Polyphony on Lesson Study in the Italian Context

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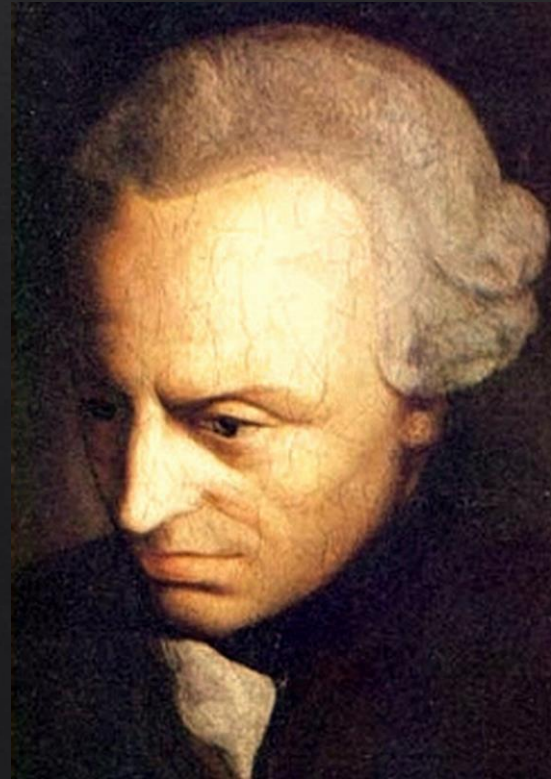Roberto Capone, Carola Manolino, Riccardo Minisola

Università di Salerno, Università di Torino

A premise

Theorie ohne Praxis ist leer, Praxis ohne Theorie ist blind.

Theory without practice is empty, practice without theory is blind.

(Immanuel Kant)
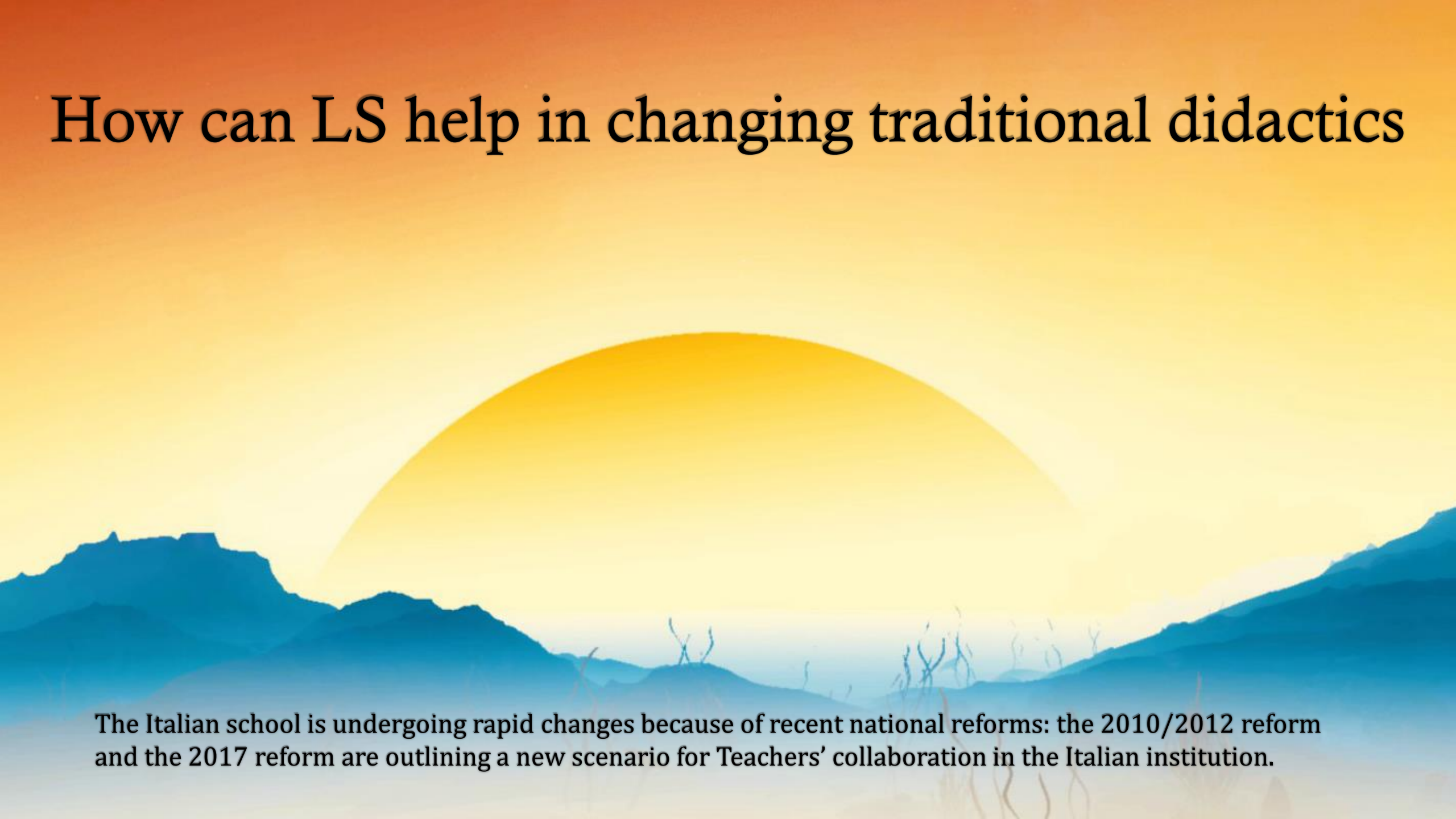
This symposium connects three LS experiments in Italy, two at the University of Turin and one at the University of Salerno.

Age of students

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

Asilo nido

Scuola dell'infanzia

Primary school

Middle school

High school

Istituto tecnico/Istituto professionale

Istruzione e formazione professionale (IFP)

Istruzione e formazione tecnica superiore (IFTS)
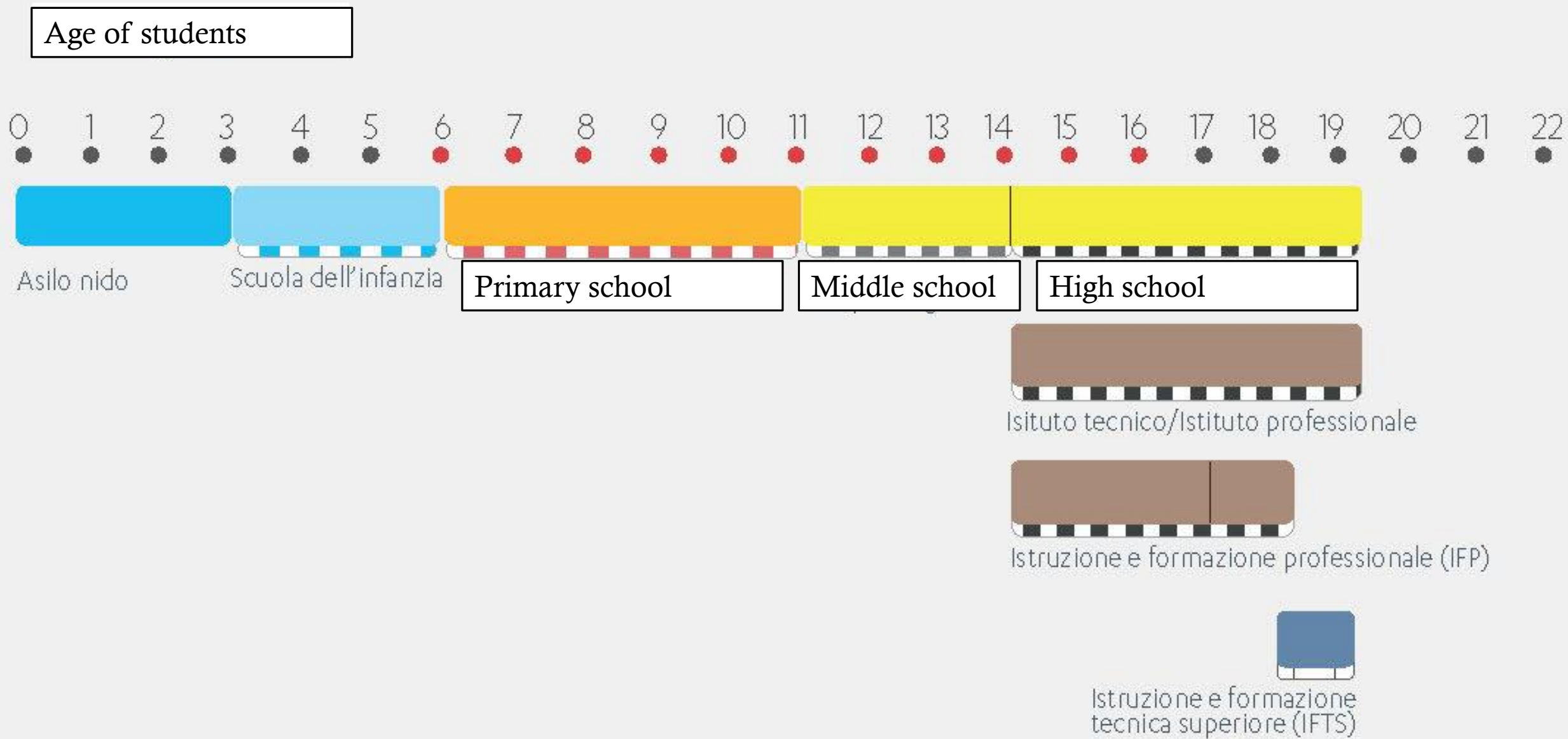
How can LS help in changing traditional didactics

The Italian school is undergoing rapid changes because of recent national reforms: the 2010/2012 reform and the 2017 reform are outlining a new scenario for Teachers' collaboration in the Italian institution.

Three experiments

The three experiments were set up to discuss common research questions, and LS activities were carried out with teachers from different school levels:
- paper 1 focuses on primary school teachers,
- paper 2 on high school teachers,
- paper 3 on prospective teachers.

What is "water"?

Shirley Tan's metaphore

Cultural Transposition

Cultural Transposition is a process, put in place by researchers of mathematics education, which, coming into contact with educational practices of other countries, deconstruct and rethink the educational intentionalities embedded in the culture of those teaching practices for rethinking to own ones.

The symposium discusses the issue of cultural transposition (Mellone et al., 2019) using different theoretical backgrounds:
- paper 1 refers to semiotic of cultures (Lotman, 1990; Radford, 2008);
- paper 2 to semiotic mediation (Bartolini & Mariotti, 2008);
- paper 3 to boundary objects (Star, 2010) and meta-didactical transposition (Robutti, 2018).

Cultural Transposition

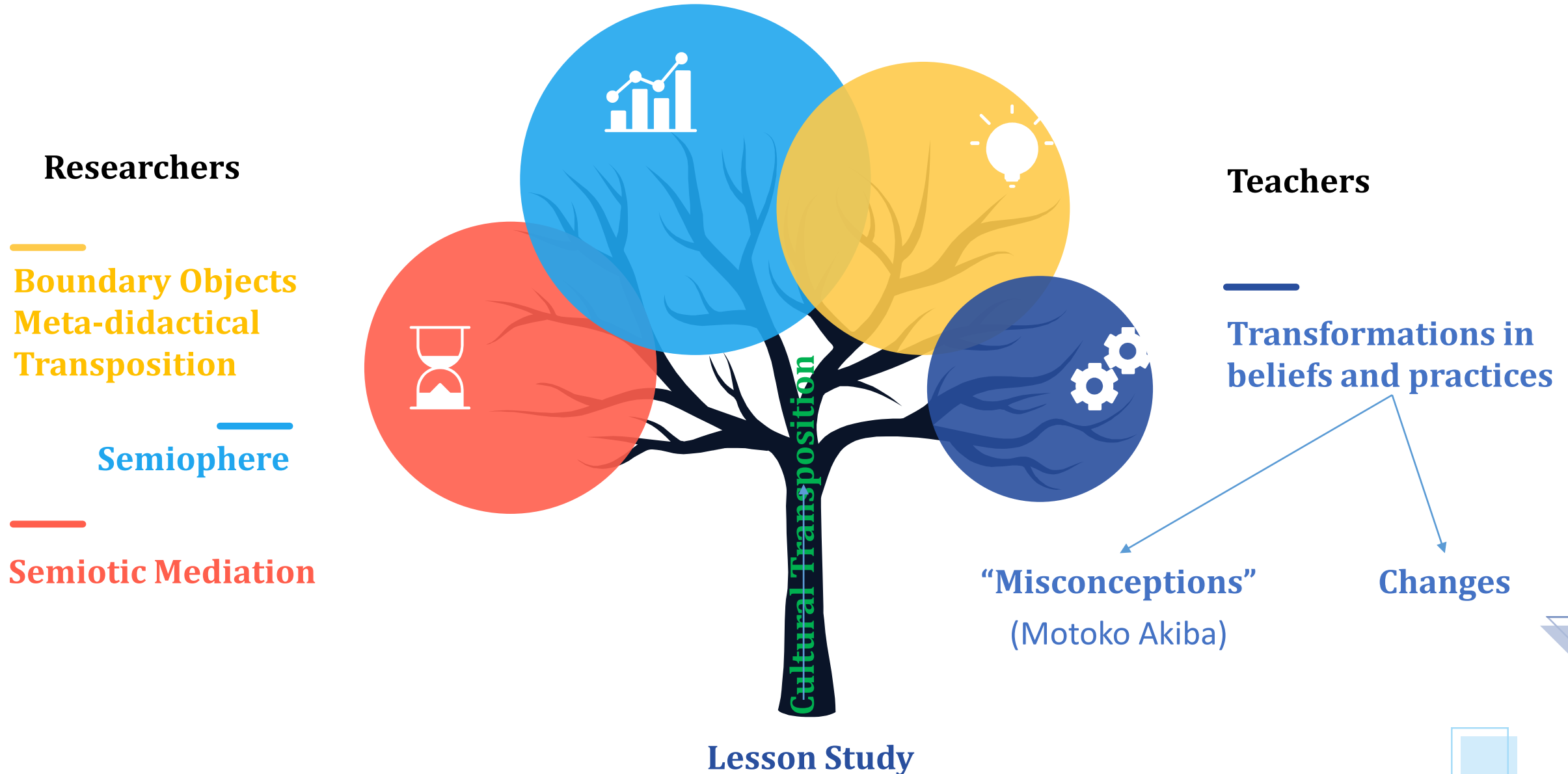The Cultural Transposition framework was essential in shaping this research work: to properly transpose LS in the Italian institutional context it is necessary to deeply study it, deconstruct it to better understand which of its components are too deeply rooted in the Japanese culture, which can be adapted to the Italian context and which components are maintained across cultures.

Cultural Transposition

EXPORT

IMPORT

The fruits of cultural transposition

Researchers

Boundary Objects
Meta-didactical
Transposition

Semiophere

Semiotic Mediation

Cultural Transposition

Teachers

Transformations in
beliefs and practices

"Misconceptions"
(Motoko Akiba)

Changes

Lesson Study

First experiment

The three experiments were set up to discuss common research questions, and LS activities were carried out with teachers from different school levels:

- paper 1 focuses on primary school teachers,

1

Cultural Transposition

practices
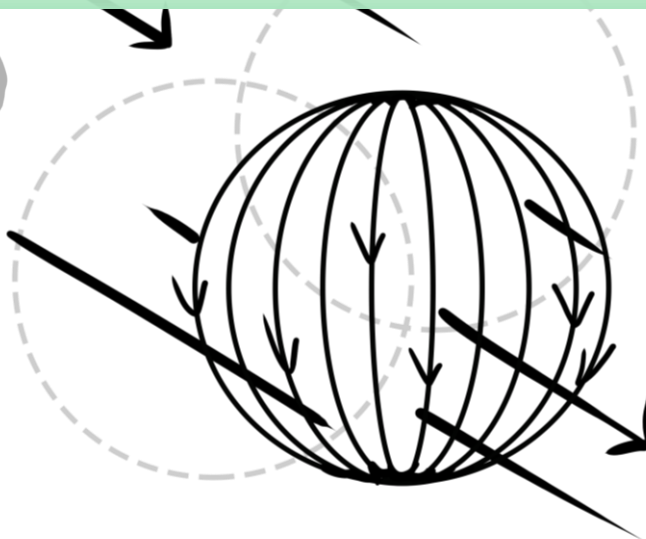
standards

gestures

tex

Cultural Transposition

FUNDAMENTAL MECHANISM:

a comparison-translation

between

(Motoko Akiba)

what is proposed

what is expressed in teachers' habits

A story from New Zealand:
the birth of a new technical language

Bill Barton

The Language of Mathematics
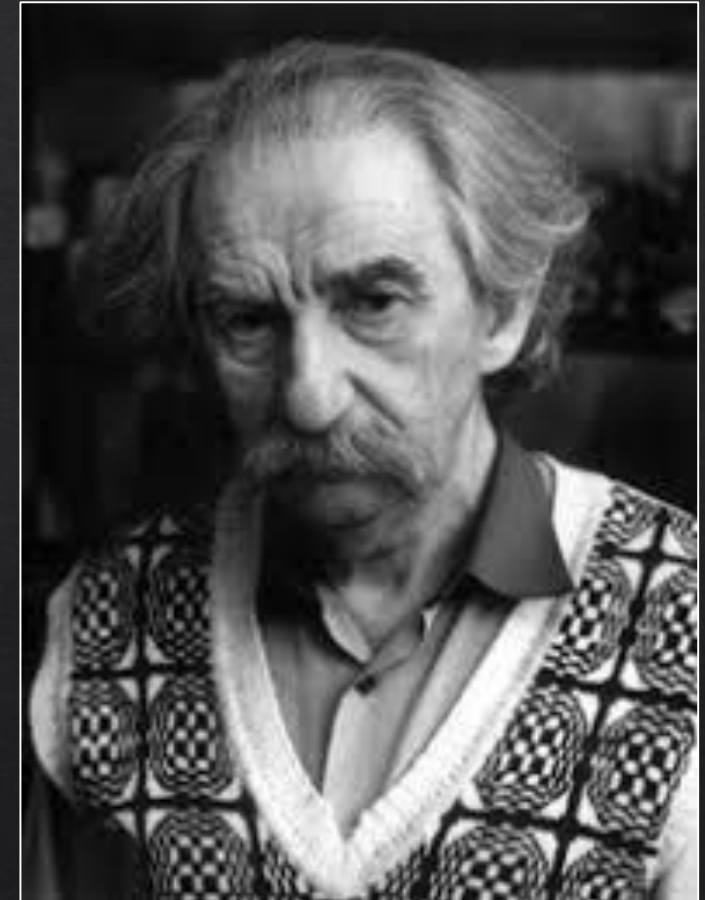Bill Barton

Te Reo Pāngarau

continuous   discrete
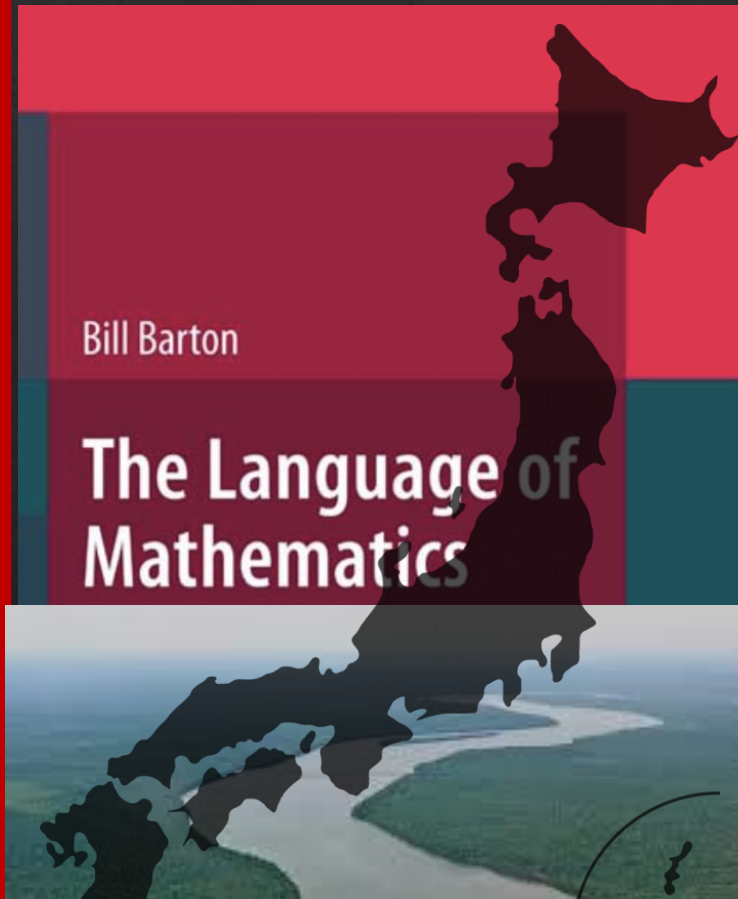
"I became curious about the way that mathematical ideas are presented differently in other languages"

Theoretical Background
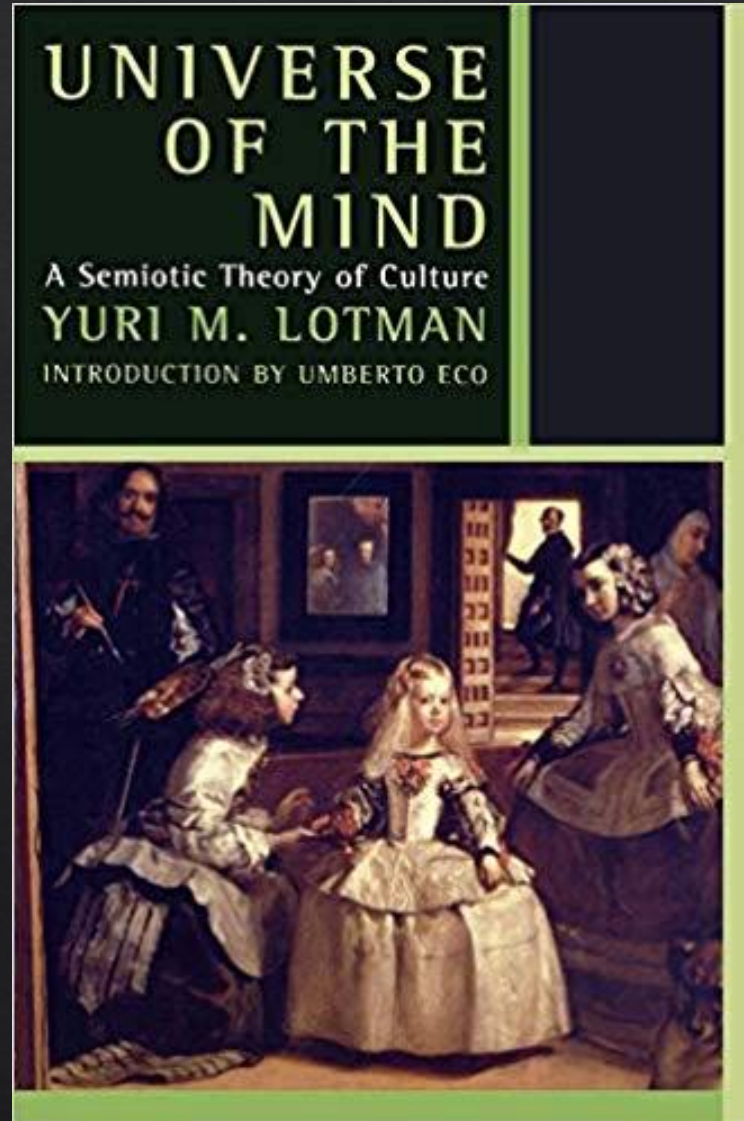
Yuri Mikhailovich Lotman
(1922-1993)

Lotman's SEMIOSPHERE

As an example [...], imagine a museum hall where exhibits from different periods are on display, along with inscriptions in known and unknown languages, and instructions for decoding them; besides there are the explanations composed by the museum staff, plans for tours and rules for the behaviour of the visitors. (Lotman, 1990, pp.126-127)

Lotman's SEMIOSPHERE
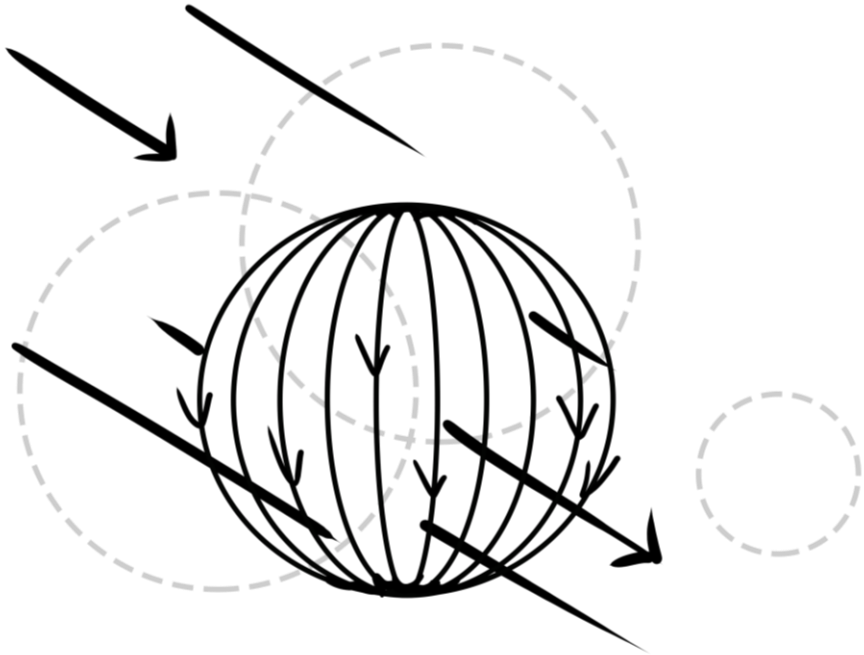

Imagine also in this hall tour-leaders and the visitors and imagine all this as a single mechanism (which *in a certain sense* it is). This is an image of the semiosphere. […] all elements of the semiosphere are in dynamic, not static, correlations whose terms are constantly changing.
(Lotman, 1990, p.127)

Lotman's SEMIOSPHERE

The unit of semiosis, the smallest functioning mechanism, is not the separate language but the whole semiotic space of the culture in question. This is the space we term the *semiosphere.* The semiosphere is the result and the condition for the development of culture [...] (Lotman, 1990, p.125)

TRANSLATION as
a primary mechanism of consciousness
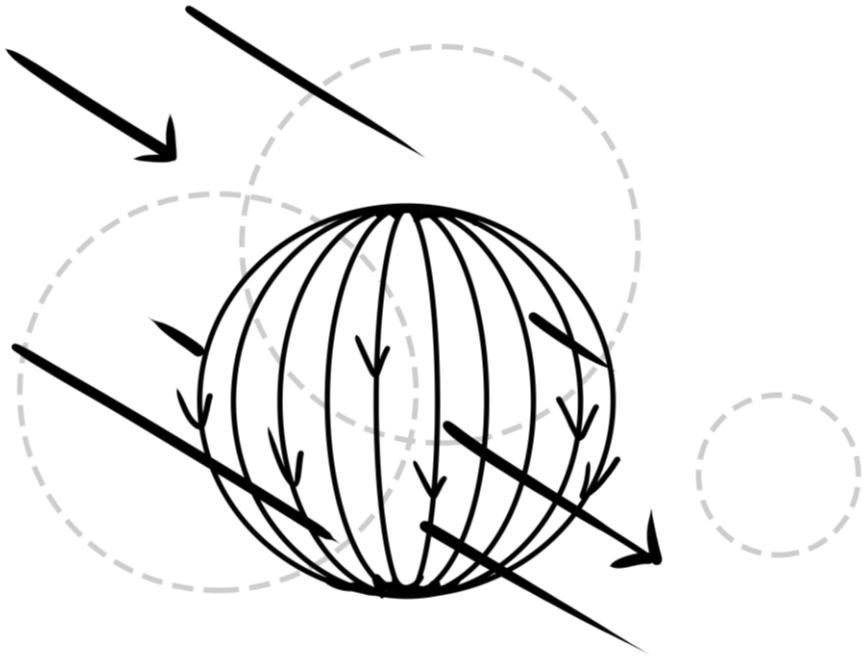
The structure of the semiosphere is asymmetrical. Asymmetry finds expression in the currents of internal translations with which the whole density of the semiosphere is permeated. Translation is a primary mechanism of consciousness. To express something in another language is a way of understanding it. (Lotman, 1990, p.127)

DIALOGUE

(Motoko Akiba)
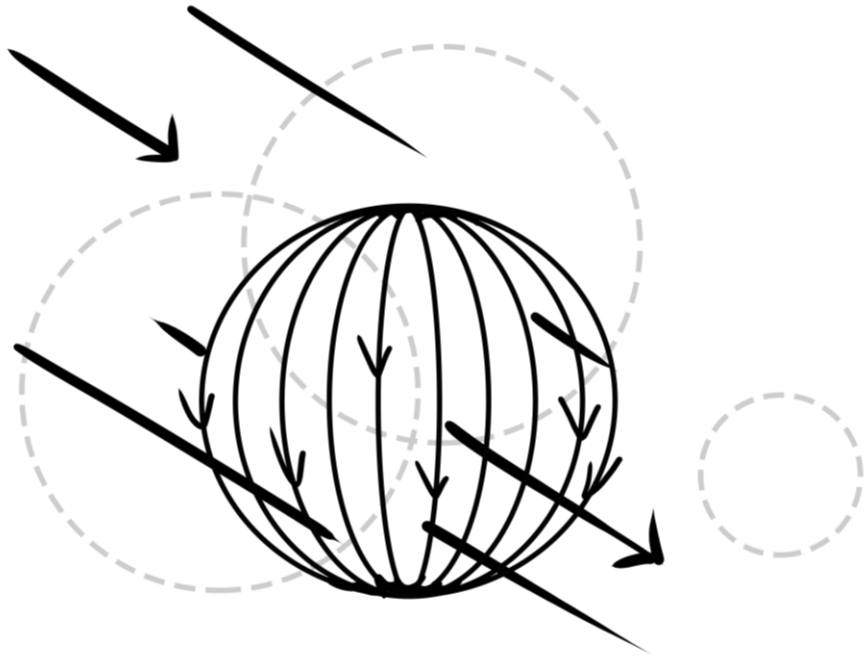
Dialogue presupposes asymmetry [...]
- in the difference between the semiotic structures (languages);
- in the alternating directions of the message-flow.

[...] However, if dialogue without semiotic difference is pointless, when the difference is absolute and mutually exclusive dialogue becomes impossible. So asymmetry assumes a degree of invariancy. (Lotman, 1990, p.143)

Research Questions

1. How to adapt the Semiosphere construct for describing the main aspects of the transposition?

2. Considered the Semiosphere as a space of communication and signification, what output do we get from using this lens to analyse our LS experiences?

The experiment

The working group:
1. Ezio, a retired former teacher-researcher;
Three teachers are 1st-grade teachers:
   2. Michela – is a support teacher;
   3. Nicoletta – teaching Italian in her class;
   4. Marcello – mathematics, science, history, geography and English teacher;
5. Valentina – mathematics and science teacher in 3rd grade.

🌷 Methodology & features of my experiment

Present

Study

Reflect

Plan

Observe
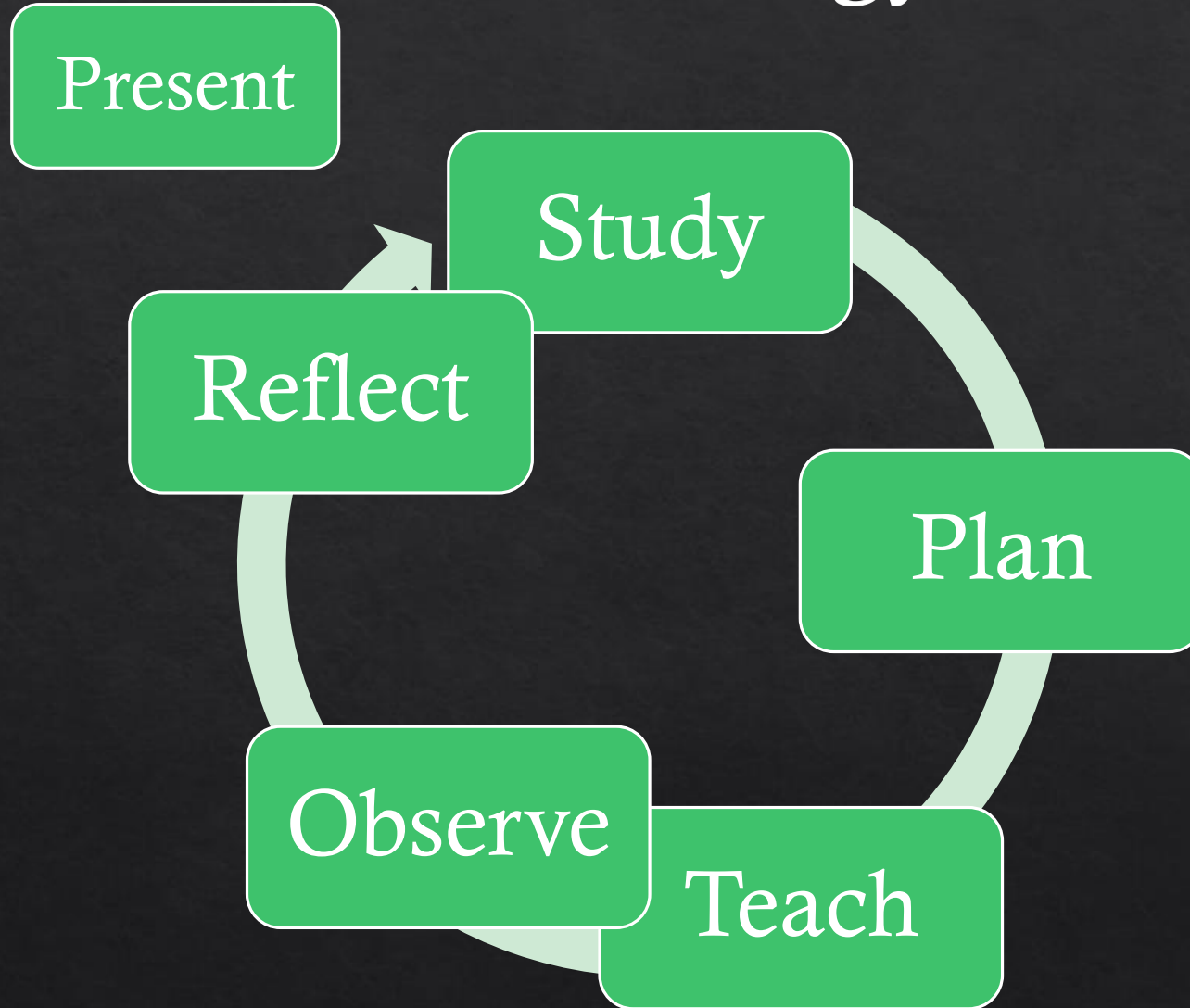
Teach

volunteer teachers: without knowledge of the LS methodology

4 cycles:
3 1st grade classes + 1 3rd grade class

Focus both on teachers' PD and on students' learning and needs

Greater difficulty: lack of adequate tools

End-cycles Reflection

Methodology & features of my experiment

For the 1ˢᵗ grade classes the topic of the lesson was **the introduction of the 'plus' sign and its institutionalization**. The specific goal on children is to understand the concept of addition as the sum of two quantities in its meaning of "putting together" and relate it to the sign of mathematical language.

For the **3rd grade** the activity was part of the educational path that includes the knowledge of weight measurements and the study of state transitions, via experiments, related to the water element. The aim is to let students reinvesting their mathematical knowledge and argumentation skills also in other disciplines.
Each teacher implemented the lesson in his or her class.

Findings

LS as in-service Professional Development

I think that the fact that, in LS, PD is **not passive attention towards an expert** who explains or advises, but is intrinsically linked to the concrete didactic action **in a specific class, composed of those students, with that story, etc.,** should be emphasised.

... is about taking a "complex" point of view on the didactic action.

LS as an experience of collective didactic planning

[...] the collective design brings into play deep aspects that are on the borderline between the **personality and professionalism of the teacher**.

[...] a point of reflection could be the **degree of teachers' engagement** with the lesson to be planned.

LS as the organization of the lesson

[...] a crucial point is the observation. The problem of observation grids [...] a precise focus of **observation should be identified** each time, even if limited or specific. Observing everything or much is impossible.

LS is a good way of working, but as a container it tends to **exclude complex activities** and therefore not to make them the object of collective reflection.

Second experiment

2

The three experiments were set up to discuss common research questions, and LS activities were carried out with teachers from different school levels:

paper 1 focuses on primary teachers,

- paper 2 on high school teachers,

The Challenge: Lesson Study with High School teachers

This symposium is focused on the case study of the Japanese "Lesson Study", transposed in Italy, carried out with high school teachers.

The aim of the experiment was to craft a collaborative design methodology between teachers, trying to integrate LS in the high school institution, in order to provide a strong basis for teachers' continuous professional development, within the semiotic mediation theoretical framework.

In Italy LS has been experimented with teachers from various schools

Our case study is the first LS experiment in Italy with Secondary School Teachers, taking into account the other experiences of LS in Italy (Turin, Modena and Reggio Emilia and Naples)

Collaborative Teaching

Liceo Matematico (*Mathematical High School*) project.

Groups of teachers plan educational activities with peers and researchers

Theoretical Background
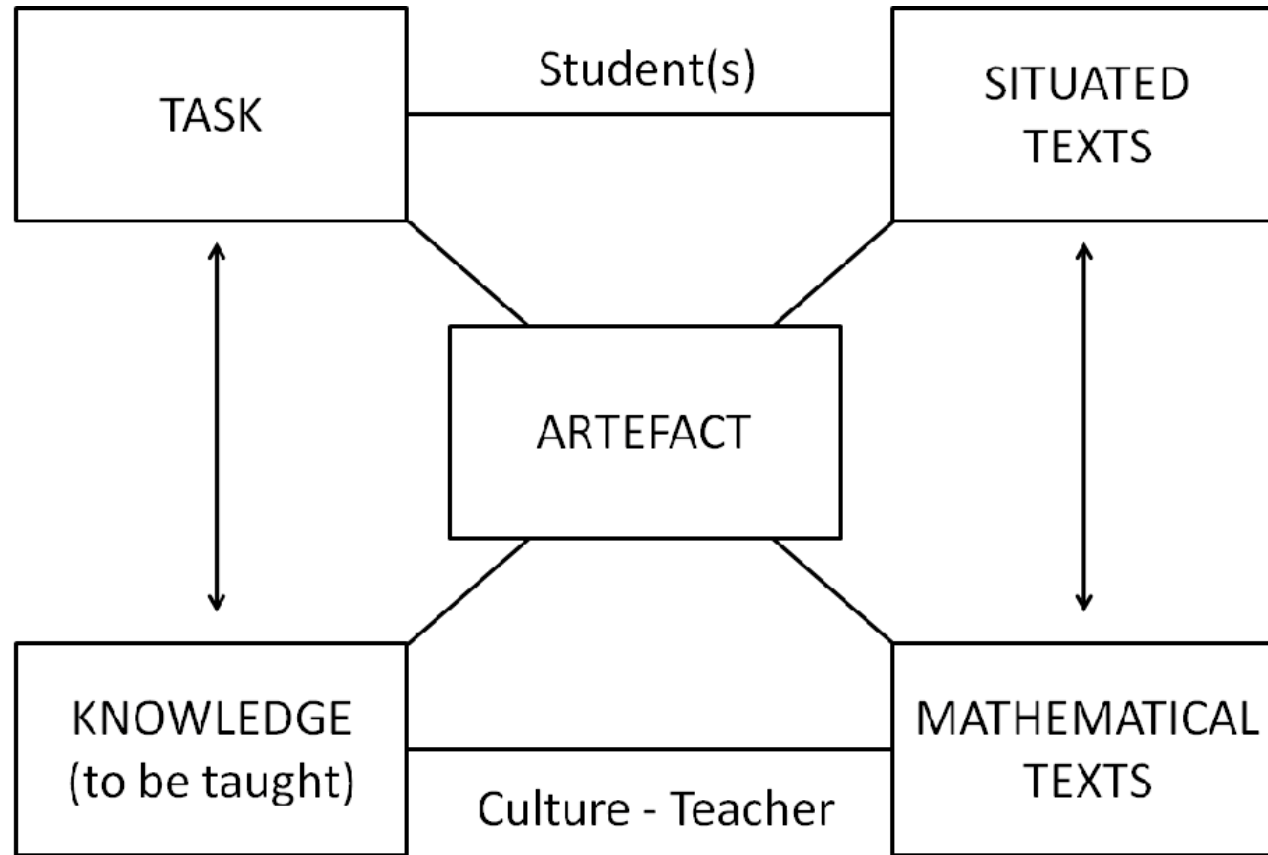
Theoretical Background

The vigotskian hypothesis has been developed, which sees a very close link between technical tools and psychological tools, thus creating a didactic path which, starting from the use of tools, aims to construct mathematically significant meanings and concepts. in this sense, learning can be considered as a social activity mediated by the teacher.

Research Questions

1. How to introduce LS to Italian high school teachers so that it is coherent with the Italian cultural and institutional context?
2. How can LS be useful with respect to "practicing teachers" professional development?
3. What is the teacher' role in the semiotic mediation both in the artefact choice and in the discussion management?
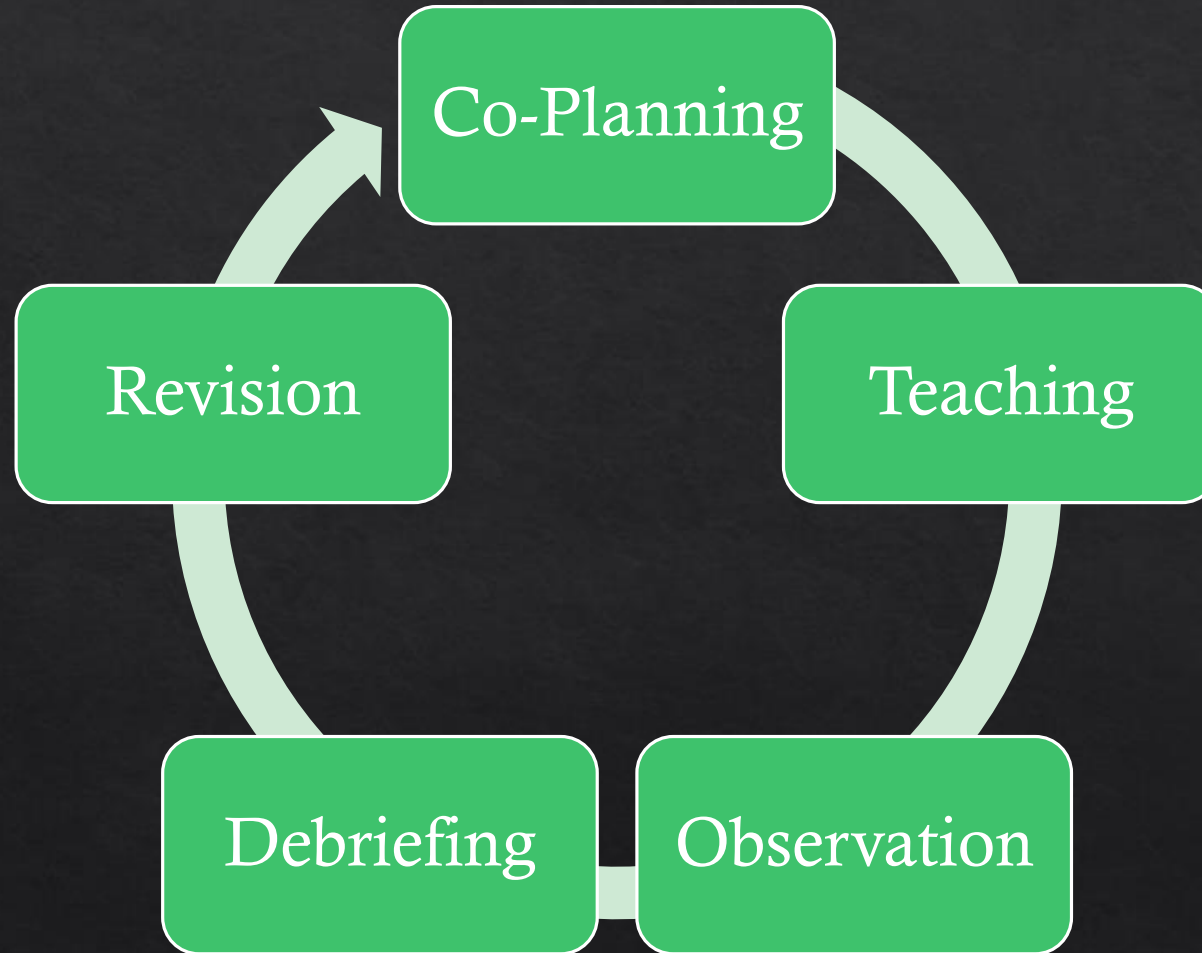
Crafting and sustainable LS

Crafting in the sense of "making or constructing something with skill and careful attention to detail".

Our Lesson Study *is Sustainable* in the sense that it is not an isolated activity.

Methodology

- **Co-Planning** — The project group, constituted of high school teachers and researchers, organizes the Lesson Plan
- **Teaching** — The pilot teacher carries out the planned lesson
- **Observation** — Some teachers and researchers observe the teaching phase
- **Debriefing** — All the components of the project group debate about observed actions
- **Revision** — The group has a revision of the LP taking into account the debriefing results

The experiment
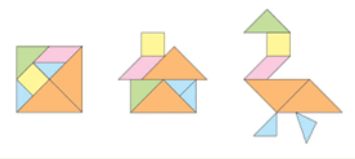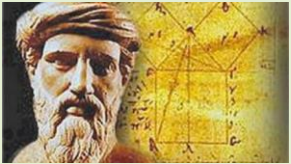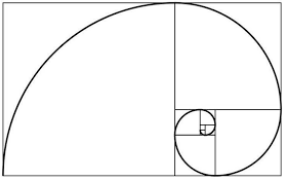
3 Teachers from Scientific High School in Avellino
3 Researchers from University of Salerno
About 80 Students attending the second year of High School
(14 -15 aged)

Lesson Plan

The learning unit "The Art of Geometry" was chosen to experiment with LS. The learning unit is divided into 5 activities

ACTIVITY 1	EQUISCOMPONIBILITY	
ACTIVITY 2	PYTHAGORAS	
ACTIVITY 3	SQUARE ROOT OF 2	$\sqrt{2}$
ACTIVITY 4	TESSELLATIONS	
ACTIVITY 5	GOLDEN SECTION	

Lesson Plan

	Activities Descriptions	Working Methodology	Times	Educational purposes	Observations
Introduction to the lesson and presentation of the topic	The topic will be introduced through the use of an artifact: the pupils will be provided with a card, containing: - a phrase from Hardy, - a painting by Escher - a hive Students will be invited to use their smartphone or tablet (in BYOD mode) to find other examples of tessellations and arrive at the "Concept of tessellation".	The pilot teacher already arranged the students in small groups of 4/5 in the previous hour, positioned so that all pupils can look at the whiteboard/LIM in case of face-to-face explanations	10'	We preferred to start immediately with the use of an artifact, to be able to "capture" the attention of the students and then get to the formalization.	Communication (clarity of deliveries, gestures) Scaffolding and Coaching (how it intervenes in student activities) What behavioural indicators? Provides students with all the essential elements of delivery; uses gestures to support understanding of deliveries Intervenes in the activities of the students in an appropriate way

Using double artifacts

The first one, used in the Engage phase in Inquiry mode uses as traces: a sentence, two images and a technological tool (smartphone). The situated texts produced by the students are transcribed on appropriately made observation sheets. In the final part of the sheets, students are asked to formalize their observations in a mathematical text: each group will therefore provide its own "definition of tessellation".

The second artifact is used to solve the daily problem, which was chosen as a reality problem: the traces are cardboard polygons, while no technological tools are used. Once again, the students will write their texts on an observation sheet. The mathematical knowledge is expressed through oral communication.

Semiotic Mediation in our LS

Student(s)
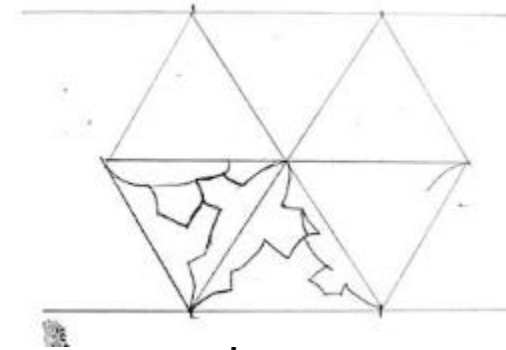
INSTEAD OF
DESCRIPTION OF
DAILY TOPIC
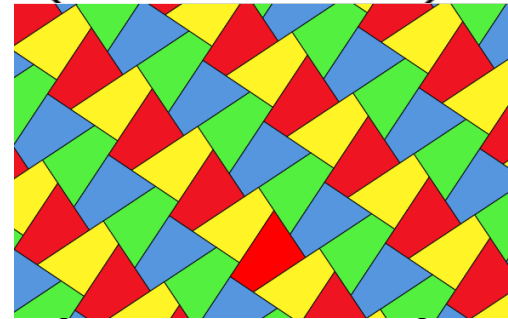
National Curriculum

Culture - Teacher

Teaching and Observing

Debriefing

✓ Use of the discipline-specific language

✓ Involvement in the educational dialogue

✓ Respect of the time

✓ Group processes

✓ Respect of the time

✓ Comunication (posture, tone, gestures, interaction with the class)

✓ Ability to engage pupils

Scaffolding e Coaching

The first lesson cycle was not on time. A revision has been necessary, in particular the LP was modified with main changes in Daily Problem and Introductive Artefact.

Other two teaching cycles were carried out and were both on time (59' and 1h1' respectively).

Findings

Semiotic Mediation
allows us to reflect on the importance of the teacher's role in the appropriate choice of artifact linked to its semiotic potential, and on the importance of the teacher's role in the management of discussion and sharing of individual signs; the teacher also seems more aware that better time management involves better class management.

In the teaching practice, LS, shared with the whole teaching community, seems to contribute not only to the professional growth of the experimenter teacher, but transfers to the whole community the refined skills and the acquired awareness of their role in guiding the discussions in the classroom..

The identification shared by the experimenter teachers with the semiotic potential of the proposed artifact was the necessary background to its use in the classroom. The careful planning of the didactic intervention, of the possible tasks and the didactic organization foreseen into LS allowed to assume the right semiotic perspective to focus on the production of signs and on the process of transformation of these signs.

The teacher, after just one LS cycle, becomes more aware of the choice and use of the artifact to make it functional to semiotic mediation

Coming together is a beginning; keeping together is progress; working together is success. (Henry Ford)

Third experiment

The three experiments were set up to discuss common research questions, and LS activities were carried out with teachers from different school levels:

paper 1 focuses on primary school teachers

- paper 3 on prospective teachers.

Relevance for Educational Practice

◈ **AIM:** is to find out the reproducible components of LS useful to implement it with practising teachers in the Italian context.

◈ **RESEARCHERS:** focus on the components of LS that can be transferred to the Italian context and those that should be modified in some way.

Interaction between different communities

Boundary Crossing & Boundary Objects

Boundary Crossing

Community 1

Community 2

Boundary Crossing

Star (2010), Akkerman & Bakker (2011), Carlile (2004)

Boundary Crossing & Boundary Objects

Star (2010), Akkerman & Bakker (2011), Carlile (2004)

Meta-Didactical Transposition

External components

External components

Boundary Crossing

Internal components

Boundary Crossing

Community 1 (researchers)

Boundary Object

Community 2 (teachers)

Robutti (2018)
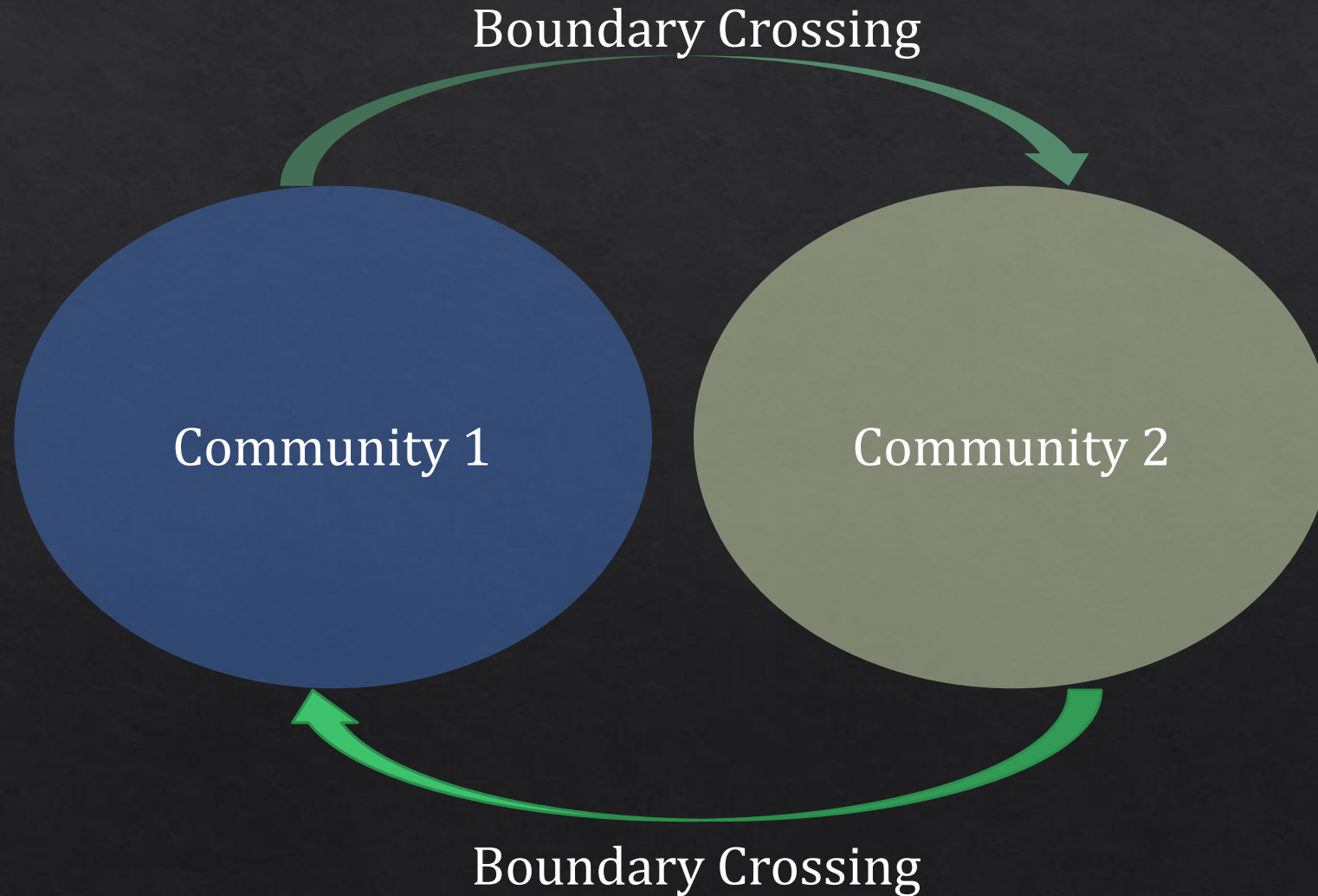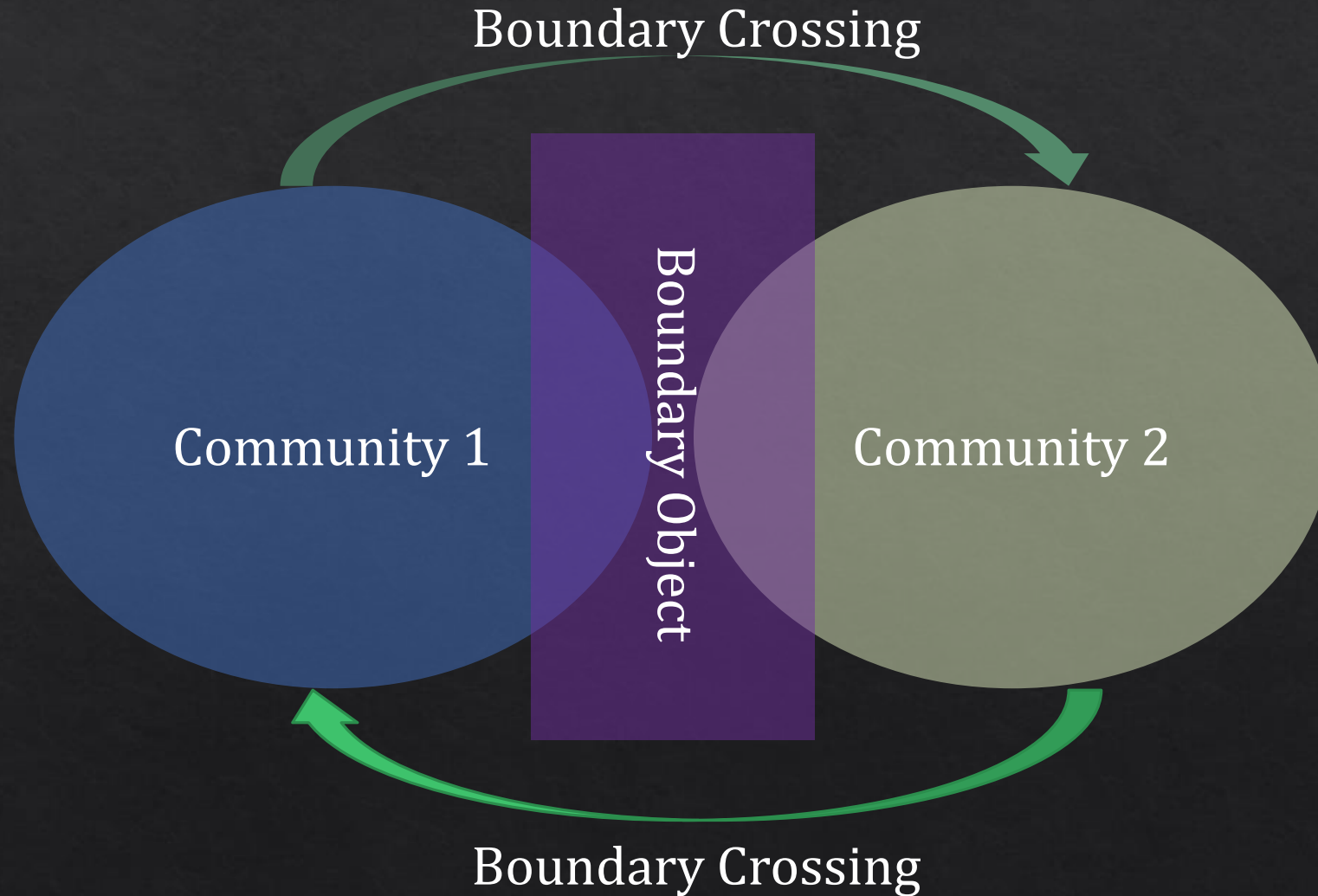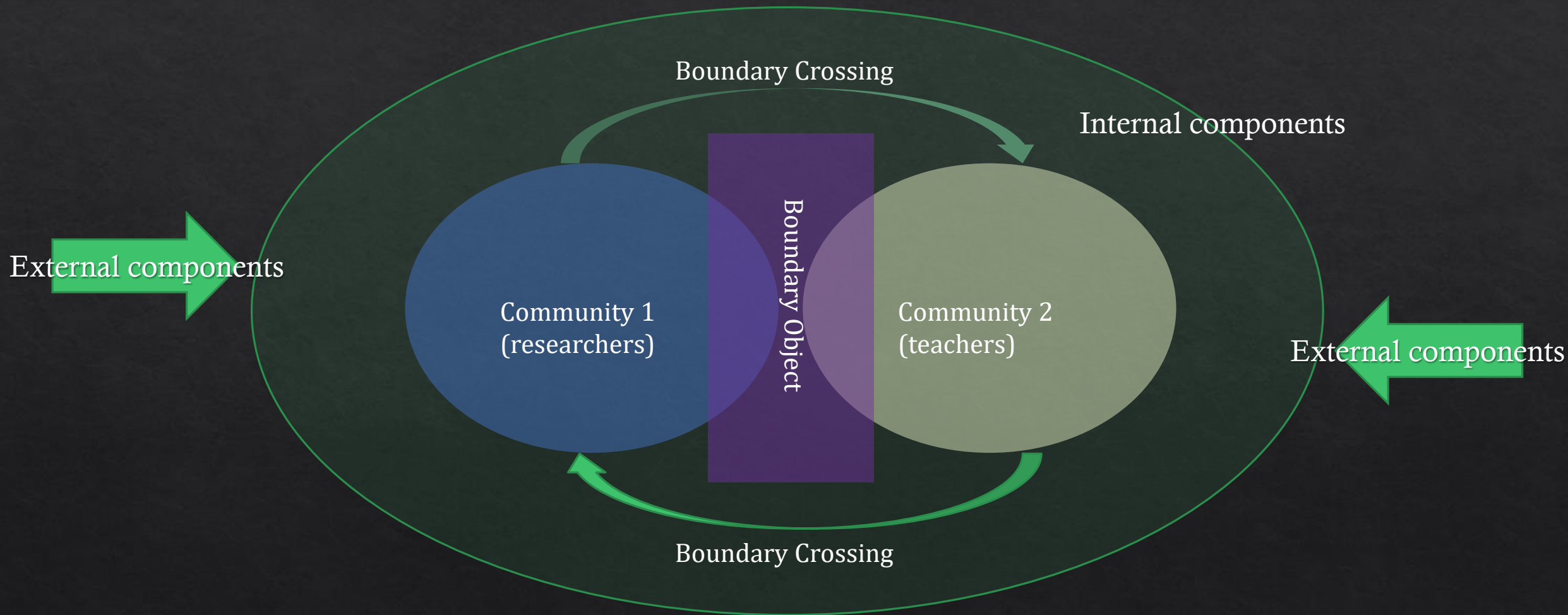
Research Questions

Is there one LS, or should we speak about Lesson Studies?

1. How to introduce LS to Italian teachers so that it is coherent with the Italian cultural and institutional context? Is there a need to negotiate a common lexicon?

2. How can LS be useful with respect to prospective teachers' professional development?

Scale of the experiment

29 prospective teachers, most with no previous teaching experience, participated in the teaching experiment on LS inserted in the course. The participation in the experiment was mandatory.

The mathematical topic, *continued fractions*, was chosen by the researchers.

The experiment lasted three months.

Robutti et al. (2016)

Number of teachers involved

Large numbers of teachers (>100) for days, weeks or months (≤1 year).

Large numbers of teachers (>100) for a long period (> 1 year).

Small numbers of teachers (≤100) for days, weeks or months (≤1 year).

Small numbers of teachers (≤100) for a long period (> 1 year).

Duration of the collaboration
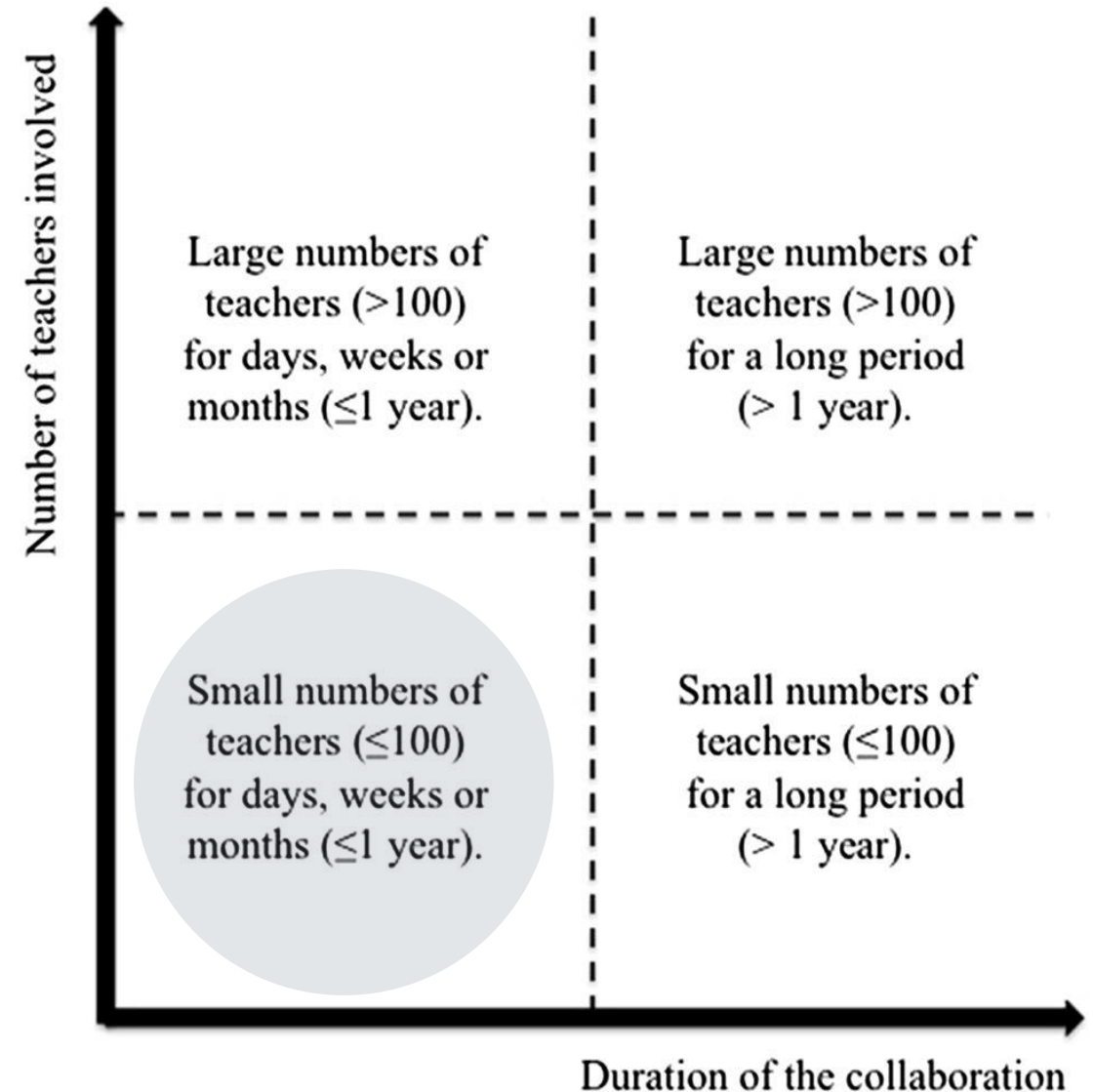
Methodology and Data collection

How the experiment was conducted

- ◈ Introductive lesson on Lesson Study
- ◈ Task: lesson planning in small groups
- ◈ Performing the lessons
- ◈ In-course online survey
- ◈ Revised lesson on LS
- ◈ Evaluative online test

Collected data

- ◈ Two sets of slides on LS prepared by the researchers
- ◈ 8 groups' reports
- ◈ 2,5 hours of videos of the lessons
- ◈ 27 in-course surveys
- ◈ 26 evaluative tests
- ◈ Written notes by the researchers

Methodolo… tion

GCD, spirals, music, architecture, algorithms…

How the…

- Introdu… …s on LS prepared by the researchers
- Task: lesson planning in small group…
- Performing the lessons
- In-course online survey
- Revised lesson on LS
- Evaluative online test

- 8 groups' reports
- 2,5 hours of videos of the lessons
- 27 in-course surveys
- 26 evaluative tests
- Written notes by the researchers

Data: first lesson

Comment

The slide presentation used in the introductive 1-hour lesson contained four slides with information on the Japanese historical, cultural and institutional context, and two slides with an overview of LS and the different phases.

The phases of the (J)Lesson Study

1. **Defining goals** Long-term educational goals are decided in accordance with the national programme and the school's mission
2. **Lesson Planning** Drawing up of the detailed Lesson Plan
3. **Research lesson** Teacher or expert teaches, other participants observe students' working in the class
4. **Discussion** Discussion is always based on students' reactions, the quality of the lesson itself is not important
5. **Reflection** Teachers metabolize what they have learned and produce a written text that remains for historical memory

Data: in-course survey

Comment

A lack of understanding of the presented LS components emerged in the activity reports, in how the lessons were presented and in the in-course surveys.

The in-course survey showed a possible misunderstanding of LS as a classroom methodology, doubts on the time constraints, and worry about teaching freedom caused by a supposed rigidity of the Lesson Plan.

The phases of the (J)Lesson Study

◈ *This new way of exposing topics is really unusual for our culture [...]*

Data: revised lesson

Comment

The 2-hour-long lesson which followed the in-course survey showed a change in the researchers' approach to explaining LS to a non-expert public.

This time, nine out of eleven slides were dedicated to discussing the phases of LS.

The phases of the (J)Lesson Study

◈ *This new way of exposing topics is really unusual for our culture [...]*

Phase 2: Detailed Lesson Plan

What is OK   What to improve

Data: tests

Comment

The positive effect of the change can be seen in the test at the end of the course.

The answers showed an overall good understanding of the presented LS components, LS as an opportunity to discuss with others and understand what being a teacher actually means, the importance of a detailed Lesson Plan emerged.

The phases of the (J)Lesson Study

◈ *This new way of exposing topics is really unusual for our culture [...]*

Phase 2: Detailed Lesson Plan

What is OK   What to improve

◈ *Probably if I had to rewrite it, and perhaps it would also be a very useful thing to do, I would be much more precise [...]*

Results: Boundary Object

We propose that LS was the Boundary Object between the community of researchers and the community of prospective teachers within the Italian institution.

The actions on the boundary object were: by the community of researchers, the reflection on how to properly convey LS to another community and the design of the introduction of LS; by the community of prospective teachers, the reflections to understand this foreign methodology and the design of their lessons.
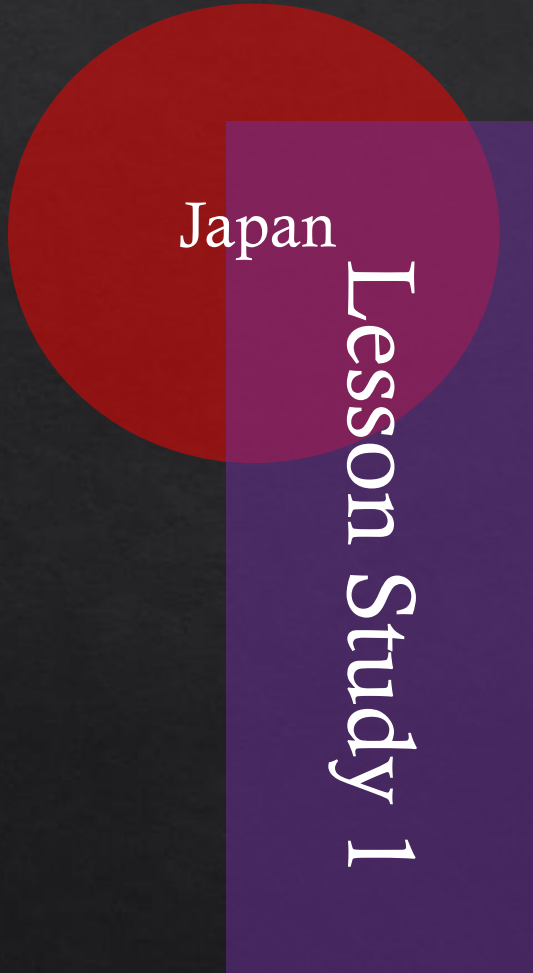
By the end of the experiment, both communities had a new understanding of the boundary object, which brought a change in both communities' practices.
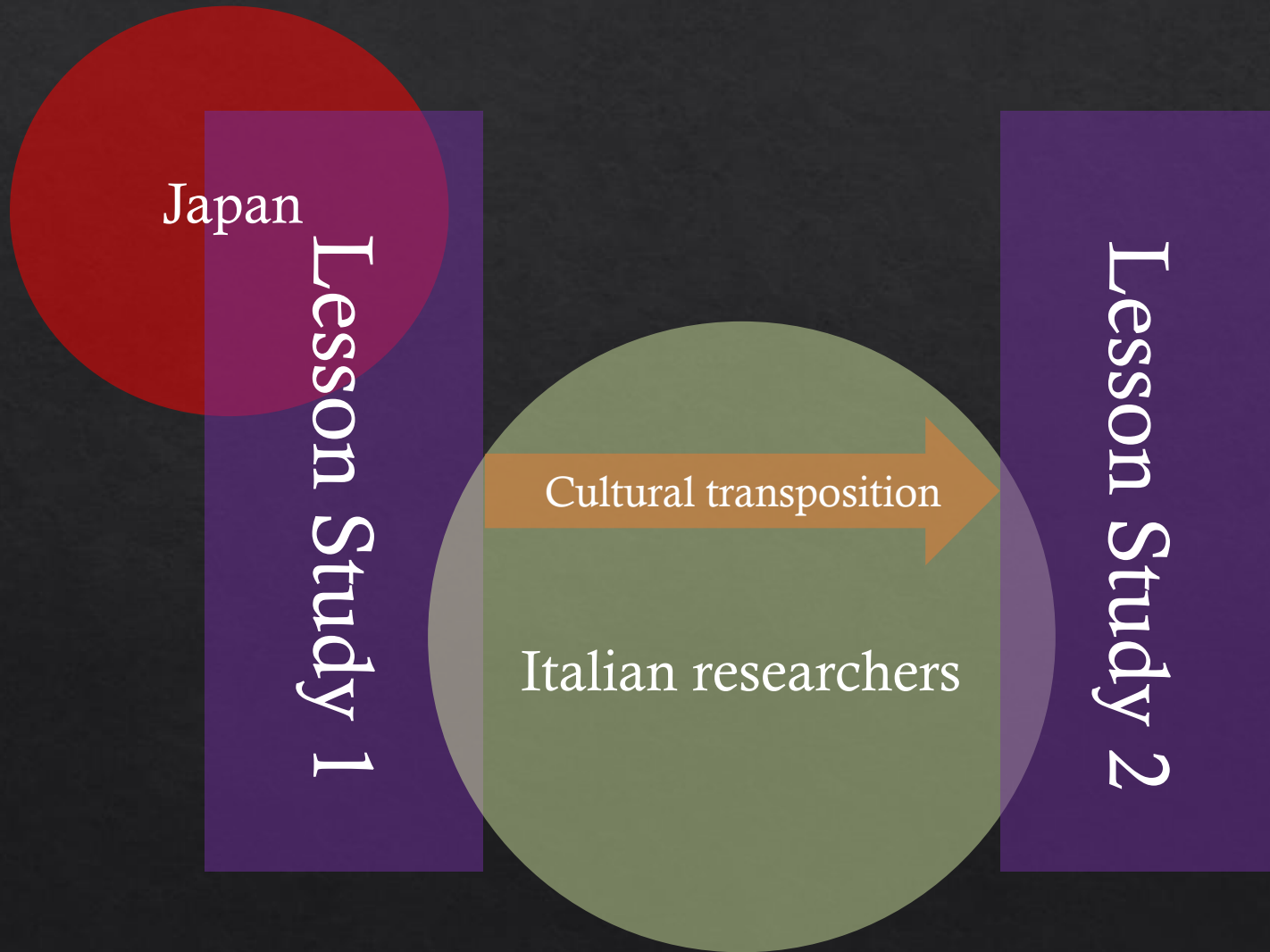
Results: Meta-Didactical Transposition

At the beginning of the experiment, the researchers had defined a practice R_1 (which we can infer from the content of the slide presentation) to explain LS to teachers. The reflection on the effects of this practice on the community of prospective teachers brought a change on both the "how LS is presented to teachers" (*praxis*) and the "why we present LS this way" (*logos*).

On the side of the prospective teachers, the answers to the test showed a good understanding on LS, thus a change in the *logos* with respect to the in-course survey (which showed a lack of understanding on LS.) Also, the answers to the test show an evolution in the *praxis* of lesson planning.

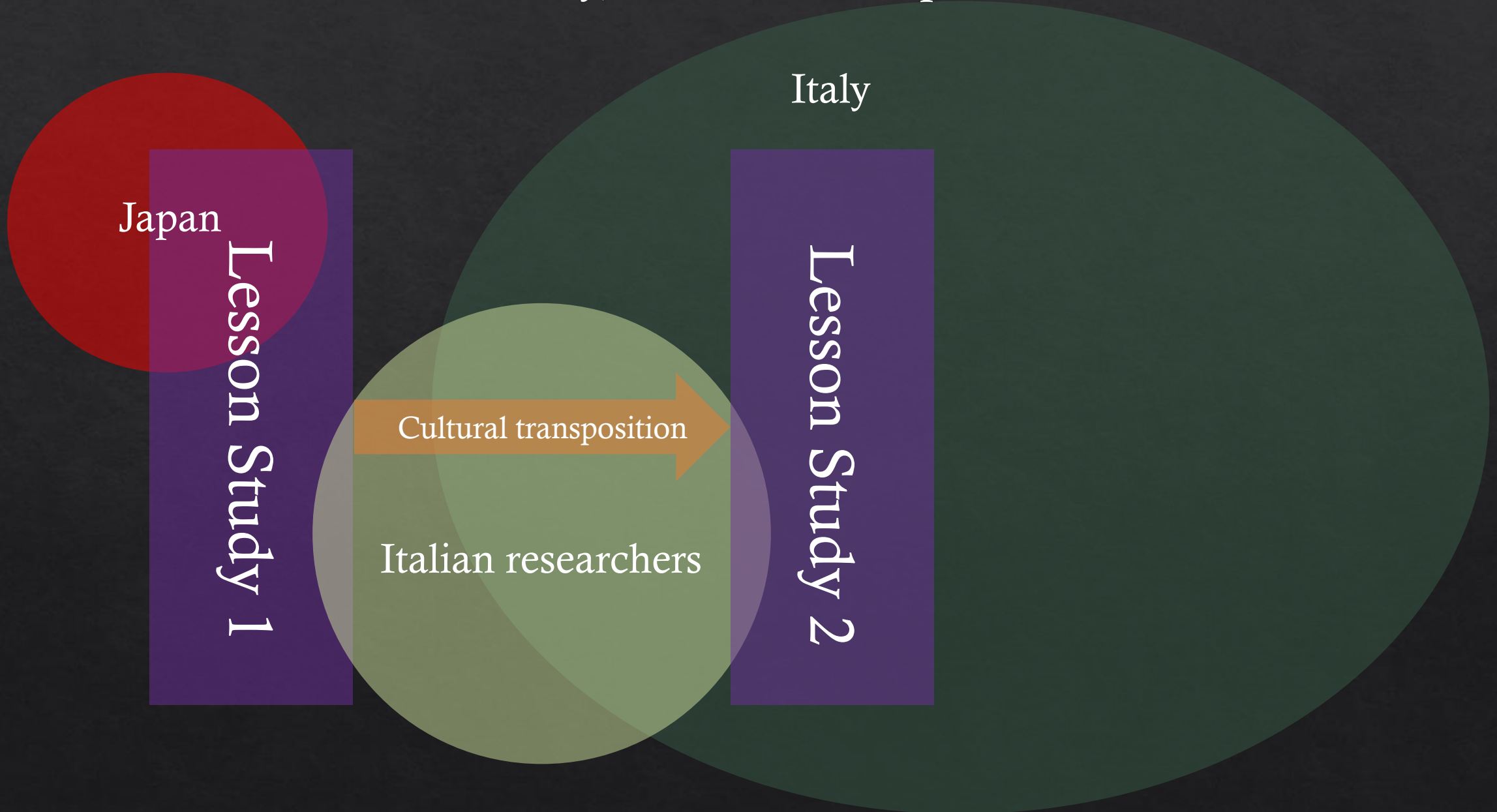# Is there one Lesson Study, or should we speak about Lesson Studies?

Japan

Lesson Study 1

Is there one Lesson Study, or should we speak about Lesson Studies?

Japan

Lesson Study 1

Cultural transposition

Italian researchers

Lesson Study 2

Is there one Lesson Study, or should we speak about Lesson Studies?

Japan

Italy

Lesson Study 1

Lesson Study 2

Cultural transposition

Italian researchers

Is there one Lesson Study, or should we speak about Lesson Studies?
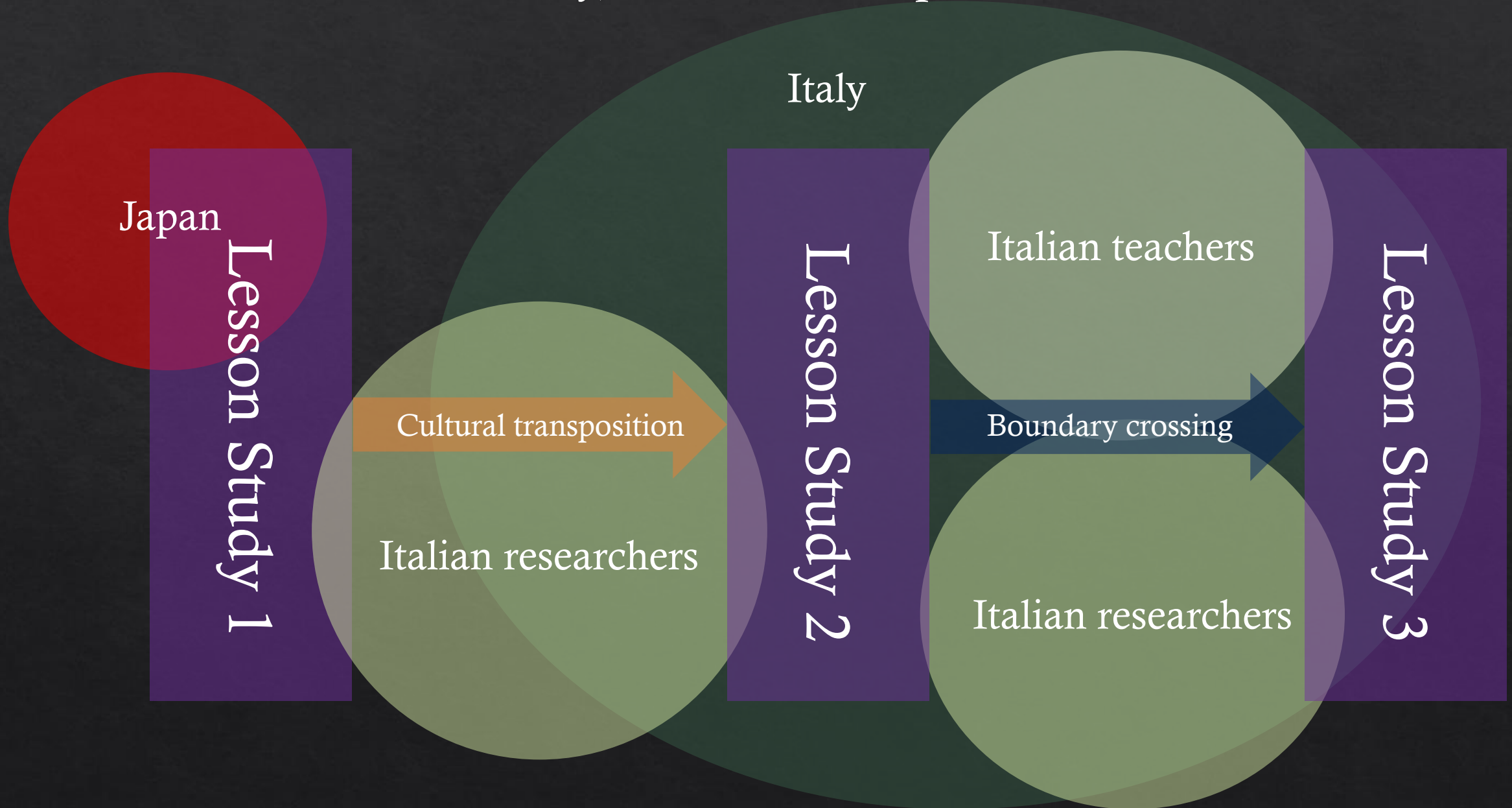
Discussion

The result of this continuous process of cultural transposition and reflection might be a LS "free" from cultural contingencies; or, maybe, we might find out that what we call "Lesson Study" is an idea, which includes the myriad of Lesson Studies possible exclusively in each particular cultural context.

Tying up loose ends

Three points of view

Boundary Object

Semiosphere

Lesson Study

Semiotic Mediation

Lesson study
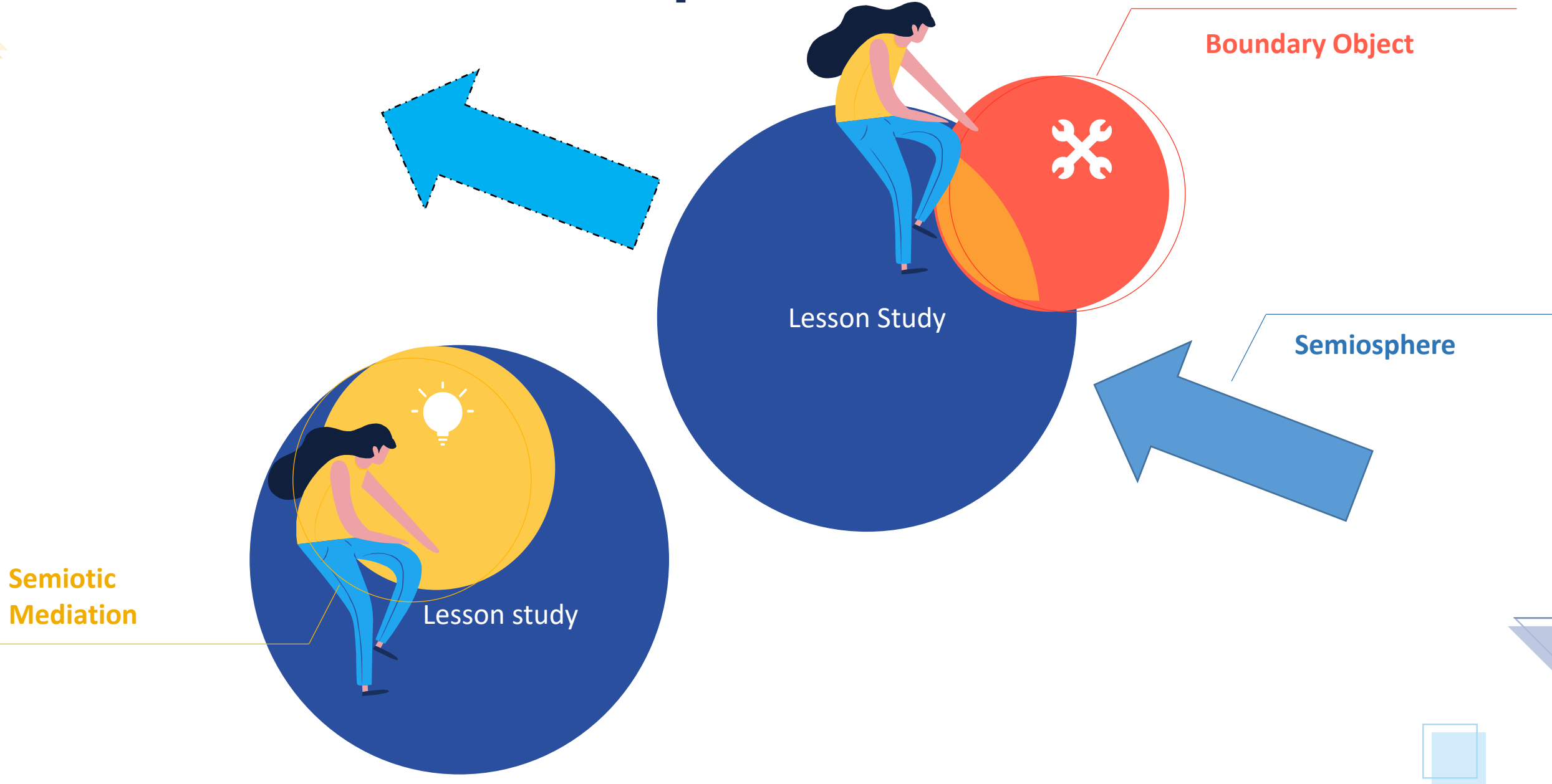
Summary of results

Semiosphere	Semiotic Mediation	Boundary Objects
We reached a new understanding of language as a system of signs which allows conclusions to be drawn from the reasoning used in it. The LS methodology stirs up the flows within the Semiosphere that make up the Semiosphere itself, allowing us to identify which elements are rooted and which remain malleable in the practices and beliefs of the teachers.	The careful planning of the didactic intervention, of the possible tasks and the didactic organization foreseen into LS allowed to assume the right semiotic perspective to focus on the production of signs and on the process of transformation of these signs. The teacher, after just one LS cycle, becomes more aware of the choice and use of the artifact to make it functional to semiotic mediation.	The analysis of the evolution of both communities of practice and of the Boundary Object itself, allowed the researchers to highlight the potential of LS as a Boundary Object to trigger some dialogic mechanisms for professional growth. The community of researchers itself developed new praxeologies for the introduction of LS in the Italian institutional context.

Roberto Capone will experiment LS in Campania with high-school teachers through the "Alphamente" project funded by the EU. More than 50 teachers will be involved.

Carola Manolino will continue her experimentation with a new project in Val d'Aosta.

Next year she will begin a collaboration with the University of Barcelona.

Riccardo Minisola will experiment LS in primary, middle and high schools in Turin, followed by a study period in Japan.

All three will continue their collaboration to implement LS in Italy supported by Ferdinando Arzarello, Ornella Robutti and Maria G. Bartolini Bussi.

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