Comparing Science Curriculum in France and in China
A case study of IBST in middle school

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Outline

1. Purpose
2. Theoretical framework and methodology
3. Data and results
   • Teachers’ conception of inquiry and IBST, teachers’ discourses about difficulties and constraints of IBST, in China and in France.
   • Teaching strategies of IBST
   • Comparison and discussion
Purpose

Contribute to better knowledge of the factors influencing elaborations and practices of IBST in China and in France

Case study in middle school
Investigate classroom realization of science curriculum with IBST in France (4 biology teachers in Strasbourg) and in China (3 science teachers in Shanghai).

Two works in progress:
1. about the enacted science curriculum in classroom
2. about resources used and elaborated by teachers
Theoretical framework and methodology
POTENTIAL CURRICULUM  
(modelled)

CURRICULUM PRESCRIBED  
or SELF-PRESCRIBED  
(analyzed)

CURRICULUM POSSIBLE  
(designed by researchers)

CURRICULUM PRODUCT  
or CO-PRODUCED  
(inferred)

Curricular questions  
(Martinand, 2003)
3 Ways to access what is happening in the classroom

To question teachers what they think Representations

To analyze preparations what they have planned Intentions

To observe practices what get’s done Difficulties, constraints

To retrieve documents prepared

To film sessions

Monod-Ansaldi & Prieur (2011)

Mathé (2010)

Calmettes (2012)
Interview before 1h
Interview just after 1h
Interview 2-3 weeks after 2h30

Film of session

First reactions
Difference between planned and implemented session
Screening of the session
Self confrontation interview (Clot 2000)
Teacher talks about his action. He questioned his practice

Representations
Presentation of the session
Documents for preparation and planarization

Time
Teaching strategies of IBST (Grangeat, 2013)  
6 dimensions

Dimension 1 : Who initiates the questioning?

<table>
<thead>
<tr>
<th>Mode 1.1</th>
<th>Mode 1.2</th>
<th>Mode 1.3</th>
<th>Mode 1.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers elaborate the questioning on their own context</td>
<td>Teachers elaborate the questioning linking with students' experiences</td>
<td>Students construct the questioning based on the situation proposed by teachers.</td>
<td>Students construct a questioning based on a theme that goes beyond the current session</td>
</tr>
</tbody>
</table>
**Dimension 2 : What is the nature of the problem?**

<table>
<thead>
<tr>
<th>Mode 2.1</th>
<th>Mode 2.2</th>
<th>Mode 2.3</th>
<th>Mode 2.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed problem: The teacher proposes a protocol that students follow step by step.</td>
<td>Quite closed problem: Teacher proposes a well-known situation within which students design their own protocols</td>
<td>Quite open-ended problem: students use limited materials (already prepared) to cope with an open task</td>
<td>Open-ended problem: students freely use materials to cope with an open task</td>
</tr>
</tbody>
</table>
### Dimension 3: What responsibility do students have?

<table>
<thead>
<tr>
<th>Mode 3.1</th>
<th>Mode 3.2</th>
<th>Mode 3.3</th>
<th>Mode 3.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>The teacher sets up the steps of a investigative process.</td>
<td>Teacher monitors students to design different procedures to achieve the task.</td>
<td>Students are responsible for the investigation process.</td>
<td>Students use self-assessment tools developed by or with the teacher.</td>
</tr>
</tbody>
</table>
Dimension 4 : How is the diversity of students treated?

<table>
<thead>
<tr>
<th>Mode 4.1</th>
<th>Mode 4.2</th>
<th>Mode 4.3</th>
<th>Mode 4.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>The teacher manages the behavior of some students to make them active.</td>
<td>The teacher modifies the task to maintain the engagement of some students.</td>
<td>Each group or a significant number of students benefit from the teacher’s guidance.</td>
<td>Some students with special needs benefit from an adaptation of the situation.</td>
</tr>
</tbody>
</table>
Dimension 5: Which place is given to argumentation?

<table>
<thead>
<tr>
<th>Mode 5.1</th>
<th>Mode 5.2</th>
<th>Mode 5.3</th>
<th>Mode 5.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>The teacher facilitates communication between students in each group or in the class.</td>
<td>The teacher communicates student’s suggestions to the class.</td>
<td>Students are encouraged to consider the arguments of others.</td>
<td>Students are encouraged to justify their responses with respect to the knowledge or evidence.</td>
</tr>
</tbody>
</table>
### Dimension 6: What is the level of explicitation of knowledge targeted by teacher?

<table>
<thead>
<tr>
<th>Mode 6.1</th>
<th>Mode 6.2</th>
<th>Mode 6.3</th>
<th>Mode 6.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher express his/her expectations for the current lesson</td>
<td>Teachers make explicit what was taught during the lesson</td>
<td>Students explain what they have learned during the lesson</td>
<td>Students explicitly have the knowledge necessary for reinvesting what they have acquired</td>
</tr>
</tbody>
</table>
Data and results
• Teachers
  ▪ 4 SVT teachers in Strasbourg, 3 Science teachers in Shanghai
  ▪ Middle school
  ▪ With experience of IBSE
  • « Ordinaries » classrooms context
    ▪ Non-specialists teachers
    ▪ Non-intervention of the researcher
  • Free choice
  ▪ Grade and level
    ▪ Part of the program of science
    ▪ Moments of the process of IBSE

Justification of these choices
### Strasbourg

<table>
<thead>
<tr>
<th>Teacher 1</th>
<th>Teacher 2</th>
<th>Teacher 3</th>
<th>Teacher 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Exp 12 years</td>
<td>Exp 20 years</td>
<td>Exp 30 years</td>
<td>Exp 6 years</td>
</tr>
<tr>
<td>Teacher trainer</td>
<td>Teacher trainer</td>
<td>Experience of INRP</td>
<td>Experience of EIST</td>
</tr>
<tr>
<td>Collaborative works with colleagues</td>
<td>Collaborative works with colleagues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 1</td>
<td>Class 2</td>
<td>Class 3</td>
<td>Class 4</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>K8</td>
<td>K7</td>
<td>K6</td>
<td>K7</td>
</tr>
<tr>
<td>All the class</td>
<td>Group</td>
<td>Group</td>
<td>All the class</td>
</tr>
<tr>
<td>22 students</td>
<td>14 students</td>
<td>12 students</td>
<td>25 students</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZEP</td>
<td>bilingual</td>
</tr>
<tr>
<td>Human</td>
<td>Disposal of</td>
<td>Origin of the</td>
<td>Breathing and</td>
</tr>
<tr>
<td>reproduction</td>
<td>nutrition</td>
<td>material of living</td>
<td>occupation of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>beings</td>
<td>living</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>environments</td>
</tr>
<tr>
<td>what is the</td>
<td>How</td>
<td>What are the</td>
<td>How to show a</td>
</tr>
<tr>
<td>origin of</td>
<td>nitrogenous</td>
<td>needs of green</td>
<td>living being’</td>
</tr>
<tr>
<td>menstruation</td>
<td>wastes are</td>
<td>plants?</td>
<td>breathing?</td>
</tr>
<tr>
<td>of women?</td>
<td>eliminated?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Shanghai

<table>
<thead>
<tr>
<th></th>
<th>Teacher C</th>
<th>Teacher B</th>
<th>Teacher A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td>M</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td><strong>Exp in teaching</strong></td>
<td>11 years</td>
<td>15 years</td>
<td>19 years</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td>Master in Science education</td>
<td>Master in Biology</td>
<td>Bachelor in Biology</td>
</tr>
<tr>
<td></td>
<td>Class C</td>
<td>Class B</td>
<td>Class A</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Grade</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Number of students</td>
<td>30 students</td>
<td>37 students</td>
<td>38 students</td>
</tr>
<tr>
<td>School location</td>
<td>Jing-An District</td>
<td>Pu-Tuo District</td>
<td>Pu-Tuo District</td>
</tr>
<tr>
<td>Themes of observed lessons</td>
<td>Current and current meter</td>
<td>Nutrition</td>
<td>Solution</td>
</tr>
</tbody>
</table>
Teachers’ conceptions of inquiry and IBST

In Shanghai
In Strasbourg
Comparison and discussion
Difficulties and constrains of inquiry and IBST

In Shanghai
In Strasbourg
Comparison and discussion
Teaching strategies of IBST

In Strasbourg
In Shanghai
Comparison and discussion
Modes 1 and 2: teacher-centered strategies and content.

Modes 3 and 4: strategies focused on learners and mastery of skills related to IBSE.
**Modes 1 and 2:**
teacher-centered strategies and content.

**Modes 3 and 4:**
strategies focused on learners and mastery of skills related to IBSE
Origine du questionnement

Considération de la diversité

Rôle de j u m e n tation

ÉlÈnation des e la séance

Questioning

Explanation

Argumentation

Diversity

Teacher A

Teacher B

Teacher C

Responsibility

Problem
References


Greeno & Moore (1993)