National Institute for Educational Research

• Research
• Expertise
• Teacher training
• Teaching Ressources
Outline

3 Paradigms for Researchers…
3 Examples of Research at INRP
Design-Based Research
The Triangle of Bermuda of Data
Conclusion, Important Questions to Address for Researchers
Context: Technologies & Education

“Today’s Aerial Geography Lesson”
Learning Situations…

ICT-based learning situations are rich, complex and changing environments.
The Need for a Systemic Approach...

...that leads to methodological difficulties
Criticisms Addressed to Researchers

• A “credibility gap”
• Not able to generalize a particular success or a laboratory insight
• Not creating usable knowledge

A tension between the desire for locally usable knowledge on the one hand, and scientifically sound, generalizable knowledge on the other (Sandoval, 2004)
Paradigms for Researchers...
1. Nomothetic

- Search for regularity
- Confirm or infirm
- Based on proofs and comparisons
- The need for simplification and reproducibility

... the difficulty to implement such methodology for complex learning situations
2. Pragmatic

- Search for feasibility
- Linked with pedagogical innovation
- Aims at producing knowledge for action
- For practitioners

... how to keep a distance between reflexion and action?
3. Hermeneutic

- Search for significance
- A theoretical construction to understand what is observed
- Extracting the internal coherence of learning

... difficult to generalize the outcomes from a specific learning situation
Examples of Research at INRP
Uses of Geotechnologies for a Fieldwork Course (Sanchez, 2008)

Are the French-Alps a continent to continent collision range?

A Preparation (2h)  B Fieldwork (2 days)  C Exploitation (2h)
Background/Research Question

Science as the capacity to make links…

RQ: How do the use of geotechnologies can influence this students activity?
Recording the Students’ Traces

XML file:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<traces>
  <instant>
    <heures>16</heures>
    <minutes>00</minutes>
    <secondes>54</secondes>
    <entite>menu</entite>
    <action>nouvelle session</action>
    <parametre1>utilisateur : ssds</parametre1>
  </instant>
  <instant>
    <heures>16</heures>
    <minutes>00</minutes>
    <secondes>59</secondes>
    <entite>carnet</entite>
    <action>modification</action>
  </instant>
  <instant>
    <heures>16</heures>
    <minutes>01</minutes>
    <secondes>00</secondes>
    <entite>nouvelleSession</entite>
    <action>ssds</action>
  </instant>
  <instant>
    <heures>16</heures>
    <minutes>01</minutes>
    <secondes>02</secondes>
    <entite>image</entite>
    <action>deplacement</action>
  </instant>
  <instant>
    <heures>16</heures>
    <minutes>01</minutes>
    <secondes>02</secondes>
    <entite>reglet</entite>
    <action>fin</action>
  </instant>
</traces>
```
Designing Chronograms

chronogrammes
9nuguet1

Phase A

Phase B

Phase C
Audio tracks
E1 : Great! Here you can see the big blocks…

Picture selection
Writing of a commentary for the picture
E1: First of all we consider the accretionary prism.
E1 : … présentant des plis en S. témoin d'un raccourcissement et d'un phénomène de subduction.

Writting of a commentary for the picture
Picture geolocalisation
E2: No, you cannot see the roads. It should be there.
Other Data
Triangulation of Data

Informatic tracks

Validity

Audio tracks

Written documents
Designing Serious Games with Geotechnologies
(Sanchez & Jouneau-Sion 2009, Sanchez et al. forthcoming)

How to implement « green » energy in Sète?
The Game’s Scenario

1. The mayor of Sète presents the trend.

2. During two weeks each company prepare a proposal.

3. Each company presents the project to the tender committee.

4. During two more weeks the companies finalize their project.
Research Questions

• How to design a pretend game with geotechnologies?
• What elements should be taken into account to design the learning situation?
Researchers and Practitionners: a Collaborative Work
A common background

Researcher \[\rightarrow\] Practitioner

---

Didactical milieu

\[\leftrightarrow\]

Learner

Learning results from interactions (Piaget, Brousseau)
Researcher ↔ Practitioner

Design of the learning situation
(by implementing theoretical ideas)
Practitioner → Researcher

data gathering (audiotapes, videotapes, written documents...)

inrp
Data interpretation (during meetings, focus group, seminars...)

Researcher ↔ Practitioner
The Impact of the use of Geotechnologies on VSWM

Hypothesis “the use of geotechnologies has a positive impact on the visuospatial working memory (VSWM) development but there are differences related to genders”
Methodology (control)

Two groups of subjects (control of internal variables)
  * Group of subjects involved into geotechnologies activities
  * Control group (matched on all important characteristics): age, gender, students levels, etc.

Anticipation of variables that have to be controlled
Methodology (data)

Tests into performances on VSWM tasks (examples)
- Task of memory (Della Sala et al. 1999)
- Task of locations (Loisy & Roulin, 2003)
Data Analysis

\[ t = \frac{\hat{\beta}_k}{\sqrt{\text{Var}(\hat{\beta}_k)}} \]

T-test if there are two groups of subjects
Analysis of variance (ANOVA) if there are more than two groups of subjects

But
- difficulty to meet the requirements for experimental validity
- impossibility to have a randomly selected population
Design-Based Research
From DE to DBR

• Ingénierie didactique (Didactical Engineering)
  Artigue, 1988
• Design Experiment
  Brown, 1992
• Design-Based Research
Design-Based Research

“A systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories”

(Wang and Hannafin, 2005).
Main Characteristics

• **Pragmatic**: solving current real-world problems

• **Grounded in both theory and the real-world context**

• The process is **interactive, iterative and flexible**

• **Integrative**: a variety of research methods and approaches (both qualitative and quantitative)
DBR as an Iterative Process

Hypotheses → Analysis → Classroom settings → Data → Hypotheses
Traps to Avoid by Researchers
Research vs Assessment

• **Research**: a systematic investigation to establish facts and **knowledge**

• **Assessment**: a process for making judgment that lead to take **decisions**
Research vs Innovation

• **Research**: a systematic investigation to establish facts and **knowledge**

• **Innovation**: a change that leads to create **something new**
The Hawthorne Effect

Subjects improve or modify an aspect of their behavior being experimentally measured simply in response to the fact that they are being studied.
The Risk of Illusions
The Triangle of Bermuda of Data
How to survive with a such amount of data?
Performing Core into Data
Designing Categories
Data Triangulation
Conclusion

Important Questions to Address
What is the Nature of the Phenomena that I Want to Investigate?

• School, classroom?
• Teachers, students?
• Professionnal identity?
• Knowledge, skills, competencies?
• Actions, interactions, behaviours?
• Artefacts, technologies?

… alternative ontological perspectives might tell a different story
What Might Represent Evidence of the Entities which I want to investigate?

• The need to determine indicators in order to collect data
• « Conceptual lenses »

... an epistemological question
Do I Have a Coherent Research Strategy?

... understanding of the methodological implications
Is my Inquiry Ethical?

... impact on students? Personal gains? Social implications?
How Can I Demonstrate that my Methodology is Reliable and Accurate?
References