

# Assessment for learning: Social science teachers' ideas on assessment of causal understanding

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## Abstract

The main *objective* of this work, carried out as part of a series aimed at identifying teachers' ideas on assessment, was to identify social science teachers' ideas on how causal understanding should be assessed when assessing *for* learning. After establishing the psychological model from which teachers' ideas should be evaluated, 68 secondary school teachers were asked to design assessment situations adequate for the mentioned purpose. Results showed convergence of data coming from Brazil and Spain and enlightened specific characteristics of teachers' ideas on causal understanding assessment. So they are useful for designing teachers' training programs on students' assessment.

**Keywords:** Causal understanding assessment, Assessment in social sciences, Knowledge assessment, Teachers' thinking.

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## Introduction

There is growing interest among psychologists and educators in knowing what personal and environmental factors affect learning motivation, understanding and conceptual change in order to favour these processes (Alonso-Tapia & Pardo, 2006; Limón & Mason, 2002). According to recent developments (Black & William, 1998; Birembaum, 2003; Birembaum et al. 2006, Segers, Dochy & Cascallar, 2003) assessment is one of the environmental factors that most influences learning activities and the promotion of understanding and knowledge and abilities acquisition. So, in order to improve students' learning it seems necessary to change not only instruction but also *teachers' perspective on assessment* (Dochy, 2005). Instead of "testing" the amount of knowledge that students have, assessment should provide information –to the teacher or the student him/herself- that could help students to overcome their difficulties and to self-regulate their understanding and learning processes.

However, there is evidence that the preferred ways of assessment of many teachers have many shortcomings (Black & William, 1998; Segers, Dochy & Cascallar, 2003). Assessment tasks are often not valid criteria of understanding and cognitive ability, as they rely mainly on rote learning (Crooks, 1988; Villa & Alonso-Tapia, 1996). In fact many tasks do not allow teachers to identify the source of students' difficulties, and so feedback lacks the necessary quality to be of help for overcoming learning problems.

In a recent paper Birembaum et al. (2006) point to the shortcomings of current assessment practices and suggest alternatives directions to overcome them. However, this review does not deal with the nature that *specific tasks* related to different learning objectives should have in order to promote understanding and conceptual change. This was a problem examined for us in a previous work (Alonso-Tapia (2002). According to this work, when trying to promote understanding and conceptual change-assessment contexts should had several characteristics from which three of them are relevant for the purpose of this paper: a) Most suitable tasks are those demanding the *application and use* of knowledge for solving problems implying some degree of novelty (*analogous* and *transfer tasks*); b) tasks should be designed to allow teachers to identify specific factors in students that hinder understanding; and c)

the assessment process should cover the different nodes and links of the conceptual or procedural network that the students are supposed to have construct.

In the context of these ideas, the following questions arise: *1) what are the characteristics of assessment tasks actually used by teachers? 2) What are teachers' ideas about how knowledge and abilities should best be assessed to favour understanding?*

In relation to the first question and within the limits of Social Sciences –the area of our research-, previous studies had shown that assessment tasks used by secondary and high-school social science teachers demand mainly rote-memory (Villa & Alonso-Tapia, 1996; Black and William, 1998; Crooks, 1988), though the possible tasks are multiple (Alonso-Tapia, 1997). However, according to explicit objectives of the Spanish and Brazilian curriculum, the study of social sciences should make students able *to understand* information contained in different kinds of document *and to build causal models* useful for assessing critically present social problems. Nevertheless, neither the mentioned abilities nor the kind of understanding implied by the causal models build by the students are usually assessed.

The assessment problem just mentioned could be due to the fact that teachers had inadequate or erroneous ideas about what constitutes a valid indicator of the abilities being assessed, of causal understanding or of specific factors in students that might hinder comprehension. If this was the case, teacher training should try to change such ideas.

For example, according to psychology, the ability to understand and extract information from different kinds of document is shown when assessment tasks meet certain criteria. Thus, it is not possible to identify clearly text comprehension at some levels of representation –the level of the propositional and situation models- if students are asked only to explain the meaning of words contained in the text, as it often happens. It is necessary to ask the students to make some kind of summary of its meaning and to use text information for solving problems of some kind. That is, assessment tasks need to meet criteria defined by psychological models of mental representations and processes to be valid as indicators of ability, understanding and reasoning. This is especially important if assessment is aimed at identifying the kinds of feedback and help that should be given to students in order to improve their meaningful learning.

Therefore, with the aim of identifying *strengths and shortcomings in teachers' ideas* about what constitutes a valid indicator of causal understanding, and of the remaining abilities being assessed *eight similar studies* were designed, using the same sample. However, due to space limitations, the objective of the present paper is to present only the results of the study related to ideas on assessment of causal understanding. Nevertheless, before presenting results, it is necessary to answer a previous question: what criteria should be used to evaluate the adequacy of teachers' ideas on causal understanding assessment?

## **Theoretical Framework**

Teachers of Social Sciences –Geography, History, Economics, etc.- try that their students understand why social organisation and dynamics are different and change depending on time and geographical area. To achieve this objective, students have to understand the concepts created by experts in these sciences for describing and explaining the organisation and dynamics of society. However, this objective is difficult to achieve because of the naïve ideas that they have about the nature of History and social functioning (Voss, Wiley & Kennet, 2004), about the nature of causality (Voss, Ciarrochi & Carretero, 2004) and about historical evidence, etc. So, assessment tasks and criteria should warrant a) the validity of inferences on student's understanding of causal relations, and b) the identification of factors responsible of understanding difficulties in order to decide the kinds of feedback and help that should be given to students to make possible their progress. However, what does *understanding of social changes* imply?

*Understanding social changes* implies the construction of plausible causal models able to explain them (Leinhardt, 1994), even though such models have to be hypothetical and revisable, as they depend on available evidence and this may change. However, when and in what degree can we say that a student has built an adequate causal model for explaining a particular kind of social change? Let us consider, for example, the basic causal model of the French Revolution presented in Figure 1 that students 13-15 years old are supposed to construct and understand according to the content of most Spanish history textbooks that have been examined.

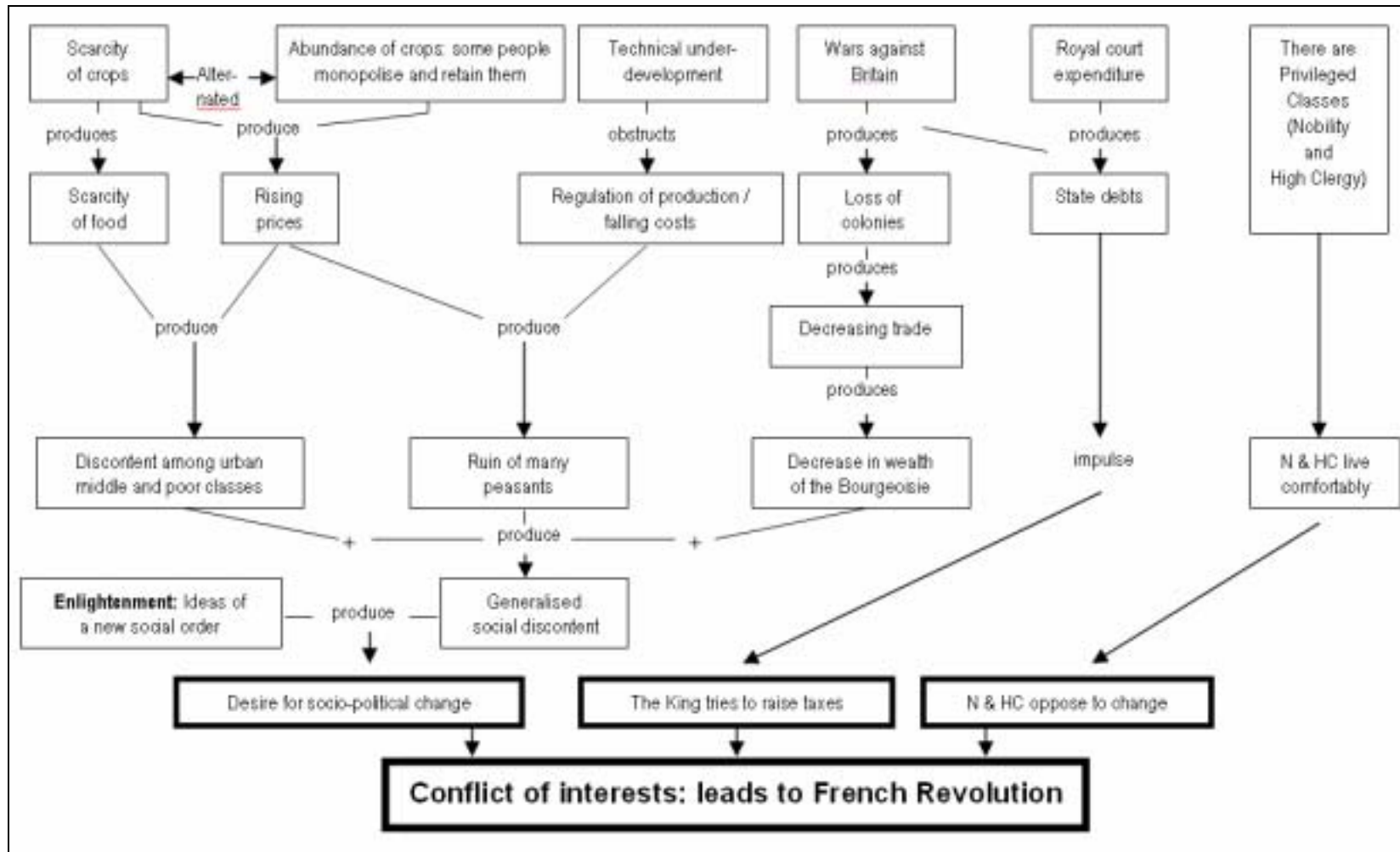
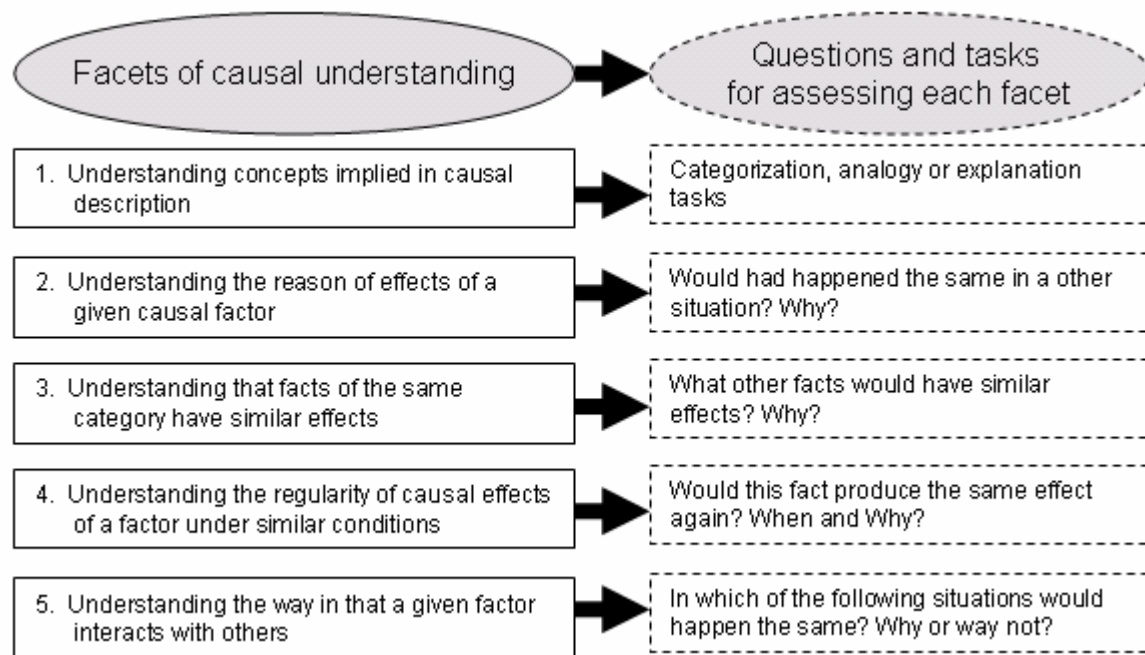


Figure 1. Basic causal map of “The French Revolution” for students 13 to 15 years old. (Alonso-Tapia, Asensio, Salguero & Villa, 1997)

What should be assessed and how –what kinds of task should be used- in order to see whether such a model has been understood and not only memorised, and what are the reasons of students’ understanding difficulties? And what is more important, what are the tasks that teachers use for this purpose? In order to answer these questions it is worth considering the conditions supporting the building of causal models.

The adequate construction of a causal model able to explain a social change implies, in the first place, knowing the facts and factors that were responsible of it, but this knowledge is not enough. It is also necessary to understand the reason because of which a factor may have had a causal effect on this change. Such understanding implies at least the five processes described next and summarized in Figure 2



**Figure 2: Facets of causal understanding and basic questions and tasks for assessing them.**

1) Students must *understand the concepts* used for describing the different facts and phenomena that change or contribute to the change. However, what does it imply to understand a concept? According to Dole and Sinatra (1998), psychologists recognise that *conceptual understanding* -acquiring or organising conceptual knowledge- implies constructing some sort of mental representation in the form of scripts, frames, schemata, beliefs, etc. (Anderson & Pearson, 1984; Rumelhart & Ortony, 1977; Shank & Abelson, 1977). Nevertheless, it is important to point out that that this construction implies two different processes.

In the first place, *conceptual understanding* implies *concept formation*, the construction of categorisation rules by which: “to render discriminably different things equivalent, to group the objects, events and people around us into classes and to respond to them in terms of their class membership rather than their uniqueness” (Bruner, Goodnow & Austin, 1956, p.1). According to most authors (Ashby & Maddox, 2005; Markman & Ross, 2003; Murphy, 2002; Smith & Medin, 1981), it is not necessary that the mental representation of this rule includes all attributes of the concept. It may be by an exemplar or a prototype allowing the categorisation of phenomena on the base of their similarity to structural, functional or relational characteristics of it. Therefore, understanding a concept implies the building of a representation allowing such categorisation.

In the second place, *conceptual understanding* implies *concept identification*, the association of the rule underlying a verbal term to that term, an association that requires prior formation of the concept. Sometimes students may have formed a particular concept, as can be inferred from their reactions to exemplars and non-exemplars of it, but they do not know the verbal label. For example, students may react to the listening or reading of pronouns by looking for their referents without associating the word “pronoun” with them. Other times, they associate a verbal label to conceptions different from those that experts attach to this label. For instance, this is the case with the concept of “alive”, which evolves from meaning, “to be in motion” to “be born, to grow and to die” (Delval, 1975; Piaget, 1926).

It is not difficult to associate the correct verbal label to a concept *as long as* a person has formed the correct categorisation rule. Thus, from our point of view, if assessment is aimed at deciding which instructional aids should be given to students in order to favour conceptual understanding, assessment activities should focus on the student’s rules for categorising phenomena. These rules become manifest in categorising or predicting behaviour and in the explanation of it, and not in remembering the definition of concepts, because a definition is a “fact” that can be remembered, but being able to recall a fact does not warrant adequate understanding. For example, if a student is asked “what is a bourgeois?” he or she can answer saying that is a rich person that lives in a city. However, when asked if a person that owns large properties in the country but lives in a city and belongs to the royal court is a bourgeois, the answer could be wrong if the categorisation rule used is incorrect.



2) Students must be able *to categorise historical events in relation to the role they play in social change*. Historical events can be classified into different categories: there are natural, demographic, technical, economic, social, political, military, personal, ideological and religious events, to mention only some. These different categories of events may play systematic roles in the organisation and change of human groups and societies unless there are counteracting factors. For instance, the application of technical innovations to production - crop rotation, fertilisers, computers, etc.- plays always a similar role: it helps to increase production rates and to decrease the workforce needed to achieve the same outcomes. If this is the case, knowing the roles played by different categories of facts may be of great help in order to understand the present and, what is most important, to anticipate what might happen if facts playing the same roles took place. So, student's capacity for categorising historical events and for applying their knowledge of the role played by the different categories of facts to explain historical events and to infer possible courses of action and historical change can be considered as an index of causal understanding. Again, tasks best suited for assessing this aspect of historical causality are categorisation and prediction tasks similar to the tasks presented in Table 1 for assessing whether students understand some of the causal relations shown in Figure 1, as well as tasks demanding explanation of causal roles played by specific factors (Alonso-Tapia & Villa, 1999); Alonso-Tapia et al. 2004).

**Table 1. Example of task and questions designed for assessing causal understanding. (Alonso-Tapia, Asensio & López, 2000a).**

A. Imagine the situation described in Box 1. There are four countries differing in the amount of crops they harvest over several consecutive years. In some of these countries there are groups of people that monopolise and retain most of the crop, whereas in other countries there are no such groups. (The situation of some of these countries is similar to the French situation just before the French Revolution (FR)) Thus, taking into account this fact, answer the following questions.

Box 1	There are people that monopolise and retain crops	Annual crop		
		First Year	Second Year	Third Year
Country A	Yes	Scarce	Average	Scarce
Country B	Yes	Abundant	Scarce	Scarce
Country C	No	Abundant	Scarce	Scarce
Country D	No	Scarce	Average	Average

- a.1. In which of the countries will agricultural prices rise most? \_\_\_ Why do you think this?  
How does the crop affect prices? \_\_\_ Why?  
How does the monopolisation and retaining of crops affect prices? \_\_\_ Why?
- a.2. In which of the countries will peasants to become impoverished more likely? \_\_\_ Why?
- a.3. In which of the countries will urban middle and poor classes become discontented? \_\_\_ Why?

B. Imagine five countries each one equal to the other in everything except the characteristics described in Box 2. Answer the following questions. (Taking into account what you have learned during the study of the FR)

Box 2	Country				
	A	B	C	D	E
It has lost its colonies	Yes	No	Yes	Yes	Yes
Other countries sell at lower prices	Yes	Yes	No	Yes	No
Crops have being worsening	Yes	Yes	No	No	Yes

b.1 In which country is trade more likely to diminish? \_\_\_\_ Why do you think this?

C. Imagine five countries each one equal to the other in every thing except the characteristics described in Box 3. Answer the following questions. (Taking into account what you have learned during the study of the FR)

Box 3	Country A	Country B	Country C	Country D	Country E
Trade with other countries	Flourishing	Diminishing	Diminishing	Flourishing	Diminishing
Prices	Rise	Rise	Rise	Established	Rise
Taxes	Rise	Rise	Established	Rise	Rise
Rights and duties of social groups	Different	Different	Different	Equal	Different

c.1 *In which country would be more likely that some group was interested in changing the way it was governed? \_\_\_\_ Why do you think this?*

c.2 Why not each one of the other countries?

D. Imagine three countries whose economy is bad –prices rise, there are many people almost starving, etc.- and where taxes are high due to state expenditure and debts, as in the epoch of the French Revolution. Imagine also that citizens of each one of these countries differ in their way of thinking, being the dominant ideas in each country the following:

Country A	Power must be hold by only one person. He/she must legislate, has to be able to force law accomplishment and, if this is not the case, has to be able to punish those being guilty.
Country B	Goods belong to everybody. Let us organise production collectively and give them to each person according to his/her needs.
Country C	The right to private property is fundamental. Therefore, every government has the obligation of making it to be respected.

d.1. Would it be likely or not that in any of these countries the way of government changed as it happened in the epoch of the French Revolution? If such a change took place, would it be similar or not to that of the French Revolution? \_\_\_\_\_. Why do you think in this way?

3) Students must *understand the interactions between different factors in producing social changes*. When students understand the conditions that help or obstruct the appearance of a particular effect, their comprehension of historical causality increases. However, understanding such interactions is a complex process. First, students’ implicit ideas about concepts such as inquiry, evidence, explanation and cause change and influence the interactions that

children of different ages are able to understand and built (Lee, Dickinson & Ashby, 1996). Second, understanding interactions implies to know not only that two or more factors produce an effect when combined, but also the nature of such combination: whether it is necessary and sufficient, necessary but not sufficient, sufficient but not necessary or whether it is only a facilitating factor, concepts on which they have intuitive ideas not always adequate (Voss, Ciarrochi & Carretero, 2004). For example, an increase of taxes can exert a causal role in a radical change like the French revolution. However, is it a necessary factor, a sufficient one or both? Or does it only facilitate an effect caused by other factors? ¿How does the increase of taxes interact with other factors in causing a revolution? When trying to answer questions like these, students need to take into account conditions whose presence or absence affect the validity of inferences about causality in a process similar to what natural scientists call “control of variables”. (Pozo & Carretero, 1989). For this reason, in order to assess causal understanding it is important the use of tasks showing whether students consider that the causal factors included their explanations of historical and social changes are sufficient or necessary, etc.

4) Students *must be able to transcend the past significance of a fact*. “Transcend” in this context means being able to understand three things: 1) A fact belongs to a given category of factors and interacts in different ways with other factors to produce a given effect; 2) if such a fact happened today in similar conditions, it would have analogous effects; and 3) these effects could be achieved or avoided acting on conditions favouring the appearance or the neutralisation of the fact considered. For example, if under certain conditions tax increase to support military expenses can contribute to the debilitation and disappearance of an empire like the Roman, a country need peace politics in order to avoid the need of having a big army and so, to increase taxes up to an unbearable level. Obviously, if tax increase happens in conditions different from those that took place at the end of the Roman Empire, the effects could be also different. Nevertheless, it is important to know the general applicability of this and others historical lessons to avoid their negative consequences.

5) Students *must be able to see that models of historical and social organisation and change are the result of interpretations* more or less supported by evidence, and that these interpretations are subjected to change if evidence or its interpretation change. The achieving of this objective is difficult because students are usually taught to accept without questioning the information given by teachers and textbooks (Gardner, 1991; McKeown & Beck, 1994).

So, it is important to assess whether students understand the subjectivity of historical interpretations in order to give them the adequate correcting help if necessary.

In summary, understanding social organisation, functioning and change is not an all or none problem. Facts are first known and then gradually understood as new information is gathered and integrated with what is already known (Alonso-Tapia, 2002; Dole & Sinatra, 1998; Limón, 2002; Pozo & Rodrigo, 2001; Rodrigo & Correa, 2001). This process, however, may give place to misunderstandings and wrong causal models depending on students' previous knowledge, on the focus and process of learning activities and on assessment planning and tasks. So, it is important to know the specific factors that hinder comprehension.

Given that understanding social organisation and change in different places and at different times depends on the five processes just described, *what kinds of data can be considered as valid criteria of understanding?* According to the above ideas, understanding will not become manifest in the reminding of facts or of the "listened" explanations of their causes and effects, though this is the criteria most often used by teachers (Villa & Alonso-Tapia, 1996). On the contrary, students will show their causal understanding when they are able a) to categorise historical facts, b) to predict the most probable outcomes of a factor in a given situation according to the mental models supported by historical or social evidence, though hypothetical en revisable, c) to build narrative explanations -not previously known -of groups of given facts, d) to explain what would have most likely happened if a given factor would have not been present, and e) to deduce the line of action probably most adequate in a present situation in the light of effects that alternatives lines of action have had in the past. However, *what are teachers' ideas about how causal understanding should best be assessed in order to identify students' difficulties and to decide how to help them?* To answer this question is the objective of the present study.

## **Method**

### *Participants*

68 subjects, 38 Spanish Secondary and High School teachers (17 men and 21 women, mean age 40.39) and 30 Brazilian teachers of the same levels (15 men and 15 women with

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ages lower than 40 in all cases) that volunteered to participate in the study after being asked to do it, formed the sample of the study.

### *Materials*

All the teachers were given the following task for get evidence about their ideas on how *causal understanding should be assessed*:

*According to our curriculum objectives, students must understand different kinds of causal relations between historical events –simple, multiple, necessary, sufficient, facilitating causes, etc.—in order to reach a plausible causal explanation of them. With this assumption: What kinds of task or question would you give to your students for assessing causal understanding in relation to the French Revolution?*

As can be seen, the question was left open in order to avoid suggestions about how causal thinking in social sciences should best be assessed. According to the nature of causal understanding above described, teachers should ask questions demanding not “rote learning” of historical and social facts, but the application of mental models to categorising social causes and effects, to explaining the role played by particular factors, to predict outcomes most likely to occur given different contexts –demographic, economic, political, technical, religious, etc.- and to apply such models to decide the lines of action more adequate nowadays given also particular sets of conditions. However, in order to create a minimum common context for all the teachers, we asked them to answer the question in relation to the French Revolution.

### *Procedure*

Teachers' answers to each question were coded using seven categories. Six categories were derived from psychological ideas on the nature of conceptual and causal understanding above described. A last category was added in order to include the tasks and questions proposed by teachers that could be answered without causal understanding. No other category

was needed. Then, questions proposed for assessing *causal understanding* were coded in the categories shown in Table 2.

**Table 2. Categories used for coding questions and tasks for assessing students' causal understanding, and examples of each category.**

<p>1. <i>Questions aimed at testing whether the students were able to differentiate causes as a function of:</i></p> <p>a) <i>Their nature: natural, demographic, technical, economic, social, political, military, etc.</i></p> <ul style="list-style-type: none"> <li>● (In a given a text on the French Revolution) Point out the causes and classify them as economic, social, political and religious ones.</li> </ul> <p>b) <i>The kind of causal relation: necessary, sufficient, facilitating, primary, secondary, structural, etc.</i></p> <ul style="list-style-type: none"> <li>● Did the situation in France between 1785 and 1788 make the Revolution unavoidable?</li> <li>● (In a given text on the French Revolution) Tell whether the causes are principal or secondary and explain why you think they are like that</li> <li>● Which of the following causes are structural (E), and which are temporary (T)? 1) Rising of bread price. 2) The bourgeoisie looks for the political power. 3) Economic stagnation of the Ancient Regime. 4) Rising of national expenditure because of the war with the American colonies.</li> </ul> <p>c) <i>The temporal distance between cause and effect: remote, close, etc.</i></p> <ul style="list-style-type: none"> <li>● Define what are <i>direct and indirect causes</i>, and give examples of each kind of cause related to the French Revolution.</li> </ul>
<p>2. <i>Questions aimed at testing whether students' remembered the causes and consequences of historical or social events.</i></p> <ul style="list-style-type: none"> <li>● Describe the effects of the USA independence on the French Revolution.</li> <li>● What were the philosophical, political and economic causes that favoured the French Revolution</li> <li>● Why did the French Revolution happen?</li> <li>● What were the consequences of the General States meeting?</li> <li>● Was there any relation between the rise of wheat prices and the burst of the French Revolution?</li> </ul>
<p>3. <i>Questions aimed at testing whether students' were able to elaborate a scheme or diagram making explicit the causal relations between different events.</i></p> <ul style="list-style-type: none"> <li>● Draw a diagram of the relationships between the different causes of the French Revolution and of three effects on each of the three social states.</li> <li>● Draw a diagram connecting with arrows the causes and consequences of the French Revolution.</li> <li>● Explain by means of a conceptual map the causes of the French Revolution.</li> </ul>
<p>4. <i>Questions aimed at testing whether the students understand the causal role played by particular factors.</i></p> <ul style="list-style-type: none"> <li>● Suppose there had been enough food. Would the Revolution had happen? Explain your answer</li> <li>● Suppose nobles had give way. Would the Revolution have burst? Explain your answer</li> <li>● Could a rise of taxes be the cause a revolution? Explain your answer.</li> </ul>

5. <i>Questions aimed at testing whether students' perceived that factors of a particular kind tend to produce consistently a given effect.</i>
<ul style="list-style-type: none"><li>• Imagine four countries with the following characteristics (Students are given pairs of characteristics that are similar or partially or totally opposed to the characteristics of France just before the French Revolution). Which of them would likely have a revolution similar to the French? ¿Why?</li></ul>
6. <i>Questions aimed at assessing whether students perceive the subjectivity of causal interpretations.</i>
<ul style="list-style-type: none"><li>• Suppose that tour textbook said that French Revolution was supported mainly by the bourgeoisie, but your teacher said that there is evidence that nobles were as supporters as bourgeois. Which of the two points of view do you think is correct? Why do you think so?</li></ul>
7. <i>Questions demanding the remembering of facts without asking to do any reference to causes or consequences</i>
<ul style="list-style-type: none"><li>• Describe how people lived, the political system and the cultural values.</li><li>• Analyse the social pyramid of the French Revolution epoch.</li></ul>

Answers were coded independently by at least two persons, reaching initially a high degree of interrater agreement (more than 90%). Where discrepancies arouse, they were discussed until a final decision on categorization was reached. Then, the proportion of teachers suggesting tasks falling in each category was calculated and analysed using the binomial test, showing specific strengths and shortcomings of teachers' ideas on what can be considered valid indicators of causal understanding. Moreover, in order to test for differences of use between categories and to see whether assessment strengths and weaknesses were a problem common to Spanish and Brazilian teachers for each category, chi-square analyses were carried out.

## Results

According to criteria of causal understanding previously established, teachers should have proposed a set of questions for categories related to each one of the comprehension levels, and not the remembering of historical and social events. This fact implies that the use of the first seven categories should have been approached 100% -though the use of the seventh would have been correct or not depending of the degree in which the previous levels had been also assessed- and that of the eight, near 0%. Nevertheless, the analysis of the degree in which each category was used showed that the situation is far from this ideal. In fact, the observed proportions in categories 1 to 7 are significantly lower than the desired value 0.99 ( $p < 0.0001$ ) and the proportion in category 7 is significantly higher than the desired value 0.01 ( $p < 0.0001$ ). Data on causal understanding assessment are shown in Table 3.

**Table 3. Percentages of teachers using each category of questions for assessing *students' causal understanding* ,and differences between Spanish and Brazilian teachers.**

CATEGORIES OF QUESTION	% of teachers using them						Differences	
	Total N: 68		Spain N: 38		Brazil N: 30		$\chi^2$	p
	F	%	F	%	F	%		
1. Questions aimed at testing whether the students were able to differentiate causes as a function of:								
a) Their nature: natural, demographic, technical, economic, social, military, etc.	1	1,4*	1	2,6	0	0,0	.80	.37
b) The kind of causal relation: necessary, sufficient, facilitating, structural, etc.	2	2,9*	1	2,6	1	3,3	.03	.86
c) The temporal distance between cause and effect: remote, close, etc.	1	1,4*	1	2,6	0	0,0	.80	.37
2. Questions aimed at testing whether students' remembered the causes and consequences of historical or social events.	39	57,3*	22	57,9	17	56,6	.01	.92
3. Questions aimed at testing whether students' were able to elaborate a scheme or diagram making explicit the causal relations between different events.	2	3*	1	2,6	1	3,3	.03	.86
4. Questions aimed at testing whether the students understand the causal role played by particular factors.	2	2,9*	1	2,6	1	3,3	.03	.86
5. Questions aimed at testing whether students' perceived that factors of a particular kind tend to produce consistently a given effect.	0	0*	0	0	0	0	-	-
6. Questions aimed at assessing whether students perceive the subjectivity of causal interpretations.	0	0*	0	0	0	0	-	-
7. Questions demanding the remembering of facts without asking to do any reference to causes or consequences	8	12**	0	0	8	26,6	11,5	.001

\* Value significantly different from .99.  $p < 0.0001$

\*\* Value significantly different from .01.  $p < 0.0001$

The analysis of these results shows the following facts:

- a) First, there are big differences in the degree in which teachers have proposed the several kinds of question for assessing causal understanding (from 0% to 57.3%, mean 8.98%). Most categories are almost empty. The main exception is the category “questions aimed at testing whether students’ *remembered* the causes and



Assessment for learning: Social science teachers' ideas on assessment of causal understanding consequences of historical or social events". These questions are suggested as valid criteria by 58% of teachers. This datum is coherent with results found by Villa and Alonso-Tapia (1996), in which 68% of questions actually asked by Secondary and High School teachers demanded from the students the recall of facts and of explanations given by their teachers. The review of Black and William (1998) has found similar results. However, remembering does not imply necessarily understanding, as Voss, Wiley and Kennet (2004) have shown after examining the role of research methodology in the conclusions reached on students' understanding. A student can remember without understanding what is remembered, or can understand without being able to recall.

- b) Second, the category "Questions demanding the remembering of facts without asking to do any reference to causes or consequences" is the second category most frequently suggested, but only by Brazilian teachers (26%), as it is the only category in which differences between the two countries have been significant. This fact, as the previous one is also negative because it implies that many teachers consider as valid indicators of causal understanding the answers to questions that are not adequate for assessing it.
- c) Third, as has already been said, the percentage of teachers that suggests questions or task of the remaining categories is very low.
  - There are almost no questions aimed at testing whether the students were able to differentiate causes as a function of their nature -natural, demographic, technical, economic, social, political, military, etc.- (0.4%). Teachers may make explicit the kind of cause they are referring to if the "standard" or most accepted explanation demands such reference. However, the lack of a systematic assessment of the capacity of distinguishing between each kind of cause makes difficult to know whether students are able to consider the potential causal role of these different kinds of factors.
  - The use of counterfactual questions of the type: "Would B have happened if A had not occurred?" make ease to assess whether the student consider or not A as a necessary cause. In a similar way, the use of questions of the type: "Do you think

that each time A occurs, B occurs too?” make it easy to assess the sufficiency of a cause. However, in spite of the importance of distinguish between both kinds of causal relation -necessary, sufficient, etc.- (Voss, Ciarrochi & Carretero, 2004) and that it is very easy to assess them, only 2% of teachers pointed to the importance of assessing these aspects of causal understanding.

- Only 3% of teachers suggested to ask questions aimed at testing whether students’ were able to elaborate a scheme or diagram making explicit the causal relations between different events and to explain it. One could think that a percentage so low is due to the similarity between this task and that of remembering a causal explanation. However, it is not necessarily so, such as Lee et al. (1996) suggest. These authors gave the students several possible causes written in boxes to explain a fact -the invasion of Great Britain by the Roman Empire-, also written in a box. Students had to draw arrows starting in box representing causes and ending in the fact to be explained. They could also draw arrows connecting causal factors between them, as if they formed a causal chain. Finally they had to explain their options. This task implies cognitive processes different from remembering because the student is confronted with the need to justify his or her options.
  
- Again, only one Spanish teacher suggested the need to assess whether the students understand the kind of causal role played by specific factors using questions similar to that exemplified in Table 3, category 4, and no teacher has suggested the use of questions aimed at testing whether students’ perceived that factors of a particular kind tend to produce consistently a given effect (category 5). However, as it happened with questions commented in the previous paragraph, these questions are especially adequate for assessing causal understanding because the students have to explain their answers, what obliged them to make explicit the mental representation of the causal relation explored.
  
- Finally, no teacher suggested assessing whether students understand that causal explanations are “interpretations”, that is, that they are subjective and might change.

## Discussion and Conclusions

Before entering the discussion, it is important to note that although the sample was small, data from both countries were very similar. Moreover, these results are similar to those found in the pre-test data of an intervention study using a different sample (Alonso-Tapia, 2004). These facts convey great relevance to our results as a pilot diagnostic of social science teachers' strengths and limitations in relation to assessment.

It was pointed out at the beginning of this paper that, in order to know the kind of feedback and help that teachers should give to their students for improving causal understanding, an adequate assessment of facets of causal understanding was needed. Previous studies (Villa & Alonso-Tapia, 1996) had shown that social science teachers assessed rote-learning most of the time. This practice is inadequate because remembering does not necessarily imply understanding. The question was then whether teachers' assessment practices were inadequate for practical reasons or because their ideas about how to assess conceptual and causal understanding were inadequate. To answer this question the present study has tried to determine whether teachers' ideas on how to assess conceptual and causal understanding have the characteristics that, according to psychology, allow a valid assessment of these processes.

However, the results have shown that Spanish and Brazilian teachers' ideas on causal understanding assessment are not adequate. They consider that being able to remember the causal models described in textbooks or explained in class provides enough evidence of understanding and, with the exception of one teacher or two, they do not mention other kinds of question or task. A quite acceptable situation would have been that each teacher had suggested questions for assessing the different aspects of causal understanding described in the theoretical section, but in relation to the basic model of the French Revolution presented in Figure 1. They could have suggested, for example, the assessment of concepts implied in causal explanations through categorization tasks, and the use of tasks and questions of the type included in Table 1. As can be seen, they are hypothetical situations designed to assess conceptual understanding of some causal relations included in Figure 1. Each situation is followed by questions asking for inferences about what might happen in relation to prices, impoverishment of peasants, problems of city dwellers, etc. Students have to justify their answers,

so that the mental representations determining them can be detected. Moreover, as it has been mentioned above, teachers could have suggested also counterfactual questions of the type: “Would have happened B if A did not had occurred?” or “Do you think that each time A occurs, B occurs too?” to assess the necessity or the sufficiency of a cause, etc. Of course, all these kinds of questions can be asked when giving traditional exams or in the context of new ways of collecting evidence –performance tasks, learning journals, portfolios, etc.- (Alonso-Tapia, 2002; Birembaum, 2003).

In summary, on one side this study has shown specific shortcomings in teachers’ ideas about how causal understanding should best be assessed. Shortcomings indicate that it is necessary to promote a reflection from the part of teachers on the degree of adequacy of the tasks that they consider as valid criteria for assessing conceptual and causal understanding and to suggest them alternative assessment models, as it has been already proposed (Alonso-Tapia, 1997, 2002; Birembaum et. al., 2006; Davies & LeMahieu, 2003). On the other side, this study has shown also the usefulness of exploring teacher’s thinking related to assessment by means of open questions demanding the design of real assessment tasks, and of using the theoretical models provided by psychology about each one of the processes that are the object of assessment for evaluating the adequacy of these tasks. If the use of this methodology showed also the inadequacy of tasks used for assessing the degree of acquisition of other cognitive abilities that social sciences teaching should favour, such as those implied in understanding the information included in different kind of documents –texts, tables, graphs, objects, etc., teacher training should offer also alternate models for assessing these cognitive abilities. Nevertheless, this is a task for forthcoming papers (Alonso-Tapia and al., 2006).

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