Preliminary Data from a Study of Elementary Teachers' Changing Attitudes Towards Geometry, Using the Interactive e-Learning ORIGAMETRIA Program for Teaching Geometry

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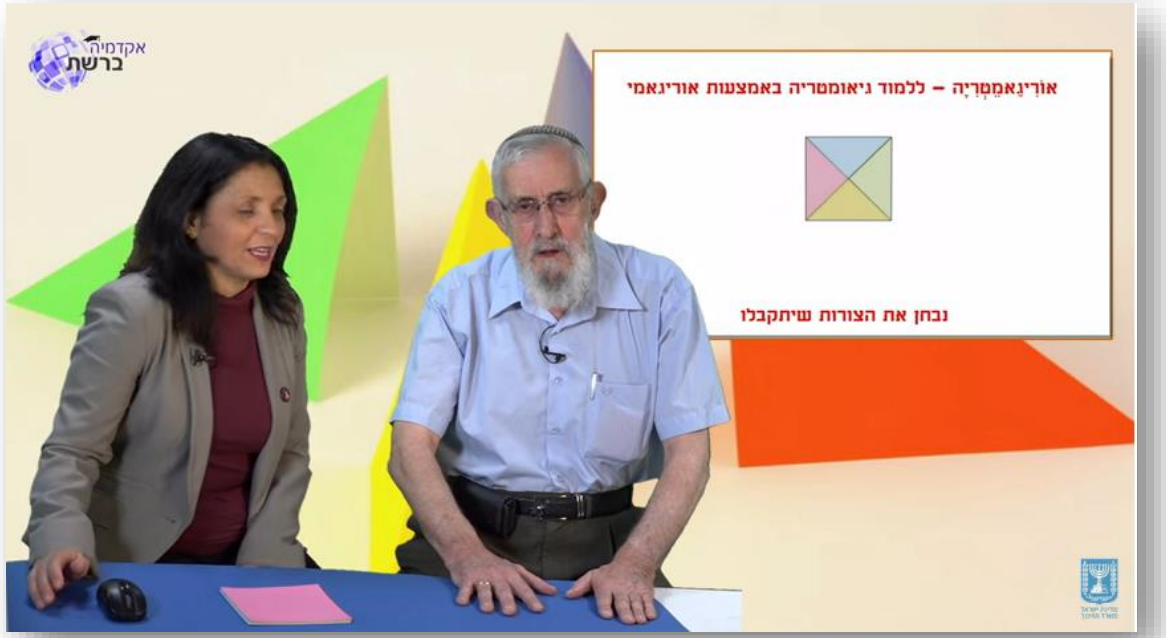
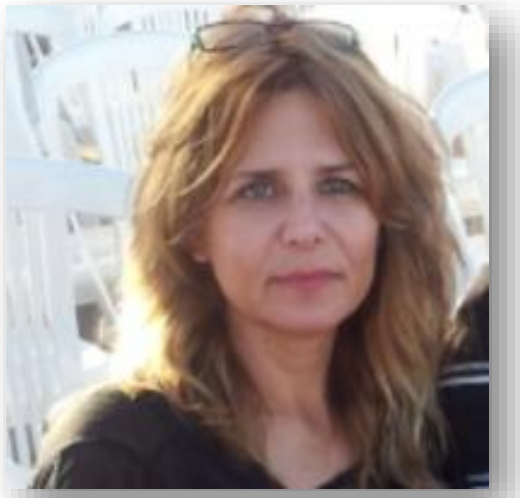
M. Golan, J. Oberman, A. Klemer & P. Jackson



Miri Golan

Dr John Oberman



Dr. Anat Klemer

Paul Jackson

MAIN DEVELOPERS

-- Senior Developer:
Miri Golan, trained educator and origami expert

-- Senior Education and Math Consultant:
Dr John Oberman, PhD, Senior Lecturer, Shaanan College of Education, Haifa, Israel.
Writer of many math text books used within Israel and overseas.

-- Education and Math Consultant
Dr. Anat Klemer (Schwartz) Dept of Math Education in the College of the Western Galilee, Haifa, Israel,

-- **Paul Jackson** (MA Univ Coll London)
Creative consultant. Professional origami artist.

האקדמית גליל מערבי
Western Galilee College

Q:
What has happened to Origametria since 6OSME (2014)?

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A:

The program has become an e-Learning program.

Please visit

www.origametria.com

for more information and sample lessons

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FACTS AND FIGURES

-- In 2017, e-Learning Origametria was accepted into the national math curriculum by the Israeli Ministry of Education.

-- It is currently taught in 150 schools, in 900 classrooms.

-- It has been taught to 600 Elementary School teachers on 30 courses in 15 centers for In-service Teacher Training.

-- The program has been bought by the private Dalton School in Manhattan, New York City, USA.

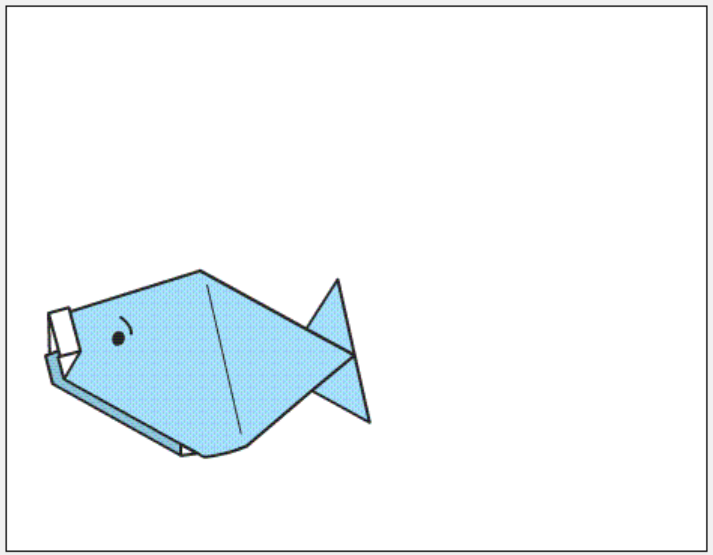
-- Miri Golan has been invited to lecture about the program at Universities in the USA, Italy, Austria, UK, Germany and Israel, also at math conferences in the USA, Canada, Singapore, Japan, UK and Israel.

An example of an activity (screen grab)

Perpendicular Line

(screen grab)

Enter



Lesson Aims	Pupils will recognise perpendicular lines and draw perpendicular lines.
Name of Model	The swimming fish.
The Lesson Structure	The measuring tool,Composition and Decomposition of Shapes, Polygons 3,Perpendicular lines and sides of polygons.
Lesson Content	In this lesson the pupils will investigate perpendicular and intersecting lines. At the conclusion of this lesson the final model will be a surprise while learning new concepts and revising previously learnt geometrical concepts.
Prior knowledge	Angles,right angle,sides of a polygon.
Materials	Two sheets of origami paper 15×15 cm,and two colored markers.

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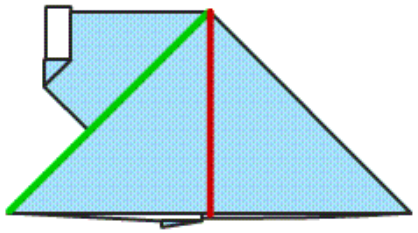
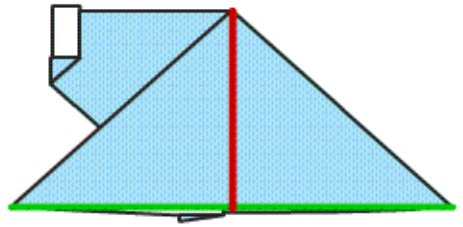
A discussion question: In the animation we can see 2 segments of lines that are colored. Are these segments perpendicular to each other?





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Answer: The angle measured is a right angle and the two segments are **perpendicular to each other.**

Since 2010, Origametria and more recently, e-Learning Origametria (**e-LO**) have been taught to approximately **600** teachers of math in Elementary Schools, in courses of **30**-hours.

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There were many positive accounts of the success of the programs, but no data.

Therefore, in 2017 it was decided to collect data.

The research was designed and run by the Dept of Math Education in the College of the Western Galilee, Haifa, Israel, led by Dr Anat Klemer.

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The Research

In recent times, there has been a shift away from researching the comparative efficacy of different teaching methods, to researching the attitudes to teachers towards their teaching.

This is known as ‘Qualitative Research’.

Ernest. P. (1989). Journal of Education for Teaching. Volume 15, Issue 1.
Shulman, L. (1996) in J. Sikula (Ed.).Handbook of research on teacher education(2nd edition)
Richardson, V. "The role of attitudes and beliefs in learning to teach." Handbook of research on teacher education (2nd edition) J. Sikula (Ed.)

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Qualitative Research: What does it study?

1.

The attitude of a teacher towards teaching geometry.
(does s/he enjoy to teach it, is it problematic?)

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The attitude of a teacher towards teaching geometry.
(does s/he enjoy to teach it, is it problematic?)

2.
Influences from a teacher's biography.
(training, experience, teaching methodologies)

3.
What will improve a teacher's attitude to teaching geometry?
(visual activities, hands-on activities, smaller classes…?)

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Aim of the Research

To examine teachers' attitudes towards challenges in the teaching of geometry using the **e-LO** program.

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Objectives of the Research

1. To determine teachers' attitudes towards challenges brought about by using the **e-LO** program.

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3. To establish the role played by the status of the **e-LO** resource in teachers' attitudes, towards the challenges.

4. To mention reasons for teachers' happiness or unhappiness with the newly-introduced **e-LO** program.

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Research Methodology

The Research Design

Two in-service courses of 30-hours of instruction with the **e-LO** program were given at two different teachers' learning centers in Israel.

No teacher had any previous experience of teaching geometry using paper folding methods.

Sampling Design

The 40 teachers who participated had up to 28 years of teaching geometry in Elementary Schools, Grades 1-6.

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4. Reflections of the teachers were presented verbally and written at the end of class instruction.

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Stage One: Results

- ❑ CHANGES IN PEDAGOGICAL KNOWLEDGE.
- ❑ A DIFFERENT EVALUATION FRAMEWORK OF PUPILS GEOMETRIC UNDERSTANDING.
- ❑ USE OF FORMAL GEOMETRIC TERMINOLOGY IN CLASS DISCUSSIONS BETWEEN PUPILS AND TEACHERS.
- ❑ TEACHERS' CONTENT KNOWLEDGE ENRICHED.

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Stage One: Results

- LARGER BANK OF QUESTIONS AVAILABLE FOR TEACHERS GIVING CONFIDENCE FOR INCREASED PUPIL TEACHER INTERACTION DURING THE LEARNING PROCESS.
- POSITIVE CHANGES IN TEACHERS' ATTITUDES TO THE TEACHING OF GEOMETRY AND ITS IMPORTANCE IN MATHEMATICS.
- INCREASED MOTIVATION OF PUPILS IN LEARNING GEOMETRY.
- INCREASED PUPIL PARTICIPATION IN CLASS DISCUSSIONS.

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Stage One: Results

- ❑ CONTINUAL SUCCESS FOR PUPILS IN ALL STAGES OF STUDY.
- ❑ INCREASED DESIRE OF PUPILS TO FOSTER GEOMETRICAL THINKING.
- ❑ IMPROVED ASSESSMENT IN PRE- AND POST-TESTS OF PUPILS

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Stage One: Results

Regarding teachers' attitudes **:**

In light of the experience, teachers perceive themselves as more aware of students' difficulties. In addition, the students' knowledge test showed a 26.2% increase in grade scores, although static tests were not conducted .

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The program improved their teaching methods, which is reflected in the children's free learning and self-examination without the need to approve for them any step in the process, and their ability to ask questions and stimulate mathematical discourse in class.

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השינוי הזה לא נבדק סטטיסטיק מכיון שהשתמשנו במבחנים מכיון שזה מחקר איכותני
התכנית שיפרה בצורה משמעותית את המתודות של שיעור אוריגאמטריה וזה השפיע בעיקר בגלל שלתלמידים היתה מוטיבציה לחקור ולשאול שאלות והיה דיון כיתתי

Indirect (and Inadmissible!) Results from the Data

(Quantitive data collected by teachers from students was not the primary aim of the research, but is nevertheless of statistical interest. It is presented here informally, not as part of the admissible data.)

"Initial results suggest that whereas students remember between 5% and 60% of geometric information when taught by conventional methods, with e-Learning Origametria, almost all students remember a minimum of 80% of the information."

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Stage Two: Future Research

Continuing research will be conducted simultaneously in Israel at the Western Galilee Academic College and the Oranim Academic College of Education, and at the William Paterson University, New Jersey USA, during 2018-19, among teachers and students.

The study will focus on levels of development of spatial perception development, among teachers who teach with the **e-LO** program and Elementary School students who study with these teachers.

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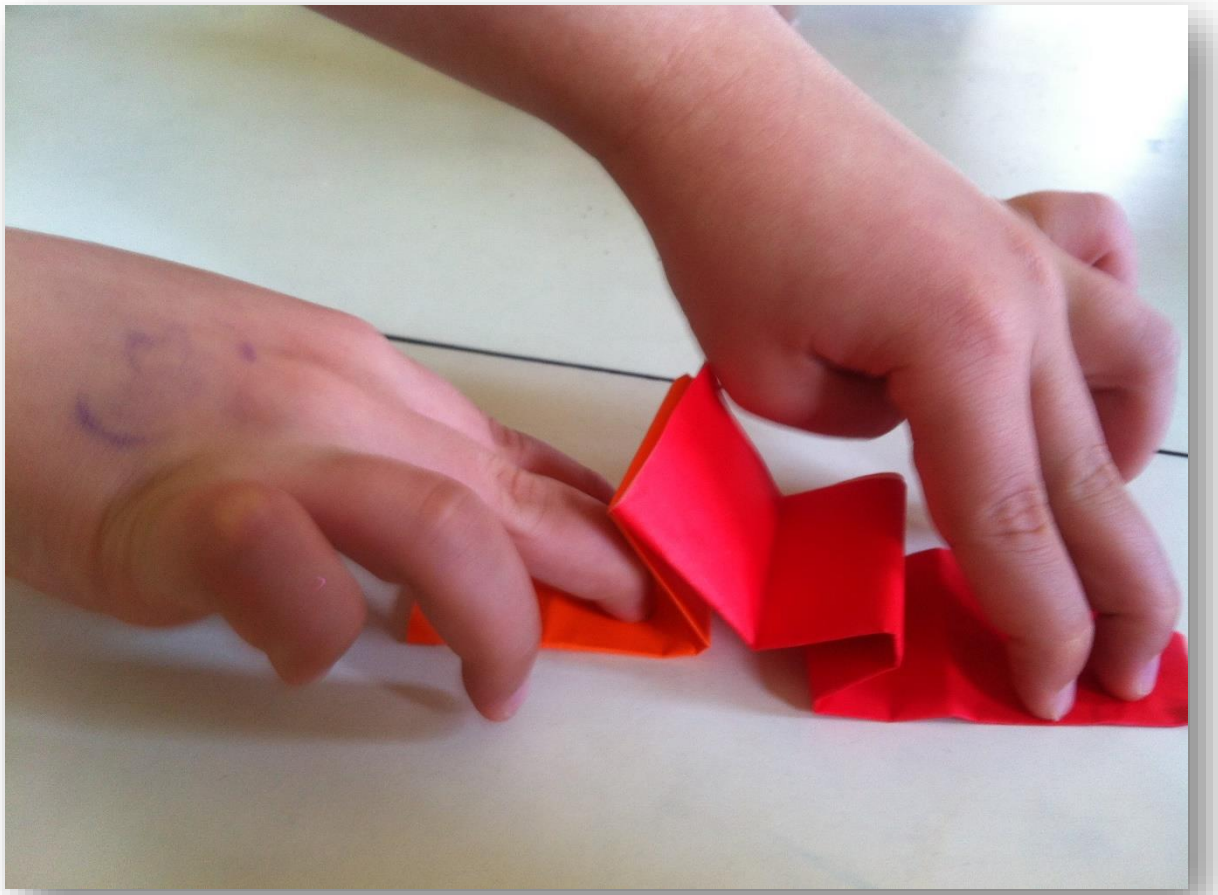

EXTRACT FROM THE RESEARCH REPORT

From a 5th Grade Teacher of Math

" Some math teachers don't like to teach geometry, so they teach children only to memorize concepts without any real understanding. These concepts are quickly forgotten. So, many children do not like geometry and feel that this is an area they are unsuccessful in. Therefore, they don't connect to it.

However, with Origametria, the children learned concepts with a deep understanding and a lot of experience.

The children enjoyed their Origametria lessons and waited for the next class. There was no geometry class in which the children did not ask me to teach origami!"

Thank you

THE END

www.origametria.com

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