

What Do Students Learn About Earthquakes With Graphical Representations? A Case Study At Grade 5.

Jérôme Santini, I3DL, University of Nice

Jacques Kernéis, CREAD, University of Occidental Brittany

A general overview

- Two previous separated studies:
Media education (Kernéis, 2009);
Volcanoes and earthquakes at grade 5
(Santini, 2009)
- A same theoretical framework: Joint
Action Theory in Didactics (JATD)
(Sensevy & Mercier, 2007; Sensevy, 2011)
- A common research question
- A comparison of two case studies:

Rationale

Within Joint Action Theory in Didactics, we describe educational practices as successive learning games (Sensevy et al., 2005):

- Didactical milieu = all that acts on the student/the teacher and that the student/the teacher acts on
- Didactical contract = the teacher's expectations towards students and the reverse
- A learning game results from the intertwinement of a milieu and a contract
- Cooperative and asymmetric game

- Knowledge as a system of capabilities
- Epistemic games are obtained by analyzing the epistemic elements of cultural knowledge practices:
 - What is the nature of the epistemic games enacted from the unfolding of learning games ? (down-top)
 - What are the relations between epistemic games and learning games ?
 - How are these epistemic games actualized (or not) in learning games ? (top-down)

Semiotics



- A cognitive framework :

Niesser (1967, p. 20) : «because we can see only what we know to look for».

Salomon (1979) : spiralaire aspects allows to exceed this paradox

Compte (2009) : mediations with specifics symbol systems

- And semiotic:

Peirce (1897, 1978) in collected papers (spiralaire semiosis)

Eco (1980): interpretation stop with habits.

Compte (2009) focus on materiality of sense and prominence of consistency rather than coherence

- Links with JATD: Contract and specific gravity of games

Specificities of film

« c'est pas sorcier » (it's not difficult)

Place for emotion

Public success (beyond young people target)

Used every part of TV mediation (not only discourse)

Scientific guarantee

More generic aspect of movies:

- nobody can catch every sign
- Unnoticed redundances and fluency

Extract synopsis (1'40)



Didactic games	Epistemic games	remarks
What happens, Sabine ?		Put-in A squeaky noise before
Earthquake research with Sabine	simulate the effects of an earthquake on the ground.	Uncertainties : What table ? « we come back to Istanbul »
Effects reliant with hypo-center interval	Explain the variety of damage an earthquake with an analogic model : distance earthquake hypo-center	We can see different amplitudes
Model of earthquake	definition of epicenter and hypo-center Explain the link between break and earthquake wave propagation	Lower level : regain consciousness Uncertainty : Red: heat, fire?
A stone in a pool : waves	Explain limits of an analogic model (different waves : horizontal and vertical)	Inkling What's the stone in a real earthquake ?

Place for drama

Série: Films utilisés sur les séismes

Carte de la liste séquentielle des mots-clés de la série

S11P1 extraitvideoCPS1

Place de la dramatisation : enclencheur

Place de la dramatisation : mettre l'accent sur un phénomène

Place de la dramatisation : retombée de l'intensité pour laisser place à l'explication

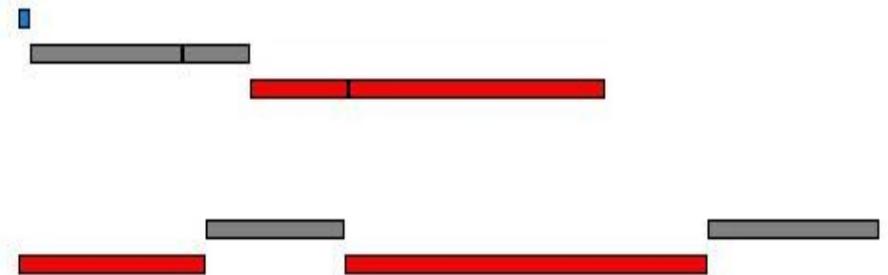
S11P1 extraitvideoCPS2

Place de la dramatisation : enclencheur

Place de la dramatisation : mettre l'accent sur un phénomène

Place de the dramatisation : retombée de l'intensité pour laisser place à l'explication

0:00 0:20 0:40 1:00 1:20 1:40 2:00 2:20 2:31



Legend:

-  Status of drama : 1-Put-in
-  Status of drama : 2-Focus on a material phenomenon
-  Status of drama : 3-Lower level for place for explanation

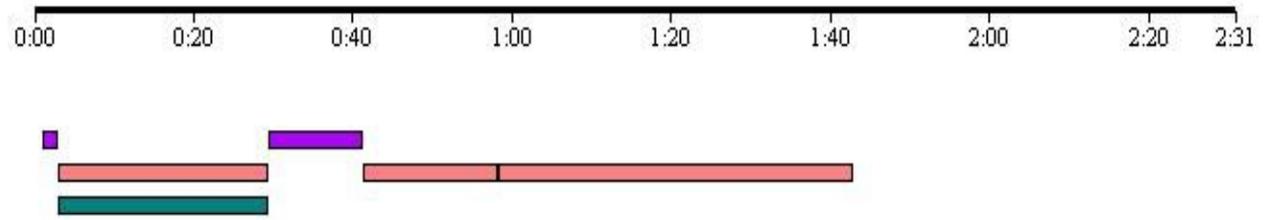
Uncertainties

Série: Films utilisés sur les séismes

Carte de la liste séquentielle des mots-clés de la série

S11P1 extrait video CPS1

- Uncertainties roots : Brutal change of reference
- Uncertainties roots : Dramatization
- Uncertainties roots : Equivocal movement
- Uncertainties roots : Shortcoming extract



S11P1 extrait video CPS2

- Uncertainties roots : Brutal change of reference
- Uncertainties roots : Dramatization
- Uncertainties roots : Equivocal movement
- Uncertainties roots : Shortcoming extract



Légende

- Uncertainties roots : Brutal change of reference
- Uncertainties roots : Dramatization
- Uncertainties roots : Equivocal movement
- Uncertainties roots : Shortcoming extract

A teacher uses this extract

Code	Generic epistemic games	Specific epistemic games
<p>volcanoes S1-S8 : 7 DG 41 LG</p>	<p>Produce a definition Criticize the peer description Take stock of the knowledge Update on the work being X3 Listen to a speech of scientific popularization X2 Refute hypotheses Analyze a text X2 Summarized in a single Table entry</p>	<p>Describe a volcanic eruption from a telling Define the types of eruptions Explain types of eruptions X2 explain the formation of a crater through an analogic model Explain the eruptive mechanism through an analogic model X2 Explicit modeling mechanism analogic eruptive phenomenon Analyze a longitudinal section Analyze a section of a quarter of a concentric structure Argue causality between climate and volcanism Describe the geographical distribution of active volcanism World</p>
<p>S9 LG 8 Characteristics and measure of an earthquake</p>	<p>Analyze and summarize a text</p>	<p>Distinguish the cause, the definition and result Describe the working of a seismograph</p>
<p>S10 LG 9 Earthquake damage</p>	<p>Here take place this first extract</p>	<p>Debrief a citizen of seismic zone Explain the variety of damage an earthquake with an analogic model Define a paraseismic standard Explain the mechanism of seismic</p>
<p>S11 LG10 Seismic mechanism</p>	<p>Update on the work being Analyze a text</p>	<p>Argue causality deforestation / earthquake listen to a speech of scientific popularization</p>
<p>S12-LG11 volcanoes, earthquakes & plate boundaries</p>		

A teacher uses this extract

*She can't separate this extract because DVD chapter, like she makes at home:
so, student see others parts of the film*

*She focuses only on the end of this extract. « what BIG difference between the
analogic model (the pool, the house and the stone) :*

*- For the teacher : « Here,, the stone doesn't reach the center of the earth, like
during a real eartquake*

*- For Jamy : « a real earthquake is different
because there are different kinds of waves :
horizontal and vertical)*

*- for us : the model is problematic because,
in a Tsunami, like in Fukushima, the wave
Doesnt decrease when it rolls away.*



The 3 functions of Salomon (1975) and Compte (2009) assured by TV rhetoric are effective in this extract.



Didactic fonctions	Strategies	Performance
Illustration	Modeling	Just shoring verbal discourse: only one reading level
Mediatisation	Analysing	Enslavement to the senses: Different reading level
Facilitation	Overtaking	<i>Supplantation : insights...</i>

Nevertheless images did its work : YGMWYS, not WYSYWIG *

Emotion doesn't always blind reason. It's often a good motivational adjuvant

The question « what do students learn is adequate.... but the teacher doesn't use specially these fonctions and games.

Specific epistemic games (in class)

- Distinguish the cause, the definition and result of earthquakes.
- Describe the working of a seismograph
- Debrief a citizen of seismic zone
- Explain the variety of damage an earthquake with an analogic model
- Define a paraseismic standard
- Explain the mechanism of seismic
- Argue causality deforestation / earthquake

listen to a speech of scientific popularization

Movie extract specific epistemic game

- simulate the effects of an earthquake on the ground.
- Explain the variety of damage an earthquake with an analogic model : distance earthquake hypo-center.
- Definition of epicenter and hypo-center
- Explain the link between break and earthquake wave propagation.
- Explain limits of an analogic model (different waves : horizontal and vertical)
- Explain the variety of damage an earthquake with an analogic model : distance earthquake epicenter
- Definition of epicenter and hypo-center
- Explain the link between break and earthquake wave propagation
- Explain limits of an analogic model (different waves : horizontal and vertical)
- Explain limits of an analogic model (different waves : horizontal and vertical)

Status of these graphical representations



Movies can play a part in knowledge access if we sometimes give up discourse mastering and linear logical

They open diverse interpretative ways

We must consider the viewing contract in a classroom.

Conclusion



- The study of graphical representations at school stems from a double semiosis.
- Students are confronted to different knowledge practices with graphical representations.
- Potentialities for science education.