to professional development and building of a professional community of teachers.

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Characteristics of the work environment

Usually not part of teachers' practice:

- Designing a textbook for a broad student population.
- Generating a textbook by making changes to a textbook designed by expert curriculum developers.
- Consulting with professionals that are not part of the teachers' usual milieu.

What teachers say (1)

T: …It took some time to get going.

I: Okay, what does it mean?

T: It took some time to get going. Uh, I remember that the moment I introduced the first change, I said: ‘What? Can I introduce changes? Can I here?’ It was not obvious to me. And, at least at the beginning, it took some time [to realize] that you can make…

What teachers say (2)

“The talks, the collaboration with the authors and the mathematician, there are not such things anywhere. It makes me feel important, that they want to listen to me and to work with me. They talk to me eye-to-eye… It changed the way I see myself and the way I use the curriculum in class. I ask myself questions now. What is the aim of this task, what would the author say about this part of the lesson, is the mathematical concept in this lesson used correctly.”

What teachers say (3)

"I feel that I am in a continuous process of growth. The project empowers me, being part of a group who works together on something important… The ability and the motivation to test my intentions all the time, not to surrender to the routine assignments of teaching, but to stop, to analyze the lesson and the tasks, to reflect on the lesson and to consider a change… The interactions with the other teachers and the project team, listening, talking, and sometimes even arguing with other teachers, learning from different people with different opinions, this is all part of me now. It is difficult for me to think of myself, who I was had I not been here."

A mathematician's point of view

Edriss Titi

Weizmann Institute of Science

Commentary

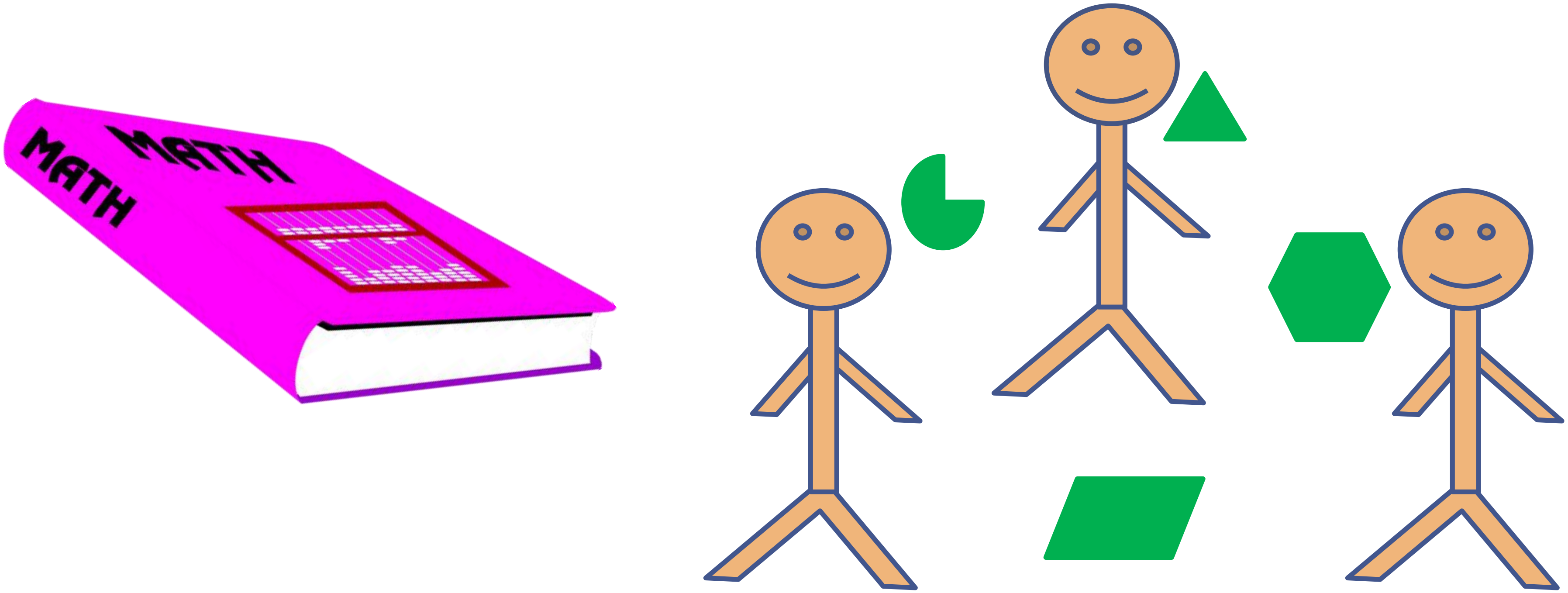
- My background
- Role in the M-TET Project
- Interactions with the teachers

Teachers editing textbooks: Changes suggested by teachers to the math textbook they use in class

Shai Olsher and Ruhama Even
Weizmann Institute of Science

Research Aim:

To study the changes teachers suggest to make in the textbook they use in their classrooms.



Methods

Research Setting

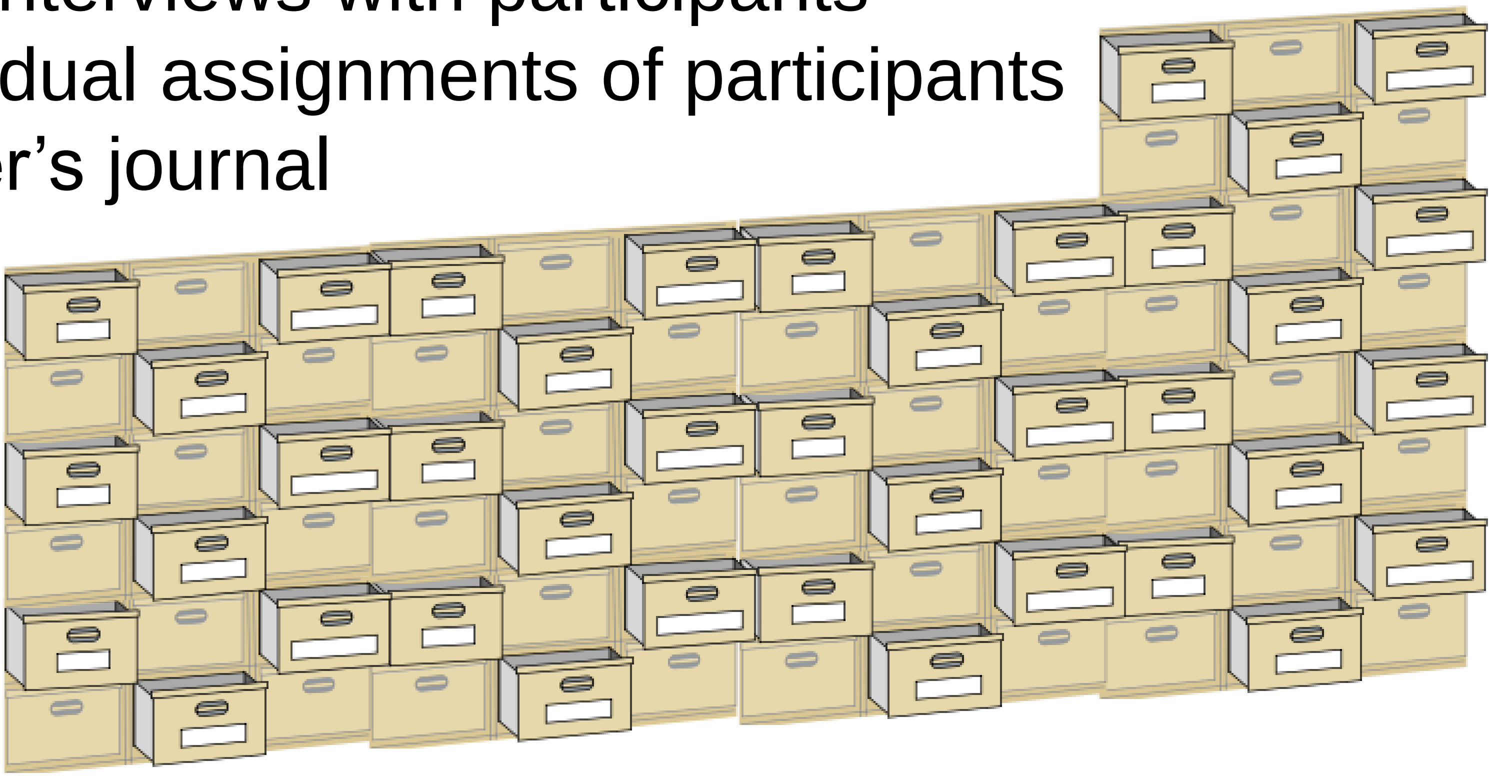
The M-TET Project (1st year, 2010-11)

Participants

- 9 teachers & 4 team members
- The teachers used the 7th grade *Integrated Mathematics* textbook in their classrooms
- Teachers with different backgrounds

Data Sources

- The *M-TET Project* website
- Video documentation & field-notes of monthly meetings
- Individual interviews with participants
- Final individual assignments of participants
- Researcher’s journal



Data Analysis

Qualitative analysis, using Activity Theory framework

1. Identifying the changes by analysing actions and their goals:
   - Coding changes with an identifiable goal
   - Choosing changes fulfilling at least one of the following criteria:
     - Discussion during at least one of the monthly meetings, followed by an operative decision that was executed
     - Work of at least half of the participants on the website
2. Characterizing the work process, the participants' engagement and the challenges

Results

4 main types of changes:

A) Creating organizing tools to improve teacher work and accessibility to parents
B) Integrating technological tools for improving mathematics teaching and learning
C) Re-structuring textbook content presentation to better suit student learning
D) Adding materials for students with low achievements

A. Creating organizers

Involved:

1) Improving accessibility to content highlighted in the textbook
2) Marking the textbook core
3) Adding meaningful unit and lesson titles
4) Creating a table of contents for practice exercises

Unit 2: Basic arithmetic rules

unit 2 green track

Lesson 1. Basic arithmetic in the Joy & Happiness performance

Order of operations and usage of brackets

The 7th graders are setting up a performance of the Joy & Happiness band for the end of the school year.
The grade level consists of 100 students and 16 teachers.

A. Creating organizers

Involved:

1) Improving accessibility to content highlighted in the textbook
2) Marking the textbook core
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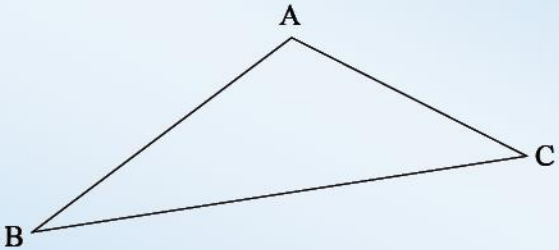
Lesson 3. Land inheritance

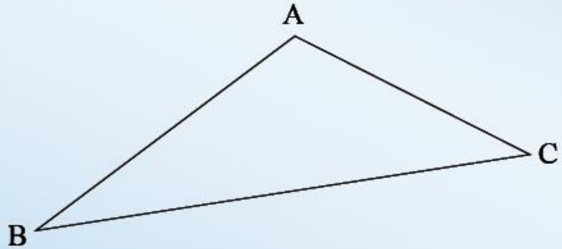
A father bequeathed uopn his four sons a triangular lot of land
with vertices A, B, C, and ordered them to divide it among them into four equal areas.



Lesson 3. Land inheritance

Applications of altitude, median and area of a triangle

A father bequeathed upon his four sons a triangular lot of land
with vertices A, B, C, and ordered them to divide it among them into four equal areas.



A. Creating organizers

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Creating organizers - Challenges

Example:

Marking textbook core:

- What is the core?

Setting criteria and marking by them vs Marking what is important in every lesson \ unit and later trying to generalize

- Ongoing disagreement that was not resolved during the whole year

B. Integrating technological tools

Involved:

1) Integrating tasks with online feedback
2) Integrating and creating online applets
3) Adding presentations
4) Adding links to games

Test yourself - Unit 12

Complete so the expression will be correct

1. $5^{\square} = 5 \cdot 5 \cdot 5 \cdot 5$ ☐

2. $\square^{3} = 7 \cdot 7 \cdot 7$ ☐

3. $5^{\square} = 25$ ☐

4. $\square^{3} = 8$ ☐

Send

B. Integrating technological tools

Involved:

1) Integrating tasks with online feedback
2) Integrating and creating online applets
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4) Adding links to games

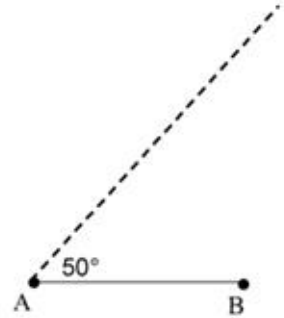
Two angles in a triangle

2. A. Place the "angle making device" on AB, **such that its vertex will be on top of B**.

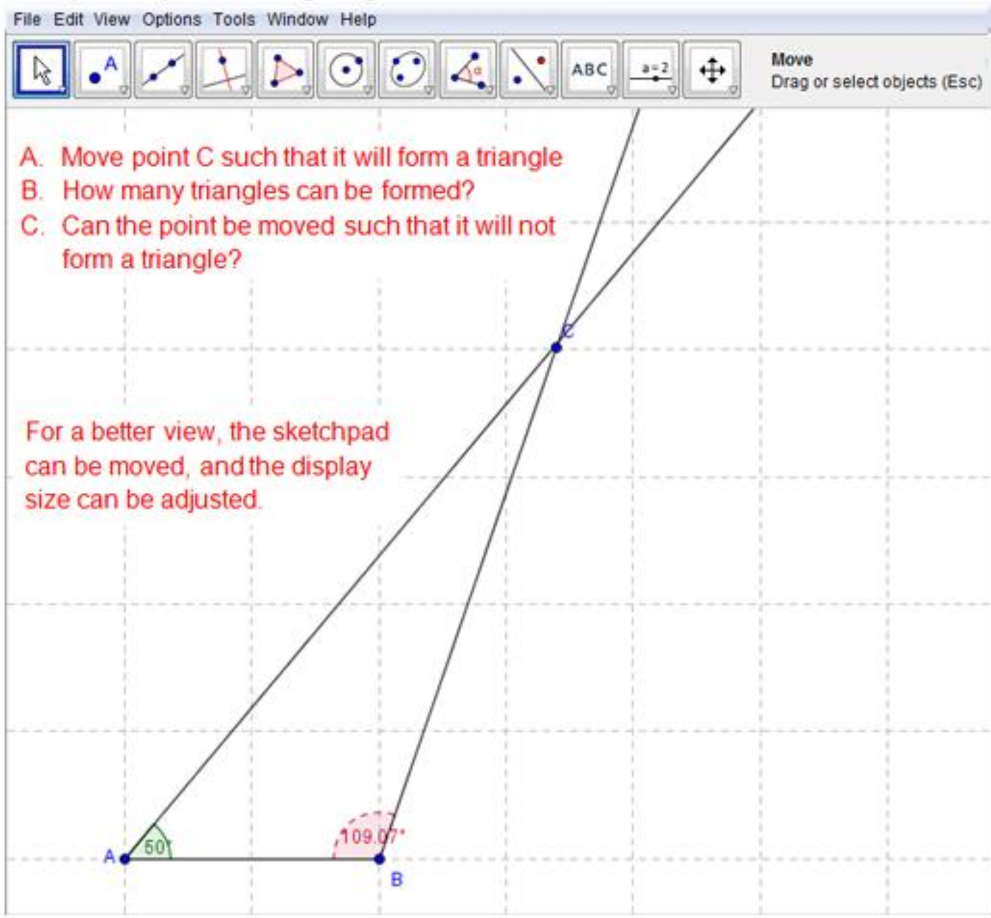
Move the other arm of the device so it (or its extension) will intersect the dashed line, and form a triangle.

How many triangles could be formed this way?

B. Ben said he could open the device, such that a triangle could not be formed. How would he do that?



Check your conjectures using Geogebra.



B. Integrating technological tools

Involved:

1) Integrating tasks with online feedback
2) Integrating and creating online applets
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4) Adding links to games

Integrating technological tools – Challenges

Example:

Dealing with off-the-shelf products:

- Could not be modified to suit teachers aims

Challenge: Inappropriate feedback for zero and negative numbers

Resolution: Teachers altered textbook tasks

C. Re-structuring textbook content presentation

Involved:

1) Arranging tasks by the level of difficulty
2) Placing practice exercises immediately following the related lesson
3) Grouping exercises by content
4) Changing the numerical examples in summaries to be different than those in tasks

7th grade students at the Smarty school are holding a "Mathematics Olympiad".

The grade level consists of 100 students and 16 teachers.

Each student may invite 4 guests.

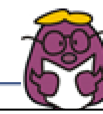
Adam and David wanted to calculate the number of chairs needed for the guests and teachers.

They wrote down the following: $16 + 4 \cdot 100$.

Adam said: the result is: 2000.

David said: the result is: 416.

1. A. Discuss Adam and David's answers. Which one of them is correct? How did each one of them reach his answer?



There are **conventions** about the order of arit

One of the conventions is: multiplication and d

In order to precede addition/subtraction operat

in the same calculation, brackets are used.

Operations inside brackets precede other oper

Example:

In the calculation $16 + 4 \cdot 100$ the multiplication precedes.

Thus, it is equal to the calculation: $16 + (4 \cdot 100)$

In order to precede the addition operation, we will add brackets such as:

$(16 + 4) \cdot 100$

Example:

In the calculation $15 + 5 \cdot 200$ the multiplication precedes.

Thus, it is equal to the calculation: $15 + (5 \cdot 200)$

In order to precede the addition operation, we will add brackets such as:

$(15 + 5) \cdot 200$

Re-structuring textbook content presentation - Challenges

Example:

Grouping exercises by content :

Grouping exercises by content to enable students to anticipate what is expected of them	vs	Students should encounter mixed types of exercises

- Ongoing disagreement that was not resolved

D. Adding materials for students with low achievements

involved:

1) Adding support in selected assignments
2) Adding preparatory exercises before starting a new topic
3) Editing textbook units and offering them as an alternative parallel track for students with low achievements

18. Evaluate each of the following expressions for: $x = 2$, $x = \frac{1}{2}$, $x = 0$

A. x^2 B. $9 \cdot x^2$ C. $3 \cdot x^2 + 3$

18. Evaluate each of the following expressions for:

	$3 \cdot x^2 + 3$	$9 \cdot x^2$	x^2
x=2			
x=5			
x=0			

D. Adding materials for students with low achievements

involved:

1) Adding support in selected assignments
2) Adding preparatory exercises before starting a new topic
3) Editing textbook units and offering them as an alternative parallel track for students with low achievements

Adding materials for students with low achievements - Challenges

Differences of opinion resulted in several work stages:

1. Adding support in textbook assignments and preparatory exercises, draws an active opposition.
2. Proposing additional solutions: Adding instructions in the teachers guide, adding more exercises.
3. Accepted solution was developed: materials for students with low achievements would appear in separate pages, not altering the original pages of the textbook.

Conclusions

Focusing on the changes teachers suggest when they <u>edit</u> the textbook instead of <u>using</u> it in class revealed:

- Special attention to increasing the accessibility of the textbook contents.

But there were other changes suggested as well:

- Integrating technology into the textbook
- Re-structuring the textbook content to better suit student learning
- Making the textbook fit for a broad population of students

Thank you.

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Commentary

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ICMT 2014
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29-31 July 2014

Teachers Editing Textbooks: Reflecting on the Whys, the Whats and the Hows

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Structure of Discussion

- Setting the boundaries
- Reflecting on the whys
- Reflecting on the whats
- Reflecting on the hows
- Returning to the boundaries

Setting the Boundaries

Fidelity of implementation

“Good teachers do not follow textbooks”

Teachers engaged in textbook editing

Reflecting on the Whys

Why is this process so critical?

- ***Curriculum developers and textbook authors***: their intentions can accurately be conveyed to teachers
- ***Teachers***: can learn and improve through interacting with other key "players"
  - ***Collaboration is key:*** Marrying teachers' wisdom of practice with scholarly views, textbook authors' perspectives, and mathematicians' disciplinary considerations
- ***Students***: not in the picture, but the ultimate recipients of the benefits of the collaboration
- ***Textbooks***: live, dynamic, negotiable, and evolving documents, rather than static and set-in-stone entities

Reflecting on the Whats

- **What gets changed?**
  - Introducing organizers, integrating technology, changing the structure of the book, revising the materials to accommodate student different needs/capabilities
    - … several of these changes are aligned with research findings (e.g., orientation, structuring, differentiation)
    - … other changes are somehow debatable (e.g., changing textbook tasks to accommodate certain features of available technological tools)
  - **What gets changed and why matters!**

Reflecting on the Whats

- **Focusing on the inputs:**
  - What was these teachers' teaching/curricular experience?
  - What were these teachers' beliefs regarding teaching/student learning (in mathematics)? What was their level of MKT?
- **Focusing on the outputs:**
  - In what ways can this process provide insights about teachers' beliefs and knowledge?
  - In what ways can it serve as a lever toward modifying teachers' beliefs and knowledge?
- **Considering the other side of the coin:**
  - What curriculum developers, textbook authors, mathematicians, and researchers learn from this process?
  - How can this learning influence their work?

Reflecting on the Hows

- **How does this process work? Roles of power and status:**
  - The two-year design: during the first year, any evaluation of teachers' work was avoided
- **The "final" products of textbook editing:**
  - How are the revised versions of the textbooks intended to be used?
  - Can they inform new rounds of textbook authoring?
- **Can this approach be scaled-up?**
  - How? What would this scaling-up entail?

Returning to the Boundaries

- Teachers cannot undertake the role of curriculum developers, but…
- Curriculum developers and textbook authors are in need of the practical knowledge and wisdom of teachers
- It is in this close cooperation and collaboration that benefits can really be reaped, both in terms of the process and the final products

- **Thank you for your attention!**

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Discussion

Reactions to and thoughts about

- Small-groups:
  - What did you find intriguing?
  - What seems to be missing?
  - What are the strengths/limitations?
- Whole group:
  - Idea sharing.