ABSTRACT This study examines the types of interaction and reflection that were developed among several groups of Spanish teachers connected via two computer-based telecommunications systems. In each case teachers contributed images of difficult situations in their classrooms. At the first stage the photographic images were recorded, scanned and transmitted. This easily hid the identity of the participants, who communicated through electronic mail. In the second stage, video recordings of similar situations were transmitted during video conferencing sessions. These recordings, captured in the teachers’ workplace, highlighted the differences in culture between the classrooms. It was possible to categorise interactions at both a general and specific level. It was almost impossible to communicate emotion using either telecommunications system and as a result it was difficult to establish the professional relationships and communication necessary to support reflection on the teaching process.

Introduction
The investigation was designed to explore the possibilities and limitations of the information superhighway within teacher education. Interest in this topic has been identified by different authors (Davis, 1995 among others) deducing that, in addition to contributing to personal development, continuing professional development is an inevitable aspect of life in an information society.

Using the review and classification of studies provided by Collis (1995), this investigation falls into the category of “Examples of Networking in In-Service Teacher Education” (p. 125). We sought to understand the potential of computer networks for teachers to develop their own
community of learning, and also for them to train themselves at their own academic level, the first stage of Mandatory Secondary Education (ciclo de Enseñanza Secundaria Obligatoria [ESO]), which includes students from the ages of 12 to 14.

Objectives

In line with Schön (1983), the author believes that conferencing and discussion about teachers’ performance in the classroom helps their professional development. According to Habermas (1988), in order to succeed, a social relationship must be condition-free, with freedom of expression and truthfulness assured.

We began with the idea that in order to carry out professional development for teachers, it is essential that they analyse and deepen their knowledge of real-life situations in the different areas of their workplaces (classrooms, staff rooms, staff meetings and parent-teacher conferences) with the aim of elaborating and modifying the elements that are unsatisfactory with respect to the teaching and learning processes. There are a wide range of elements, from previously held conceptions of oneself and one’s students, to strategies and other members of staff’s perceptions of factors that determine one’s work. These are the social and political conditions of education.

We argued that in order to ensure professional development by communication through a computer network, it was better to plan and establish processes of Investigation-Action between the participants from the various schools that were hooked up to the network. Such processes should offer the following:

- they should offer the opportunity to experience the serious dilemmas that exist in one’s classroom work;
- they should enable one to feel at first hand the obstacles and conflicts found in one’s classroom practices;
- they should provide opportunities to overcome resistance to change, encouraging the formation of the teacher’s own theories and beliefs;
- they should help to establish a community of meanings and reflective processes that help all the participants to understand the outcomes, assumptions and reasoning.

We understood that Investigation-Action integrates knowledge and action. At the same time, such an integration implies that to change the way teachers work is to change the way that they understand their work and their objectives.
The research questions investigated in this article focus on the situations that arise when a group of teachers, from geographically dispersed centres, have a computer-based network available to communicate with one another.

The main question asked was, “Does a teacher’s professional development improve?” This question was further broken down into the following:

- Do academics use the network?
- What do they use the network for?
- Which aspects of their work can be improved through discussion?
- Which processes do they develop through asynchronous interactions in the computer-based network?
- Is it possible to ensure the freedom of expression, accuracy of remarks, etc. proposed by Habermas (1988)?

Therefore, the aim of this research is twofold. First, we want to study computer-based telecommunications systems and their characteristics. Secondly, we want to determine their potential and limitations in training situations.

**Description of the Interaction Established among Academics through Computer-Based Telecommunications Systems**

One can distinguish two types of interaction and each one is a stage of our fieldwork. In the first one, teachers used a form of electronic mail, similar to the one presented by Thach (1995), to analyse and discuss classroom experiences. We used this technology to reflect on and question examples provided by teachers of a difficulty in their work. Earlier, they had taken pictures of these in their classroom, which were digitised and sent to the other stations in the computer network. In this first stage there was asynchronous communication, that is, it was not necessary for the parties to participate at the same time.

In the second stage, in addition to using electronic mail, we also used the following technologies:

- A video conferencing system, similar to the one described by Berge (1995).
- A 10-minute video recording of the situations under discussion. This was digitised and sent to the rest of networked workstations.

The ‘face-to-face’ or synchronous communications, provided by the video conferencing system in the second stage, took place through the Digital Network of Integrated Services (RDSI) provided by Spanish Telecoms, using LIVE PCS 100 TM equipment from the firm Picturetel. The monitor displays local or remote windows, and also has a facility to transmit audio as a
private or public audio conference. The video recorder incorporated in this equipment had a dual purpose: to focus on and transmit the participants in the discussions as well as record documents. The swapping of the pictures that were shown on the computer screen was voice-activated, i.e. when someone spoke, their video picture was transmitted from that network station. This automated system eliminated the need for a moderator or coordinator to control the conference.

Methodology

Sample

Participation in the study was offered to a group of public schools in Spain that teach the 7th and 8th years of Basic General Education (Educación General Básica), or, according to the terminology introduced by the current educational reforms, the first cycle of Mandatory Secondary Education (ESO), which covers 13 and 14-year-old students.

Out of the schools invited, the first three to respond were:
- C.P. Miguel de Cervantes de Mejorada del Campo (Madrid).
- C.P. Alcade de Móstoles (Madrid).
- C.P. La Latina (Madrid).

Four members of the teaching staff participated in each school, together with three members of the Department of Didactics of the Universidad Complutense of Madrid, making a total of 15 teachers.

Each school used the following computer equipment:
- A personal computer, MS-DOS compatible with a hard drive of at least 1Gb.
- A scanner to digitise photographs.
- A modem with at least 14.400 bits per second.
- A telephone line.
- Equipment with the capacity to install a communications program that would determine the parameters, which all of the computers in the network would have to use, in order to establish interaction between users.
- The central computer (Holt) with a capacity of 2 Gb, which was located in the Department of Didactics.

Development Plan

The work conditions and a series of activities were arranged in two phases, in two academic years.

May-June 1994:
- The three schools were selected.
The purposes of the study were explained.

The communications program was connected and tested, enabling two windows to be present on the screen: one for texts and the other for photographs.

In order to ensure freedom of expression and openness in the contributions made by the participating teachers, two email addresses – one anonymous and another by name – were issued to each member of the study.

September-October 1994:
A series of meetings was held to train the teachers in the use of the communications software and the scanner, so that they could create files with photographs that illustrated details of classroom activities. They were also taught to compress and decompress files. Finally, the work plan to be followed during the investigation was presented.

October 1994-June 1995:
Interaction by electronic mail.

December 1994, March and June 1995:
Face-to-face meetings were held to analyse the work completed and evaluate the relevance to the personal and professional development of the teachers.

One of the conclusions which emerged in June 1995 was the poor ability to contextualise many classroom situations through electronic mail. Such an obstacle impeded making relevant evaluations for the teachers who were analysed. This was a difficulty also shown by Davis (1995), who pointed out that “When telecommunications are employed, the social context is harder to appreciate and can vary considerably for the participants” (pp. 108-109).

This conclusion, combined with the falling cost of video image digitisers, led us to include their use in the second phase of the investigation with two purposes:

- to contextualise classroom situations as the object of analysis and discussion;
- to develop monthly debating sessions through video conferences.

October 1995 to June 1996:
Interaction was developed in the same way as in the previous year, but using classroom situations illustrated with video images. Face-to-face meetings were held to analyse the value of the processes and reflections generated and their repercussions on professional development.

Collection of Data
Research information was collected about the kinds of teaching situations, difficulties, problems and doubts presented by the participating staff about...
work in the classroom or centre in question. It was also necessary to take into account the intentions and interpretative framework (theories, beliefs, etc.) used by the rest of the participants when we analysed and evaluated real-life situations. A process of triangular evaluation was deployed. The teaching staff of one school formulated a question, teachers from other schools responded to the investigation and, as the third point of triangulation, staff from other centres not related to the investigation had the role of external observers. This took place at the end of each month. An analysis was carried out to distinguish between different categories of knowledge, which is presented in the next section.
In addition, the total number of interventions mediated through the network was tallied up, along with the person they addressed and their purpose.

**Discussion of the Results**

The research is discussed using the themes of reflection and deliberation. The word ‘theme’ denotes an aspect of data that was common to both phases of the investigation. The themes are: ‘technical difficulties’, ‘message content’, ‘the nature of communication through computer networks’, and ‘results of interactions in teacher education’.

**Technical Difficulties**

Difficulties experienced by the teachers in using the computer network were evident in both phases of the study. Once these difficulties were analysed, we discovered that they were of different natures. In the first phase, which was characterised by asynchronous communication, the technical problems arose from the knowledge and application of the commands and codes contained in the communications program. In the words of a representative group of participants, it is complicated to use the network because one must know how to use “chains of codes which are difficult to understand”, or, as someone admitted, “those huge lists full of words and numbers are hard to digest”. The participating teachers had problems using the compressed files; for example, to decompress and execute a file called AULA.ZIP, they had to follow these steps:

1. Create the subdirectory AULA in the hard drive:
   ```
   C:\ MD AULA
   ```
2. Change to this subdirectory:
   ```
   C:\ CD AULA
   ```
3. Copy the files that begin with PKUNZIP (which was the decompressing program) from drive A:
   ```
   C:\ AULA\ COPY A:PKUNZIP
   ```
4. Copy from drive A the file AULA.ZIP:
5. Finally, the files are decompressed with the following instructions:

C:\AULA\COPY A:ULA.ZIP

The difficulty expressed by a representative of the group of teaching staff was not merely in having to remember the commands, but also learning the routine that had to be followed in order to execute them. Having completed the previous operations, if someone wanted to know the content of AULA (which was a photograph that showed the organisation of material and students in a classroom), he had to run the file AULA.EXE.

We found various reasons which explain the low level of on-line communication that took place during this phase. For example, mistakes were made in logging-on conventions for the use of email. Many of the participants failed to check their electronic mailbox. Another mistake was forgetfulness, as documented by some members of the network: “when the discussion is held over a very long period, it’s possible to suffer from a memory lapse or for problems to arise that cannot be corrected”. We add to this lack of interaction the confusion experienced by those who were at their workplace trying to contact the rest of the teacher-users and who received no response. The teaching staff in the first phase also had difficulties in controlling and using some of the computer hardware, such as the scanner. They were the first to use such equipment in their schools.

We observed that technical difficulties are a common issue in investigations into the use of telecommunications in teacher education. For example, Gunn (1995) found difficulties due to overload of the four lines of communication she had at her disposal in the USA; and Zhenzhong & Harrison (1995) reinforce this fact when they affirm that the subjects most frequently discussed by experienced teachers who interacted through the computer were of a technical nature, which stemmed from the difficulties when using this medium. Our conclusion is that teachers need technical training so that they and their students can develop skills to avoid these limitations.

In the second phase, the technical problems were of a different nature. They arose out of the implicit difficulties in the interaction processes that are characteristic of synchronous communication. When analysing the encounters in the face-to-face meetings held every three months, one person described the video link as something valuable that permitted one to hook up and “communicate face-to-face at a distance”. It was this comment that led to discussion and
questions: specifically, what was understood by “hook up and communicate”? If it dealt with textual or verbal information, then the network did make it possible to hook up and communicate. However, if it meant initiating and maintaining a human relationship in all its dimensions, then computer networks, which currently use a monitor screen, rarely transmit nonverbal communication such as a look or intonation expressing emotion. These, together with other aspects, permit us to show our feelings toward people. An illustration of this idea is given in this comment from one of the users:

If I want to show someone that I’m enthusiastic about what she says, or express that I get along well with her because she impresses me and I admire her ideas, then I’d like to look only at her, and have her realise that my way of looking was ‘special’, uniquely for her, not for everyone else who appeared with her on the computer screen. Similarly, how could I let her know that I’m looking at her when I also have to maintain a relationship with three or four people? If we were physically together face-to-face, I could look at her only and not the others.

This issue of limiting the processes of communication, together with the difficulty of provoking reflection at a distance, affect the goals of this investigation in a substantial way. They are now analysed in three sections.

Message Content

A second theme of the analysis was the content and meaning of the relationships established between the teaching staff through a computer network. Within these contexts we noted the absence of ‘emotions’. The reports provided by each centre, and the recorded debates held afterwards with the participants in the study, suggest that the reflections and evaluations from a distance were more widely accepted by the teachers who became the object of group analysis. The teachers appeared to develop empathy, because it made each one think on a personal level and they were pushed into restating meaningful teaching situations. These are denoted as ‘macro’; i.e. those that deal with ‘more generalised content or questions’. Two examples were: a procedure for planning a school outing; and a strategy followed by all the teaching staff at the same academic level to draw up timetables. We observed that the discussions over more limited questions were not perceived as relevant when they were raised because these peculiarities pertained to only one classroom or school. In other words, the commentaries or analysis at a distance of ‘micro’ situations (like those
that take place when we develop or select material, when we are dealing with the selection and organisation of pre-determined content, or when we decide on a particular way to interact or take the lead, etc.) were not considered relevant to other teachers. Teachers did not feel understood by those who made such judgements, nor did they identify themselves with the content of that analysis. On many occasions, teachers considered such evaluations stupid because they were made from a place which was outside of their experience. The teaching staff who were evaluated in this way tended to think that it was difficult to help someone answer a question without knowing the full story. The social context of the teacher under discussion was important, particularly his or her alliances and negotiations which are part of the local social context.

Therefore, two categories were identified: the macro for issues of general interest and the micro for items specific to a location or person.

In addition to the professional content of the teachers’ interactions, there was evidence of personal communication and emotional content. In the analysis of the discourse based on interactions among the participants, we observed elements unrelated to the original topic of reflection. For example, in one of the debates over “substitutions of teaching staff when, with justified cause, a teacher could not go to his classroom”, one participant said:

> There’s no reason why I should have to choose one of my colleagues as a substitute. It’s necessary to distinguish between when one can’t give a class due to private reasons, like going on a trip out of town (in this case, I’d draw up a timetable to catch up on all the classes not taught), and when one can’t teach due to illness (and in this case the administration should make arrangements to cover my absence), although I have to tell you that I haven’t been on sick-leave for 20 years.

Such a declaration was interpreted by the teachers in other locations as being a personal statement, belonging more to the private world of the contributor and unrelated to the content of analysis. In addition, four of the 15 members interpreted the commentary as being one which pertained more to the participant’s own emotions: “In some way, he felt it necessary to communicate some facet of his personality. We’re sure that his social environment prevents him from making such personal statements”.

However, in the first phase of the study, there was little emotional content in the interactions through the computer network among the teaching staff. One school concluded in its final report:
electronic mail is a means that does not incite one to establish emotional relationships; at the most one maintains those that already exist and were established in a personal fashion. We base this affirmation on the evaluation of the majority of the participants of this centre, and we judge that the relationships maintained with other teachers not previously known were professional relationships and, above all, cold.

The medium used in this research for establishing relationships was electronic mail, whose primary form of expression is textual. This limits the expression of emotions and feelings, easy to convey with a look, tone of voice and other means of nontextual and nonverbal communication. In the debates recorded, it was declared that:

it is possible through written texts to express feelings and emotions, as clearly seen in poetry, but electronic mail has a component that ‘suffocates’ such expression, and it is the very rigid format used in this type of written interaction, in which the message text has a limited and assigned place, where each colleague can write his ideas.

The previous group of teachers were referring to communications programs already in existence. In general, they used very rigid formats for sending messages through electronic mail; a format is shown in Figure 1. A communication format that contains a line for ‘Subject’ does not invite the participants to confess and state explicitly when the topic to be dealt with is ‘emotive’. The teachers expressed a certain inhibition at the moment of writing and identifying the content of their participation. One of the participants said:

There’s no reason why I should have to publicise that I want to talk about my trials and tribulations, because on the other side of the computer someone can read it who’s not in harmony with what I need; not because when he reads it several days have passed, but rather, as has already happened on other occasions, because very possibly those who read it won’t understand it, and it might seem to them that the content of my message is comical. At most, what I do is put ‘personal’ in the ‘Subject’ section. I know that I could simply avoid identification of myself and use a fictitious name, which is replied to in an anonymous way. I believe that feelings in electronic mail are something that is not taken seriously.
The second phase of the investigation was characterised by the addition of video conferencing sessions to the relationships maintained through electronic mail during the first part of the study, and it added a visual channel to the communication. It was ‘the look’ of those who were at the other end of the telephone line that provided a visual aid for the participants and was a helpful means of showing an element of their emotional states. This data has not been confirmed in recent studies. Davis (1995) pointed out that a view of others is normally used to augment the flow of the conversation and the identity of the participants, but she made no reference as to how it affects emotional statements and personal situations.

This absence of feelings in the messages sent through different channels of the computer network was debated in the meetings that took place at the end of every three months. They came to the following conclusion:

Human beings open themselves emotionally when they find themselves in a comfortable and meaningful environment, when there is a common history and some shared experiences. Evidently, these are circumstances that were not produced among the participants who, in their physical and personal distance, contacted and interacted by means of the network.

These conclusions result from the lack of a common interpretative framework among the participants. It appears that little value was placed on judgements about life in the classroom, when that life is unrelated and distant for those who make such evaluations.

The Nature of Communication through Computer Networks

In the quarterly debates recorded by the team, a theme was presented on the ‘degree of kindness’ of the network to make true communication possible between the different participants in the research. (This links to the latter part of the preceding discussion.) The first aspect or element considered was the process and depth of reflection.

It is necessary to distinguish between the phases of the study. In the first phase, characterised by electronic mail, a low level of reflection was observed. The research considered that moments of reflection would contain all the following processes:
x an analysis of the other’s views;
x a communication of the interpretation of this analysis;
x a verification and contrast of how our interpretation has been understood;
x a placing or re-interpretation of the views held about the others.

According to 11 of the 15 participants, these were processes of interaction that did not flourish. The little communication that did take place was characterised by a rapid sending of messages. The following argument, put forward by one of the participating groups, explains the scarcity of reflective communication:

regarding a question asked through electronic mail, or the interpretation of a response given by someone about a problem or point of interest, there immediately emerges in each one of us our own reflection but, as we don’t have available and directly in front of us the person with whom we are speaking at that moment of replying, we delay writing about such a reflection or replying verbally (sometimes because we think: ‘well, later on I’ll think about it some more and write the response’). And there is our problem! That is, when several days have passed, and we go over our reflection or reasoning, they have faded to such an extent that the response loses relevance and strength.

Such messages helped researchers conclude that communication through the network in the first phase of the investigation was more informative than reflective. This is despite evidence from the participants, stating that when they received an email message expressing a question or raising a doubt about what happens in the classroom, they did rapidly initiate a process of reflection. Two factors were detected which obstructed the development of the reflective processes.

One factor was the absence of immediate feedback. This seems to be a necessary element for reflective processes to take place; and, more importantly, necessary for them to be complemented with reflections generated by other participants. This drawback to interaction via email has also been reported by Zhenzhong & Harrison (1995), when they showed that one result of ‘on-line’ or synchronous communication was immediate feedback, which gives life to the interaction. Asynchronous communications – including those made through electronic mail – do not have this.

The second factor was the absence of visual images of the other participants. Participants’ attitudes and gestures could have added meanings to the content of the message.

The absence of these two elements seems to have been an obstacle, because one of the most important aspects of high-quality communication is the ability it gives the participants to understand the meanings
or values that are imparted to the events analysed, as well as the sense of the symbols used and actions carried out. The meanings were only understood when there was, at least, a message flow between the different participants. Such a flow rarely occurred via email. This lack of reflection is explained by considering the propositions of symbolic interaction; where reflection is a necessary process in the construction of meanings. In order for it to take place, what we need to be able to do is:

- to analyse ourselves, including attitudes and responses of other people to ourselves; understanding that, in this situation, such responses act like a psychical mirror that reflects how we are considered by others. This facet of reflection, which permits us to look at ourselves through the eyes of another, provides an objective view. It is a view that will be important in promoting the professional development of teachers.
- to analyse others in order to understand them and interpret the world through the discovery of meanings assigned to the symbols being used. This level of reflection will permit us to know the scenes, the roles and the basess of the situations generated by others when teaching; and it will make it possible to construct a community of meanings among the participants, which is necessary for quality communication.

Both components of these reflective processes can only be developed when there is a flow and an immediacy of exchanges within the interaction. We tried to solve this lack of interaction in the second phase of the study with the addition of a video conferencing system. Here we hoped:

- to present, as the object of our analysis, teaching situations that are found in real classrooms, in a more contextualised way;
- to use the video conferencing system as a tool that would encourage discussion at a distance.

The participants came to the unanimous conclusion that the latter of these aims was achieved; the video conference did make it possible for the exchange of ideas to be rapid. As a result, new ideas were added and current ones were developed which, on many occasions, were superior and had more impact than those generated in previous interactions. Video conferencing provided more depth when analysing classroom situations. This is illustrated by a comment from one of the participants:

> If we feel a kind of ‘memory loss’ in the interactions via electronic mail due to the ‘temporal pauses’ that existed between the sending of an idea and the reception of a response, with the video conferencing system these pauses no longer existed. This is what has permitted the analysis of
and reasoning behind some teaching activities to be more fluid, faster and more profound.

One of the reasons that explains this increase in reflective relationships is the fact that the video conferencing system provides the ‘visual presence’ of the other participants and, as one of them expressed, “the relationship through the network comes closer to the one that actually exists in ‘face-to-face’ situations”. Although this is true, such an equivalent does not transmit nonverbal elements to specific participants situated in another location, as noted previously.

Furthermore, we extended the scope for contextualisation of the contents. In this sense, there were different degrees of ‘atmosphere’ detected in each phase of the research, as well as variation of the elements and circumstances. Davis (1995) has shown that the way in which the social context affects the teaching and learning processes is an influential element, although it is difficult to appreciate, and varies considerably for each participant.

During the first phase of the research, interaction through the textual environment was complemented with analysis of photographic images of a classroom and a debate held on a theme related to the study. Two types of situations appeared to arise and this, in some way, affected the level of equality that the participants enjoyed. The first type of situation was characterised by the basic text which generated reflection and the discussion. It contained questions that were presented in an interrogative way. Seeing as the questions were the same for all the participants, we concluded that there was equality between participants. It was easy for everyone to understand the questions, since they did not require a high degree of comprehension of previous events. The second type of situation was different in that the text contained statements about an event experienced by the authors. The following intervention by one of the participants warned about the existence of inequality between them:

> When I find this kind of statement I feel like a ‘second-class citizen’ because I perceive that there is not equality of interaction in the network, and because those who make such statements have already shared these situations; they have the same experiential references and have lived the classroom events whose photograph is the object of study. I don’t know anything about this so I find myself in an inferior position, unable to make the kind of statements they do.

In the recorded meeting held at the end of the last quarter of the first phase, it was concluded that there were two different environments: one which
generated questions about the content of a photograph; for example, what
do you think about this distribution of classroom space? Or, could we
improve the positioning of the students to favour the development of
debates in the classroom?; and that which was based on a series of
statements about such images, for example, “after several practice runs, this
is the best way to distribute information on the blackboard”.
An explanation given was that in order to intervene or respond to
certain questions about an image, it was not necessary to have shared
experiences with respect to the content of such images. This was
because it was assumed that they had not been sufficiently relevant for
those who made them, since they asked for help with understanding
them. Nevertheless, at the final meeting of the quarter, it was
concluded that when someone commented about a classroom event in
which they had participated, it was basically because “it was clear that
such certainty was due to having ‘lived’ these events and knowing
how their students had experienced them”. Clearly, they were experi-
ences that not all participants had had at first hand.
On the one hand, there were those who had experienced such a situ-
ation and had more information, having generated common meanings,
shared opinions and previous knowledge about these situations. On the
other hand, there were those who did not have interpretative references
resulting from participation in such classroom experiences, and
evidently they found it more difficult to contribute to the analysis.
The second phase of the research was introduced before we knew the
potential of 10-minute video clips and that offered by a video confer-
encing system to develop recorded discussions at a distance. Although,
a priori, we thought that the increase in the number of representational
systems and, consequently, that of sensory channels (voice, music and
moving images) would improve the quality of interaction, it did not
happen in that way. When the references to each classroom situation
were analysed, the participants did not respond with sincerity or
freedom of expression because they were no longer anonymous and
because they saw their images on the screen. The following declara-
tions by one of the participants demonstrates this conclusion:

When I intervened and saw the camera in front of me, right away I
thought that a lot of people were going to see me. This gave me certain
inhibitions and insecurities, and I looked for interventions and
commentaries that I thought would be positively received. Many times I
didn’t intervene or tell the truth for fear of not being understood.
In this sense, interaction in the second phase was not of high quality even though there was an increase in the number of references which encourage interpretation and comprehension of the events. We did not achieve freedom of expression of ideas among the participants. This fact has led us to conclude that in the two phases of the research there was no true communicative action because, according to Habermas (1988), this must provide the participants with the possibility of being able to maintain reflective relationships, as well as having freedom of expression, sincerity and equality.

In the last recorded meeting at the end of the second quarter of 1997, the participants concluded that this type of computer-mediated communication maintains the roles, hierarchies and relationships of power that existed before establishing relations through the computer network. We now attempt to characterise the interactions in each of the two phases of the research.

### Table I. Interactions via computer networks across the two years (n = 1374).

<table>
<thead>
<tr>
<th>Type of Intervention</th>
<th>During 2 years (n = 1374)</th>
<th>In the 1st year</th>
<th>In the 2nd year</th>
<th>Addressed to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers of first cycle of ESO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request for didactic help</td>
<td>323 (23.5%)</td>
<td>144</td>
<td>179</td>
<td>39 to ESO teachers</td>
</tr>
<tr>
<td>Request for technical help</td>
<td>41 (3%)</td>
<td>30</td>
<td>11</td>
<td>284 to university teachers</td>
</tr>
<tr>
<td>Questioning others</td>
<td>82 (6%)</td>
<td>29</td>
<td>53</td>
<td>65 to ESO teachers</td>
</tr>
<tr>
<td>Responding to questions</td>
<td>124 (9%)</td>
<td>47</td>
<td>77</td>
<td>17 to university teachers</td>
</tr>
<tr>
<td>Responding to specific question</td>
<td>59 (4.25%)</td>
<td>40</td>
<td>19</td>
<td>98% to ESO teachers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33% to university teachers</td>
</tr>
<tr>
<td>University Professors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question work of teachers</td>
<td>176 (12.85%)</td>
<td>61</td>
<td>115</td>
<td>Responded to 33%</td>
</tr>
<tr>
<td>Questions about classes</td>
<td>58 (4.2%)</td>
<td>39</td>
<td>19</td>
<td>ESO teachers</td>
</tr>
<tr>
<td>Respond to request for help</td>
<td>452 (32.9%)</td>
<td>198</td>
<td>254</td>
<td>ESO teachers</td>
</tr>
<tr>
<td>Respond to technical questions</td>
<td>42 (3.05%)</td>
<td>31</td>
<td>11</td>
<td>ESO teachers</td>
</tr>
<tr>
<td>Respond to questionings</td>
<td>17 (1.25%)</td>
<td>11</td>
<td>6</td>
<td>ESO teachers</td>
</tr>
<tr>
<td>Total</td>
<td>1374 (100%)</td>
<td>648</td>
<td>726</td>
<td></td>
</tr>
</tbody>
</table>

Table I. Interactions via computer networks across the two years (n = 1374).

In the last recorded meeting at the end of the second quarter of 1997, the participants concluded that this type of computer-mediated communication maintains the roles, hierarchies and relationships of power that existed before establishing relations through the computer network. We now attempt to characterise the interactions in each of the two phases of the research.
In the first phase, the participants were able to hide their identity in all of the interactive situations, except when they had to respond to a question directed to the email address bearing their name. It was set up as described in the methodology section, so that each participant could have two electronic mail addresses: one by name and the other by password. In this way, they could send and receive anonymous responses on professional topics. In the second part of the study, the participants had an additional mode of communication in which it was difficult to remain anonymous: the encounters and debates through video conferencing. We were surprised to find that, of the 1381 messages that were sent during the two years, only seven of them were anonymous (0.5%). Three were issued in the first phase, and all except one in the second phase were sent to encourage or reinforce an idea. The exception was a message sent to criticise a ‘supportive’ attitude that one of the participants had shown. The teachers came to the unanimous conclusion that there was freedom to express personal experience or perception of information and messages shown on the computer screen, thereby overcoming hierarchical or professional position. However, the evidence that we present below shows that, despite the potential for breaking with power structures, they were in fact maintained and accepted by the participants.

In it we note that:

- the university professors were questioned minimally (1.25%) and more in the first year than in the second;
- the university professors asked more questions than secondary teachers (16.85% of all interventions, as opposed to 6% asked by the teachers of ESO);
- the greatest percentage of interventions by ESO teachers were made to ask the university professors for advice and academic help (23.5% of the total number of communications);
- the university professors’ main activity was to direct and respond to the requests for assistance made by the ESO teachers (32.9% of the total number of interactions made in the two years of the research);
- both the requests for assistance made by the secondary teachers to university staff and the percentage of professors’ questions tended to increase in the second year of the research. This was interpreted as a reinforcement of the kind of relationships already existing in the computer network.

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We concluded that the computer-mediated communication documented during those two years maintained relationships and hierarchies of power already in existence among a series of users, by reinforcing the identities of the university ‘orientators’. At the same time, they provided means by which the secondary teachers could analyse and understand themselves and express their doubts, difficulties, inadequacies, etc. Following acknowledgement and responses, the tutors initiated a process of reconstruction orientated towards those who professed scientific knowledge - they were, after all, experts in this field of knowledge (both technical and academic). It appears that power relationships exist because the request for assistance made by the secondary teachers predominated over the orientation given by the professors at the university. It appeared that the university tutors were expected to guide and ‘drive’ the classroom teachers. This kind of relationship was characterised by Foucault (1979, p. 143) as: “there is an exercising of power when bodies are submitted, gestures are guided, and behaviours are required, etc”.

Results of Interaction in Teacher Education

As explained in the introduction, we attempted to establish a community of meaning, using the Investigation-Action approach to integrate knowledge and action. We have looked for the existence of shared meanings and outlined two categories of reflection and debate via a computer that might lead to the generation of some joint discussion over teachers’ work in the classroom. One of them may be defended by those who think that it is possible to help the teaching staff to:

x doubt and question ‘macroscopic’ contents and outcomes of one’s work, as well as some general beliefs and values about teaching;

x identify some classroom problems or teaching situations that have little value from the point of view of external observers;

x eliminate at least part of their resistance to change.

A second category observed among the participating teachers was the difficulty in understanding the decisions, behaviour and meanings explained by the teachers in their classrooms. For example, in one of the debates held over the selection of curricular contents, one teacher was questioned and criticised when she said that she selected and chose the contents after knowing the group of students with which she had to work, and “depending on what she found, she decided what to do, taking no notice of the content of the official syllabus”. Some of the criticisms were: “if you are in the 7th year of EGB, why don’t you teach some of the content of the official programme issued by the Ministry of Education?”, “don’t you think that your students are going to suffer from inferior conditions, learning and development with respect to those who have been taught these things?”,”I consider your behaviour to be irresponsible because your students are going
to have a lot of difficulties when they get to the Bachillerato and Selectividad (Spanish exams); they’ll be worse prepared than those whose teacher has taught them the official programme for Language and Literature”. Responding to these commentaries, the teacher said:

It’s difficult for me to be able to transmit the feelings, perceptions and personal experiences which a knowledge of the social and family situations of the majority of the students can awake. In order to understand my decision, it’s necessary to live in the environment of these students. That is, it’s necessary to know what is the most relevant thing to them, how they feel ... Living in their environment is to come to know even how their houses smell inside, and experience their own deficiencies. Only this knowledge can help to understand why almost 80% of the students between 12 and 13 years old are still not able to read comprehensively nor use written language with the slightest hint of correctness. Bearing in mind this situation and the academic level, from my point of view it makes no sense, nor is it reasonable to speak about subjects not relevant for them such as a ‘direct object’ or a ‘subordinate clause’. I have considered it more prudent and beneficial for the students to opt for the reinforcement of the basics and forget about the content of the official syllabus.

In a similar way, 11 of the 15 participating teachers considered that in order to create a process of communication, it was necessary that those who interacted actually shared experiences, so that they could build references to experiences and meanings for all of them. A meeting within each one of the centres made it possible to experiment, in sympathy both with the events presented and the meanings given to the words and phrases, in line with the context and circumstances of those who used them. This understanding was not achieved between teachers at different schools.

Grundy (1991) showed that analysis of social action contains certain risks because it may only be evaluated by those who ‘live’ it. In the same way, no matter what the action, human relations must be oriented by a previous judgement. This also depends on the interpretation of the events experienced, which depends on the prejudices and views held by all those that meet together on such an event. Now, since this meeting did not exist (nor does it usually exist among participants because of ‘living’ in different schools), there was little shared construction of new meanings. This analysis helped us to understand the difficulty faced by those who wish to make a valid interpretation of classroom events without a valid interpretative framework or common references.
We therefore consider that the processes of Investigation-Action have been distorted. This is because the teachers, rather than determining their actions based on an understanding derived from practice, followed the advice and suggestions offered by the ‘experts’ to direct their work. This dependence is explained by the well-defined dichotomy that exists in the Spanish educational context between the ‘theorists’ or ‘experts’, and the ‘pragmatists’. The ‘pragmatists’ have been trained to teach in a context that leads them to adapt themselves to directives and guidance provided by the ‘experts’, who are found in administration, without having the opportunity to question such directives.

A recent order from the Spanish Ministry of Education (which appeared in the Boletín Oficial del Estado on 5 March 1997) follows this hierarchical relationship. The first clause of this order specifies that the invitation to participate is aimed at teachers who wish to use computer technology to access digital information through the Internet, and the fifth clause indicates that the participating teachers in each school will receive specific training through the network. It is evident that, in using the Internet, the hierarchical structure is maintained; the experts, who are found in administration, will instruct and guide the pragmatists, who are located in their schools.

It is important to note that the processes of Investigation-Action have been successful in other studies. In the USA, Judi Harris (1994) designed and described a process where the process itself became the object of teaching. This process included interaction between subject experts and groups of approximately 20 teachers. A possible explanation of this discrepancy in results is due to the objectives within the cycle of Investigation-Action. The poor processes of Investigation-Action, resolved through the Spanish computer network, were directed towards the development of a real group of teachers. However, the object of analysis and improvement was the work in one teacher’s classroom where ‘macro and micro-questions’ came together. It is evident that in the US investigation, the analysis showed common contextual references, as well as some shared experiences including a shared knowledge of situations and dilemmas.
Conclusions

This section summarises the conclusions that we have reached, following the same thematic order.

The difficulties the participants had with electronic mail were generally technical, requiring as it did several commands and the execution of routines. Different problems arose when the relationship was synchronous. When teachers could communicate ‘face-to-face’ at a distance, we noticed limitations in the network when transmitting nonverbal communication such as looks and emotions.

The content of the messages sent by the participants could be categorised as macro and micro. The first dealt with general questions about teaching (establishing timetables, school outings to exhibitions, etc.) that were not dependent on the particular school contexts. The micro-contents referred to real classroom or school topics (for example, the relevance of contents related to a local festival, such as the origin of typical dishes) and these generated activities related to local history or culture. There was a low level of personal and emotional expression.

The generation of relationships of an emotional nature was practically nil because the previously existing relationships were maintained.

Three factors emerged connected with reflective processes, contextualisation and relationships of power. There was a low level of reflection in communications through electronic mail. This can be explained by the absence of immediate responses to questions about classroom situations and the resulting uncertainty and unease felt by some participants. Reflection increased in frequency and depth when a video conferencing system was used.

Responses through electronic mail depended on whether the debate or reflection arose from an affirmation (where there was an unequal level of knowledge because those who affirmed statements knew more about them) or from a question (where the participants considered they began with similar levels of knowledge). In interactions mediated by video conference, even though they gave more contextual references (visual and audio), the anonymous nature was lost and with it the relationships dependent on their own freedom of expression and honesty.

Different information about the type and direction of interactions demonstrated the existence of dependent relationships between the
participants, leading to the conclusion that the computer network maintained the hierarchy of values and previously existing relationships between the teachers of the first cycle of ESO, with regard to the university staff (considered as experts).

The computer network we used did not provide good conditions in which to speak and reflect in detail about life in the classrooms. Only prolonged, profound and relevant processes are valuable for the teachers and, consequently, these same processes will lead them to become responsible for their practices and look for alternatives whenever it may be necessary; that is, knowledge will lead them to develop their own thoughts and break with the dependence on the experts. The prior relationships were maintained by the participating members and the role of the computer network in this research has been determined by what Habermas (1988) called technical rationality; that is, to contribute to the guidance of others by experts in a certain area of knowledge.

Suggestions for Future Investigations

Looking towards the future, it would be interesting to know how message content between previous participants would evolve if relationships formed through the computer network continued. With regard to the expression of feelings, it would be valuable to try other formats of Internet communication that better favour emotion-based relationships, as well as analysis to see which are personal and emotional communications between participants (reactive or inhibitive).

From the point of view of teacher education, it is helpful to ask if the continuation of this kind of relationship through the computer network (via electronic mail and video conference), combined with more frequent face-to-face encounters (once a month), could make it possible to share relevant interpretations of specific classroom situations, as well as eliminate the dependent relationships that currently exist in Spain between teachers in secondary education and university professors.

Celestin Freinet is considered an excellent reference in the development of multiculturalism and in the teaching of didactic strategies such as ‘scholastic correspondence’. It is therefore interesting to ask: if communication via computer had existed then, would Celestin Freinet have used it as a teaching strategy? In the not-so-distant future, will it be possible to generate experiences like the following, narrated by Freinet, via data communications?
Unforgettable scenes! after twenty years I still remember the day we received our correspondence from Trégunc, a little package that contained breton cakes carefully wrapped, thin like muslin, deliciously covered in butter. The handing out came next; three per head, including, of course, the teacher. If only you could have seen the children running home, carrying for their brothers and sisters, or for their parents, such a treasure on their little behalf! In the afternoon, a child arrived saying: “Dad said that we have to send them oranges, figs ...”. (Freinet, 1968, p. 102)

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References

