

# TEACHING-LEARNING ONLINE STRATEGIES: CONCEPTUAL CHANGE AND NEGOTIATION

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## ABSTRACT

The paper defines a learning design methodology and the related strategies in which the activities are planned in order to move the discursive interactions to the center of the process and to adjust and transform the educative methods according to the online educational context. Peer discussion and negotiation are the core activities proposed to obtain conceptual change in online learning. We aim to investigate the methodology's effectiveness in different knowledge domains. We show the results of the experiences conducted adopting this methodology in the following courses at the University of Macerata: Child Observation in School Context Workshop (academic years 2006-07); Developmental Psychology Course (academic years 2005-06); Educational Psychology Course (academic years 2006-07). As general outcomes, the experiences allow us to outline a set of guidelines and a model useful to plan and organize online learning activities.

## KEYWORDS

Conceptual Change, Negotiation, Peer Discussion, Learning Design, Teaching-Learning Strategies

## 1. INTRODUCTION

According to socio-constructivist theories, we assume learning as an outcome of social and discursive interactions (Gee & Green, 1998), including both disagreement and agreement (Doise & Mugny, 1981; Pontecorvo, 1993; Carugati & Selleri, 2001). In this approach, knowledge is considered the result of *construction of meaning* and *negotiation* that happen within social exchanges (Bruner, 1990; Pontecorvo, 2005), so that teaching is not just a simple transfer of information, but is an active building of data and understanding situated within authentic relationships and tasks (Scardamalia & Bereiter, 2002). Along with individual cognitive arrangement, we refer to the notion of *naïve theories* and *expert* ones considering *conceptual change* as a transition from the first to the second ones (Mason, 2006). Becoming aware of the limits or the mistakes of subjective theories is the first step towards better organization of meanings. Every teaching-learning process aims to facilitate a makeover *from naïve to expert approach*. In agreement with Gardner (1991), a *naïve student* is a student who has a collection of theories built on direct experiences, made through simplified deductions and put together without a strong organization. His or her cognitive processes

are based on conceptual structures that seem *theory like*, that is to say a compilation of consistent and connected knowledge, not always working correctly. The *expert student* instead can manage his or her knowledge in a proper way. He or she can use his/her competence in daily problem solving and apply correctly his/her understanding even in innovative ways or unknown situations. The whole learning activity aims to encourage the students toward a new awareness about their knowledge (Arfelli Galli, 1997; Nicolini & Moroni, 2005; Nicolini & Pojaghi, 2006).

The paper is organized as follows: section 2 outlines the methodology and proposes a general format for learning design. Then the three experimentations of the methodology are described: the Workshop of Child Observation in School Context (section 3); the course of Developmental Psychology (section 4) and the course of Educational Psychology (section 5). Section 6 draws some general conclusions.

## 2. TEACHING-LEARNING GUIDELINES and METHODOLOGY

The learning methodology aims to provide the teacher with further tools necessary to organize and lead effective online activities and to afford the students with the skills needed to handle the new communicative practices. As an output of a wider research, Nicolini & Moroni (2006) created a list of teaching/learning guidelines, as the starting point of the learning design. The guidelines of our approach are: active participation and direct practice; discursive negotiation; interest both about contents and relationships; teacher's and tutor's scaffolding; students' self regulation; reflection about learning experience; and employment of several instruments in teaching-learning activities. On the basis of these guidelines we outline a general learning methodology, summarized in table 1. The first column shows the plan of the activities; in the second column the related goals are specified; the third column refers to the methodological approach.

Table 1. The teaching-learning methodology

Core activities	Goals	Guidelines
Naïve theories recognition	Eliciting self explanation and using naïve theories	<ul style="list-style-type: none"> <li>▪ active participation and direct practice;</li> <li>▪ discursive negotiation;</li> <li>▪ interest both about contents and relationships;</li> <li>▪ teacher's and tutor's scaffolding;</li> <li>▪ students' self regulation;</li> <li>▪ reflection about learning experience;</li> <li>▪ employ of several instruments in teaching-learning activities.</li> </ul>
Peer discussion: analogies and differences	Discussing among peer to realize limits and errors of subjective point of view. Promoting conceptual change	
Peer discussion: negotiation	Searching and negotiating toward a possible agreement Promoting conceptual change	
Encounter with scientific theories	New knowledge acquisition supported by the activation of personal conceptions. Promoting conceptual change	
Hands-on activities	Applying new learning and new theories achieved	
Peer discussion: evaluation	Discussing among peer to evaluate the whole activities	
Self assessment	Encouraging metacognitive reflection	

Though the core activities are essential to obtain conceptual change, the model is flexible and the tasks can be planned taking into account the specific learning context. The model is an empty format that has to be personalized according to: general aim, learning objectives, knowledge domain, community characteristic, and physical and relational context.

## 3. CHILD OBSERVATION in SCHOOL CONTEXT WORKSHOP

The first experimentation we carried out concerned the workshop of "Child Observation in School Context", a practical course, organized during the academic year 2006/2007, finalized to train competences in child observation method. 88 students were involved in this experience.

### 3.1 Knowledge Domain: Child Observation

The workshop is addressed to the students of Sciences of Primary Education that will be teachers in their professional future. Observation is a specific ability required for teachers: when observing the children in school context they are supposed to assume a scientific approach.

### 3.2 Activities' Structure

The workshop consists of a system of progressive proposals, both subjective and collective. Table 2 illustrates the actions, the calendar, the goals and the performances, referring to the guidelines.

Table 2. Activities' structure, goals, tasks and calendar of the Child Observation in School Context Workshop

Timetable	Activity	Task	Goals	Links to the Guidelines
13rd nov 26th nov	1	Write down your idea of "observation" and then an observation text after downloading the videotape available at the url... Publish it.	Eliciting self-explanation and using naïve theories	Instrument: writing an observational text.
27th nov 10th dec	2	On the base both of your own observation written text and of the others' ones, create an individual table containing the necessary and sufficient indicators to realize the most complete and correct observation written text	Eliciting self explanation and using naïve theories	Instrument: building a table.
11th dec 23rd dec	3	Publish your own table. 1st web forum: within your own group find analogies and differences among the realized individual tables	Discussing among peer to realize limits and errors of subjective point of view Promoting conceptual change	Discursive negotiation; interest both about contents and relationships; reflection about learning experience; Instrument: web forum.
27th dec 07th jan	4	2nd web forum: within your own group discuss and negotiate till you agree to realize only one table. Then publish it.	Searching and negotiating toward a possible agreement Promoting conceptual change	Discursive negotiation; interest both about contents and relationships; reflection about learning experience; Instrument: web forum.
08th Jan 14th Jan	5	Read the recommended handbook	Meeting scientific theories Promoting conceptual change	Instrument: reading a book.
15th Jan 28th Jan	6	On the base of realized activities and apprehended concepts, realize by yourself an observation text related to videotape available at the url... The text has to be published	Applying new learning and new theories achieved	Reflection about learning experience; Instrument: writing an observational text.
29th jan 05th feb	7	3rd web forum: speak about the realized activity within your own group, expressing an assessment on the Child Observation in school context Workshop	Discussing among peer to evaluate the whole activities and their structure	Discursive negotiation; interest both about contents and relationships; reflection about learning experience; Instrument: web forum.
06th feb 10th feb	8	Send a personal dossier to the Faculty composed by written texts of every tasks (exercises, forum's interventions, observation texts, individual and collective tables, assessment of the workshop, self-assessment)	Metacognitive reflection and self assessment	Reflection about learning experience; Instrument: building an individual dossier.

The workshop is articulated in 8 tasks related to specific goals. First of all, the students are asked to give a definition of the term "observation" (activity 1). The goal of this task is to promote the self-explanation process (Chi et al, 1994). Self-explaining helps the participants to move from implicit to explicit understanding of the domain (Pine & Messer, 2000). At this point they have to experience the first hands-on activity, since they are asked to write their first school context observation, using the video available online (activity 2). The video is a real school situation recorded by an external observer. This activity is finalized to use theories and knowledge owned by the students before the learning process. Then, on the basis of both of their own observation written text and of the others' ones, the participants have to create an individual table containing the necessary and sufficient indicators to realize the most complete and correct observation written text. The use of different writing tools (in this case the table) is important in order to encourage different types of knowledge organization. The students are then asked to discuss within the web forum about analogies and differences realized among the individual observation texts (activity 3). The peers' discussions are finalized to recognize limits and errors of the subjective point of view shown in the observational texts. Research showed in fact that in conceptual change knowledge acquisition is greatly facilitated by interactions with peers (Vosniadou et al., 2001). In the fourth activity the students are asked to negotiate a shared list of indicators for the child observation, looking for a possible agreement. To reach this result, participants used argumentative strategies in order to challenge, claim their position, express agreement or disagreement, compromise and integrate ideas (Moroni et al., 2006). In a discursive paradigm conflicts loose any negative connotation. On the contrary, they are seen as important steps of the learning processes (Doise & Mugny, 1981; Carugati & Selleri, 2001). In this frame negotiation means bringing "differences into existence" (Mitchell & Andrews, 2000) and letting them interact in order to build new and more complex solutions. Only at this stage the students are asked to read the recommended books (activity 5). The encounter with the scientific theories is now facilitated by the naïve theories recognition, achieved through the previous tasks.

The new knowledge obtained by the study is established and mixed with the students' previous knowledge. The participants are supposed to compare the scientific theories with their definitions and, if necessary, to realize any potential mistakes in their previous works. The activity is therefore finalized to improve the awareness about the relevance of the internal world affecting any observation tasks. This understanding facilitates the move toward a scientific approach. On the basis of the realized activities and apprehended concepts, the participants now have to write a new observation text related to the second school-video available online (activity 6). This activity aims to enable the students to experience the professional practice in the light of the newly learned concepts and skills. The workshop offers to the participants the possibility to train the professional role and gives them a chance to put in practice some of the professional competences that they will have to manage once graduated, that is to say both observational and negotiating skills. Discussing in the web forum, the participants are then invited to speak about the realized activity within their group, expressing an assessment on the Workshop (activity 7). The activity's purpose is to encourage metacognitive awareness through peer discussion. Finally, the students send a personal dossier (activity 8) to the Faculty composed by written texts of every task. Collecting and composing a personal dossier is a further strategy planned in order to promote reflection and metacognitive attentiveness.

### 3.3 The Outcomes

In this section we shall focus our attention on the outcomes. In order to evaluate the Workshop, we intend to detect the presence of evidence for conceptual change and professional skills achievement from the analysis of participants' products. The examination was carried out by comparing the observation text realized by every student at the beginning of the course and the one produced at the end. Table 3 describes the main differences between unskilled and skilled observation texts.

Table 3. Naive and expert observation texts

Naïve observation text	Expert observation text
<b>Text structure</b>	
Short and free text	Long and structured text (titles, paragraphs, bullet points, tables)
<b>Context</b>	
Absence of information about duration and observational method adopted	Presence of information about duration and observational method adopted
Absence of information about the focus of attention and the aim of the observation	Presence of information about the focus of attention and the aim of the observation
Mishmash of description and interpretation of data	Separation between description and interpretation of data
Absent or incorrect use of text references and quotations	Presence of text references and quotations
<b>Linguistic expression</b>	
The text shows generalizations, abstractions, deductions without argumentations, all-encompassing conclusions	The text shows analysis of events and concrete objects with argumentations; conclusions supported by descriptive and concrete elements, with reference to details and intermediate passages
Use of his or her own point of view as an absolute one	Use of his or her own point of view as a relative one
References to unobservable data such as thoughts, feelings, intentions of the observed subject	References to observable data such as actions, language of the observed subject and observer's internal world
Use of impersonal linguistic forms	Use of personal linguistic forms
Absence or deficiency of cognitive verbs	Presence and explicit use of cognitive verbs

Table 4 shows in a synthetic way the results of the analysis.

Table 4. The outcomes

Observation text	Low quality	Medium quality	High quality
<b>Initial</b>	34	46	8
<b>Final</b>	10	35	43
	<b>-24</b>	<b>-11</b>	<b>+35</b>

We found that the number of low quality texts decreased (-24), as well as the number of medium quality texts (-11), whereas the number of high quality text increased (+35).

## 4. DEVELOPMENTAL PSYCHOLOGY COURSE

In this section we are going to show the structure of the course of Developmental Psychology organized during the academic year 2004/2005. The course was attended by 50 students. The focus of our attention being the methodological choices and organization, we will not provide in this case a detailed analysis of the outcomes, but only some qualitative remarks.

### 4.1 Knowledge Domain: Developmental Psychology

Psychology is a particular science among the others, since it is a discipline consisting of researches conducted by human beings about the functioning of human beings. The correspondence between subject and object of studies makes its epistemological foundation quite difficult. This configuration has an influence in the teaching process of psychological topics (Arfelli & Nicolini, 2000). In fact, every student can feel reasonable to consider herself or himself as an expert in understanding and managing something so well-known as his/her interior processes (Heider, 1958; Farr & Moscovici, 1984; Gardner, 1991). This is the reason why, when a student begins to study psychological matters, the teacher has to take in consideration the necessity to move him or her from a naïve organization of knowledge towards a scientific one, building several bridges between the first and the second.

### 4.2 Activities' Structure

We designed the course of Developmental Psychology applying a methodology similar to the one adopted in the Workshop. In this edition the course was divided in 3 modules and structured into 7 activities. The whole program consisted of a set of online actions and an oral face-to-face exam. Also in this course we aimed to encourage the students to achieve an active knowledge, avoiding a passive assimilation of contents disjointed from the real contexts of experience and application. From a procedural point of view, the online course was highly structured. On the contrary, from the contents' point of view, the materials were not fully defined at the beginning. A large part of the didactic resources was in fact represented by the written texts of the student, both individual and collective. These texts constituted a basis for debate and negotiation of new learning. The handbooks were introduced only at the second stage. The participants were directly involved in the process of construction of the learning contents. Another goal of the course was that students could begin to behave as a community of practitioners (Wenger, 1998), trying to acquire the appropriate linguistic repertoire and the good practices of the professional profile of teachers.

### 4.3 The Outcomes

In the first activity the students were asked to give a definition of the terms: *newborn, child, boy/girl, adolescent, young, adult and old*. We collected texts such as the following one, in which a student provided his naïve definition of *old person*:

*An old: is a person very aged, without psycho-physical-sexual abilities. In this age body is decayed and mind quite totally reduced its abilities. He or she is characterized by wrinkles in the face, flabby muscles, white hair and a deformed skeleton. These are the elements of weakness, while I strongly believe that the only power of an old person is his or her family that loves him or her against his or her physiological imperfections.*

The interactions among the participants and the discussion about what they wrote contributed to their becoming aware of the implicit theories. The students had to face that their definitions were hard fitted in their personal experiences. After the peer negotiation, the meeting with scientific contents was planned. The new knowledge achieved from the books can be at this stage supported by the personal conceptions, previously gathered, to be denied or improved. Sometimes the same student voiced his or her disagreement about the ideas personally expressed in the first activity. We consider this kind of change an indicator of a high level of reflective and metacognitive thinking, as the example extracted from the forum show:

*After reading the opening three chapters of the handbook, I turned back to the definitions I gave for the subjects in the first activity. I found them naïve, vague, and over all conditioned by the common idea that*

*lifelong human development is marked by specific behaviors, in evolution during the first phases, stable in adolescence and adulthood, involved in old age.*

The web forum's texts let us notice a progressive acquisition of a technical linguistic repertoire while in the first activity we found a typical common sense language. In the following messages the student used specific and appropriated terms such as "neuronal plasticity".

*The old age can be still productive, also on a cognitive level.*

*The research about old age demonstrated the great plasticity of human brain, that is able of important restructurations during adulthood and old age too.*

Also this experience of online teaching seems to confirm the efficacy of our methodological scheme.

## 5. EDUCATIONAL PSYCHOLOGY COURSE

The last experience we want to illustrate is the course of Educational Psychology that the students of the Education Faculty study during their third year. The examples we are going to show are extracted from the course of the academic year 2006/2007 that involved 37 participants.

### 5.1 Knowledge Domain: Educational Psychology

In this course the topic is teaching-learning process that is a core concept for a future teacher. We planned to start the activity recognizing the students' ideas of infant mind, asking them to express this concept at the beginning of the course. The ideas on the teacher's role and the conception of teaching-learning processes are in fact strictly connected to that basic concept. After the *destruens* phases in which the students recognized their naïve conceptions, we allowed the students to experience the *construens* ones, collaborating in small groups to create a common product and meeting the scientific information offered in the handbook.

### 5.2 Activities' Structure

While in the previously reported courses the students were asked to write a free-text, here they were supposed to build a conceptual map and to fulfill a three columns table. The first task consisted of the construction of a conceptual map with the word "child" as the starting point (activity 1). This kind of didactic instrument has some advantages: in a very simple way it entails a diagrammatic organization of knowledge.

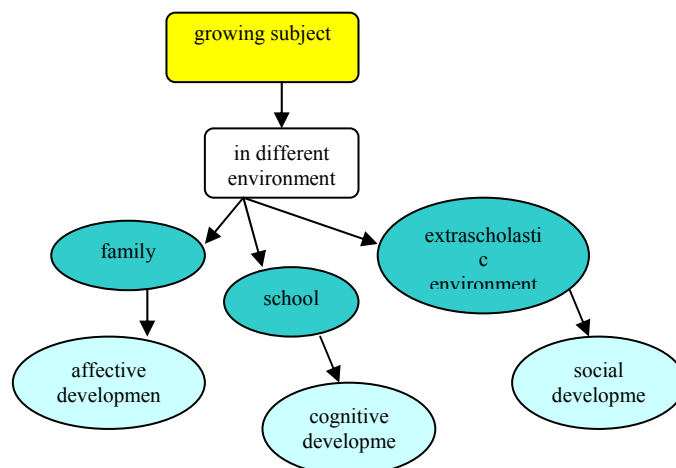


Figure 1. Example of individual conceptual map

Moreover the map lets the concepts that are active in background to come to light and pushes the author to recognize the connections among conceptual clusters. The collected individual maps showed several naïve conceptions about children: the child is described as "full of energy, simplicity and spontaneity"; there are

links to words of common sense and stereotyped visions such as “vitality, egoism, and energy”. In other cases a deterministic conception of development emerged (Fonzi, 2000): in the example shown in figure 1, the affective development is linked only to family, the cognitive one to school and the social one to extra scholastic environment. In other maps we found evaluative expressions that hid a moralist attitude instead of a descriptive one.

Once again we proposed the comparison between the personal map and those of the other participants (activity 2). The emerging different interpretations permitted students to become aware of the partiality or the wrongness of everyone’s expressed knowledge. The next step consisted of a collaborative task: the students, divided into three small groups, had to build a unique map representing the ideas of all of them (activity 3). In these products we considered as evidence of conceptual changes the typology of words used, the hierarchical organization of concepts, the presence and property of cross links. At this point the students could face another more complex task (activity 4). They were asked to fulfill individually a three columns table: starting from the left, in the first column the students could write the characteristics of child based on the previous activities; in the column on the right they were asked to write the connected role for the teacher; in the middle they could synthesize the related conceptions of teaching-learning processes. The table is a further tool for knowledge organization, useful to put in evidence correspondences and links among concepts. The activity is therefore finalized to develop the awareness of the implicit links among ideas. As we have already showed before, at that point in the course the students were invited to read some parts of the handbook and then to activate a discussion in the web forum (activity 5). The encounter with the scientific and coded theories takes place only after two important and required steps: the activation of the personal knowledge and the awareness of the individual naive conceptions. We then proposed another forum to revisit the previously expressed conceptions (activity 6). The goal was to move participants towards a more structured idea of teaching-learning process. At the end of the course the students were requested to compose a personal dossier (activity 7): it was a further strategy planned in order to promote reflection and metacognitive consideration.

## 5.4 The Outcomes

The outcomes showed the accomplishment of organization of an upper level of knowledge (Lapadat, 2000; Kelly & Green, 1998), both in collective maps and in individual tables. Analyzing the shared maps, we found an improvement of direct and cross links, several quotations coming from scientific books and an increase of proper connections. Moreover, the maps built by the groups showed the process of progressive construction of a shared linguistic repertoire. The students in this collaborative products converged toward a common lexicon, linguistic expressions and specific terms.

The tables showed more problematic results. In some tables we could observe that the students revisited only one of the three concepts. In several cases they changed their definition of child using the negotiated term (for example “subject in growth”), but they kept the previous ideas about the teacher’s role (defined as “eclectic, pragmatic”). This example shows the need to involve in the revision process all the ideas connected to the central concept in order to obtain a meaningful conceptual change. In other tables we noticed that the change was deeper and concerned all the three conceptual nodes. In some of them a complex knowledge revision came out, within the same concept and among different ones.

## 6. CONCLUSIONS

The teaching/learning methodology described in this paper and tested in three different knowledge domains proved to be incisive and led to significant results. As general outcomes, the accounted experiences spawned a set of guidelines and a model that can be a useful tool for those who have to plan and organize online learning activities. The structure of the activities is basically organized in a sequence of action-discussion-reflection-revision. The model is a flexible format and the tasks can be planned taking into account the specific disciplinary needs, in accordance to the specific context of the classroom.

Overall, we claimed that peer discussion and negotiation are the core activities to obtain conceptual change. Moreover, we argued that in online learning the encounter with the coded knowledge of the

discipline has to be postponed after the activation of the personal knowledge and after the recognition of the pre-existing theories.

Even though the three experimentations we carried out refer to the domain of Psychology and Education, in our opinion our plan can be used also in other domains, such as scientific disciplines. We have already tested the methodology in teaching-learning processes of scientific disciplines, such as the comprehension of digestion in children of primary school (Nicolini, 1999) and the understanding of cave's building process with adults. But these experiences, at the moment, are only applied in face to face courses.

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