# Design-aware analytics supporting teachers' monitoring of blended learning scenarios: Two experiences in higher education

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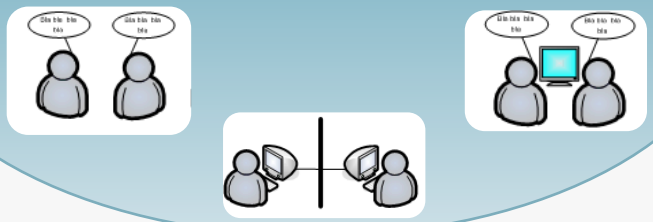
# Context

**Blended Learning**
[Graham, 2005]

Multiple **locations**
Multiple **interactivity types**

+

**CSCL**
[Stahl et al., 2006]



Multiple **social levels**
Multiple **interactivity types**

**DLEs**
[MacNeil & Kraan, 2010]

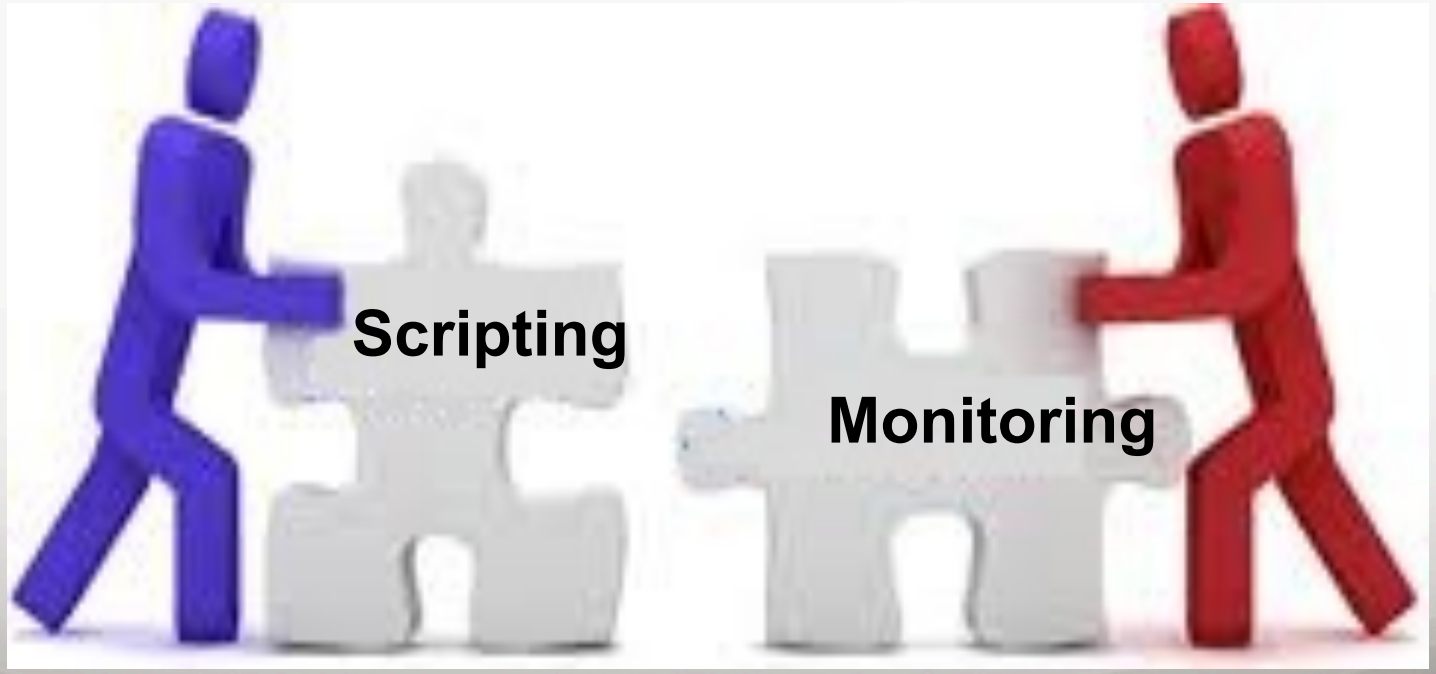
Multiple **tools**

# Challenges to LA

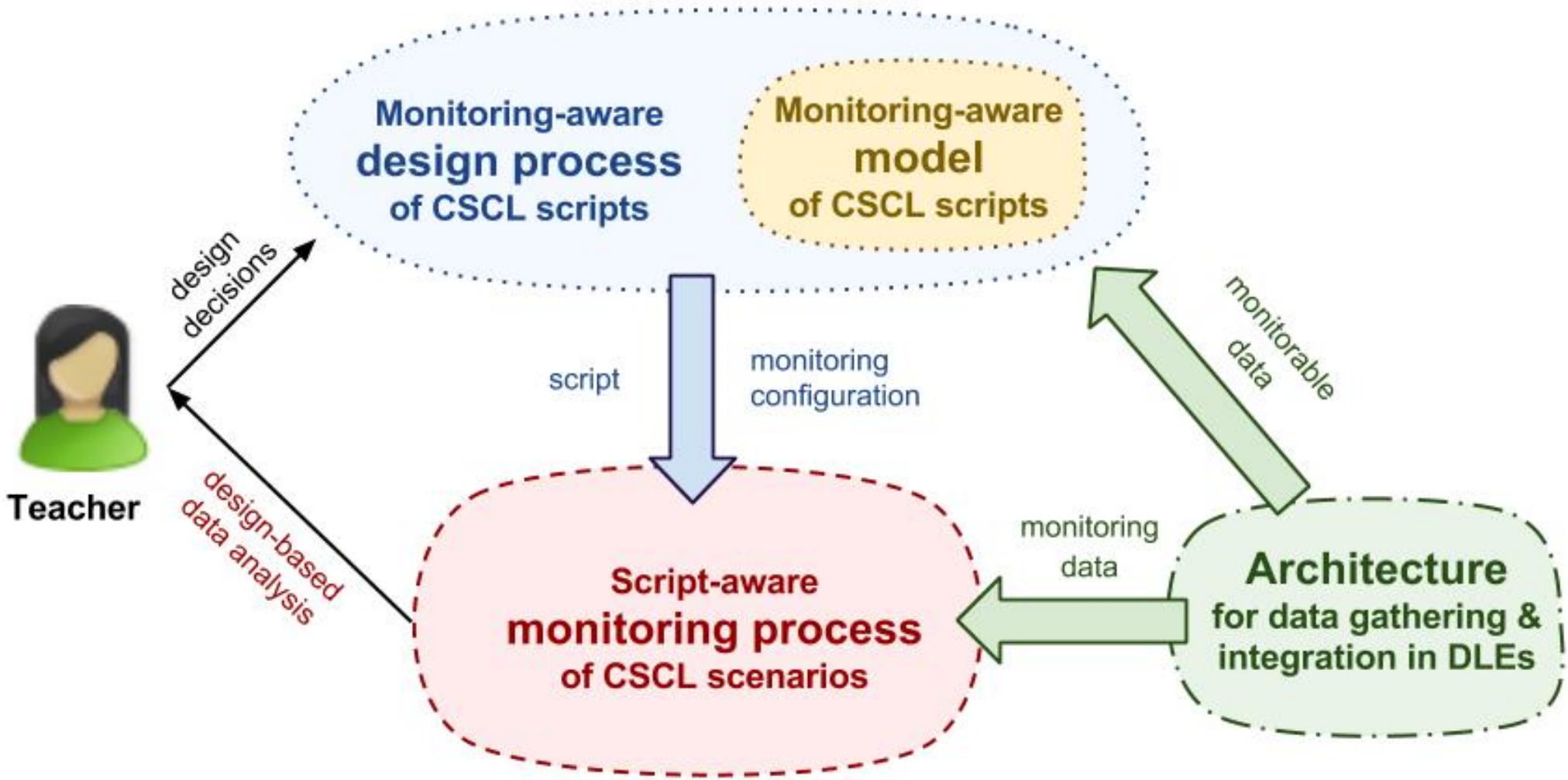
- The problem of "dirty & incomplete" data
  - Analysis should be aware (and make the user aware) of the weaknesses of data
- The need for contextualization
  - Data should be analyzed in their context
- Teachers' workload and interpretation of the results
  - Results must be manageable and easy to understand
- Ethical issues regarding e.g., data validity and adverse impact

# Overall approach

- Analyze whether the *current state* of interaction (monitored at enactment time) matches the *desired state* of interaction (defined in the script at design time).



# Proposals

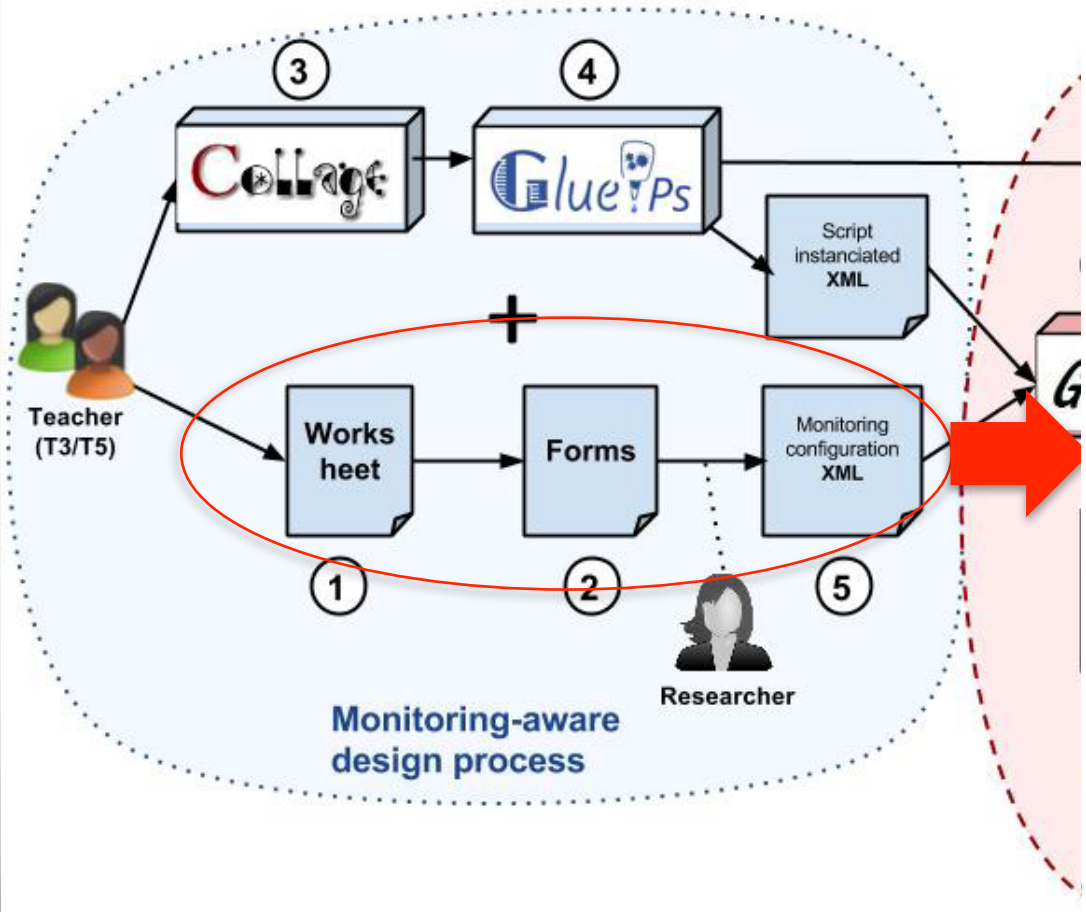

Monitoring-aware
design process
of CSCL scripts
Monitoring-aware
model
of CSCL scripts
design
decisions
script
monitoring
configuration
monitorable
data
Teacher
design-based
data analysis
monitoring
data
Script-aware
monitoring process
of CSCL scenarios
Architecture
for data gathering &
integration in DLEs

# Methodological approach Design-Based Research

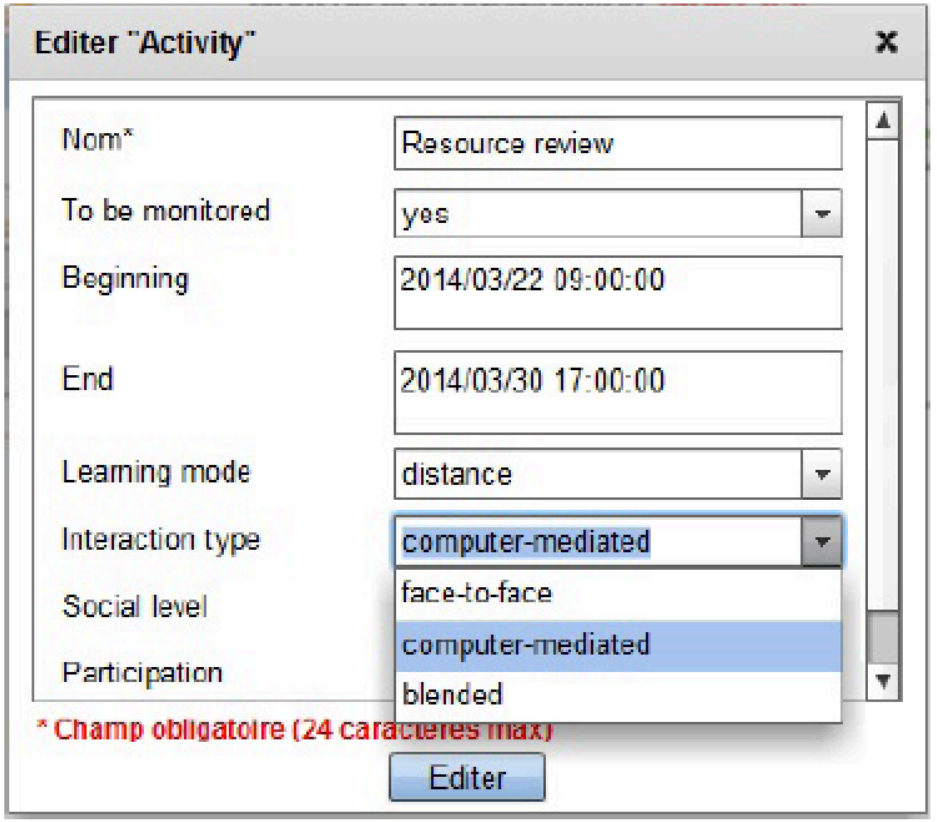
- Design-Based Research
  - Iterative research
  - Situated in educational contexts
  - Paternship between researcher and practitioners
  - Focus on design and testing a significant intervention
  - Use of mixed-methods
- Strong emphasis on applying research to a real problem → Close connection to pedagogical practice

# DBR – Research process

# What we did in practice (1/3)



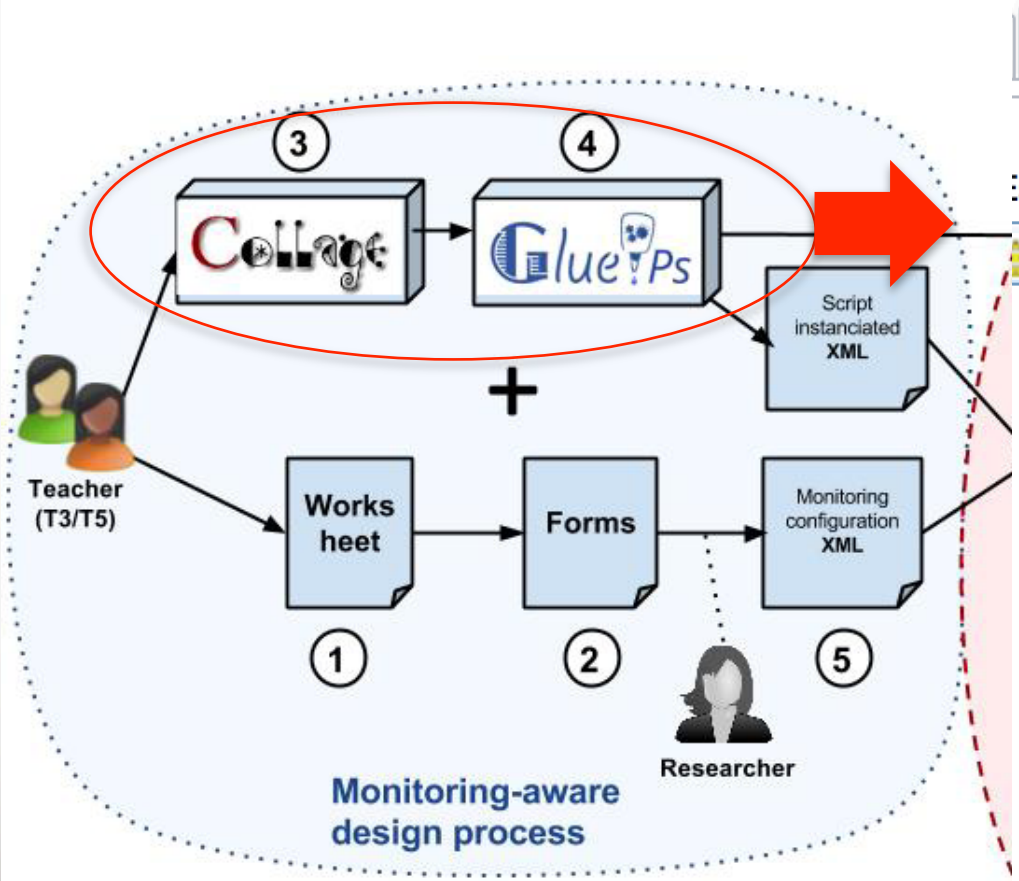

| GENERAL ACTIVITY DESCRIPTION | |
|---|---|
| **Activity name:** | Group discussion and synthesis |

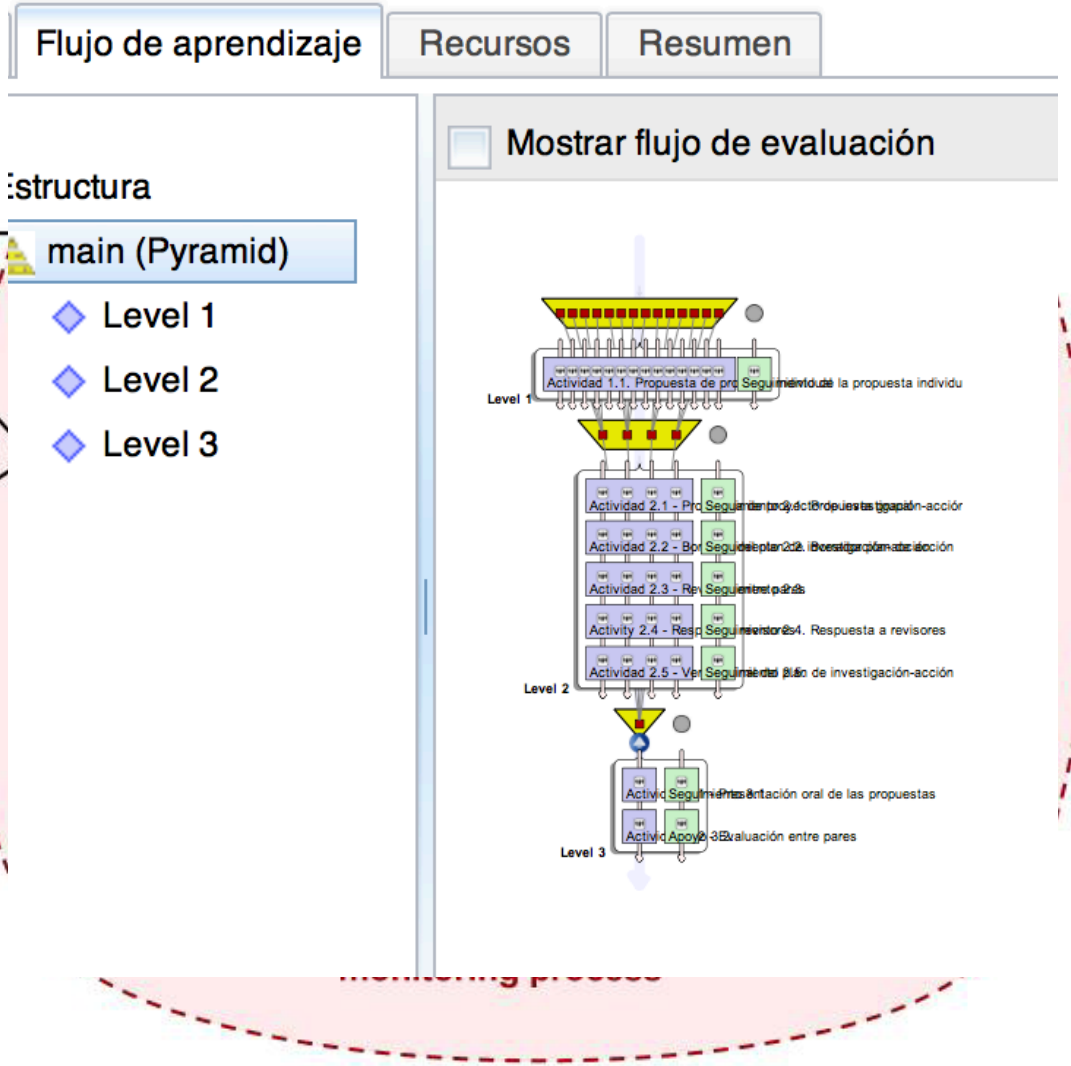



4.9: *EdiT2++*: form used for the description of a learning acti

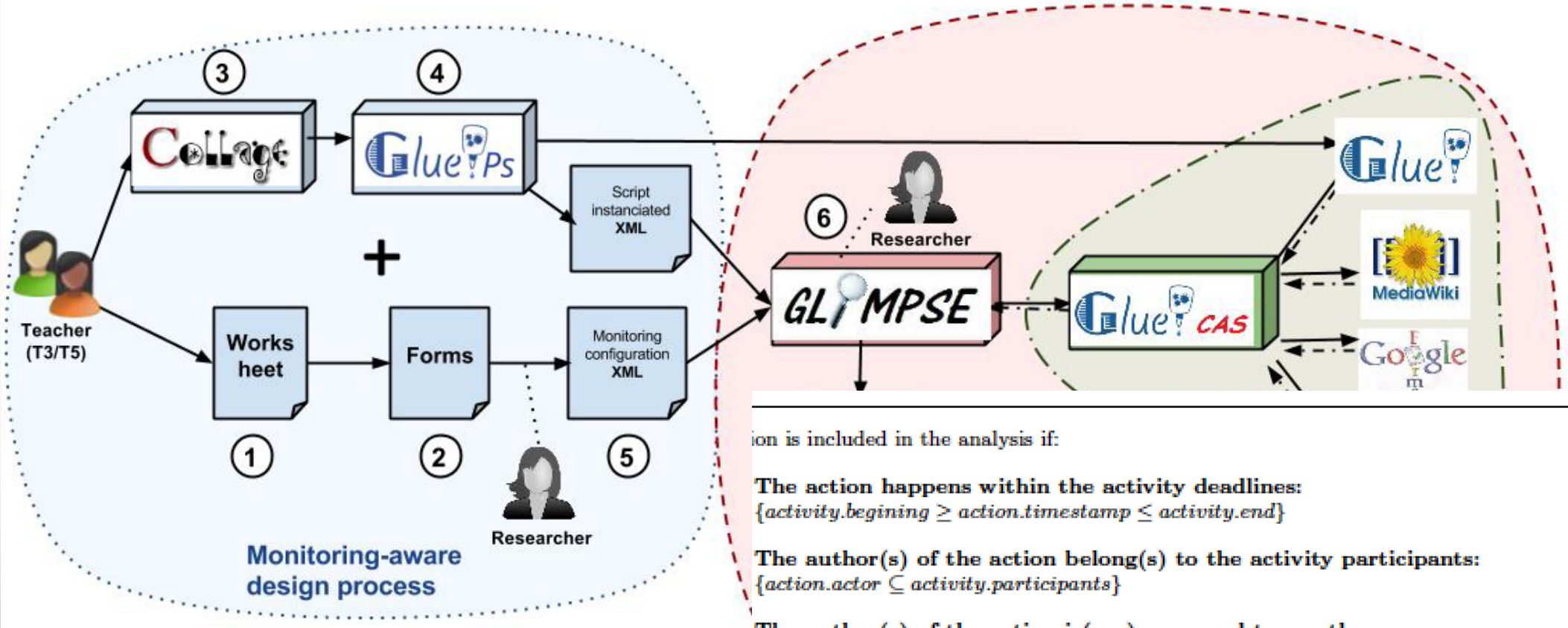
| | | | | | | |
|---|---|---|---|---|---|---|
| **Concept map** | GDraw | No | -- | mandatory | by groups | documents and group's editions |
| ***Teacher's observations*** | *Teacher's observations* | -- | -- | -- | -- | *Student's attendance to the lab sessions and other comments* |

# What we did in practice (1/3)



# What we did in practice (2/3)




ion is included in the analysis if:

**The action happens within the activity deadlines:**
$\{activity.begining \geq action.timestamp \leq activity.end\}$

**The author(s) of the action belong(s) to the activity participants:**
$\{action.actor \subseteq activity.participants\}$

**The author(s) of the action is(are) supposed to use the resource:**
$\{action.actor \subseteq resources.users\}$

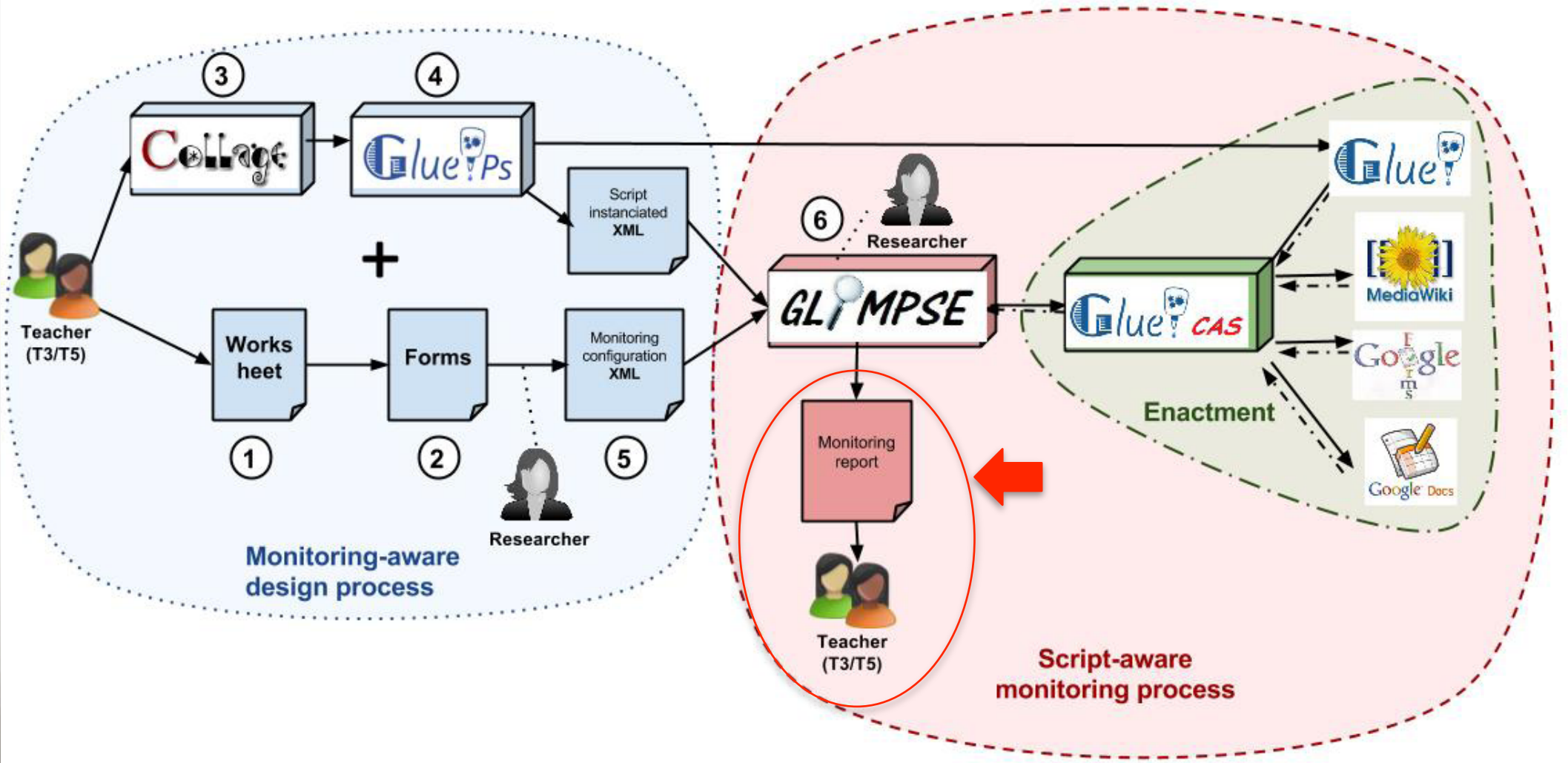
**The action involves a resource to be monitored during the activity:**
$\{action.resource \in activity.resources\_to\_be\_monitored\}$

**The type of interaction must be monitored in a given resource:**
$\{action.type \in resource.actions.to\_be\_monitored\}$

# GLIMPSE - Heuristics

- Select an action to be included in the analysis
- Define and compare the *current* and *desired* state of the interaction regarding:
  - participation,
  - collaboration,
  - group formation and
  - expected use of resources.

# What we did in practice (3/3)



# Monitoring report

**Integrated data sources**

**Groups and participants**

Students' self-reports

GLUE!-CAS blogs

Teacher's observations

**Warnings**

| Groups | Participants | Workgroup report (super-group) | | Final research proposal (Super-group 1) | | Activity description: Improvement of the proposals | | Teacher's observations | | | | Warnings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | link | participation | link | access | link | access | link | attendance | submission | comment | |
| Super-group 1 | StudentName1 | | 20% | | 4 | | | | 2 | | | |
| | StudentName2 | | 20% | | 5 | | | | 2 | | | |
| | StudentName3 | | 20% | | 7 | | | | 2 | | | |
| | StudentName4 | | 20% | | 8 | | | | 2 | | | |
| | StudentName5 | | 20% | | 7 | | | | | | | |

The system has not registered any access to the *Final research proposal* by *StudentName6*

A warning is raised to advise the teacher

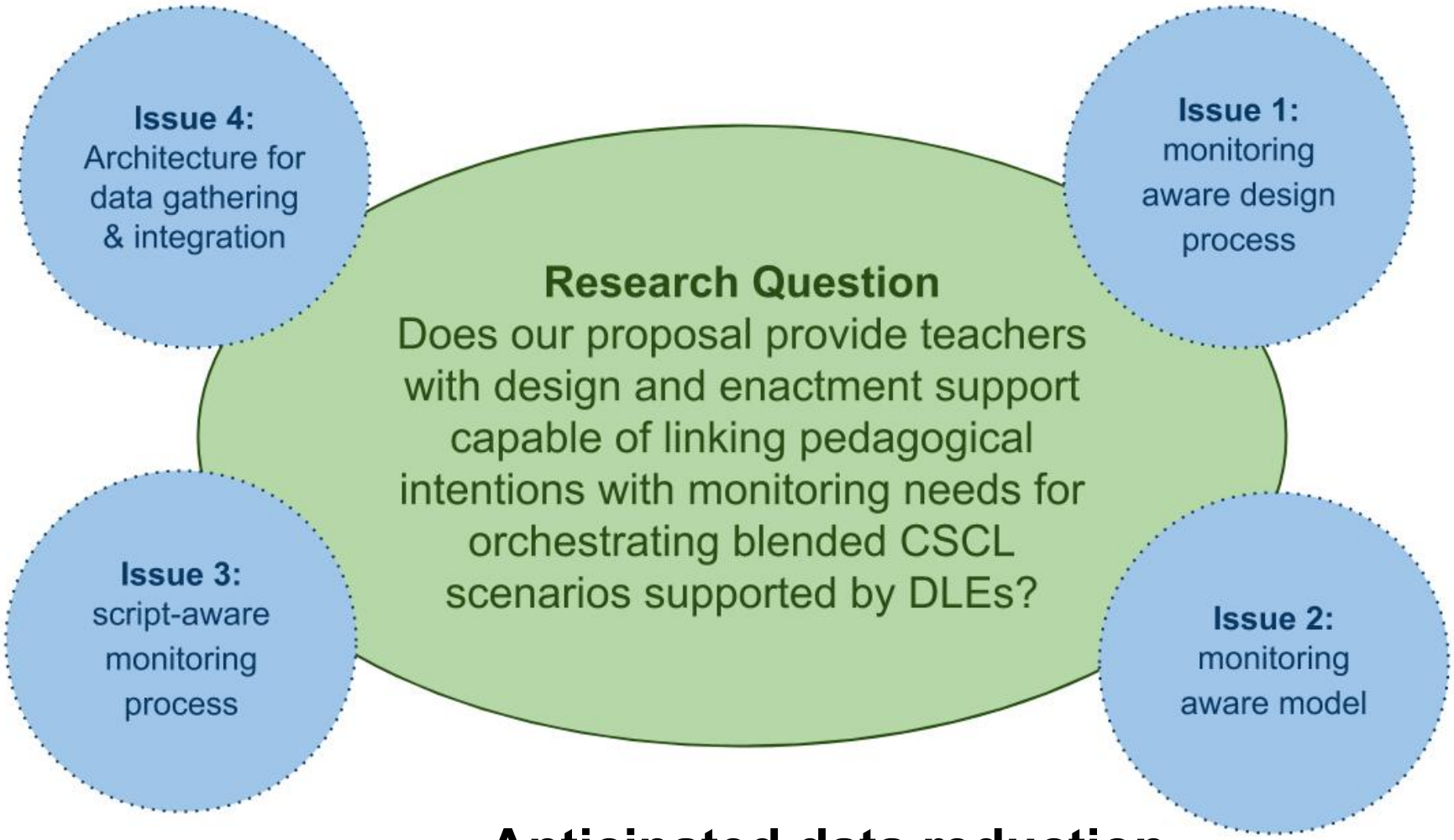
| Groups | Participants | Workgroup report (super-group) | | Final research proposal (Super-group 2) | | | Activity description: Improvement of the proposals | | Teacher's observations | | | | Warnings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | link | participation | link | access | edition | link | access | link | attendance | submission | comment | |
| Super-group 2 | StudentName6 | | 20% | | 0 | | | 0 | | 2 | | He arrives late but contributes a lot | ** There is no evidence of StudentName6 using Final research proposal (Super-group 2). This resource must be used by each group member. |
| | StudentName7 | | 20% | | 10 | | | 2 | | 2 | | | |
| | StudentName8 | | 20% | | 6 | 9 | | 2 | | 2 | 1 | | |
| | StudentName9 | | 20% | | 11 | | | 2 | | 2 | | | |
| | StudentName10 | | 20% | | 9 | | | 0 | | 2 | | | |

| Groups | Participants | Workgroup report (super-group) | | Final research proposal (Super-group 3) | | | Activity description: Improvement of the proposals | | Teacher's observations | | | | Warnings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | link | participation | link | access | edition | link | access | link | attendance | submission | comment | |
| | StudentName11 | | 20% | | 12 | | | 0 | | 2 | | | |

# Evaluation

Focusing on the teacher's perspective

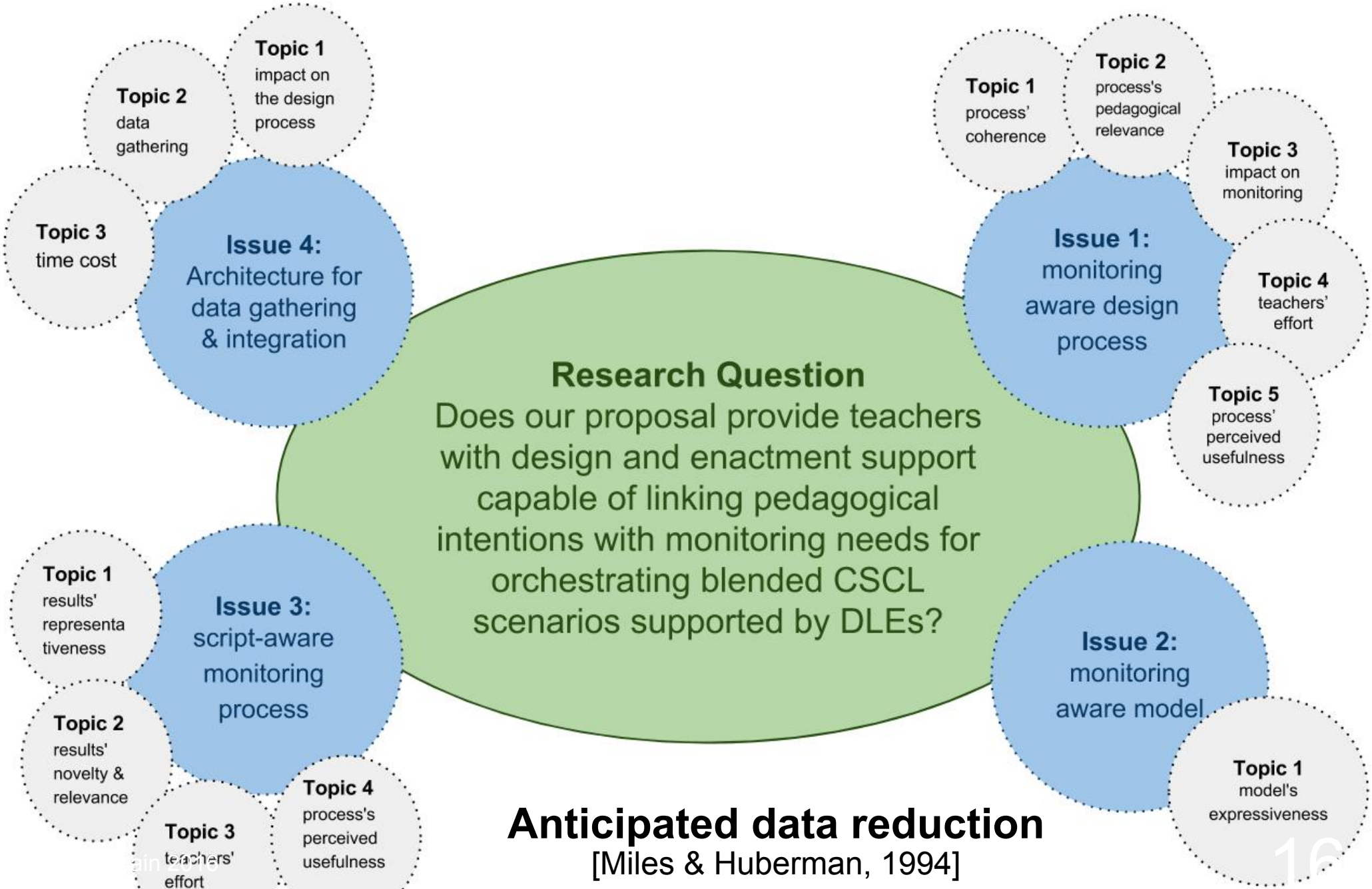
# Evaluation




**Anticipated data reduction**

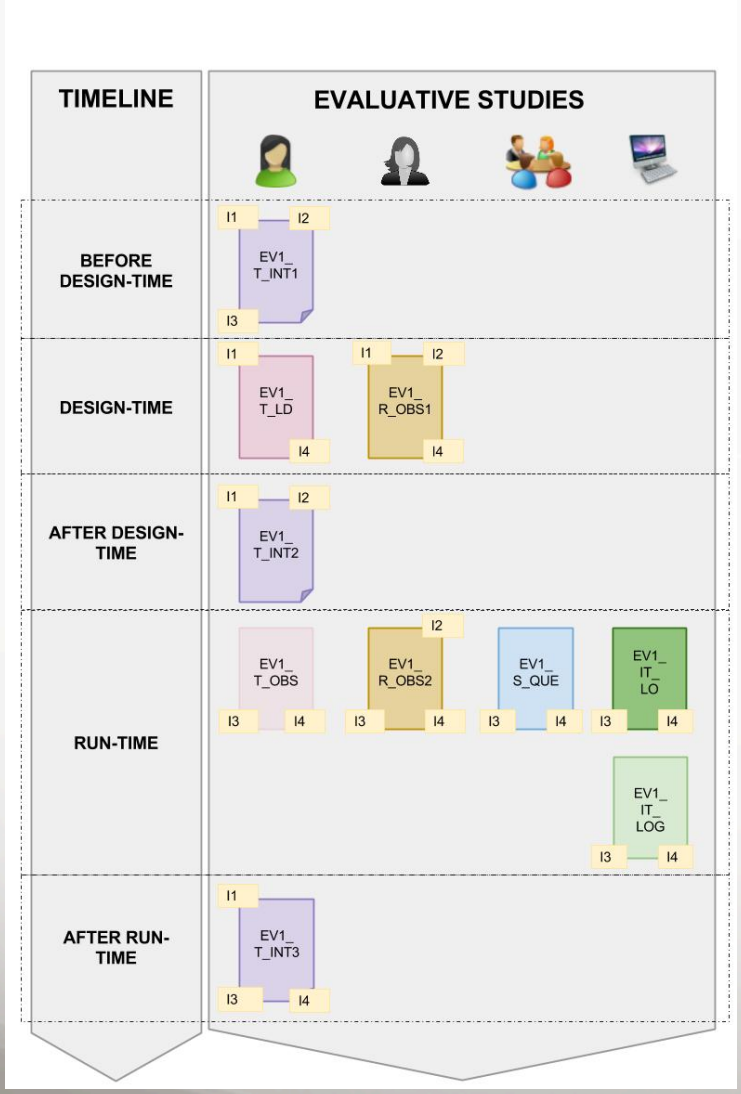
[Miles & Huberman, 1994]

# Evaluation

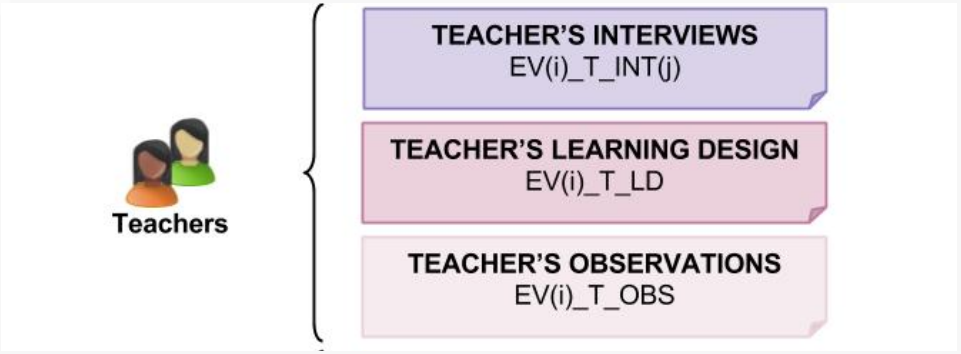


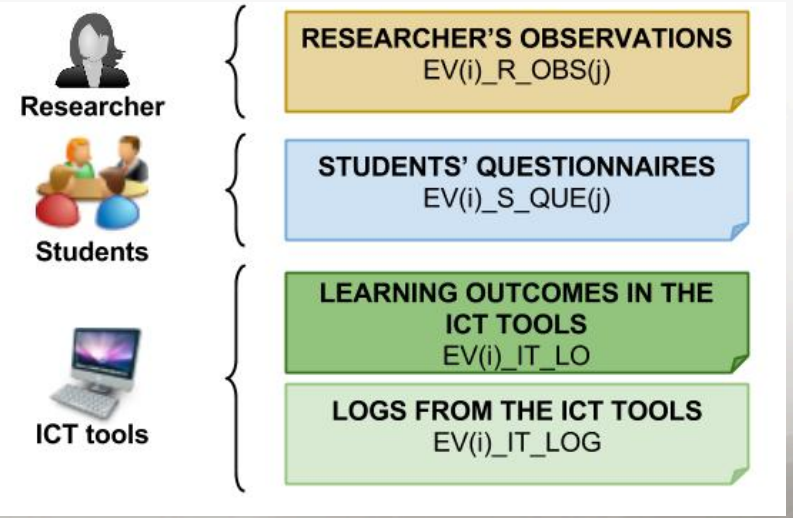

**Anticipated data reduction**
[Miles & Huberman, 1994]

# Data sources

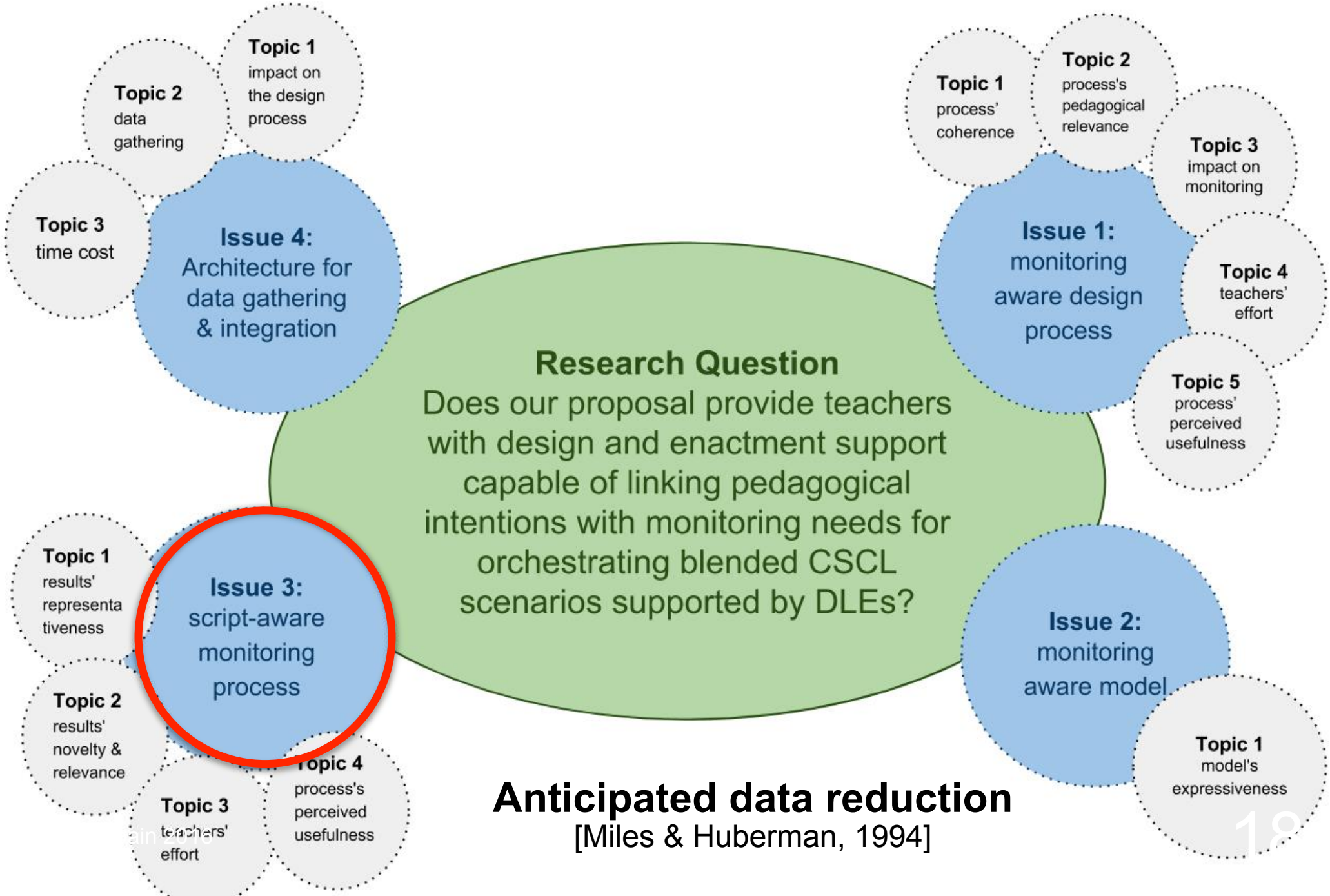



**Informants & data gathering techniques**



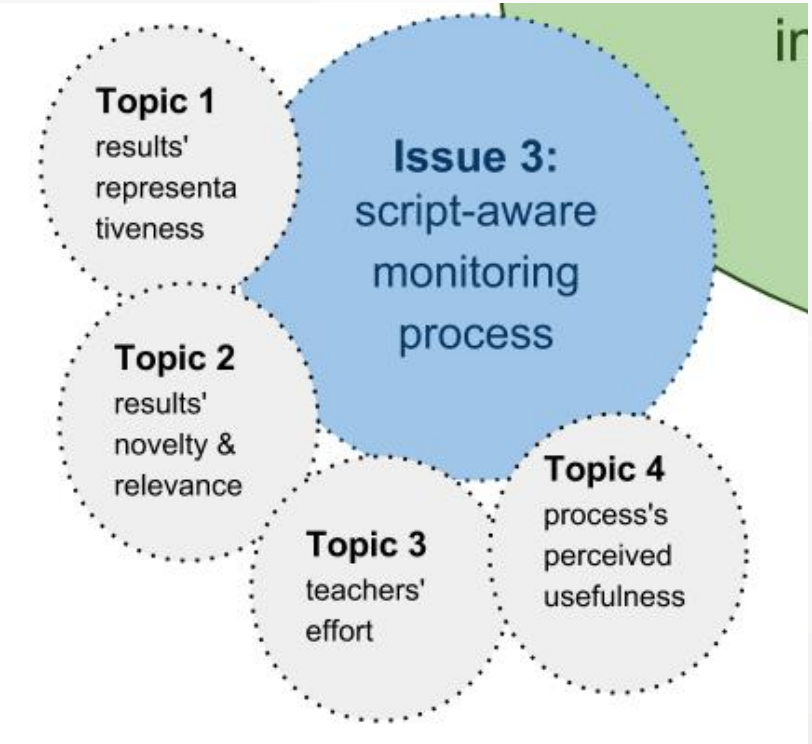



# Evaluation




**Anticipated data reduction**
[Miles & Huberman, 1994]

# Script-aware monitoring process




- The interpretation of the reports was easy and efficient.
- The information was **generally accurate**, reflecting a realistic view of the process. A small percentage of false positives and of problems that passed unnoticed, but the teachers did not consider them to be critical.
- The quality of data is very limited (i.e., accesses to docs, not actual reading...). The approach promotes to interpret the data using extra information teachers might have available. This points to lines of potential improvement.

# Script-aware monitoring process

- Achievements and limitations

- The process provided teachers with relevant feedback to improve the awareness on the learning situation and to support the regulation tasks.

- More advanced solutions should be found to support the gathering of data directly provided by teachers and students (to enrich computer-mediated evidence)

- New data sources and indicators are required to minimize the deviations and to take into account the quality of the participation

# Conclusions / Remarks

- The alignment between scripting and monitoring helped to improve both processes
- Teachers intervene in the definition of the analysis with an affordable effort, and were able to interpret the results
- The approach is **minimalistic**: shows initial evidences that teachers check with their available information
- Positive impact on data validity, responsibility, and diminution of potential adverse impact

# Thank you!

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