Statistics teaching in middle school: resources and practice
A case study and associated methodology

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Outline

1) Towards new methodological developments for studying teachers' resources: the *documentary work valise*

2) Presentation of Vera's valise: main material

3) Workshop on selected data: video clip & associated resources (teacher and student)

4) Perspective: towards comparative research in China and Norway

Reminder

Following teacher documentation, teaching and assessment practice (French propositions, seminar February 2013)
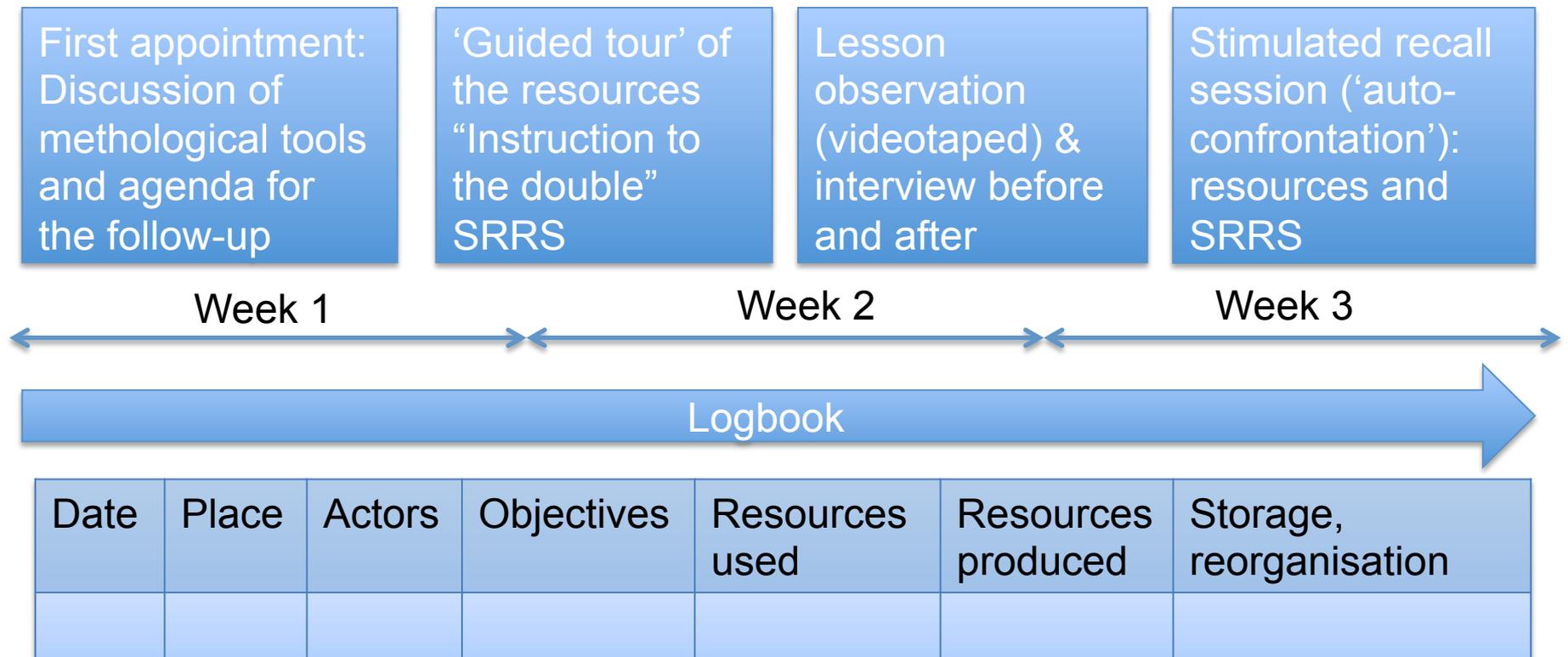
Choose and follow teachers, teaching this content. One teacher in France (in nutrition resp. in statistics) and one teacher in China

Elaboration of a common methodology. We will take into account all his/her work (preparing a lesson - discussing its implementation), all his/her resources (textbooks – web-based resources), his/her interactions with colleagues in his/her school, or other communities of teachers, his/her way for assessing students work.

Making short videos (5mn each) illustrating the case studies (with english subtitles).

Toward new developments of the methodology

Current state of the reflective investigation methodology…

First appointment: Discussion of methological tools and agenda for the follow-up	'Guided tour' of the resources "Instruction to the double" SRRS	Lesson observation (videotaped) & interview before and after	Stimulated recall session ('auto-confrontation'): resources and SRRS

Week 1   Week 2   Week 3

Logbook

Date	Place	Actors	Objectives	Resources used	Resources produced	Storage, reorganisation

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Toward new methodological developments …

Shortcomings:

Difficult to get data over the long period of the documentational geneses

Difficult to compare data related to the same teacher (e.g. for the same lesson from one year to another) due to a relative vagueness of the procedures (e.g. the SRRS)

Difficult to compare two different teachers (e.g. for the same lesson – the case of the C2SE project) due to a number of missing contextual (cultural, social, historical, institutional, epistemological data)

Difficult to analyse a case that you have not followed yourself due to a number of 'missing' (implicit) data

Toward new methodological developments …

The *documentary work valise*
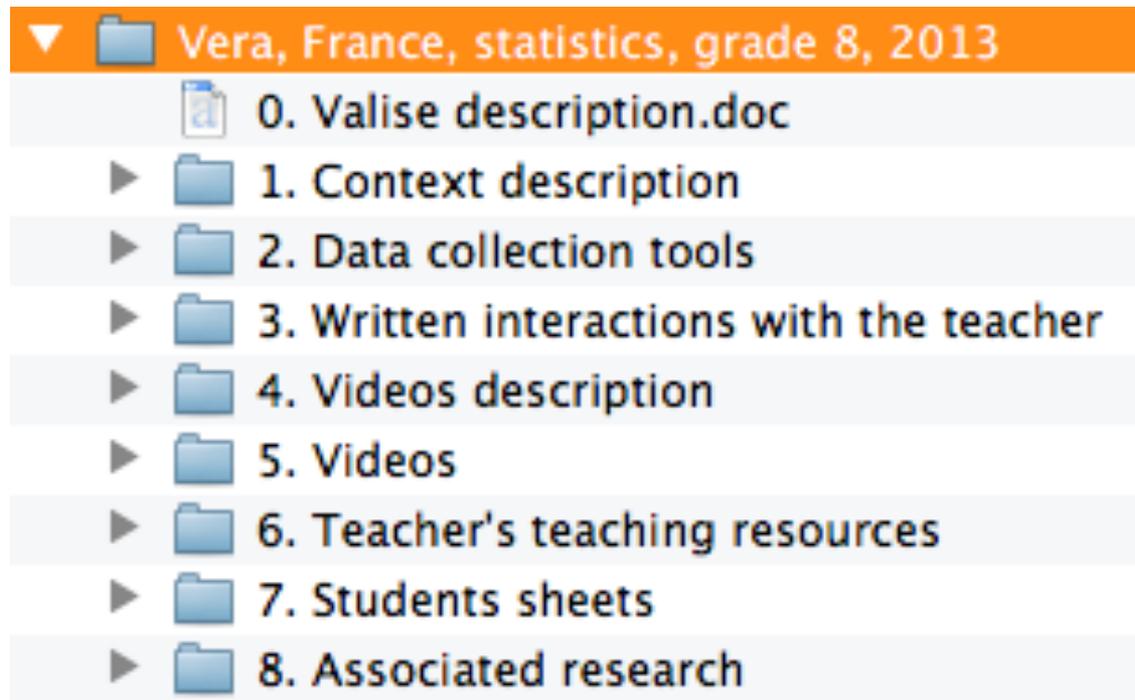
A brick towards a 'clinical study' of teachers' documentary work

Presentation of the valise material

Valise description

Context description (related to the teacher): school, curriculum – program prescriptions, both national and local

Data collection tools: interview/s and SRRS guides

Written interactions with the teachers (e.g. emails)

Video observations: script of episodes; transcriptions & translations

Videos themselves: split into short episodes

Teacher's teaching resources: teacher resources, extracts of textbook, etc. and also linked to research (e.g. SRRS, logbook)

Students sheets: books; written notes; exercises

Associated research: papers related to particular topic areas & papers written on the basis of the valise material

Presentation of the valise main material

Zoom-in on the video part of the valise

▼ 📁 Vera, France, statistics, grade 8, 2013
   📄 0. Valise description.doc
 ▶ 📁 1. Context description
 ▶ 📁 2. Data collection tools
 ▶ 📁 3. Written interactions with the teacher
 ▶ 📁 4. Videos description
 ▶ 📁 5. Videos
 ▶ 📁 6. Teacher's teaching resources
 ▶ 📁 7. Students sheets
 ▶ 📁 8. Associated research

Session 1

Preparation of the lesson. Exploring the resource system to find relevant elements (*mother resources*) and design a *daughter resource*, towards a new document

Session 2

Implementation of the daughter resource, inputs of pupils, modification "on the fly". Gathering traces of pupils and teacher's activity

Session 3

Debriefing after a class test on the main results of the previous lesson. Pupils errors need to rethink some elements of the daughter resource?

Session 4

Stimulated recall

Critical episodes of the previous sessions are presented to the teacher, who reacts…

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Workshop on a piece of data
Presentation of the context of the lesson

(1) The French national Curriculum: grade 8, statistics/percentages

Extract from the text:

Objectives	Abilities	Comments
Computations including percentages	Determine a percentage related to the character of a group consisting of the combination of two groups whose numbers and percentages for this character are known	Situations of everyday life or from other disciplines allow to implement a proportionality coefficient expressed as percentage.

(French education system: 5 years primary + 4 years lower secondary ('collège') + 3 years upper secondary education)

Workshop on a piece of data

Presentation of the context of the lesson

(2) The school & its catchment area: urban (near city) area with 'mixed' population; new and friendly school

(3) The teacher- Vera: experienced mathematics (and science) teacher; used to teach science at upper secondary, now mathematics at lower secondary education (for approx. 5 years)

Illustration

Workshop on a piece of data
Four episodes and analysis

Session 1, episode 6

S1, Ep.6: Vera explains which resources/books she uses and why

- Vera's 'progression' (per chapter/topic area)

- 'trace ecrite'

- first pupil book & five other books (incl. Triangle, etc.)

- Vera looks for very specific things which correspond to her practice

-> PD: study of textbooks & teacher choice of resources,
      learning trajectories & activities/exercises

Workshop on a piece of data
Four episodes and analysis

Session 2, episode 7

S2, Ep.7: Vera explains and distributes the exercise/s: differentiated in three levels – 'where are the courageous?'

L1: one question;

L2: one question + one intermediary;

L3: four questions (thus 3 intermediary)

-> PD: study of observed (video) teacher pedagogic practice: e.g. Differentiation & resources used for differentiation

Workshop on a piece of data
Four episodes and analysis

Session 3, episode 12

S3, Ep.12: De-briefing after the class test

"… not very tolerant … it's either right or wrong."

analysis of exercise 1- mistakes- see copies:

"There are 15 rugby players in a team, and 3 are older than 25 years of age. Express the proportion of players older than 25 (in the team) in a simplified fraction and then as a percentage."

-> PD: using errors to see potential in student thinking (instead of deficits)

Exercices n° 1

Sous forme fractionnaire : $\frac{3}{15} = \frac{1}{5}$.

Λ

sous forme de pourcentage = 6%.

Exercice 4 :

Pourcentage de Rugby | 15 | 3

nombres de joueurs | 25 | 5   25 ans ?

Pour trouvé 5 j'ai fais $\frac{25 \times 3}{15}$ ce qui me donné 5.

Donc il y a 5 joueurs qui ont plus de 25 an

"There are 15 rugby players in a team, and 3 are older than 25 years of age.

Express the proportion of players older than 25 (in the team) in a simplified fraction and then as a percentage."

Workshop on a piece of data

Four episodes and analysis

Session 4, stimulated recall

S4,

Workshop on a piece of data
Four episodes and analysis
-suggestions for professional development activities

Process/es for viewing and analysing

Step 1: identify key mathematical ideas and skills (in the task/exercise):

-> what are the key mathematical ideas and skills this problem uses?

-> what do you predict students will answer? Why?

-> which misconceptions/errors might students have when solving this problem?

-> How do you think the teacher is interpreting the students' understandings? (evidence for that?)

Step 2: prepare to watch the video (see worksheet)

Step 3: watch the clip with the focus on understanding pupils' errors

Step 4: complete the worksheet (all columns)

Step 5: reflect on your work

Potential Study Questions:

- how would you describe the errors students are making?

- in which ways was their thinking on the right track?

- what potential rationale could you imagine they had for their thinking?

- what could be the teacher's purpose in posing incorrect conjecture/s? How might this help students understand the correct better?

Perspectives for further work
In the frame of C2SE… and beyond?

- For further work in France, China (& Norway):

- Could/can a similar 'valise' (or several 'valises') be produced in China (and/or Norway)?;

- What makes a 'valise' a *good tool* (a) for research; and (b) for teacher professional development;

- What sh/could be added/taken away in such Chinese (or Norwegian) 'valises'? What is im/possible?

- Can we have comparable 'valises'? (for comparative research)

- Issues of validity and reliability, and generalisability?

- Comparability of teacher documentation work across countries?

- Methodological implications?

References

Gueudet, G., Pepin, B., & Trouche, L. (online), Collective work with resources: an essential dimension for teacher documentation, *ZDM, The International Journal on Mathematics Education,*

Pepin, B., Gueudet, G., & Trouche, L. (2013), Investigating textbooks as crucial interfaces between culture, policy and teacher curricular practice: two contrasted case studies in France and Norway, *ZDM, The International Journal on Mathematics Education, 45*(5), 685-698

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