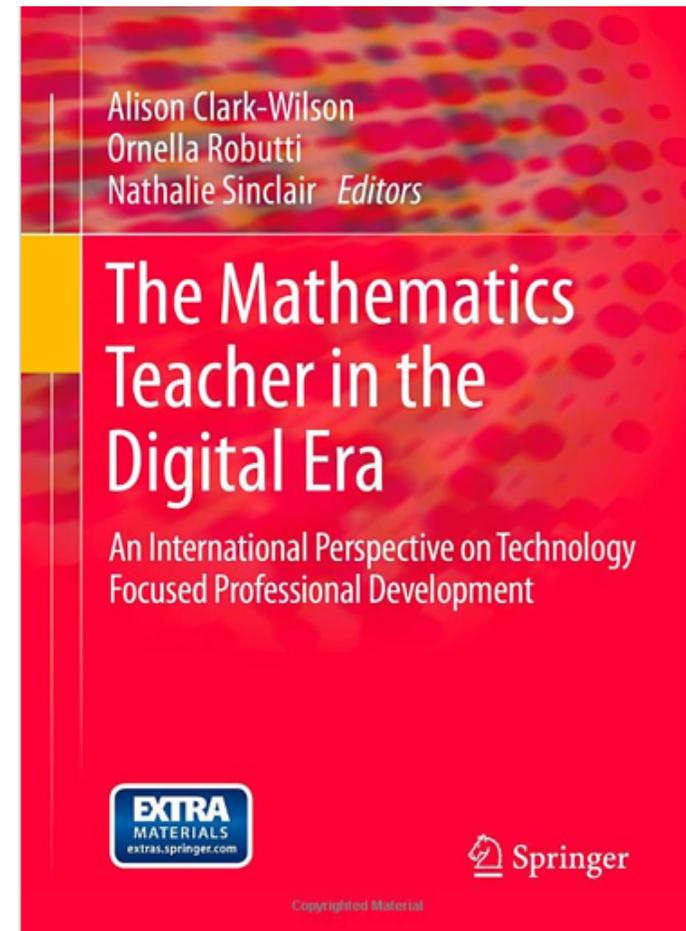


The Meta-Didactical Transposition a model for analysing teachers' education programmes

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- Rossella Garuti (Intendenza scolastica italiana di Bolzano)
- Ferdinando Arzarello (Università di Torino)

**The META-DIDACTICAL
TRANSPOSITION
takes into account the
practices in the
institutional teacher
education programmes.**

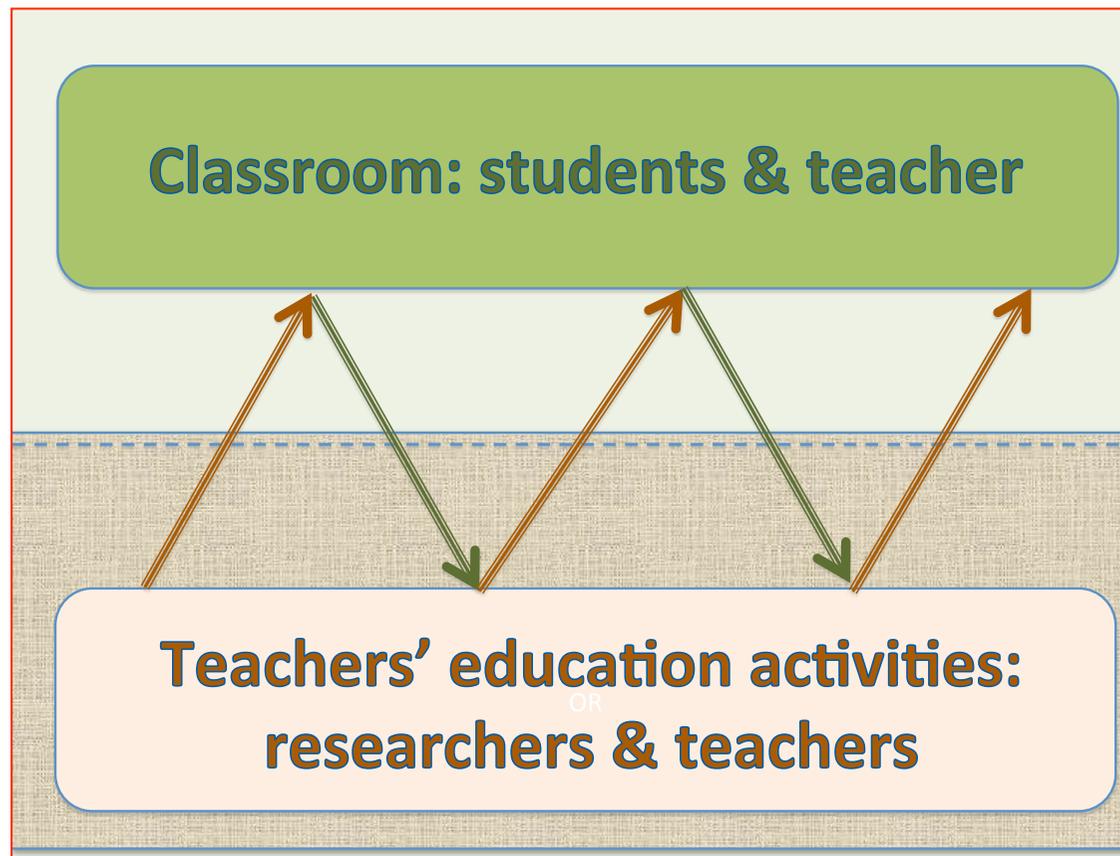
Such practices concern
both the **researchers** and
the **teachers** involved in
these activities.



[Arzarello, Robutti, Sabena,
Cusi, Garuti, Malara,
Martignone, 2014\)](#)

Why “meta-didactical”?

The term “**meta-didactical**” refers to the fact that important issues related to the didactical transposition of knowledge must be faced at the meta-level:

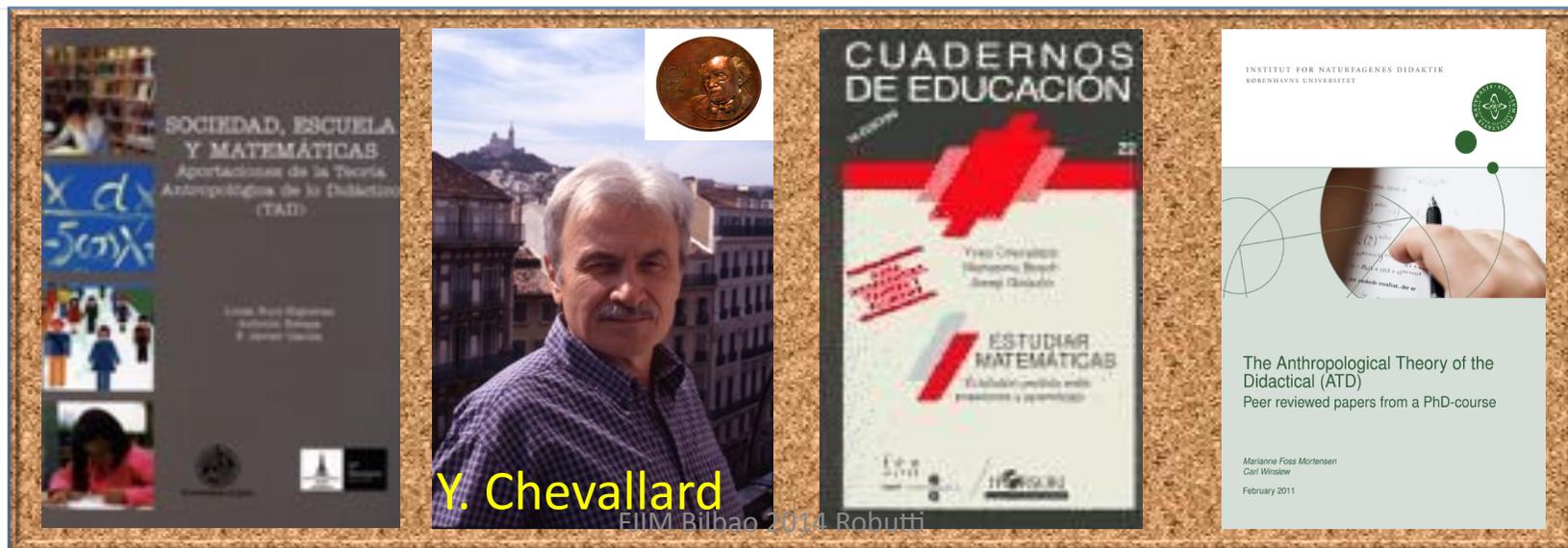


The **META-DIDACTICAL TRANSPOSITION (MDT)** focuses on the following key aspects of teacher education:

- **A. the influence of institutional components** and their relationships with the different communities;
- **B. the praxeologies of teachers and researchers** and their evolution over time;
- **C. the dialectic between communities** of teachers and the researchers involved.

A. The influence of institutional components

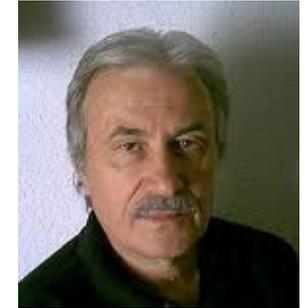
The MDT model is inspired by the **Anthropological Theory of Didactics (ATD: Chevallard, 1985,1999)** in order to study the practices of (in-service) teachers and researchers during (institutional) educational programmes.



The **institutional dimension** is important because the teachers' professional development is contextualised inside and constrained by the **institutions**:

- the official curriculum,
- research communities,
- schools,
- the Ministry of Education,
- policy makers,
- teachers' associations,
- textbooks,
- the National Agency of School





Chevallard's Anthropological Theory focuses on the institutional dimension of mathematical knowledge:

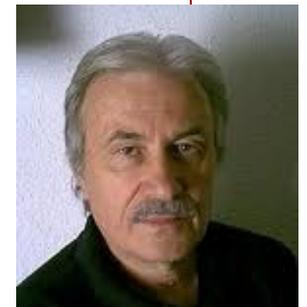
“ATD puts mathematical activity, hence the activity of studying in mathematics, within the bulk of the human activities and of the social institutions” (Chevallard, 1999).

B. the praxeologies of teachers and researchers

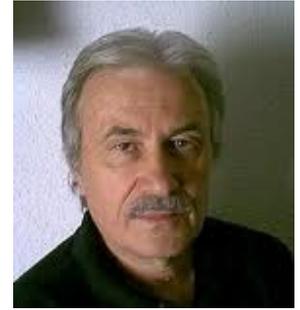
The ATD by Chevallard provides a general epistemological model of mathematical knowledge, conceived as a human activity.

The main theoretical tool is the notion of **praxeology** (or mathematical organization) which is structured in two levels:

- **Praxis** or "know-how"
- **Logos** or "knowledge"



A PRAXEOLOGY consists in:



- **Task**
- **Techniques**

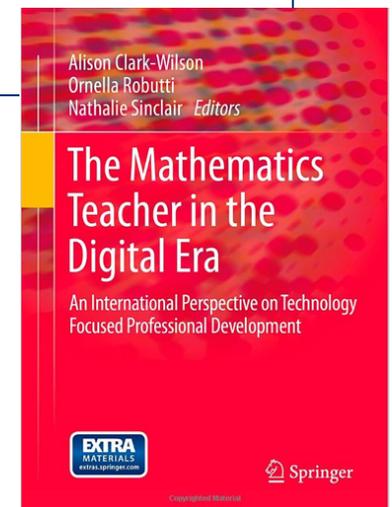
the task and the techniques used to solve the task

- **Technology**
- **Theory**

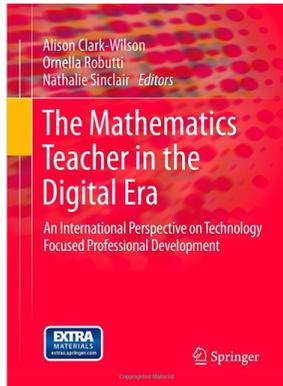
arguments that justify the techniques for this task

C. the dialectic between communities

The practices and theoretical ideas developed in teachers' training programs are the result of the **interaction between** the reflections of the **research** community on the previously designed and developed educational praxeologies and the actual practices used by **teachers** in their professional activities.



The model is influenced by the specific Italian situation, described in Arzarello & Bartolini (ICMI study, 1991), namely by what is called **Research for Innovation in the classroom**:



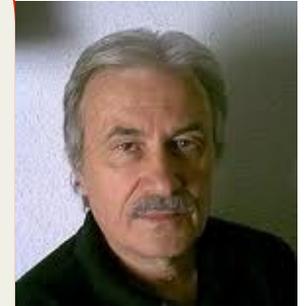
“Studying the teaching/learning of mathematics both in specific classroom situations, and within their expansion to a wider educative system”.

This implies a specific role of the teacher as researcher, participating to a **community of inquiry** (Jaworski, 2001).

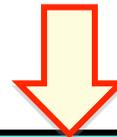
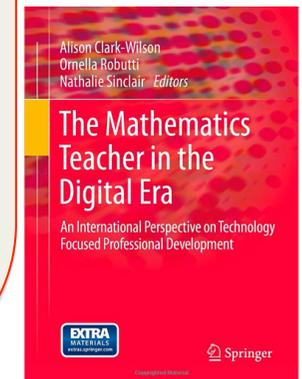
Summarising

ATD

1. Institutional aspects
2. Praxeologies
3. Didactical transposition
4. Brokering
5. Double dialectic



&



Meta-didactical transposition

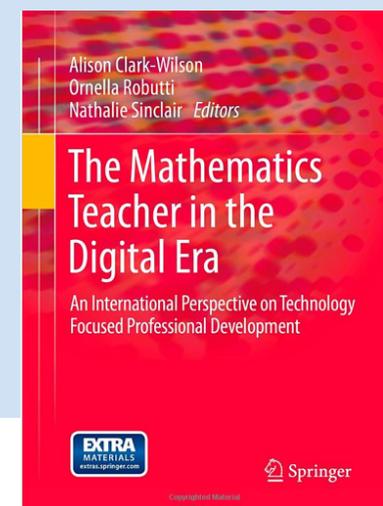
The ***META-DIDACTIC TRANSPOSITION*** gives elements to describe the ***dynamic processes*** related to teachers' professional development in terms of:

1. evolution of praxeologies,

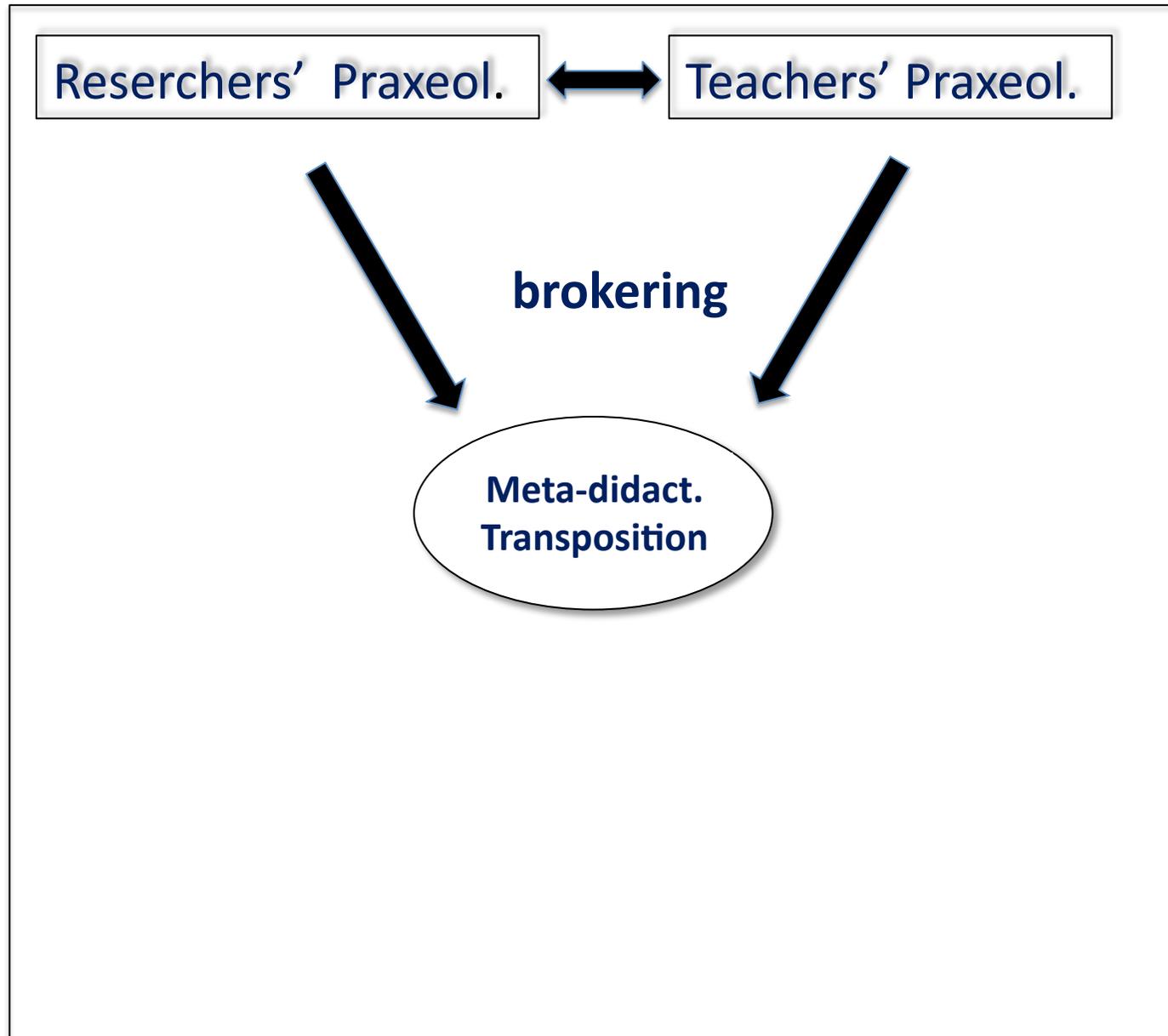
2. transition of components from external to internal,

3. role of broker,

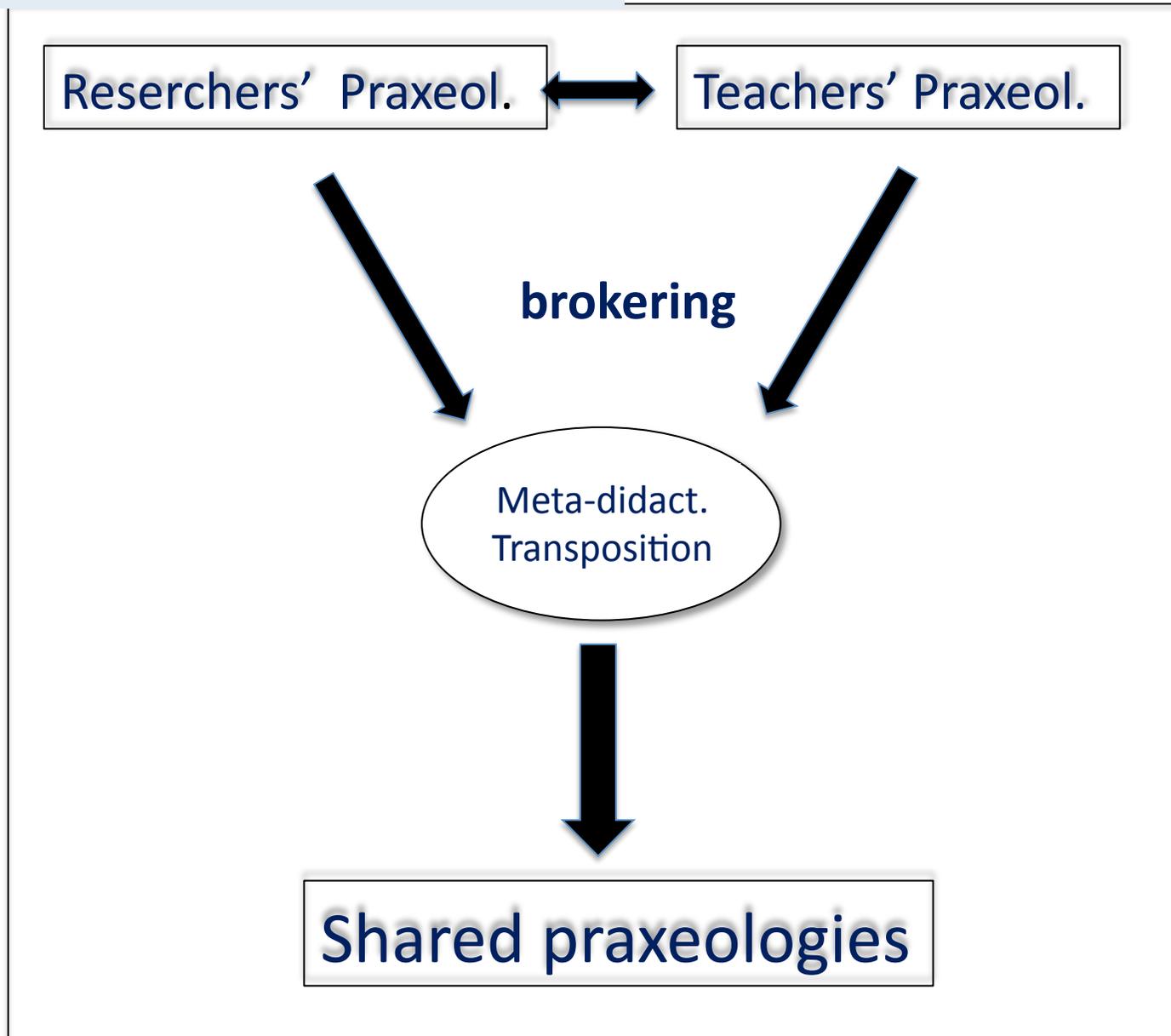
4. double dialectic.



1. evolution of praxeologies



1. evolution of praxeologies



1. evolution of praxeologies



European development for the use of
mathematics technology in classrooms



At the end of the process, the initial technique (and its theoretical counterpart) may become a new set of techniques, shared within the two communities of researchers and teachers.



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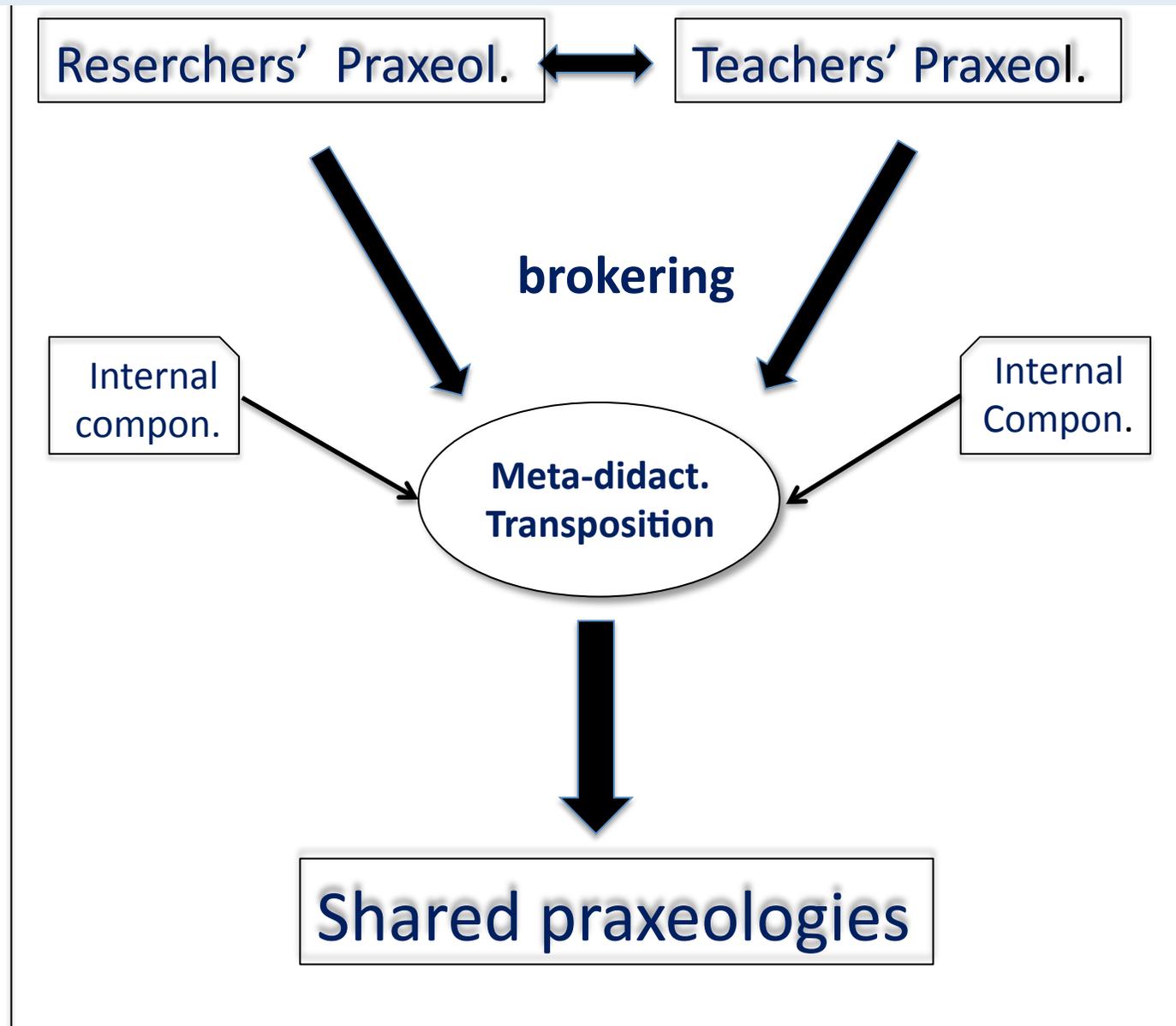
2. transition of components from external to internal

Internal and external components

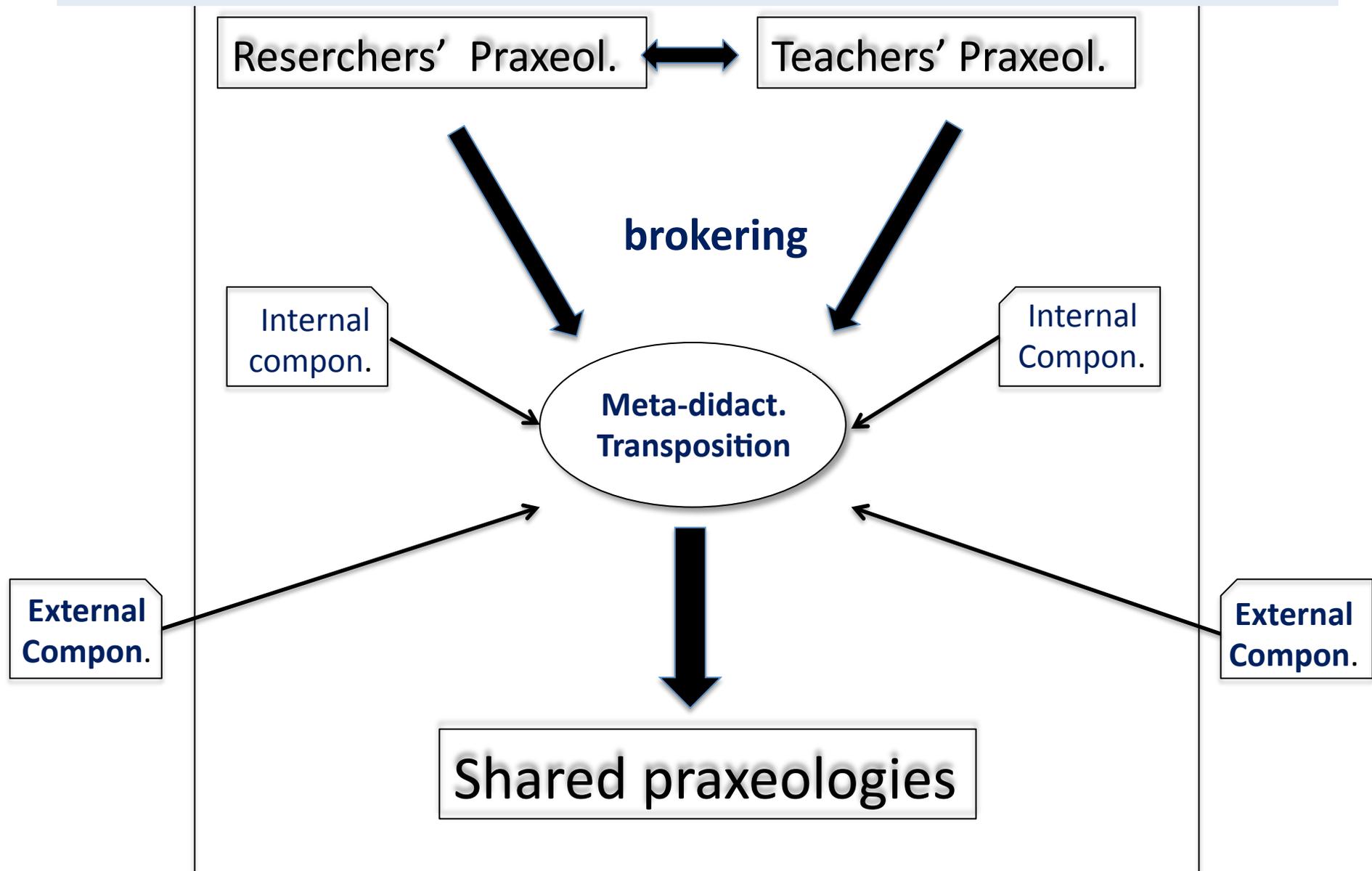
Some elements of the two communities praxeologies change their status over time.

Typically, they change **from external to internal** components of the community.

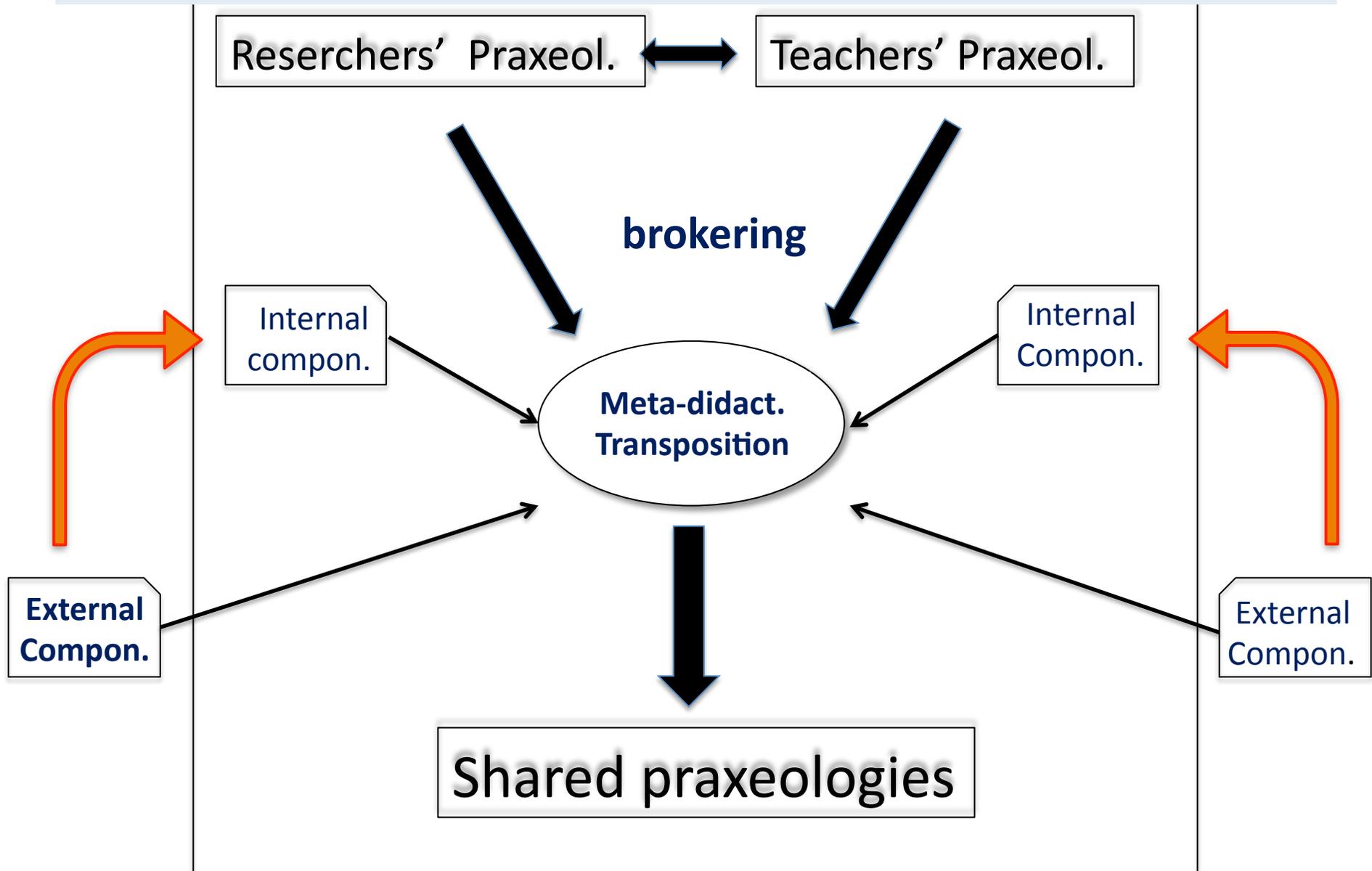
2. transition of components from external to internal



2. transition of components from external to internal



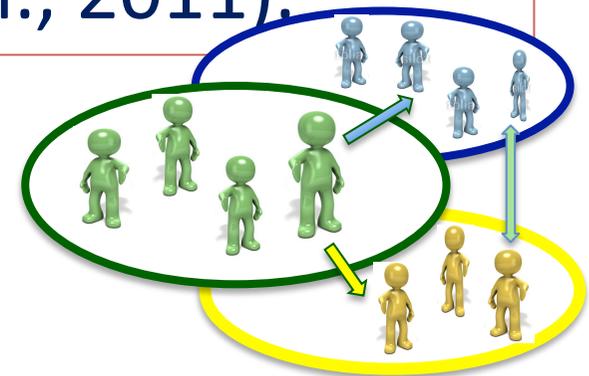
2. transition of components from external to internal



3. role of broker

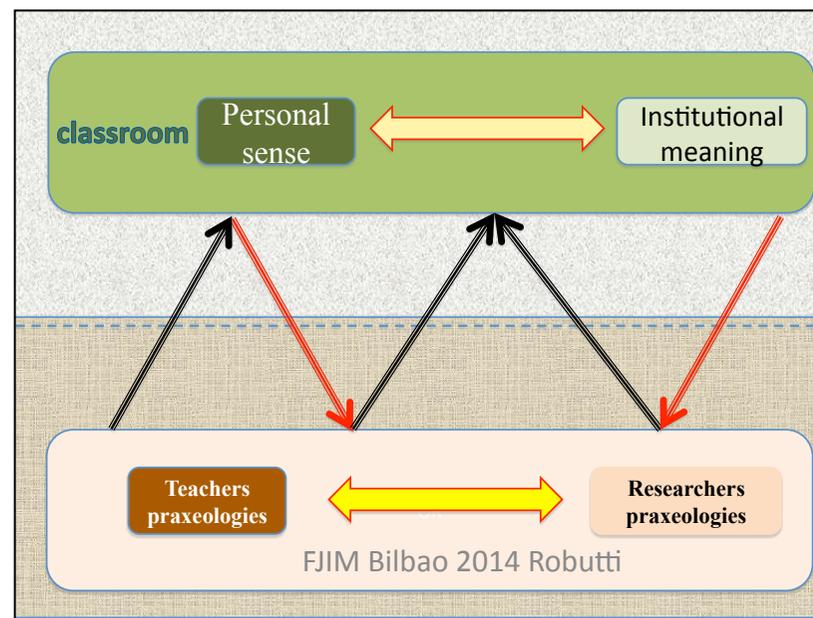
A **broker** has the status of belonging to more than one community (e.g. of researchers and of teachers).

« Brokers [...] are able to create new links between communities, enable coordination, and - if they are good brokers - open new opportunities for the meanings attributed to objects in play » (Rasmussen et al., 2011).



4. double dialectic

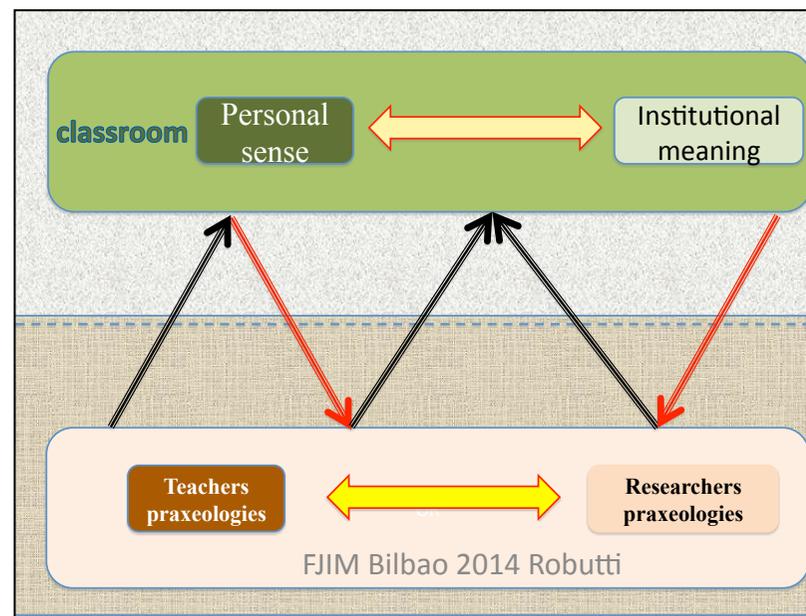
In *MDT*, the practices and the theoretical reflections developed in teachers' education activities, are under scrutiny. They are the result of the interaction between the reflections of the community of researchers about the didactic praxeologies previously designed and developed, and the concrete practices used by the teachers in their professional activities



4. double dialectic

1st dialectic at **didactical level** in the classroom: between the personal sense that students attach to a situation, and the scientific shared sense that it has.

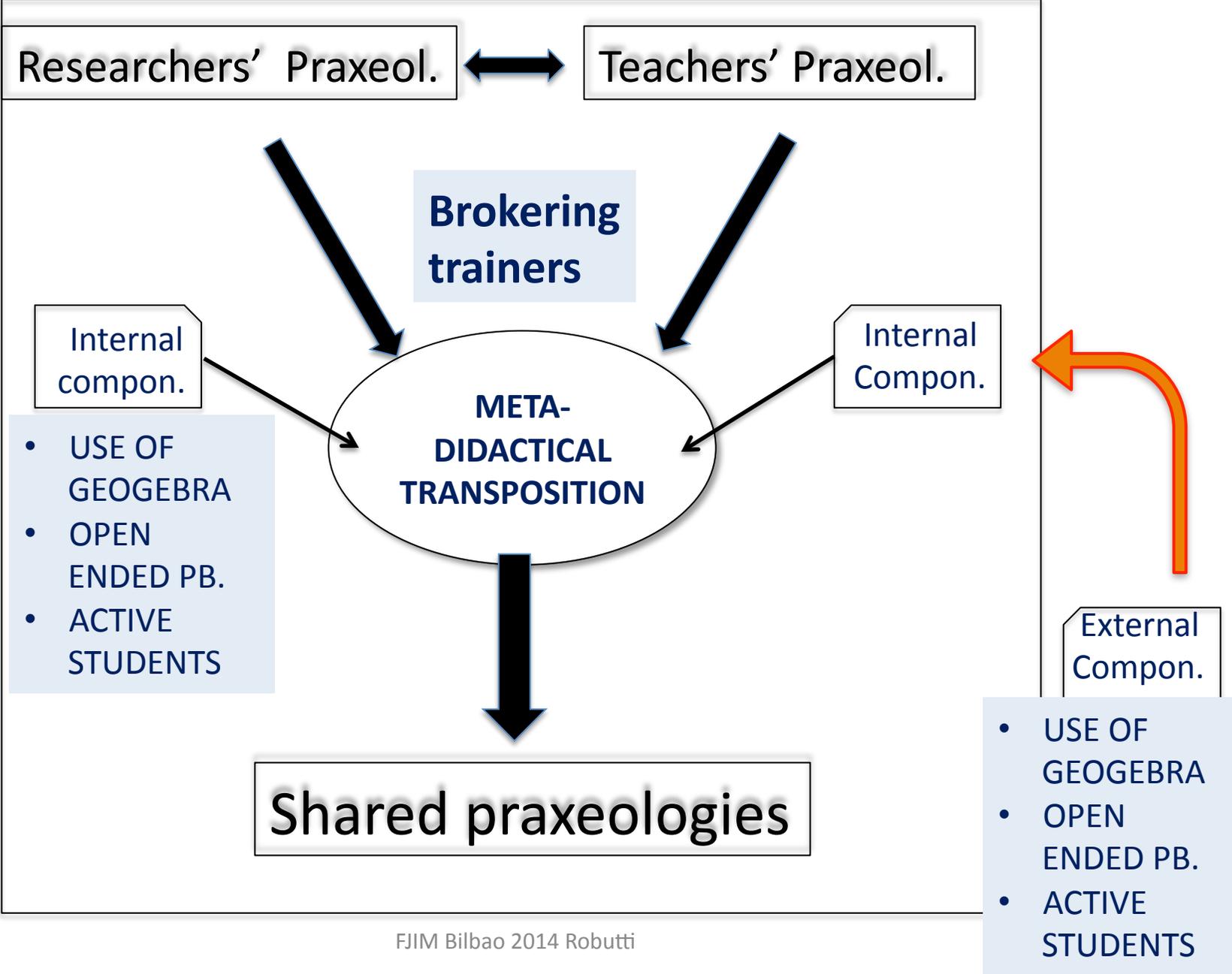
2nd dialectic at **meta-didactical level**: between the interpretation that teachers give to the 1st dialectic because of their personal sense and the meaning given by the community of researchers.



Example

Consider a community of teachers who began an educational programme in which, due to institutional situation (e.g. curriculum changes), a community of researchers introduces a specific ICT tool (e.g., **GeoGebra**), with a specific teaching practice (use of **open problems**) that let **students** be very **active** during the lessons.

Initially, these components are external for teachers. By the end of the educational programme, they can become internal and commonly used.



IMPLICATIONS ON THE RESEARCHERS COMMUNITY

- Using a new model to describe teachers' and researcher' communities involved in teacher education programmes
- Awareness of researchers involved in the institutions to design teacher education programmes
- Developing theoretical constructs in the teacher education programmes according to the MDT
- Awareness of researchers on their and teachers' praxeologies.

IMPLICATIONS ON THE TEACHERS COMMUNITY

- Awareness of teachers on their praxeologies
- New competences (on the methodological-didactical level)

which lead teachers to activate a **change**.

A TEACHER

During the school year often I used GeoGebra for proving theorems or to solve problems. During these lessons the students have always been "**passive spectators**".

Through this activity of PIANO LAUREE SCIENTIFICHE students have become "**main actors**". They had to put in place all of their knowledge and skills to carry out the proposed activity. And do you know ... the "first actor" is not easy! Let's say that it takes its time!

SOME OPEN PROBLEMS

- Emotions,
- Fear,
- Metacognitive components
- ...

A TEACHER:

I have already said that I will change ... many years that I was saying "I'm going to use GeoGebra in the laboratory," and I never did.

It is a kind of ... I do not know if laziness ... or even a little '**fear**', is not it? So, among other things, there is YouTube as parachute.



Thank you!

FJIM Bilbao 2014 Robutti