CONCEPTUAL MAPS AS A TOOL TO MAKE A SCIENTIFIC EDUCATIONAL VIDEO, IN COOPERATIVE LEARNING

Valentina Paterna, Teacher, Le Parole della Scienza, Italy

Alessio Borelli, Journalist. Italy

Email: paterna.valentina@gmail.com, www.leparoledellascienza.it

Abstract. This work describes how a documentary video, about a scientific experience in cooperative learning, was made coordinating different work phases across conceptual maps creation and sharing among the project's stakeholders.
The video illustrates how to explain the fluids pressure concept to a 5th elementary class presenting a scientific experiment and using the cooperative learning method. The maps' graphic simplicity and conceptual clarity encouraged knowledge exchanges among the working teams overstepping geographical distances to produce a video to train teachers in cooperative learning method. The ideas are shown and connected to each other by a tool that is immediately readable and easy to improve.
In conclusion we can say that conceptual maps are a valid and low cost tool for knowledge sharing, shots arranging and video producing.
Keywords: knowledge sharing, video documentary, scientific experiments, cooperative learning.

1 Introduction

The result of this work tries to highlight the precious influence of conceptual maps in order to achieve what we intended: creating a scientific educational video in cooperative learning. The video is supposed to be used by INDIRE in Florence (i.e. Istituto Nazionale Documentazione Innovazione e Ricerca Educativa) in the European project of PON "Scientific education" and directly involved a 5th grade of I.C. "King-Mila" in Turin. Such a setting permits to review the proposed activity analyzing and correcting potential errors. The scope of this project is exposing an example of teaching creating learning opportunities for teachers. The assumption is that through fieldworks teachers will convert theory into practice by being exposed to concrete images of teaching strategies: cooperative learning.
Preparing the video was a very complex procedure that required the integration of different resources from different parties: researchers of INDIRE, teachers of the 5th grade, a project "Parole della Scienza" expert, and technicians who carried out recording and editing. Such difficulties generated the problem of managing interdependence and interactions with different opinions. Conceptual maps tied our ideas to one another, shared and organized them over the distance, such a choice allowed us to use a graphic modeling to express our concepts synthetically. Furthermore, these maps supported communicative settings in our experience.
The map structure on fig.1 was created by the authors of the video at the end of the experience to explain the architecture of the path that leads to the video that involved the participants.

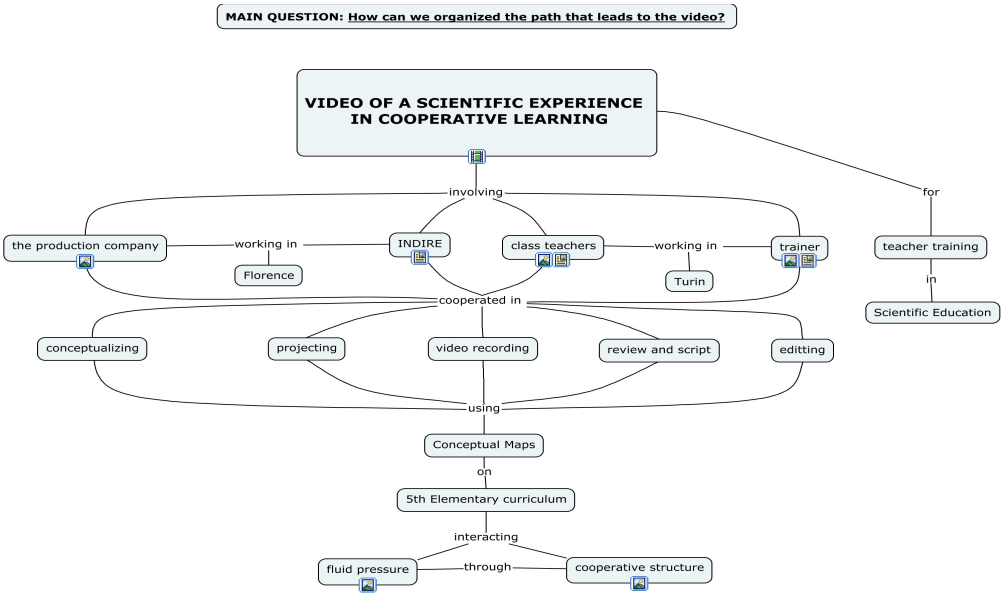

Figure 1. Conceptual map of the video was useful in helping the director to get an incisive editing

1.1 Theoretical frameworks

The object of the video is to show how teaching science in an elementary school class can be carried out by cooperative learning. As it has been proposed by David Ausubel, learning can happen through reception or through discovery: in the first case, information passes through teacher to the pupils, leading the latter to be passive. However, on their own and through the teacher's guidance figure, the pupils achieve to discover the encountered concepts. Confirming Ausubel, J.D.Novak believes that "meaningful learning is opposed to rote learning and refers to a learning way where the new knowledge to acquire is related with previous knowledge." The latter can also incorporate new information into the pre-existing knowledge structure but without interaction. Rote memory is used to recall sequences of objects, such as phone numbers. However, it is of no use to the learner in understanding the relationships between the objects.
According to what has been proposed by the authors, we decided to propose a lab activity in which the students were active subjects in the proposed experiment, through controlling and direct observation. The pupils have elaborated the hypothesis and predictions to explain the observed experiments and to verify them empirically. The teacher was a guide who provided pupils with stimuli and encouragement throughout the entire process, a learning facilitator; they were protagonists in this process because they were actively involved in the experiments. The scientific concepts, taught through concrete experiences, allow a real construction of knowledge for the pupils. Constructivism is the base to ensure that learning will be stable throughout the time. Through such inquiry learning approaches, we put students into situations that demand critical thinking and encourage the internalizing of major concepts. Inquiry activities also give students the opportunity to express, confront, and analyze preconceptions and misconceptions in an active way. Robert Karplus proposed and used an instructional model based on the work of Piaget. This became known as the "Learning Cycle". To explain this theory to the different parties the teachers and the expert created a conceptual map below.

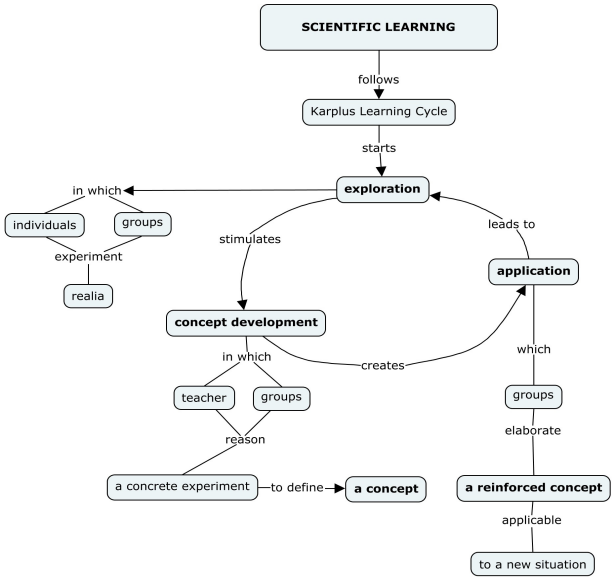

Figure 2. Karplus Learning Cycle

Carl Rogers emphasizes motivation to be central in learning: "A person learns significantly only those things that are perceived as being involved in the maintenance of or enhancement of the structure of self ".
The method used for the experiment was the Cooperative Learning that takes the students as the main source throughout the learning process. The cooperative learning class is divided in pairs and groups who meet with what the teacher puts forward, discussing it, experimenting it and observing it. Through a lesson under cooperative learning, all pupils think, speak and participate actively and in the meanwhile contribute to knowledge construction.

2 Methodology

2.1 The video creation through concetual maps

The video was recorded in January 2015, in a Fifth Grade Elementary School in I.C. “King-Mila” in Turin. The teachers, beside Prof. Falasca, elaborated the activities and programmed the way to conduct them in class. In order to clarify things further, some conceptual maps were built up through which the activities and the content of the video were displayed. For example, the map of figure 2 was sent by e-mail to researchers to explain the application of Karplus Learning Cicle in the class. The map was a precious resource to connect theory and activity. The other map was particularly important to describe and schematize the class setting, to help the video technicians figure out how the class was arranged as for desks, student movements in order to ease the recording process. The diversity of the work environment made necessary to introduce the characteristics of a cooperative class and a detailed description of various moments of a scientific experience. As you can see in the fig.3, the class was divided in groups, each of which consisted of pairs who fully independently moved their desks to provide spaces. Then, cooperative roles were assigned to each of them: the Voice manager, the Time keeper, the Materials manager and the Presenter.

Figure 3. Cooperative roles

In order to create a relaxed and collaborative environment, the students applauded themselves, taking into account that the working day would be long and hard. Each pupil puts forward one's particular skills to provide the proper peer with the necessary support.

2.2 The scientific experiments and the cooperative structures

In the first part of the activity, the materials were delivered to the pupils who were in charge of distributing them, while making them take turns in order to experiment first-hand and observe their peer. Emotive involvement is extremely high in both work phases. Through the moments in which they have to reason and reflect, the possibility to talk and face with a peer over the experiment gives them the chance to improve their lexical and dialogical capacities. Thus, they feel encouraged to build up hypothesis and predictions and verify them with their experiments. For the first experiment the pairs blew a balloon; We immediately asked the groups: "Why did the air you blew caused the balloons to blow?" Thus we asked the pupils to push the balloons slightly with the cardboard to observe how it deformed and how the air inside moved. At the end of this experience we asked the class to create a concept map to be used to describe the concept of pressure, starting from the examined events. The result comes from the pupils cooperation, who summed up and reworked the experience in order to formulate and learn the concept more easily. Using conceptual maps as a tool to re-elaborate the experiment, helps pupils to rearrange thoughts about the examined concepts.

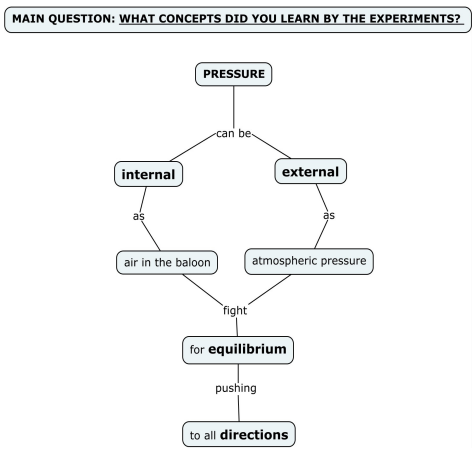

Figure 4 Map designed by a group of pupils.

For the second experience, we used a hotplate and an erlenmeyer flask with a balloon inside. In this case, the teacher conducts the experiment and the pupils are observers. Once the hotplate was hot enough, we placed the erlenmeyer flask on it. We observed the balloon blowing again on the external side of the flask and to allow the metacognition we used the *Placemat* cooperative structure.

The last request was to write a post-it about the satisfaction in the activity, expressing it through a short sentence or an emoticon. In the cooperative class, the focus is developing social skills, teaching them to reflect upon their emotions and discussing them with each other. In order to work together, it's essential to learn to negotiate over one's own believes and mediate, thus reaching group decisions or group responses. This element is an important purpose of the video.

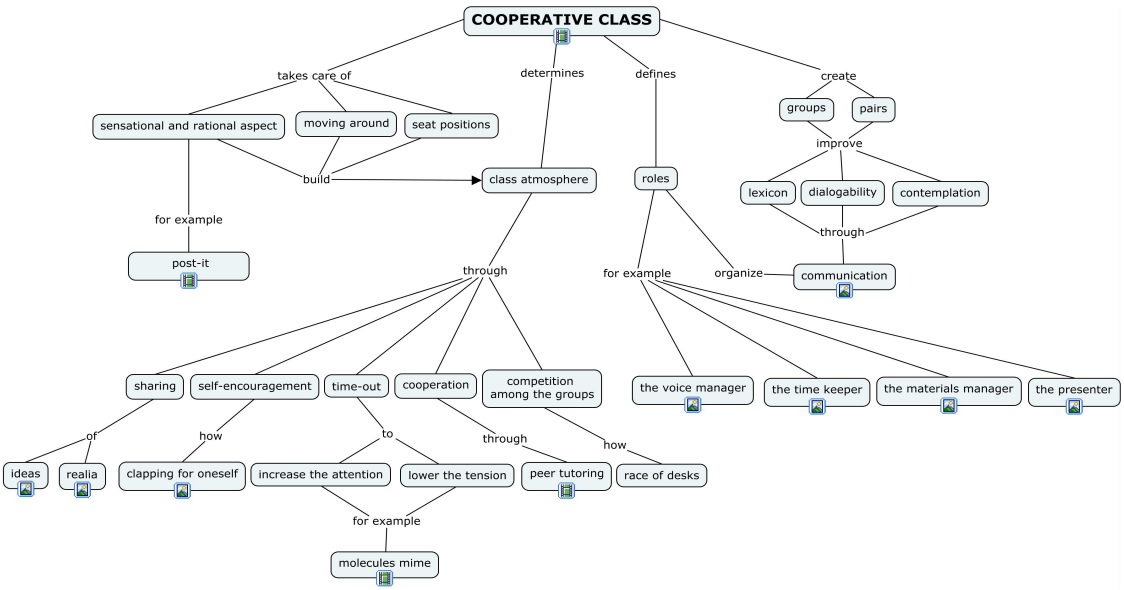

Figure 5. Conceptual map of peculiarity in a cooperative class

The map shown in Fig. 5 has been the guide to video editing. The technicians used it to highlight single elements of a cooperative class; thus marking the methodological characteristics of the activity. Another important part of collaboration with INDIRE researchers was programming single scientific experiments. Conceptual maps were a helping hand in this step as well, facilitating the schematic representation of an activity, describing the methods through which experiments were proposed and the cooperative structures to be used for reflections. Organizing activities in this way made easier to exchange ideas among those who were laying out the project, by allowing the researchers to create a clearer mental image of what would be going through the class during the recording, supported by the graphic scheme of the map. Furthermore, it allowed us (i.e. the teachers) and Prof. Falasca to organize different steps of the experiment in a better way.

3 Conclusion:

This experience produced a video for teacher education and represents a way of laying the cognitive groundwork for developing teacher self-reflection.
You can watch the video on the website http://repository.indire.it/repository_cms/working/export/6684/.
It aims at training newly hired teachers, who can find here an example about how to set up a science class in cooperative learning.

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