

# Professional vision in scientific practice. The co-construction of meanings through the use of Skype

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**Abstract.** The paper intends to show, thanks to STS perspective, how ITC technologies contribute to the formation and sharing of scientific knowledge as it is being produced. Also the paper intends to investigate the process by which meanings are constructed in scientific practice through the use of web technologies. In particular, the use of Skype allows the sharing and communication of materials, texts and images, which are able to construct scientific knowledge. The contribution presents the case of Skype usage among researchers (molecular biologists and experts in nanotechnology) who, for the first time, observe and comment on the results of their own experiments.

**Keywords.** Professional vision, ICT, Knowledge, Professional practice, Learning.

## **1. Shaping scientific practice through the use of web technologies: theoretical framework, research aims, field and research issues**

By observing an episode which is part of a more ample ethnographic research program dedicated to learning in scientific practice (Viteritti 2011; 2012; 2013), the paper intends to observe how ITC technologies contribute to the formation and sharing of scientific knowledge as it is being produced.

In fact, the paper intends to investigate the process by which meanings are constructed in scientific practice through the use of web technologies. In particular, the use of Skype allows the sharing and communication of materials, texts and images, which are able to construct scientific knowledge. Experiences mediated through the social world of digital technologies foster a wide participation that shapes more stable techno-scientific knowledge through time.

In the light of this premise, the paper aims to examine the following issues: sharing knowledge and visual knowledge in the interdisciplinary field; the social construction of knowledge and visual knowledge intended as situated learning; the social construction and sharing of knowledge through the digital world.

From a theoretical perspective, the contribution combines different perspectives: the ethno-methodological approach (Garfinkel, Lynch Livingston 1981), STS studies, with particular reference to professional vision and visualization (Goodwin 1994; Lynch and Woolgar 1990; Grasseni 2004; Perrotta 2012), virtual ethnography (Pink,

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2007; Dicks, Mason, Coffey, Atkinson 2005; Hine 2000) the framework of learning in practice (Lave e Wenger 1991; Higgs, Barnett, Billett, Hutchings, Trede 2012; Viteritti 2012) and laboratory studies (Latour and Woolgar 1979; Latour 1987).

From an empirical point of view, the contribution presents the case of Skype usage among researchers (molecular biologists and experts in nanotechnology) who, for the first time, observe and comment on the results of their own experiments. The study involves nanotechnologies able to transport cholesterol, passing through the blood-brain barrier and releasing the cholesterol after which it decomposes itself. The experimental practice is situated in a wider program regarding Huntington's disease, a neurodegenerative illness, which was studied in the laboratory where I conducted my ethnographic research (Viteritti 2012).

My aim is therefore to understand how the use of technologies such as Skype and email can foster learning and the elaboration of knowledge by allowing scientists from diverse interdisciplinary fields to work together and share their research issues and findings.

The paper combines various research issues:

- learning the visualization process of science through practice, in the form of graphs, images and texts, and the role that these visual representations have in the construction of scientific knowledge;
- the way in which knowledge (in the form of images, texts, data and representations) is produced, circulated and shared through web infrastructures;
- scientific cultural training in practice, starting with the sharing of visual knowledge through web resources;
- the gradual construction of scientific knowledge through the use of images, graphs and texts exchanged and discussed thanks to the new socio-digital world in which scientists work.

## **2. E-mail, Skype, images and the social construction of science: a little digital ethnography**

To support these research issues, let me take you into the laboratory where I've spent much of my time in the last few years. This is the story of Marta, who is investigating the role played by cholesterol in Huntington's disease. Her hypothesis, which is confirmed by numerous experiments, is that in the presence of the disease a cholesterol deficit occurs at neural level. In the following account, Marta tries to analyze how cholesterol can be transported into patients' neurons by special nanoparticles (in this case, the experiments are conducted on animal models: mice), also thanks to colleagues in other research laboratories elsewhere in Italy and around the world, via Skype.

This is a small but emblematic ethnographical study which illustrates cooperation through the web and how this can contribute to the co-construction of scientific knowledge.

One day in the laboratory, I was observing a young novice, Margherita, at work. As I watched her learning to carry out her first PCR procedure (an experimental technique used in molecular biology to multiply DNA), I was struck by a certain scene. One of the senior researchers involved in

molecular biology, Marta, was seated in front of her computer wearing headphones, and seemed to be speaking to herself.

In reality, Marta was speaking with someone, and looking at images on her computer screen. Struck by some of the observations she was making, I watched and listened, and at a certain point she said:

“Sorry, Giò, let me see properly. Where do I have to look now to see the cholesterol being released and the nanoparticles? Yes, yes, now I see them, yes, I can see them”.

I cannot hear the other person’s voice because Marta is wearing headphones, but I decide to stay there because it gives me the opportunity of understanding the role played by Skype in the exchange of information and the formation/sharing of knowledge.

I was observing a conversation between two researchers – a molecular biologist studying the role of cholesterol in Milan, and an expert in nanotechnology in Modena. The dialog via Skype linked two disciplinary fields with different requirements: transporting cholesterol to sick neurons and testing nanoparticles capable of doing so. The Skype conference I was observing allowed me to see how practical cooperation was established between the two researchers: Marta and Giò were testing the initial results of their work and were sharing hypotheses and interpretations. They were seeking points in common, were agreeing on how to analyze and verify their working hypotheses and were doing so through Skype, which from that moment would become a resource for a stable cooperation. At the end of the Skype conference, I got Marta to tell me the tale of how the nanoparticles met up with the cholesterol, and of the Skype-based collaboration between the laboratory in Milan with that in Modena and yet another in Los Angeles. Subsequently, Marta and I had various other conversations, and she supplied me with some photos which illustrate the story of this cooperation via Skype.

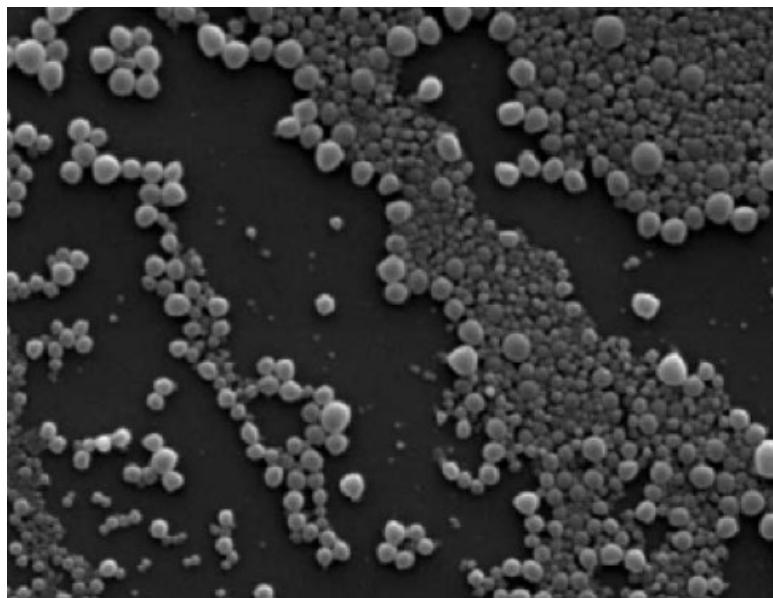
### **3. The story of four photos shared on Skype and the mutual construction of scientific knowledge**

In the following photos shared via Skype, we shall see how the two researchers worked together at a distance. Over a period of time, Marta and her colleague Giò (in different cities) met up on Skype to observe photos of the experiments they were working on.

The first of these which Marta gave me is the black and white photo of nanoparticles. She told me that the first meeting on Skype allowed her *to recognize the nanoparticles which pass through the blood/brain barrier, thanks to Giò’s expert eye*. Here is Marta’s account of this event:

“Sometimes Giò and I have met in Milan, or in Modena, but the rest of the time we see each other and talk on Skype, or exchange emails with photos and results: we’ve been doing this right from the start. This is the first photo he sent me via Skype: it was the first time I had seen nanoparticles and I had to learn how to see them. At the beginning, I found it hard to find the right conditions to be able to see them under the microscope, in the sense that they’re very, very small, so Giò helped me

to see them. In that first conference on Skype he basically taught me how to see them” (interview with Marta).



**Figure 1.** Nanoparticles able to pass through the blood-brain barrier.

In the second Skype conference, the one I found myself observing by chance that day in the laboratory, Marta was busy recognizing the nanoparticles which pass through the blood/brain barrier. She recalls that second conference and tells me how, via Skype, she learnt to recognize the nanoparticles with their red fluorescence, thanks to Giò's indications.

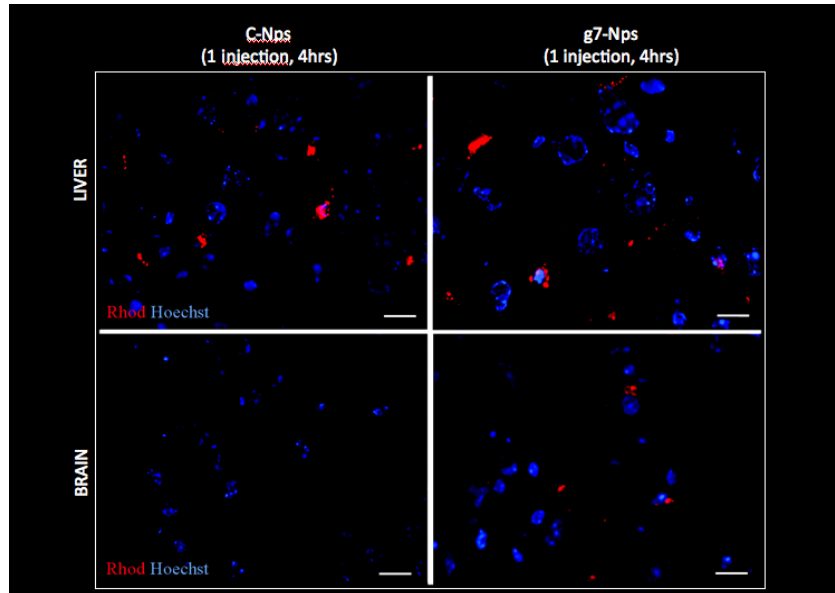
“I remember saying to Giò: “Yes, I can see them! They're the ones with the red spots, I can see them, I understand, it's them.”” (interview with Marta).

Marta tells me of the third Skype conference, in which they exchange a photo where the nanoparticles transporting cholesterol can be seen.

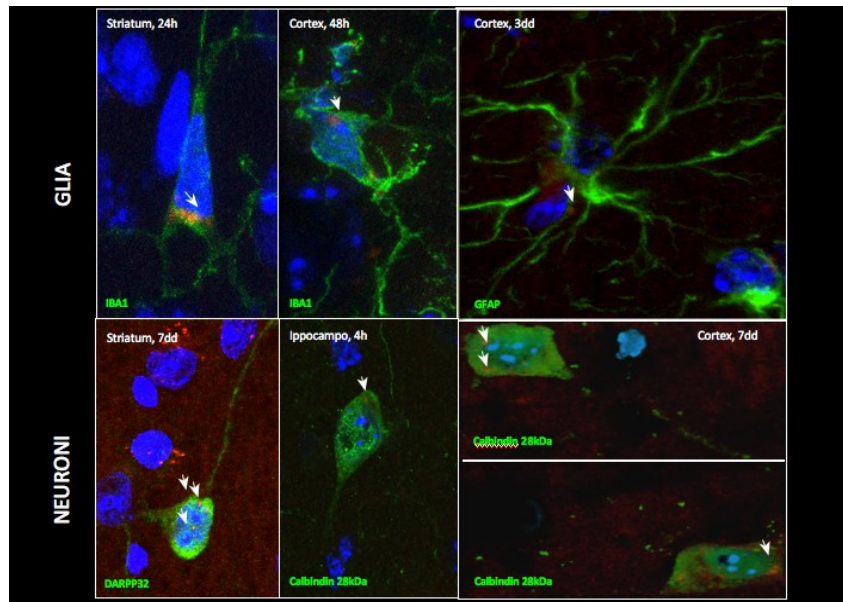
“In that third Skype conference, we discussed a photo where you could see nanoparticles that were no longer red, but yellow: the yellow emerged from the fusion of the red nanoparticle signal and the green cholesterol one. In that conference, Giò and I learnt to recognize the results of our experiments, that is, how the fluorescent cholesterol is released. It was the first time I had seen it, and the first time Giò had seen it, so in that meeting at a distance we looked at the results together and agreed on what we were seeing”.

The last photo supplied by Marta refers to an exchange of emails with a laboratory in Los Angeles, where experts in Huntingdon's disease carried out an experiment in electrophysiology using the results obtained by Marta and Giò. This experiment in Los Angeles aimed to find out whether the cholesterol, once released, produced an

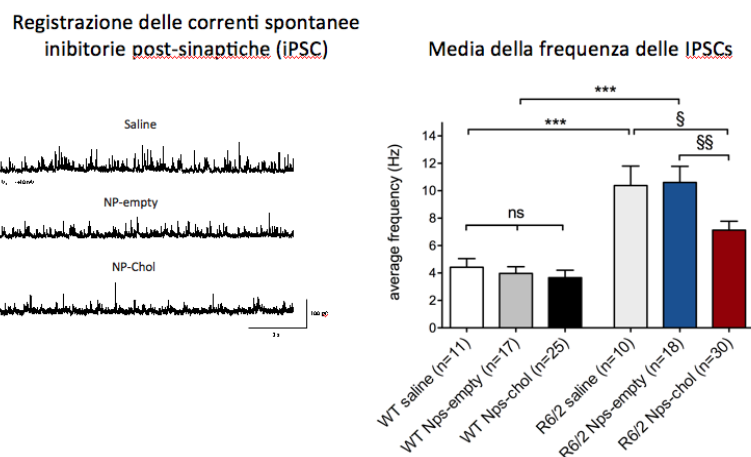
enrichment of the synapses and neural function in the mouse's brain. The graph exchanged by the researchers would appear to confirm this hypothesis.



**Figure 2.** The nanoparticles are those indicated by the red peptide.



**Figure 3.** The nanoparticles degrade and release the cholesterol



**Figure 4.** Electrophysiological test

The researchers involved in this little story of cooperation with the help of web resources are now moving on to drafting an article which will be submitted to an important scientific journal. It is being written jointly by Giò, Marta and the researchers in Los Angeles, and the text is taking shape via the exchange of emails and web conferences. A first draft of the paper is now ready, and Marta recently sent copies to the others. This text, the future article, is an artifact which was elaborated through an interdisciplinary method seeking to unite the forces of all the elements in the process: photos, graphs, Skype, emails, and the researchers who worked together.

This little episode explains the gradual construction in action of scientific knowledge. In this case, it happened through the production and sharing of results in the form of images shared via the web. The story speaks of the process of the mutual construction of knowledge sustained by web resources, intended as devices for sharing, which become a second nature. The web becomes an allied actor in the co-construction of knowledge. The researchers spend much of their time in front of their computers, exchanging files, images, temporary results, drafts of papers, conference calls, etc. The socio-digital world favors the assemblage of knowledge among science professionals and the web becomes part of the social space of the laboratory. Through the web, scientific knowledge seeks out verification, partners and allies. The web thus becomes the place where still-vulnerable scientific knowledge searches for stability.

#### **4. Doing science using web resources (Skype and email)**

The process of doing science through the web, which thus becomes a naturalized social space, requires visual skill, capacity for learning to see and recognize images and develop “skilled visions” situated in the various communities of practice (Grasseni 2004, 2007). The process of acquiring visual skills shapes the competency of professional vision when the images are not yet stable and are still evolving. Through the web (Skype, in this case) the images which are exchanged represent the seeds of knowledge which will become more stable and formalized in the elaboration of the scientific article. The scientific knowledge shared and interpreted in the form of

images which are still uncertain, incremental and evolving and the web vehicle allows the incisive circulation of images in search of stability and convergence of significance in the developmental stages of the various viewpoints.

Through Skype, researchers shape and share their hypotheses, creating interdisciplinary allies. The collaboration of researchers and Skype make networking possible and the interpretation of images, together with the meanings which link them, evolve from being opaque and uncertain to becoming clear and shared. The images exchanged via the web are not neutral, but strongly depend on the relationships and social mediation that construct them. They then become naturalized in practice and are transformed into real and more stable scientific objects. The communication resources of the web become the social and material space for sharing knowledge. They speed up procedures, reduce ambiguities and uncertainties and permit the carrying out of complex tasks at a distance.

The web becomes a learning space for the social actors and all the human and non-human elements involved – the web, photos, images, debates, researchers, cholesterol, nanotechnologies – can associate and seek alignment.

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