Effective Assessment for Learning CIDREE
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Assessment of
“scientific investigation and problem solving”
in science education in France

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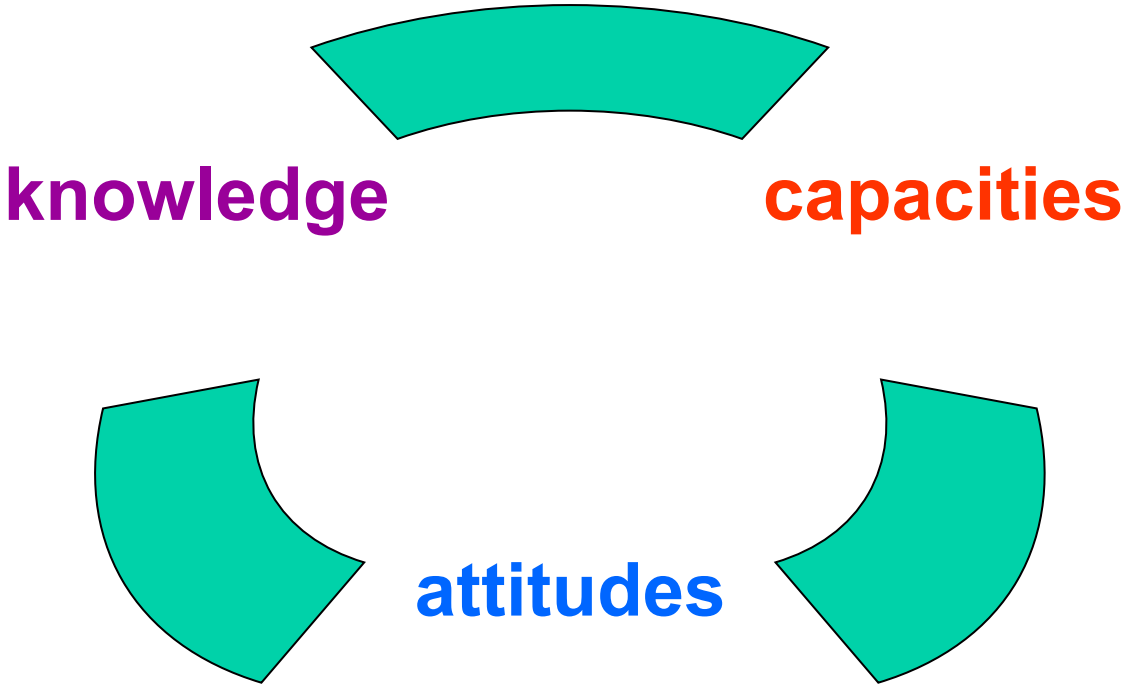
ENS DE LYON

1. Context

The common base of knowledge and skills

- Orientation law 2005
- From the primary to the end of middle school

Competencies



A whole of knowledge, capacities and attitudes appropriate to the context (DeSeCo, 2002)

The common base of knowledge and skills
Assessment and validation

A personnal booklet of knowledge and competences

"*The mastery of a capacity or competence must be assessed repeatedly, in distinct situations, if necessary at a time different from the introduction of the concerned knowledge or capacities*".

Personal booklet for all the compulsary scolarity.

Differents grades

A tool for the team of teachers but only little experience in collective evaluations

(Hasni, 2006 ; Houchot, 2007)

- Assessment of competence in science education in French middle school.
- Diversity of assessment of competence “scientific investigation and problem solving”
- What transformations ?
    - Between institutionnal documents ?
    - From institutionnal documents to teachers’ pratices ?

O.C.E.P.

- *Observatory, Curricula, Assessments, Practices*
- Since 2009
- Collective expertise of IFE
- http://ife.ens-lyon.fr/ife/ressources-et-services/ocep

2 studies of OCEP

- **Assessment of scientific investigation and problem solving on websites** (Dell'Angelo, Magneron, Coquidé)
- **Assessment of scientific investigation and problem solving in the classroom** (Robinault, Mercier)

2. Assessment of scientific investigation and problem solving on websites

- Analyze of the assessment situations
- French ministerial website *Eduscol*
- Two academic institutionnal websites (Orléans-Tours, Créteil)
- Analyze in 2010-2011

Booklet of competencies (*Eduscol*)
Scientific investigation and problem solving

Step 2
End of primary school

1. Perform a sequence of inquiry
2. Manipulate and experiment, a hypothesis and test it, argue, to test several possible solutions
3. Express and exploit the results of a measurement and research using scientific vocabulary in writing or orally

Step 3
End of middle school

1. Retrieve and organize relevant information
2. Make, manipulate, measure, calculate, apply instructions
3. Reason, argue, or perform an experimental technology, demonstrate
4. Present the approach, results, communicate using language appropriate.

Website *Eduscol*

Same matrix of situation for learning and for assessment

- Title of the scientific subject
- Class referred
- Duration of the proposed situation
-Location-problem to introduce the situation for learning or for assessment
- Setpoint given to the student
- Fields of science knowledge
-Knowledge and skills
-Expected Responses
-Indicators of success
- Aids or "helpers" delivered on demand as needed

Eduscol

Some abilities rather than a complex task
No progressivity in the skills expected

niveau	3ème		4ème		5ème		6ème
Sujet	ADN	Cellules de défense	Hormones et puberté	Combustion	Respiration du poisson rouge	le traitement des eaux usées	Influence de l'homme sur la population de sangliers
Extraire des informations d'un fait observé, d'un document, d'un document numérique	1	1	1		1	1	1
Formuler une hypothèse				1			
Mettre en relation	1						
Décrire le comportement d'une grandeur			1				
Proposer une expérience	1			1	1		
Mettre en œuvre un protocole expérimental				1			
Utiliser un appareil.		1					
Faire un dessin scientifique		1					
Réaliser un graphique, un tableau, un schéma, une figure géométrique codée, un dessin scientifique ou technique en respectant des consignes et des conventions.			1			1	
Exprimer un résultat par une phrase correcte				1		1	
Confronter le résultat au résultat attendu, valider ou invalider l'hypothèse		1	1				1

Academic Website (Créteil)

For the teacher
Preparing a learning situation and / or an assessment

- Title, class, duration
- Objectives and origin
- Place in a progression
- What students know
- The choice and the scenario of the complex situation
- Instructions to be given to students
- The different media work
- The expected responses
- Criteria for success
- Aids, “helpers”

For the student

-Student's name, date, class
-Discipline, title
-Problem situation
-Instructions
-Various documents to exploit
-Task
-Success criteria
-Table of the competencies assessed: *unearned, strengthen, acquired, expert*

Difficulties and differences in interpretation of the assessment "*to practice investigation, to solve problems*"

In the interpretation of complex task and on the number of skills to assess in a situation.

On the links between learning and assessment.

The multitude of texts, published since 2005, on methods of teaching and assessment have generated difficulties for teachers, perplexed by a lot of documents perceived as contradictory injunctions

3. Assessment of scientific investigation and problem solving in the classroom

- Collaborative process and design project, between teachers and science education researchers
- Build learning tasks articulating process of investigation and introduction of skills assessment
- http://pegase.inrp.fr

Pour les **P**rofesseurs et leurs **E**lèves
un **G**uide pour l'**A**pprentissage des **S**ciences et leur **E**nseignement

Pegase website is aimed at French (and French-speaker) physics and chemistry teachers and trainers at secondary schools. This website has been designed through a long term collaborative process between physics teachers and science education researchers. Teacher can find complete teaching sequences, with fruitful comments and videos from teaching situations. For further information, more general resources are available in the “Professional Development” section. These resources are explicitly linked with teaching activities. They can be used by teachers’ trainers.

?
sur la plage,
erait voir les
l. Pour cela il
érents, soit il
le plus court
s, soit il peut

sse Philémon

permet de
sé.
réalisez vos

1 était-elle

One summer day, sunlight, barefoot on the beach, Philemon dream of ice cream. He would like to see the flavors of ice cream that offers the merchant. For that it has the ability to use two different paths, or it can cut through the dunes by the shortest path but this path is formed of black boulders, or he can walk on the beach consists of white pebbles.

1. *Question: In your opinion, what pushes Philemon to choose to go through the beach?*
2. *Protocol: Propose a protocol that helps answer the question with the equipment proposed.*
3. *Experimentation: After approval of the teacher, make your experiment*
4. *Comments your observations*
5. *Results: was your answer to question 1 correct?*
6. *Conclusion: What can you conclude?*

Self-assessment

In this activity, I have	I don't know how	I don't really know yet	I can do
Identified a problem			
Participed in the design of a protocol			
Implemented a protocol			
Extracts information from an experiment			
Validaded or invalidaded a response			
Reached a conclusion			

Evaluation methods
Request of students
during classroom activities

- Skills assessment through direct observation of students in a situation
- The teacher asks for oral explanations
- Verbal explanation allows the teacher to understand how student constructs gradually the sense of what he is doing.

Assessment and validation

- Validation in the individual booklet of skills and knowledges of the student.
- How to articulate assessment and validation in the booklet ?
- Necessity of some uniformity, same type of assessment beetween team of teachers
- Teaching is *designing*, teaching is *collaborating*

Collective teacher work and IBST

A French survey evidencing teachers representations through the diversity of scientific domains (mathematics, biology, physic - chemistry…)

IBST requiring collaboration and collective thinking (Monod-Ansaldi & Prieur 2011)