An example of meta-didactical transposition from France: the Pairform@nce and M@gistère projects

Gilles Aldon

Institut Français de l'Education

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Context

- Pairform@nce and now M@gistère are national teacher education programs from the ministry of Education

- Design of resources and peer collaboration.
- Both face to face and on-line work: a web based platform with a set of training paths
  - synchronous and asynchronous meetings,
  - workshops,
  - personal autonomous work

- Distinction between a training path and a training session
  - Training path: a tool for teachers trainers to organize, set up and manage a training session.
  - Necessity for teachers educators of important adaptations.

Theoretical framework

Design-based research is a formative approach to research, In education tools might include [...] professional development programs (Malcom Swan, 2014)

The Meta-Didactical Transposition model takes into consideration the practices of mathematics educators (researchers) and those of teachers, when both communities are engaged in teachers' education activities.(Arzarello, Robutti& al. 2014)
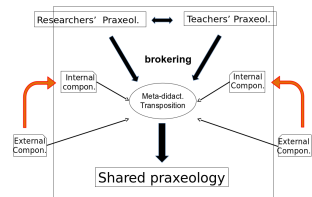
The documentational genesis models a process where instrumentalisation conceptualises the appropriation by the subject of the resource and the instrumentation describes the influence of the resources on the subject's activity. At a given time, resources become a document when combined with schemes of utilisation.
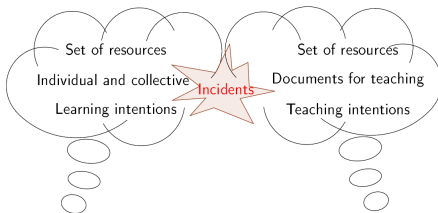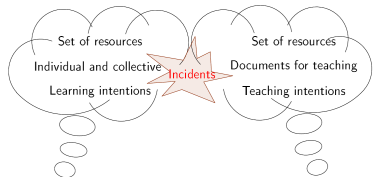
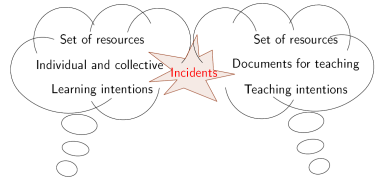The documentational genesis models a process where instrumentalisation conceptualises the appropriation by the subject of the resource and the instrumentation describes the influence of the resources on the subject's activity. At a given time, resources become a document when combined with schemes of utilisation.

A didactic incident has been defined as an event of the didactic system that modifies the dynamics of the situation.

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Professional development   of teachers.

Design based research

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Didactical incidents

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Documentational genesis $\longrightarrow$ resources for teachers,
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Didactical incidents $\longrightarrow$ analysis of dynamics
                                                          in the process of PD

Examples

In-training session: *Algorithms and programming to do mathematics* designed, in four stages:
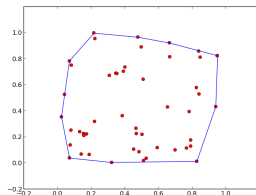
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In-training session: *Algorithms and programming to do mathematics* designed, in four stages:

- presentation (distant phase),
- fundamental algorithms and their implementation (face to face)
- lesson design and implementation in classrooms (distant phase)
- making-up (face to face)

Convex hull algorithm of Graham

Trainers'praxeology :

- Task as an exemplification of sorting algorithm.
- Technics refer to fundamental algorithms (quick sort or heap sort), Transposition to the class : to give an application to tasks.
- Justification of technics by proving the algorithms, Using algorithms to work mathematical contents (angles, scalar product,...)

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Distance between trainers'praxeology and trainees'praxeology does not lead to a shared praxeology.

Didactical incident as contract (or meta-contract) incident : aims' misunderstanding.

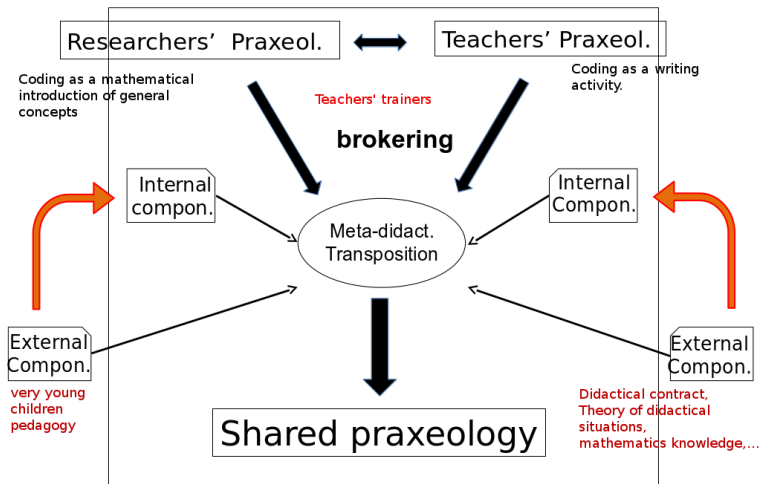Institutional aspects leads to a rupture in the dynamic of MDT.

Design of a lesson

A very different context :

- Design of an in-training session for 4-5 years old children's teachers.
- Theme: coding in mathematics, writing and reading lessons.
- Six hours distant and three hours face to face session.
- A team of trainers and teachers.

Shared praxeology

Shared tasks with techniques of analysis,

$\Longrightarrow$

leading to design of lessons

Justifications of these techniques with shared theoretical framework

Conclusion

MDT a framework useful in

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- the analysis the implementation

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But also

A framework allowing to precise design based researches, taking into account the actors within particular institutions

Gracias Grazie Thank you

Swan, M.(2014). Design Research in Mathematics Education. In Lerman, S.(ed), *Encyclopedia of mathematics education*, Springer

Clark-Wilson, A., Robutti, O., Sinclair, N. (2014). *Mathematics teachers in the digital era*, Springer, London.