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Designing empathy: the role of a "control room" in an e-learning environment

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Abstract

Purpose – The purpose of this paper is to focus on the challenge of designing an interface for a virtual class, where being represented together contributes to the learning process. It explores the possibility of virtual empathy.

Design/methodology/approach – The challenges are: How can this feeling of empathy be recreated through a delicate staging of location and interactions? How can the feeling of togetherness be organized in a 3D environment without creating a feeling of distraction? What are the tools of empathy in a mediated situation? The authors propose to use the concept of "contradictory semiotic analysis" to describe the design process that taps into visual cultures to build a representation and tools that support users' empathetic interactions. The analysis of designers' work from a semiotic point of view shows that they do not necessarily paint after life but play with different media and representations to build "remediated" situations of use.

Findings – The paper introduces the concept of "control room" elaborated after Manovich's control panel, to describe the visual interface that supports a diversity of points of view, hence supporting mediated empathetic relationships.

Originality/value – The paper answers the design questions: how can the system of representation support the feeling of empathy amongst participants through a delicate staging of space, people and of interactions within this space? How can a participant get, first, a feeling of togetherness and, second, a feeling of empathy with other participants? The design methodology is explained based on a "contradictory semiotic analysis" made of the comparison with similar platforms and with other modalities of empathy in different media. Second, the design proposition is described. Third, the design challenges that this type of production entails are discussed and the difficulties faced during the design process are analyzed.

Keywords Internet, Design, Distance learning, Semiotics, E-learning, Empathy, Control room, Interactive technology, Smart education, User interfaces, Virtual learning environment

Paper type Research paper

1. Introduction

Producing an e-learning platform is often motivated by the belief that a realistic environment can be an appropriate solution to develop a feeling of togetherness between students. But, is it the only one condition? Studies on 3D environments (second life in particular) have questioned the relevance of 3D realism to encourage

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collaboration in e-learning context first because these environments are difficult to manipulate and second because their focus is on browsing rather than on concentration (Dourish, 2006; Schaefer *et al.*, 2010).

Encouraging collaboration and interactions between students in professional training is one of the main challenges faced by teachers. In virtual context, it requires the implementation of technical and social mediations because the distance is not only physical but also technical, socio-cultural, socio-economical and educational (Holmberg, 1995, 2005; Moore and Kearsley, 2005; Jacquinot, 1993). Empathy, as the ability to share another person's point of view, increases attention and improves understanding of the lesson and group exercises. In that context, ways to support togetherness between students and teachers in an e-learning environment designed for professional training are explored.

The interplay of learning and technology has been studied in computer-supported collaborative work (CSCW), especially computer-supported collaborative learning (CSCL), and virtual agent in 3D environment research. CSCL research analyzes the nature of learning processes and the role of collaborative learning mediated by ICT. One of the focuses is how collaborative tools can help interactions as well as representation of participants (Stahl and Hesse, 2010; Stahl *et al.*, 2006):

> How can the analysis of interactional methods help to guide the design of CSCL technologies and pedagogies? This question points to the complex interplay between education and computers in CSCL (Stahl *et al.*, 2006, p. 416).

While these studies focus on activities and the design of tools to perform activities collectively, we want to explore how empathy can be supported by representation of the class as a stage. Building on the metaphor of the computer as a theater (Laurel, 1993), we consider that the screen is a synthetic space where interactions are taking place and where multiple viewpoints can be provided. We suggest that the contribution of media studies to the development of e-learning, is the analysis of the representations of presence in medias.

In this experiment, our design question was: how can the system of representation support the feeling of empathy amongst participants through a delicate staging of space, people and of interactions within this space? How can a participant get, first, a feeling of togetherness and, second, a feeling of empathy with other participants?

We first present the design challenges encountered when trying to represent a group of 15 to 30 learners on the same interface and to represent a team work (four students) interface so as to foster empathy on e-learning services designed for professional training.

Then, we explain the design methodology based on a "contradictory semiotic analysis" made of the comparison with similar platforms and with other modalities of empathy in different media. Second, we describe the design proposition. Third, we discuss the design challenges that this type of production entails and analyze the difficulties faced during the design process. We therefore wish to contribute to the discussion on design issues in computer supported collaborative learning.

2. Design questions: exploring visual solutions for empathy

This article focuses on the challenges of designing an interface for a virtual class that supports empathy. Empathy is based on mechanisms of information processing

for an implicit communication with others and is the basis for intersubjectivity (Decety, 2002, p. 9). Empathetic phenomena are present in every interaction. Empathy is the simultaneous sharing of psychological states by the partners of an interaction and a cognitive ability to understand and internally see from others' viewpoints. While there is no way we can actually trigger a psychological process, how can we at least provide the tools so that it can take place? The keyword here is viewpoint. Through empathy, we can actually imagine (create an image) of what another person sees as if we were in her shoes. If one switches from the psychological to the visual plane, the situation can therefore be described as managing different viewpoints during the interaction. The points of view are given by the actual position of the interlocutors. A person can therefore imagine the reverse shot of what she sees.

The main question is how does an interface support this process of empathy?

Two other questions are dependent:

(1) How do we adjust different viewpoints to different activities? For example, how do we see each other and the professor and her/his slides at the same time? How do we combine a wide shot of the scene with a close-up of the professor? How can we see students from behind and from the front at the same time? How do we combine a general bird eye view of the class and its activities with a focus on a student asking a question?

(2) How do we organize the feeling of togetherness in a realistic environment without creating a feeling of distraction?

To answer these questions, we designed a probe (Gaver *et al.*, 1999; Boehner *et al.*, 2007) called "VUE a virtual class". VUE ("sight" in French) is a virtual environment, a collaborative, immersive and synchronous online service for professional training. Our research team composed of designers, developers, and information and communication researchers (including the authors) analyzed a number of tools and graphic solutions for the visualization and manipulation of perspective. Combining graphic, cinematographic and 3D "grammars" that organize perspective, we explored how empathy is supported by a multi-modal representation of self and others. The probe was then tested with users to evaluate the relevance of the design choice and their efficiency in terms of declared empathy.

3. Design methodology: "contradictory semiotic analysis"

To design e-learning interfaces, researchers in HCI have often set up ethnographic and ethno-methodological analysis of face to face learning situations that developers tried to emulate in on-line platform (Chow and Jonas, 2010). These analyses have helped designing numerous systems. Nonetheless, this painting from nature/after nature methodology can be completed by a study of already mediated forms of interactions and representations of interactions. Indeed, information and communication studies have shown that mediated systems are never a simple transposition of face-to-face situations to situations on line (Jeanneret, 2008). The transition to a situation mediated by a device requires a chain of mediations that must be taken into account. Moreover, the software offers uses hypotheses in a computer program – we call them suggestions – so it is very important to consider mediation at work in the transition from a face-to-face situation with to an online situation (Akrich *et al.*, 2006).

3.1 Semiotic design method: "contradictory semiotic analysis"

Semiotics is about meaning making. It studies how human beings make sense of their world. Starting from affordances in tangible environments to symbolic representations in computer interfaces for instance (Norman, 2002). In Peirce's model of semiotics (Peirce, 1966) meaning making is based on literacies (Hoggart, 1957). In the triadic structure of the sign, the object and its "representamen" always rely on an "interpretant" that is both personal and social, and that qualifies our relationship to signified and signifiers. In this process therefore the personal past is always involved that makes us understand in some ways the object in front of our eyes, the situation, or the concept. We make sense of things not only because of our real life interactions but more and more because we can compare mediated relationships in different media, book, cinema, photography, or digital interface. From a semiotic point of view, as the one defended here, representations matter just as much as activities. The focus is on how activities are represented rather than performed (Almquist and Lupton, 2010).

Designers use and anticipate this semiotic literacy when they bridge from the unknown to the known (Hatchuel and Weil, 2009). In design practice, the designer elaborates not only from the existing objects and ways of representing them, but also from the "interpretant" (Chow and Jonas, 2010). The design process includes hypotheses on how people interpret things, from what angle, with what references. The designed object embeds these hypotheses.

As the team designed VUE, they realized that a virtual platform is not only a space for coordination between actual people. A virtual platform creates participants as actors and characters who play a role in a space that they animate. To address this issue, they deployed a specific semiotic methodology that we chose to call "contradictory semiotic analysis" and that we describe now. This methodology is based on a "dialog" between semiotic studies that balance the convergent effects of themes and the diverging effects of media. The word contradictory is borrowed from the field of rhetoric and law. It means that all information pertaining to a case have to be explored and presented to both parts. Each element of a case is therefore discussed so that contradiction can arise, supporting defendant and prosecutor diverging view points. This conversational side of the design process has been introduced by Schön (1984) in the reflective practitioner. He shows how a designer "shapes the situation, in accordance with his initial appreciation of it, the situation 'talks back' and he responds to the situation's back talk" (Schön, 1984, p. 79). Here the expression "contradictory semiotic analysis" is used so as to illustrate the converging/diverging semiotic process that designers use to explore the expansion of a concept (here empathy) so that it can become operational in mediated interactions.

This method was observed after working with the design team of VUE. It is also sustained by observations and analysis of design work in other research projects and design training in design and engineering schools. It is also supported by research trends that point out the semiotic work of designers (Heskett, 2002) and the place of abduction in design.

Semiotic analysis consists in finding and analyzing recurring meanings through a corpus of texts or images. The formal characteristics are culturally grounded so that the analysis is able to put the signs in a specific time and space that contributes to their meaning.

First, the design team of VUE – designers and social scientists – analyzed and compared e-learning platforms. In the designers' work this phase coincides with

a double hypothesis: first that there are recurring features in e-learning platforms that correspond to some of the issues of e-learning. These characteristics are what constitute the e-learning "genre" that they have to take into consideration. Second, people are going to interpret these e-learning platforms on the basis of their experiences with similar platforms or other learning situations and media. The designers want to make sure that they tap into this cultural background. Out of four existing projects they selected and focused on how students and teachers were represented. This first part of the method assesses the knowledge base that is relevant to the field of innovation (Hatchuel and Weil, 2009). This semiotic analysis pointed out a number of elements that were considered as guidelines for the design of "VUE".

The semiotic analysis focused on the following points:

- rendering of environments;
- representation of actors;
- terms of interactions; and
- possibilities of multiple points of view.

As we can see on these screenshots of e-learning platforms, no interface represents the classroom as a whole (Figure 1). What is more, students are not always shown on the screen (Figure 2: only the teacher is present). On other interfaces, students are present through a line of their webcams (Figures 1 and 3) or a table of their webcams (Figure 4). These design choices make it very difficult to represent all students on the screen and thus cannot easily contribute to a feeling of belonging to a class. In addition, these four platforms offer a single type of class: the conference mode. Group work or tutorials are not taken into consideration. Most platforms strive to strike a balance between

Source: www.sviesolutions.com/

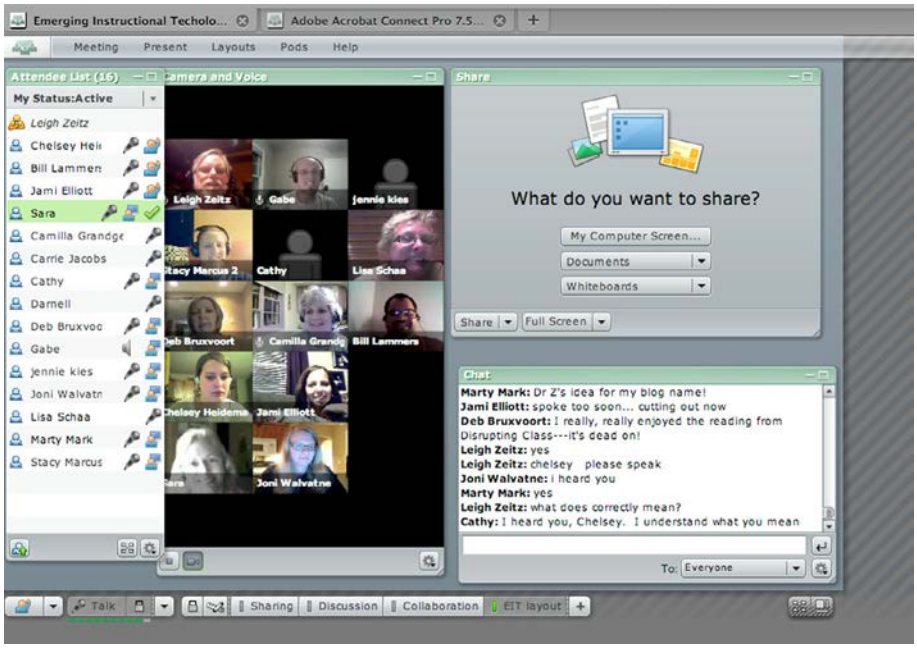
Figure 1.
E-learning training, VIA

Figure 2.
Dim Dim e-learning platform

Source: www.dimdim.com/

Figure 3.
ISL iMeeting

Source: http://v5.islonline.com/islgroop/overview.htm



Source: www.adobe.com/fr/ products/connect/

Figure 4.
Adobe connect

a representation of students and working tools. Two aspects in particular seem to be very important. First, users are given some leeway to personalize their tools and working environments. Second, users are given the possibility to access two screen spaces: the virtual rendering of the class (either a table of webcams or a 3D environment – second-life like – not represented here) and the toolbox.

We noticed that the dispersion of avatars/users in the representations of the class made it is difficult to actually create a feeling of togetherness and empathy.

In the second stage of the "contradictory semiotic analysis", rather than looking at what others had done in the same field, the design team focused on empathy as it has been dealt with in other media. They wanted to see how issues of self-representation, the representation of presence and management of multiple viewpoints had been aesthetically treated. This second stage in the designers' work targets two different things. They decide to innovate: they could either copy and slightly modify the previous interfaces so as to produce a variation of the same. Or they want to reorganize the interface and service and therefore want to import new features into the product. In both cases, they do not want to lose the user, so they bank on users' literacies in other media. They then chose to focus on how they could promote the feeling of togetherness and empathy in the interface. They therefore turned to another knowledge base on the theme of empathy to uncover historical systems of representation of self and others. They therefore studied how empathy was being dealt with in visual medias: painting, photography and film.

In cinema, in particular, they noted that empathy means that the viewer is made to share the viewpoint of the character either through a first person narrative viewpoint or

with medium shot (to feel closer to the actors, to simulate an immersion in the scene) and close-ups (to show facial emotions). But empathy is not only built through first person narrative. A number of other shots give the spectator a feeling that she is part of a group, that she can share the general view that characters have from inside the movie: the experience of dialog in a group can be rendered through bird eye view or third-fourth shot that have all the actors visible to the camera (in particular to allow complicated dialog scenes between more than two people without changing camera position). The way the scenes and the characters are shot is not enough to provide the feeling that you can change viewpoints. Editing techniques in cinema (and subsequently in video and 3D world) provide dynamic change of viewpoints: shot and reverse-shot for example, to simulate a dialog, etc.

While empathy is at the level of representation of people, the design team observed that togetherness lies at the level of representation of the atmosphere of a class, of a group working, so by the representation of different levels of interaction.

The main advantage of using representations and media as a starting point is that it prevents the design to try and fail emulate "real life". The exploration of media based representations helped craft alternatives that support experiences that cannot be lived in "real life": to see different scenes at the same time, to be both very subjective and omniscient, to make ellipses in time and space, etc.

We call this whole process "contradictory semiotic analysis" because it organizes a dialog between the rationales of two semiotic systems. The first analysis relies on gathering similar interfaces with allegedly similar purposes. It aims at digging up the characteristics of the genre. The second analysis picks up one characteristic and surveys other instantiation of this characteristic, regardless of purposes, or types of media. The process is therefore first inductive: looking at all similar interfaces to come up with the same rules, and patterns. Out of this first semiotic analysis, came two concepts: togetherness and empathy. The second one is deductive: starting from the hypothesis that empathy and togetherness are a question of viewpoints, it then moves on to look at what are the different instantiations of this rule in different media and situations. The last stage is abductive (Peirce, 1966). Abduction has been the subject of renewed interest in design to explain projection in the design work (Sowa, 2003; Sowa and Majumdar, 2003; McJohn, 1993; March, 1984; Roozenburg, 1993). In our case, thanks to the analysis of how empathy and the feeling of togetherness are build in particular in movies, the design team selected a number of elements from this grammar, that they then adapted to the e-learning interface. This is what Chow and Jonas call a "transfer" (Chow and Jonas, 2010). "During transfer, the sources act as signs, the new concepts are objects of signs, and the designers perceive the sources as denoting the objects." This transfer acts on several levels: it works on the form of the service (as it recognizes similarities), on the context of the service (as it takes from one context to place in another) and on the underlying design principle (to share someone's point of view).

3.2 Design and first tests of the interface "VUE"

In VUE the team implemented a "widget trend" and "a serious game trend":

(1) *Widget trend.* Each student can select all the elements she needs from the toolbox and can customize her interface. The design team selected this option in particular to address the issue of change of point of view and "camera like" moves.

(2) *Serious game trend*. Designers took the example of second life where students are immersed in a 3D realistic environment and are represented by a virtual agent. They also kept a part of the screen that is devoted to the choice of tools and the assessment of the situation as in most video games.

In a co-design approach, the research team organized user tests. They gathered eight employees working in different fields, from 22 to 49 years old (to have different profiles). All testers worked in the tertiary sector or were destined for this type of occupation (two students also participated in this test). Third-fourth had already followed vocational training but no e-learning class. The test took place in three stages: the manipulation of the prototype of VUE, a questionnaire and a focus group.

The tests focused on the following points: the graphic design, tools of representation and of change of perspective. Several fixed visual interfaces offering various perspectives of the classroom space were shown. The testers were asked to comment these interfaces and describe their impressions on these different points of view on the class. They had to comment the following four assertions:

(1) "I feel comfortable with this interface, in this space."

(2) "I want to participate / animate this virtual classroom."

(3) "I feel immersed in the class."

(4) "This interface is easy to use."

4. Description of the design proposition: VUE, a collaborative, immersive and synchronous online service

The scenario of use of VUE follows the sequence of a face-to-face professional training in which the teacher is the animator of the educative process. VUE can be described as a turnkey platform using the features of Web 2.0. It also takes into account the education as a whole, i.e. all steps of learning, since lesson set-up to review. But, for our investigation, we focused particularly on the time of the class. Two situations are considered: the lecture format that includes 15 to 30 students facing the teacher and the group work format in which students are grouped by four and five.

4.1 The interface in conference mode

In the interface in conference mode, there were in fact two interfaces: the student's (Figure 5) and the teacher's (Figure 6). The interface of the teacher is a reverse-shot of that of the student.

Contrary to the e-learning platforms that were examined, one of the main features of the interface is the large place occupied by the classroom. While they all use a number of elements and tools like space for slide presentation (which often occupies most of the screen), live performance of the teacher, student representation (via webcam, photos, avatars, virtual agents, a list of names [. . .]), communication tools (chat) and sometimes elements to measure the mood of the class (smileys, color code [. . .]), VUE uses all these tools but gives priority to the representation of the classroom. Students consequently occupy the seat that they have chosen. They are not seen as a list of webcams. The teacher faces the class as in a real situation.

The interface for the teacher is a reverse-shot of that of the student. He/she is facing the audience as in a "real life" lesson (Figures 7 and 8).

Figure 5.
Student interface in conference mode, VUE

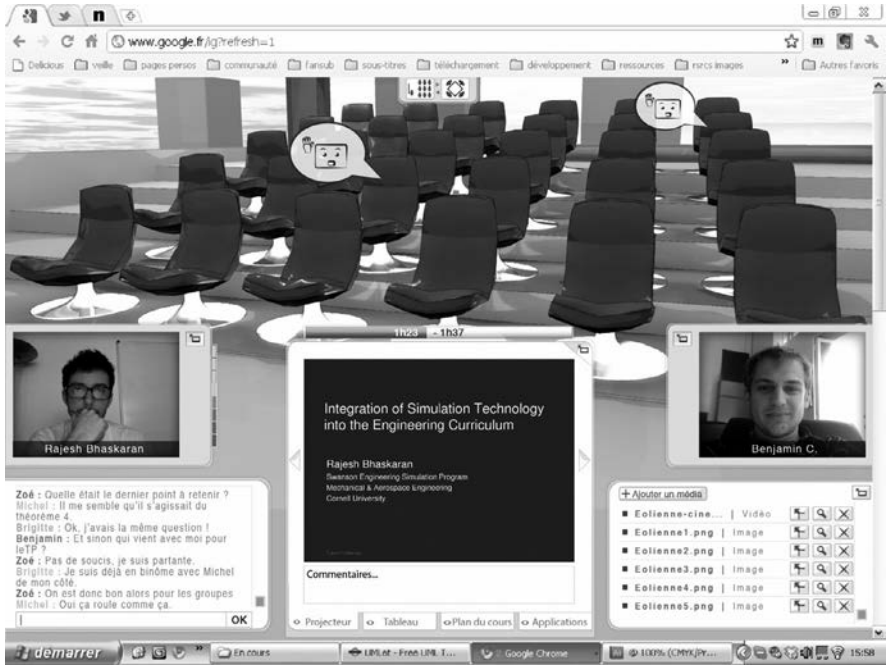
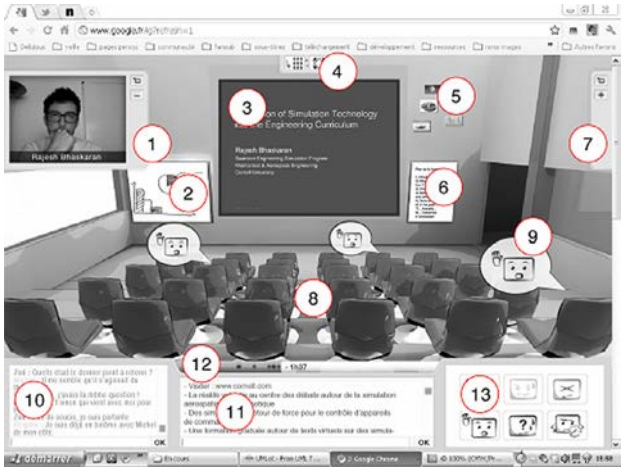


Figure 6.
Teacher interface in conference mode, VUE



1. Webcam teacher
2. Whiteboard
3. Slides
4. Permutation « lecture» interface to « group work" interface
5. Documents
6. Lesson plan
7. Webcam student
8. Classroom
9. Smileys to represent a question of a student
10. Chat
11. Note-taking
12. Timeline
13. Smileys

Figure 7. Description of the interface for the student

14. Permutation « lecture » interface to « group work" interface
15. Classroom
16. Smiley to represent a question of a student
17. Webcam teacher
18. Chat
19. Slides
20. Timeline
21. Webcam student
22. Other medias used during the lesson

Figure 8. Description of the interface "teacher"

When she enters the platform VUE, the student faces an empty classroom (like in Figure 1). She then chooses a seat in which her avatar will consequently appear. We have chosen not to show all the webcams to avoid overloading the interface. The identity of the student is revealed when the user makes a roll-over on top of an avatar: an identity card and a picture appear.

4.2 The interface in group work mode

The configuration of the interface "group work" is very different (Figure 9). The bottom of the screen, with the tools, remains identical: chat, timeline, note-taking (which, this time, is shared between students in the group) and emoticons. In contrast, the top of the screen is very different: we have the webcams of learners (each one

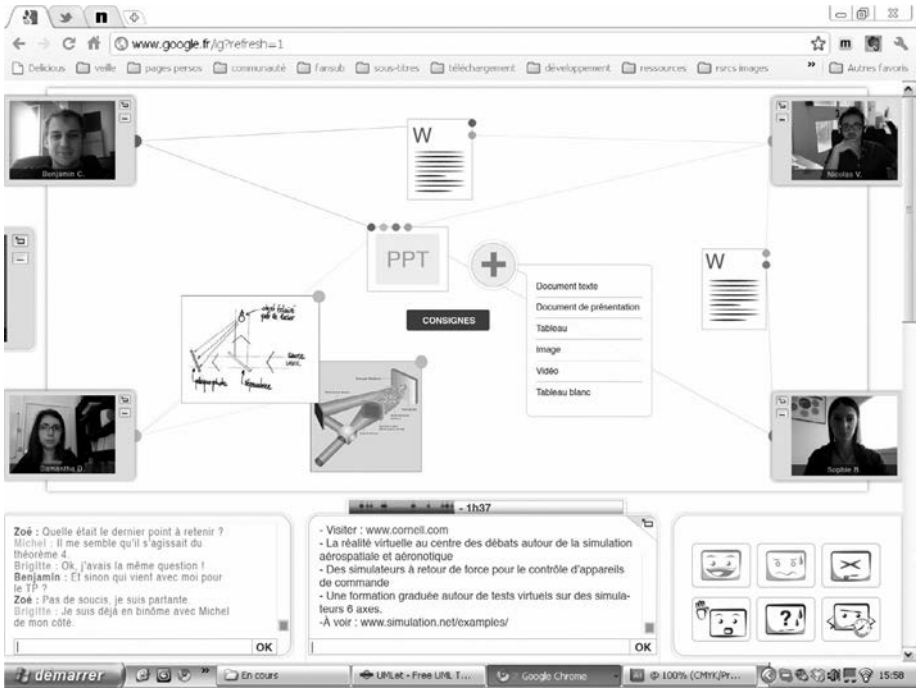


Figure 9.
Interface in group work mode, VUE

occupies a corner of the screen) and it is possible to show the teacher's webcam too (on the left, between Benjamin and Samantha). They are located around a "table" on which there are current files, as in a business meeting. On this table, one finds all the documents on which the group is working. When students work on a particular document, there is a new configuration of the screen (Figure 10).

5. Results

The 3D platforms seemed too distracting while they did contribute to a feeling of togetherness. On the other hand, none of the 2D e-learning platforms (Figures 1-4) that the research team analyzed recreates a classroom atmosphere that reflects interactions and interplays between students, students and teachers but also whispers and background noises, all these elements that contribute to not feeling alone behind one's computer. To look for ways to fight this feeling of loneliness is important as loneliness is one of the main reasons for the loss of attention or for students to give up the program (Blandin, 2004). Togetherness lies at the level of representation of the atmosphere of a class, of a group working, so by the representation of different levels of interaction.

Between 3D representations and 2D representations, a third way consisted in managing the co-presence and sense of togetherness in the interface by providing various points of view of the classroom, i.e. to offer different plans thanks to the angles of camera.

Based on photographic and cinema techniques that build several viewpoints of the same scene, the design team developed visual solutions for the VUE platform. It provides the users with different viewpoints on the same situation. This solution

Figure 10.
The interface in group work mode with document, VUE

empowers users to choose the relevant point of view, as if choosing from different cameras. What the tests showed was that a number of features were thought as "natural" even though they came from a translation of different techniques of mediation.

5.1 The student interface in conference mode

A global view of the class from the back of the room gives the users the possibility to feel part of a whole group. It is a slightly "false" natural view point as it builds in fact an "omniscient" view point and not a personal view point. On their screen, students have a high angle shot of the classroom, from the last row. However, they are also represented in the classroom by an avatar. Since students chose their place, designers had raised the possibility that they could see the hall from their seat, simulating maximum immersion. However, this position masked a portion of the class (behind the students) and therefore part of the information. Finally, each student has the same view on the class, from the back, in an omniscient position.

The design team chose a need to know basis design: small groups are easy to represent in a realistic manner by just transmitting their webcam images. Issues of representation are far more complicated with a growing number of students. Designers played on different representations of the users that followed a modular degrading design, from realistic to schematic. It was felt that realistic representations on a need to know basis did not quite give so much liveliness as representing everybody (either webcam or full-fledged avatars) in great detail. Still it allowed users to feel that the room was indeed filled with people, and access their full representation when they

were actually active (speaking) or because the user would want to see the details (on-demand basis).

To simulate the feeling of togetherness, research has been done in the field of audio design (Bruillard, 2010). But to avoid too many distractions, the team chose to render the chatty atmosphere of the class through speech balloons above the learners.

5.2 The teacher interface in conference mode

The interface "teacher" presents a semiotic construction used in comics and "photo-novels":

- In the upper zone of the interface (Figure 6) the teacher has an overview of the class – from the rostrum face his class.
- In the lower zone, he sees everything that, in a classroom, would be behind it: interactive whiteboard, course materials projected on the wall [. . .].

This configuration offers the advantage of presenting everything the teacher needs for his lesson (tools, documents) in addition to the classroom and students on one screen. There is a whole set of shots (view from the rostrum to the students) reverse-shots (view from the classroom to what is behind the teacher). During a lesson, every sense of the professor is solicited, in particular sight and hearing, so it was important that he could use everything he needed to teach. Indeed, our tests have shown that it is very complicated for the professor to change the "camera" while he was teaching. That is why the interface "teacher" offers a single point of view of the scene and there is no blind spot in his field of vision. The research team also provided the teacher with his own webcam image. Users tests have shown the necessity for an image feedback for the professor. Thus, he can control his image and readjust his attitude, tone [. . .]. This is again a reverse-shot compared to his position in front of the students.

5.3 Offering different perspectives

The aim of the research project VUE was to design a synchronous e-learning service for professional training. The challenge was to represent on the same graphical interface all the tools needed to conduct a class and to represent the whole classroom.

First, the results obtained with user tests showed that it was important to gather features and tools in the same area. That is why the research team divided this interface into two zones, high and low (Figures 1 and 2), the lower zone representing a dashboard.

But, second, it became necessary to represent all the configurations of the classroom: the classroom in conference mode, in group work mode, the teacher's viewpoint, the student's one, a student asking a question, etc. User tests also showed the importance for the teacher to have an overview of the classroom and his students while also having a feedback image of herself. Thus, it is possible for the professor to identify students in difficulties or to focus on one of them when they ask something. The testers suggested that these different perspectives could and should change depending on the type of activity that occurs during the lesson. For them as students, it was necessary to represent the atmosphere of the classroom to create a feeling of togetherness and promote collaborative work. For example, the testers preferred when a larger zone was devoted to the shared space – whether the classroom in conference mode or the common "desk" in collaborative group mode – rather than giving too much importance to the tool zone. In such a disposition, they felt more inclined to

participate in the virtual classroom because this layout supported exchanges and conviviality. With these tests, researchers realized the importance of varying points of views on the classroom. Indeed, this change of views on the classroom space enriches the learning experience because it allows empathy. In particular, viewing the whole situation, the teacher will initiate appropriate actions easily. Conversely, student becomes aware of what is happening in the classroom.

6. Discussion: from "control panel" to "control room"

In Lev Manovich ground breaking book on New Media Language (Manovich, 2001, p. 90), the author points out how:

> [...] cultural interfaces of the 1990's walk an uneasy path between the richness of control provided in general-purpose HCI, and the "immersive" experience of traditional cultural objects such as books and movies.

In particular, he notes how "a virtual instrument panel" or a "control panel" gives the user the possibility to organize the activity and check on the results through complex feedback loops. It offers information to make decisions, interfaces to visualize situations, and tools to launch actions. Most systems manage the two statuses of digital images:

> [...] the image as a representation of an illusionary fictional universe and the image as a simulation of a control panel (for instance, GUI with its different icons and menus) that allows the user to control a computer (Manovich, 2001).

In the literature on designing e-learning environments, the focus is indeed on providing the relevant tools for a personal or collective learning as well as finding the "right" representation of users.

Following our different findings, we think that we need to define more precisely the "control panel" analyzed by Lev Manovich. The control panel that the team developed was focused on the way people control their viewpoint on the situation. They can access different angles of the same scene. We think that this type of control is more like a "control room" than a control panel. The control room in television broadcast is the place where the video feeds from the different cameras can be watched. The production team selects the video feed that is going to be broadcasted by TV channels. The "digital control room" in our classroom also enables the user to select the "camera" that she sees as better fitting her need to understand the situation, to participate more effectively, or on the contrary to take some distance. It is a visual tool directly affecting the way the information is accessed. Each user becomes his/her own digital vision director.

To conclude, the control room is not just a tool, it is a structure, a digital object that determines the lesson format and teaching and learning practice. Indeed, the control room allows the user to make decision, to visualize different viewpoints and normalize the circulation of points of views. It can be considered as a device, a "dispositive" (Foucault, 1977), that shapes and organizes practices and communication.

7. Conclusion

The goal of this experimentation was to design an interface for a virtual class where being represented together contributes to the learning process, and explore the possibility of virtual empathy. In e-learning, loneliness is one of the main reasons for the loss of attention or for students to give up the program.

The methodology that we defined as "contradictory semiotic analysis" that consists in confronting media and importing visual grammars from one media to another has helped us create an interface that takes into consideration the importance of viewpoints in the organization of an e-learning context. The design challenge was to propose a kind of control room that tries to recreate an atmosphere of class by promoting a feeling of togetherness. The experimentation shows that the users felt more involved in the learning process, because the question of diversifying viewpoints had been addressed in the interface. However, monitoring empathy raised the issue of the attention of the learners. As attention and empathy are mediated and not in a face-to-face environment, an interface that is too elaborate or that is associated with a video game interface can actually be detrimental to the overall attention of the learners. For this reason, we are currently working on the concept of modularity. We mean to explore ways to channel the attention of the learner by visual effects: the spotlights, the use of blur, defusing some features as time goes by [. . .]. One of the scenarios that need to be explored is the balance between the display of slides and the display of the classroom. To develop these modular interfaces, we use the same method: "contradictory semiotic analysis", relying on the visual literacy of users not only through the use of common metaphors, but also using visual grammar that people are familiar with. We think that this method could be applied to different fields of HCI.

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