



# **AriLab2 Abacus and Euro Microworlds: Presentation and cross-experimentation**

Jean-Philippe Georget  
DIDIREM Université Paris 7  
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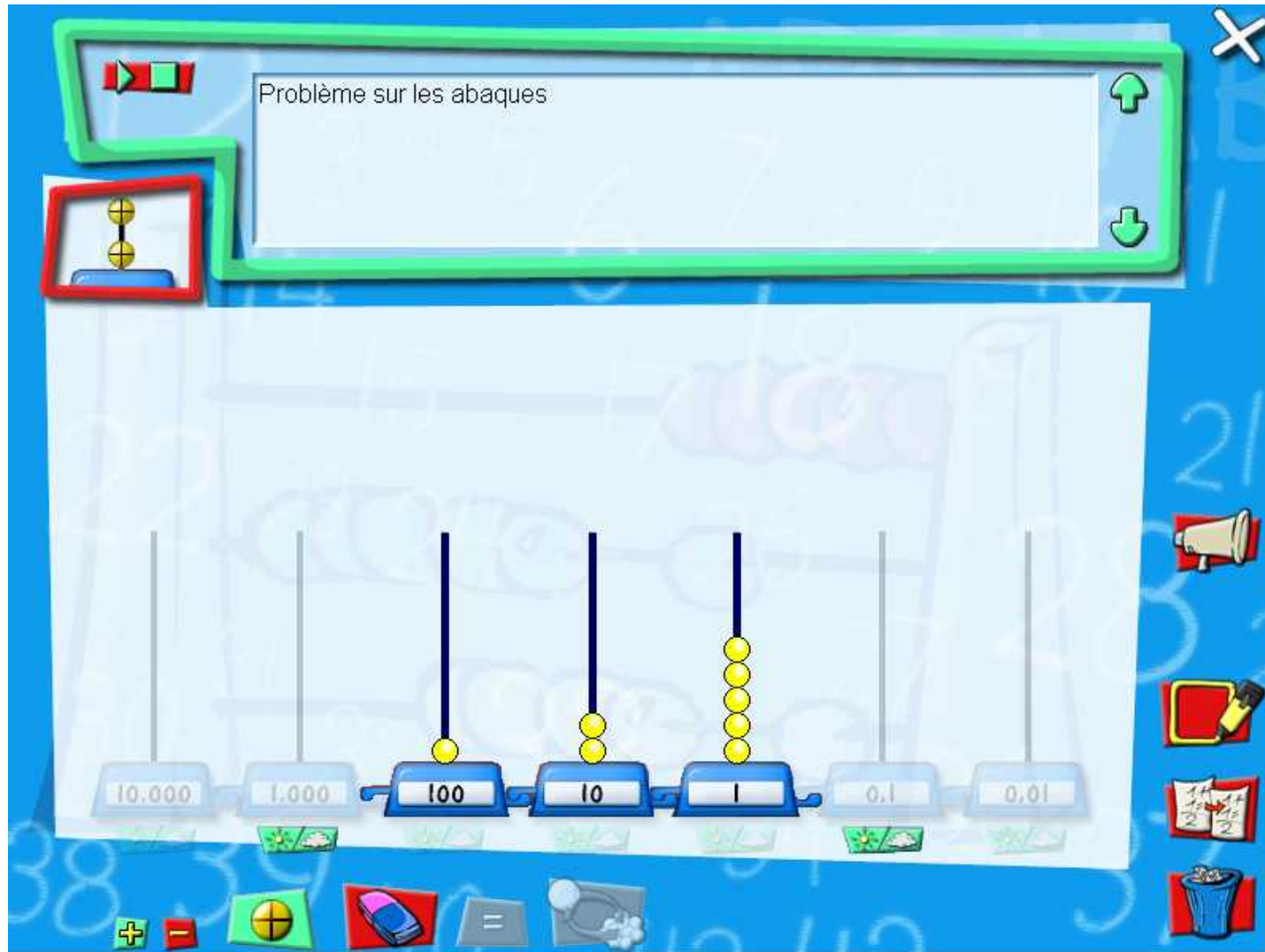
# Analysis of ARILAB2 and a priori analysis

- search didactical functionalities for the cross-experiment
- main theoretical frames used
  - The instrumental (Trouche, Guin) and the ergonomic approach (Tricot)
  - The theory of the didactical situations (Brousseau)
  - The anthropological theory (Chevallard)
- finally a closed activity chosen

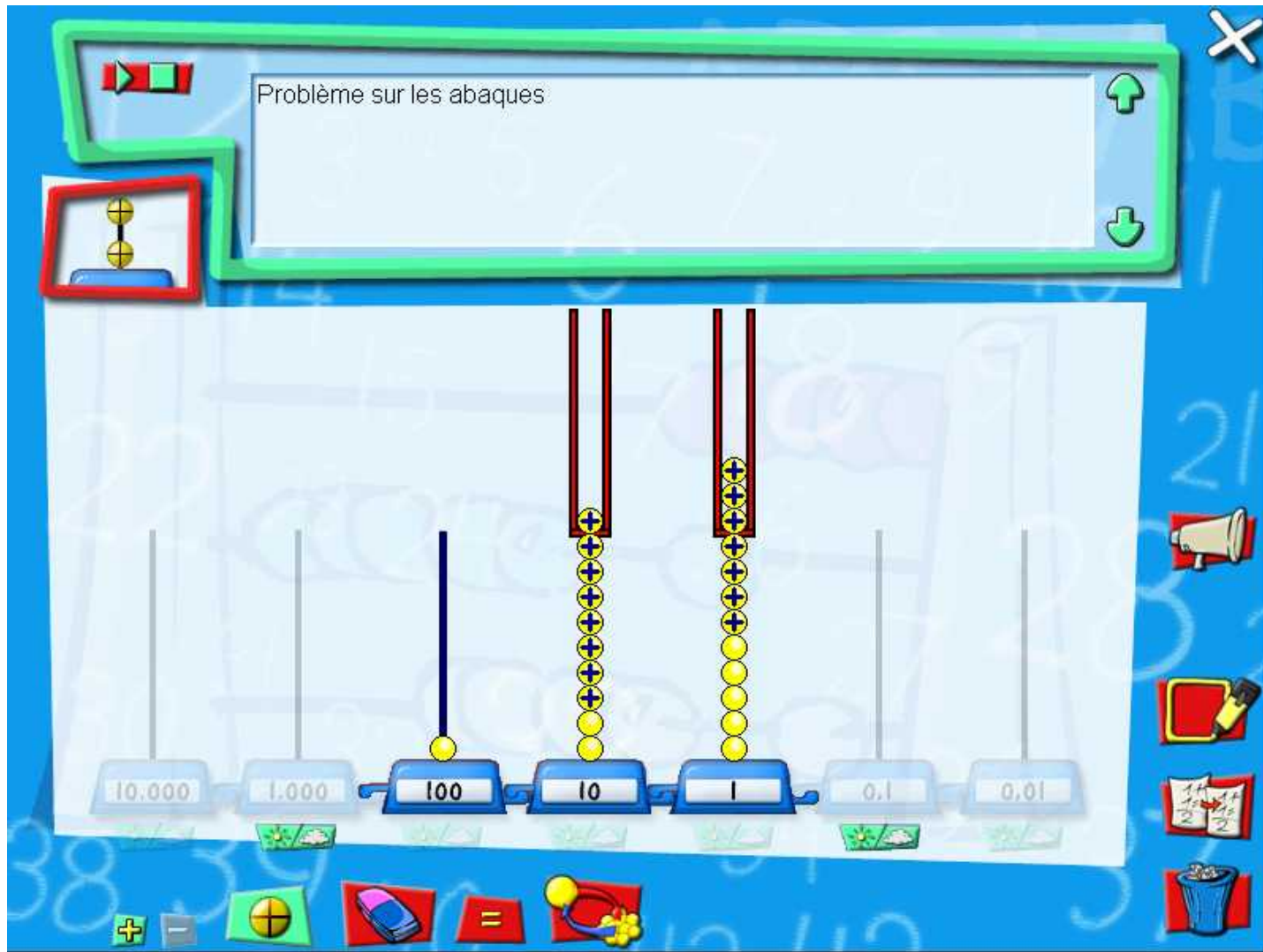
# ARILAB2 Euro microworld



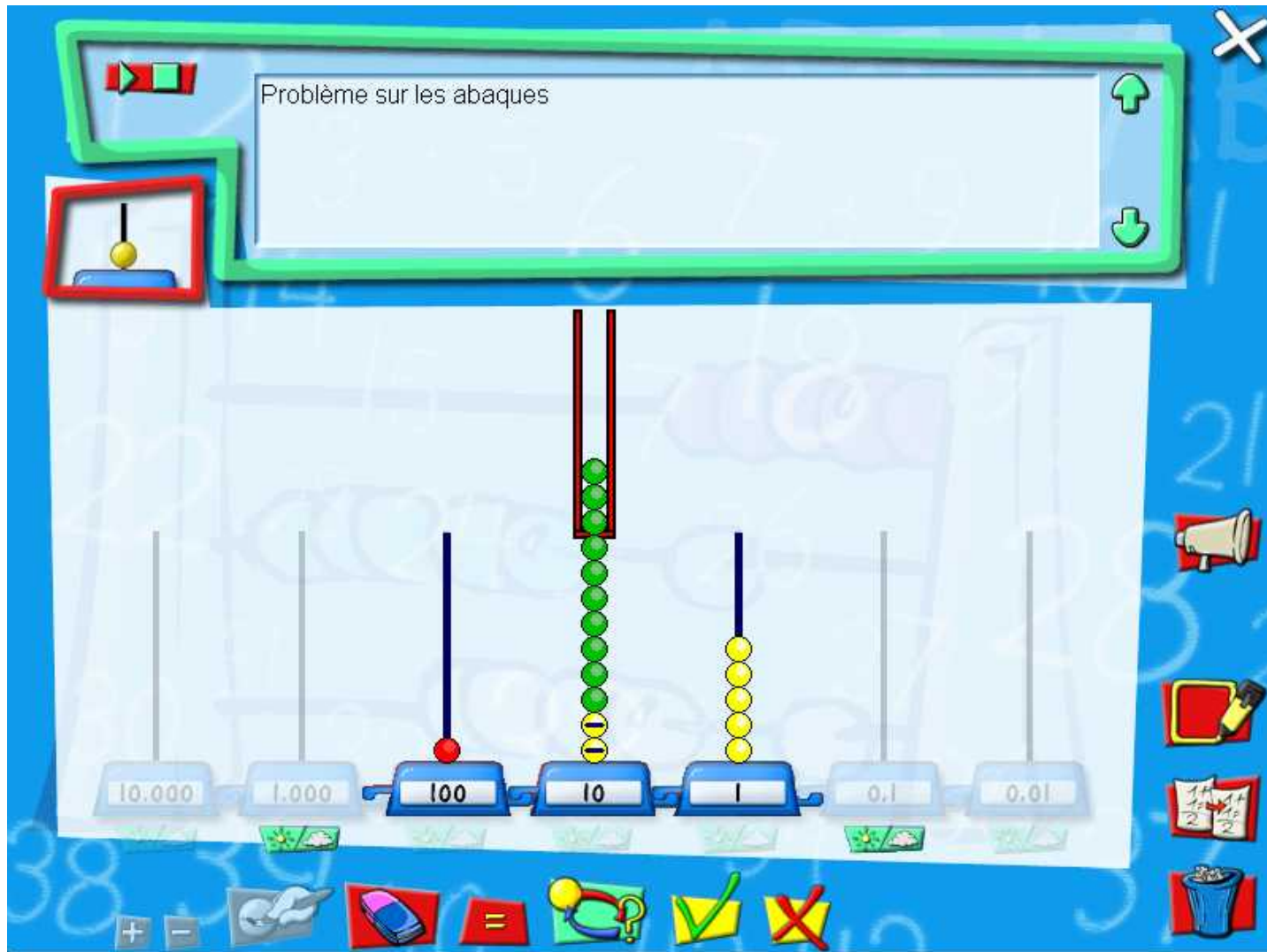
# ARILAB2 Abacus microworld 1/3



# ARILAB2 Abacus microworld 2/3



# ARILAB2 Abacus microworld 3/3



# Goals of the DIDIREM experiment

- cross-experiment goals
- make pupils meet several techniques of subtraction by the way of several tasks in two microworlds abacus and euro
- go towards a canonical technique with the help of the tool and the discussions between the students and the teacher

## Different tasks for 3 sessions

- 30/45min for each session
- discovering both microworlds in an « interactive » way and then solve a final problem
  - S1: the euro microworld
  - S2: the abacus microworld
  - S3: final exercise, pupils free to choose the microworld used
- the teacher chooses 5 pupils within the volunteers (7-8 years old)
- screenshots on papers for the pupils

# Session 1

- discovering the euro microworld
  - learn how to exchange a 100 euros banknote, the meaning of the feedbacks when the exchange fails
  - complete an exchange of 125 euros starting with a 50 euros banknote
  - a problem: you have the banknotes 50, 50, 20, 5 (125) then you spend 90 euros. How do you do?

# S1: Complete the exchange in progress...



S2: If you spend 90 euros...



## Session 1: the experiment

- pupils don't use the tool as anticipated: they use the trash or the desk to pay part of the 90 euros and then don't know what to do
- the teacher must reformulate “You spend 90 euros from 125 euros. How much does it remain to you? Everyone succeed
- one student (*Grégoire*) makes a mental solving and uses the tool only to have a representation of the result

## Session 2

- discovering the abacus microworld
  - learn how to use the abacus  
(125-25, 125-90)
  - a problem: use the abacus to make 267-78  
(two exchanges needed)

## Session 2: the experiment

- *Grégoire* propose to remove one hundred and add one ten. interpreted as an incorrect exchange procedure by the teacher and not as a correct but not expected procedure ( $125-90=100-90+25=10+25$ )
- a long time to represent 267
- no one find a way to use the abacus to find the result (confusion between the procedure for the exchange and the subtraction)
- finally the management of the exchange is clarified by the teacher but the result is not found

# Session 3

- Final problems
  - problem 1  
you have 541 euros and spend 175, how much does it remain?
  - problem 2 - *not done because of lack of time*  
There are 541 passengers in a train and 175 go down. How many passengers does it stay in the train?

## Session 3 : the experiment

- collectively solving the previous subtraction 267-78
- all students (except *Grégoire*) choose the euro microword before reading the task
- difficulties to represent 541 in the euro microworld then came back to the abacus microworld
- only *Gaspard* succeed without help. He also explains his procedure
- *Grégoire* solves mentally but finds 365 instead of 366

## Interpretation of the results

- the a-didactic situation and the use of the feedbacks given by the tool did not work as expected in the a priori analysis
- insufficient mathematical knowledge of the pupils to achieve the educational goal
- instrumental genesis always in progress at the end of the experiment even we have paid a special attention to this point (interactivity for session 1 and 2)

# Some results of the experiment

- some facts partially interpreted
  - pupils don't use the feedbacks given by the microworlds as expected to validate their exchanges and ask for the validation of the teacher. Didactic contract?
  - session 3: all pupils choose euro microworld before knowing the text of the problem. More confident?

# Some limits of the experiment

- several difficulties encountered
  - knowledge of the students not so well known and/or not really available
  - some tasks too hard for the pupils:
    - meta-task « how do you do? »
    - task « spend 90 euros » with the euro microworld not congruent with the reality
    - two exchanges in 267-78
  - intervention of the teacher of the class

# Conclusion

- probably not all the pupils have seen the interest of the final activity but...
- pupils are more confident with the tool at the end of the experiment
- they also often use the given feedbacks autonomously
- more about results of the cross-experiment in the Michele Cerulli's presentation