

MOVEMENT IN/OF MATHEMATICS: INSIGHTS FROM A RESEARCH IN MATHEMATICS EDUCATION

Giulia Ferrari

Research fellow

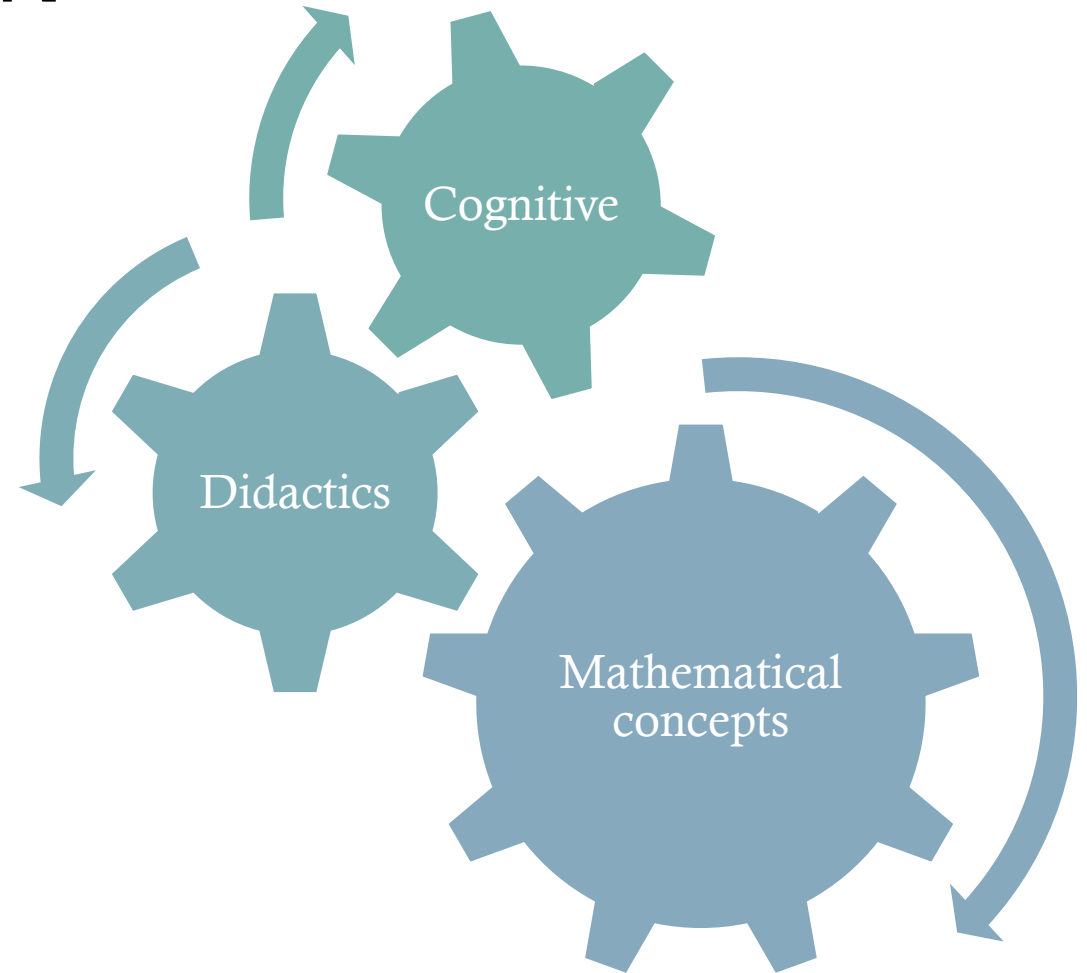
Dipartimento di
Matematica «G. Peano»

International Day of Women and Girls in Science

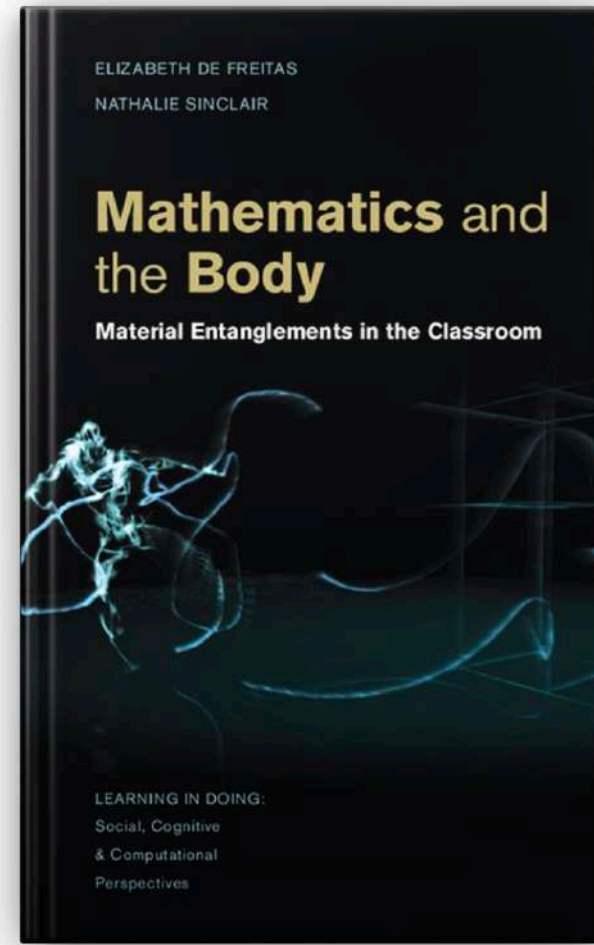
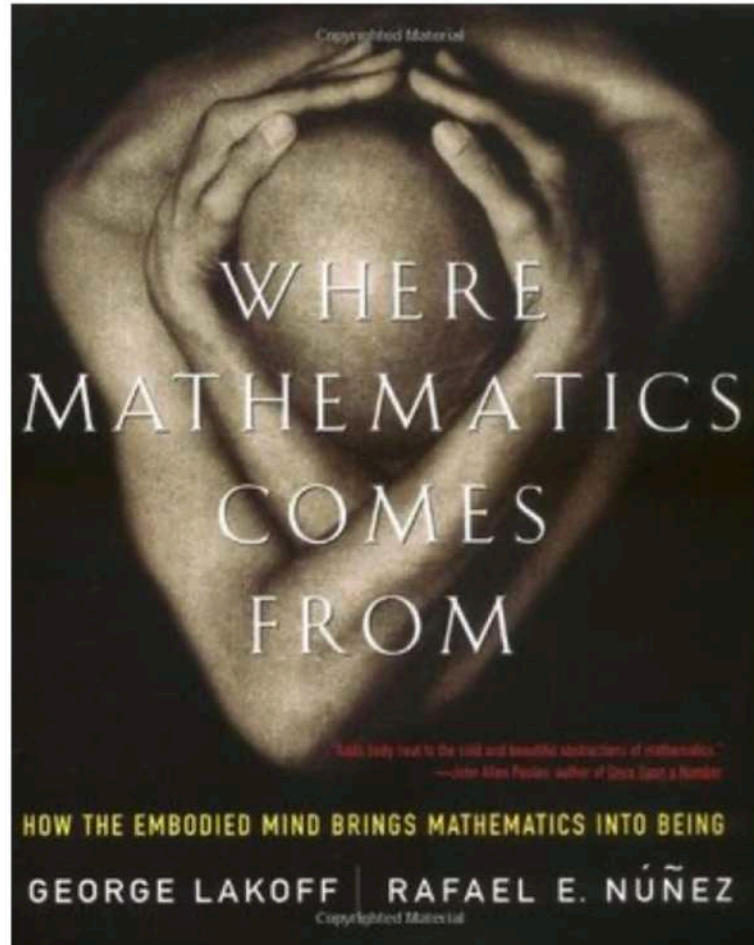
FEBRUARY 11, 2021

MATHEMATICS EDUCATION

- Didactical methodologies and interventions
(How to teach mathematics?)
- Processes of teaching and learning mathematics
and mathematical practice
(How do we teach, learn and do mathematics?)
- Epistemology of the discipline and ontology of
mathematical concepts
(What are mathematical concepts? How did
they develop?)



Doing and learning mathematics is not just a mental activity, but a physical one



Movement in/of Mathematics

→ The nature of mathematical concepts is dynamic:

mathematical concepts are “material objects on and with which mathematicians perform thought experiments. These thought experiments are not the disembodied mental ruminations with which we typically associate mathematical thinking but, rather, gestural choreographies and exploratory diagramming” (Sinclair & de Freitas, 2014)

→ Mathematical activity is overall grounded in perceptuo motor activity (bodily actions, gestures, manipulation of materials, acts of drawing, etc.):

“the understanding of a mathematical concept rather than having a definitional essence, spans diverse perceptuo-motor activities which become more or less significant depending on the circumstances. For instance, seeing a trigonometrical function as a component of circular motion or as an infinite sum of powers may entail distinct and separate perceptuo-motor activities.” (Nemirovsky, 2003)

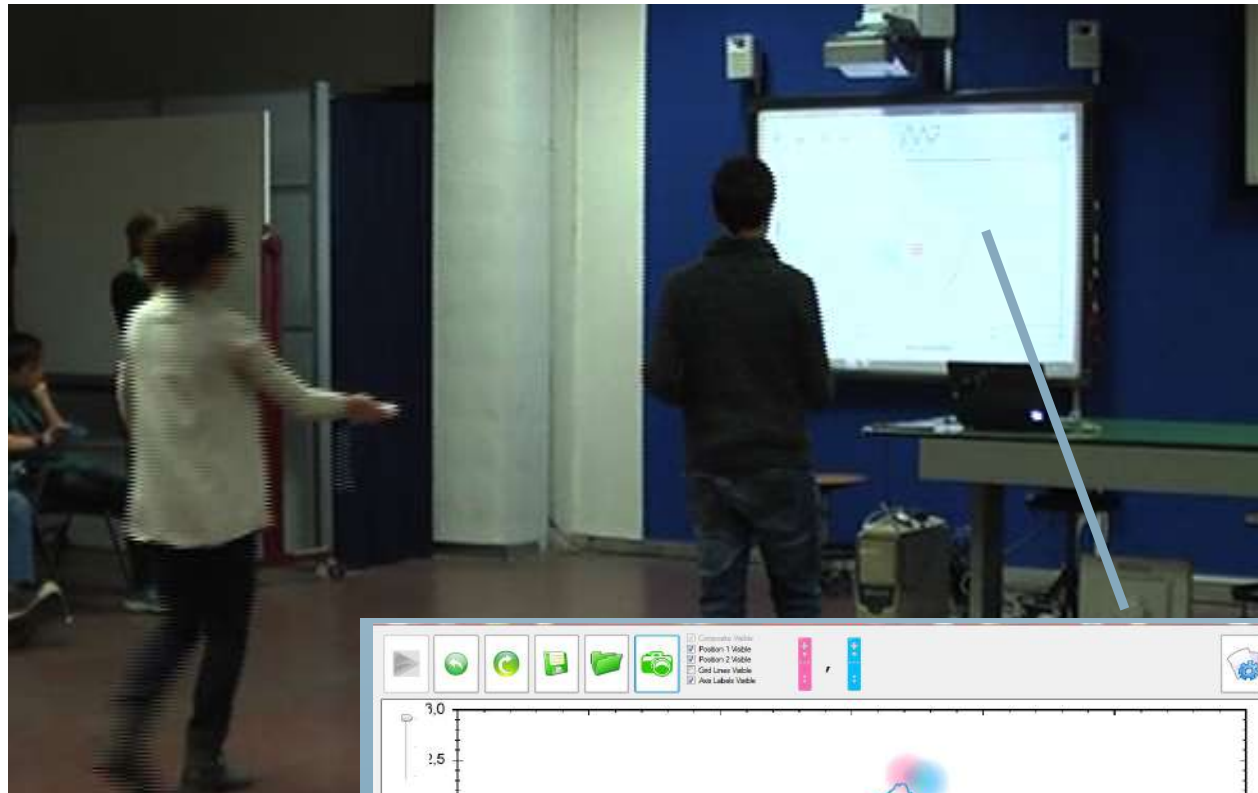
Which is the role of movement in the doing/learning of mathematics?

RESEARCH LINES

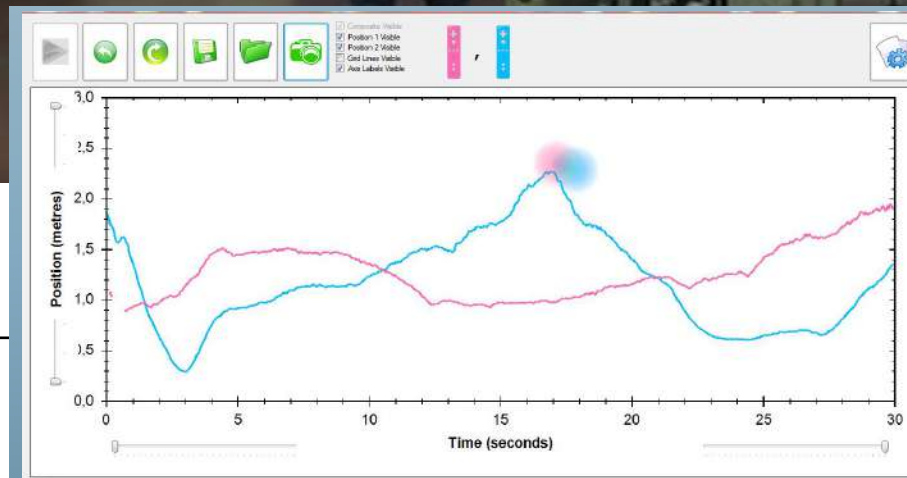
In my work I have been investigating the relationships between movement and mathematical thinking through:

- 1) the implementation of innovative mathematical activities that make use of (technological) tools and involve the use of the body (teaching experiments)
- 2) the study of proprioceptive possibilities in such activities particularly through the gesture/diagram interplay and the relationships between the material and the representational in different context (case studies)
- 3) studying the role of affectivity in the doing of mathematics
- 4) developing innovative research methodology (working progress)

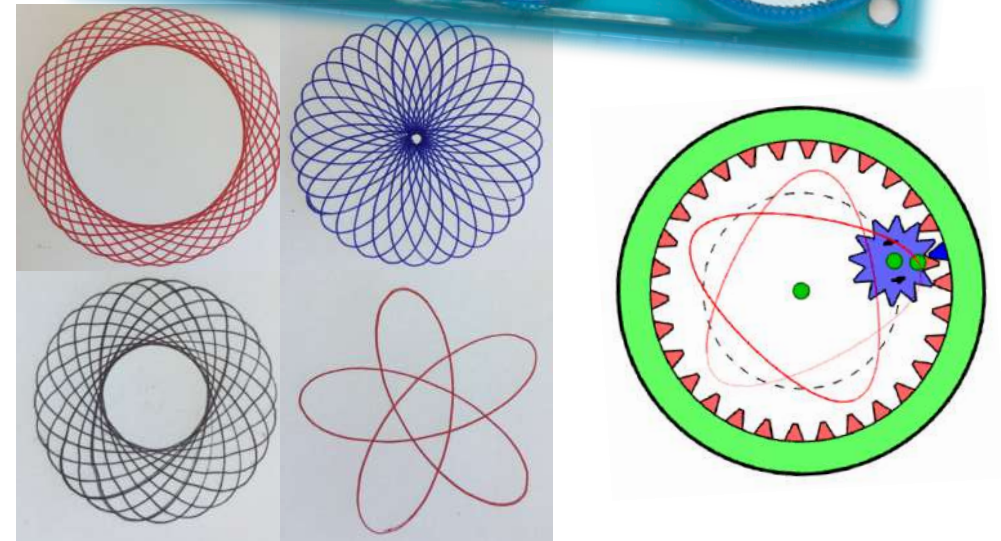
WIIGRAPH



Ferrari, 2019



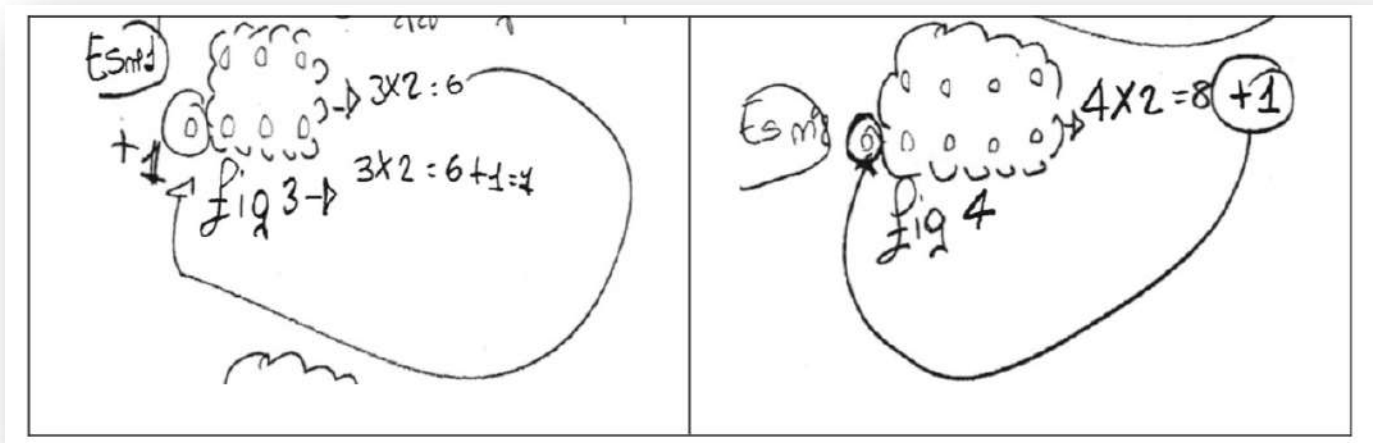
SPIROGRAPH



Ferrara, Ferrari & Savioli, 2019

DIAGRAMS AND DIAGRAMMATIC ACTIVITY

- Students working on pattern sequences
- Students drawing of a circle with WiiGraph and recovering the relationships with the sinusoidal functions



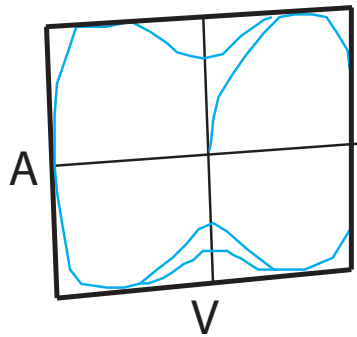
Ferrara & Ferrari, 2017



Ferrari & Ferrara, 2018

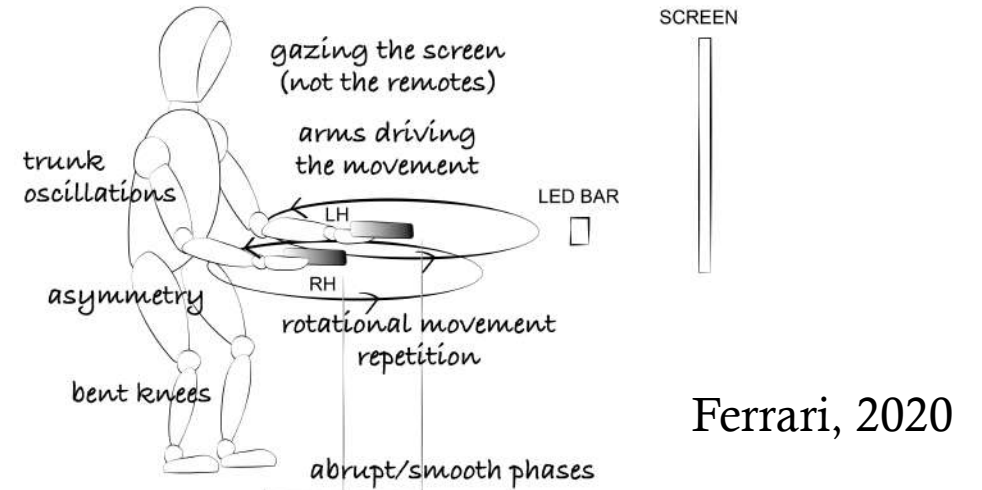
PROPRIOCEPTIVE POSSIBILITIES AND THE DEVELOPMENT OF NEW SENSITIVITIES

Conversations with materials and diagrams: making sense of the «apple-shaped» graph



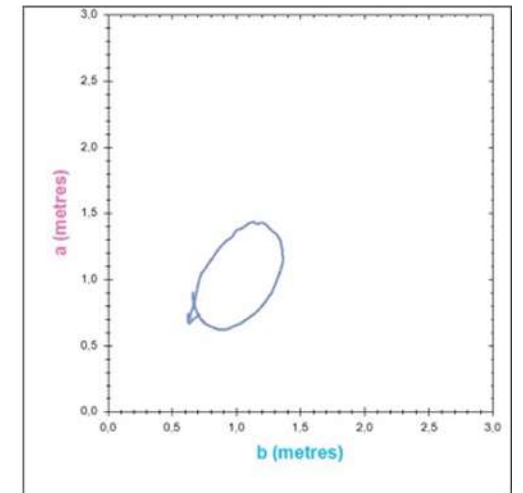
Nemirovsky, Ferrari, Rasmussen & Voigt, 2020

Folds and nuances of a mathematical concept



Ferrari, 2020

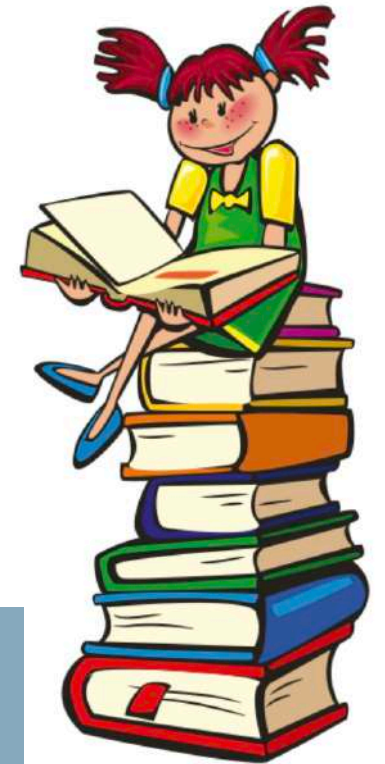
Drawing a circle by means of hands' coordinated movements: kinesthetic engagement and the enlargement of the field of significance



TACKLING THE GENDER GAP IN MATHEMATICS IN PIEDMONT

(Di Tommaso, Contini, Piazzalunga, De Rosa, Ferrara, Robutti)

- In grade 4, Italy has the highest gender gap in mathematics (GGM) among the participating countries in TIMSS (2015) and the gap increases from grade 2 to 10 (Contini et al., 2017).
- The project was structured as a randomized control trial involving 2 classes in each of the 25 primary schools that participated in the study.
- The post test showed that the outcomes of the girls who participated in the experiment significantly improved.



Properly designed teaching practices have the potential to reduce the gender gap in mathematics in primary school.

11 FEBRUARY
2021

ONLINE
CONGRESS



INTERNATIONAL DAY OF WOMEN AND GIRLS IN SCIENCES

Giulia Ferrari

giulia.ferrari@unito.it



Thank you!

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