Chapter 4

Paraverbal Communicative Teaching T-Patterns Using SOCIN and SOPROX Observational Systems

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Abstract

This chapter focuses on how to analyze the paraverbal communicative fluency of teaching style. Essential paraverbal criteria related to kinesics and proxemics were studied in lecturers offering courses. Some lessons were analyzed using the Observational Systems of Paraverbal Communication SOCIN and SOPROX, both observational instruments that enables a broad analysis of kinesics and proxemics. The recording instrument used to codify SOCIN and SOPROX was LINCE software and the Theme software was used to detect temporal patterns (T-patterns) in the observational data. The results reveal the power of the teachers' illustrative and regulatory kinesics. The regulatory function makes use of clearly defined kinesic gestures such as emblems and kinetographs, whereas the illustrative function is accompanied by largely undefined kinesic gestures.

Key words Paraverbal communication, Kinesics, Proxemics, Observational instruments, T-Pattern analysis

1 Teaching Communication

In order to understand and improve the scenarios to be managed by teachers it is important to identify the essential aspects of communication, such as gestures, voice quality, and the use of teaching time and space, which are associated with the teaching discourse. In this regard, it is clear that one of the keys in optimizing teaching tasks lies in paying close attention to the communication and teaching style that each teacher may develop and rework over time. More recently, accurate and detailed reviews demonstrated that very little educational research has been concerned with the role of gestures in teaching and learning. "The few existing studies that focus on gesture in an education context, often appearing in journals whose primary focus is not educational research, suggest that such research might be of tremendous importance in helping to understand better the role of gestures in knowing and learning science." ([1]: 365).

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An intrinsic part of all teaching activity is a constant communicational flow, in which the spontaneous nature of communication is considered to be a habitual feature. The observation of students' reactions may thus be useful for optimizing this communication [2]. As such, there is good reason why communication is regarded as an indicator of the communicator's emotional, as well as symbolic experiences [3]. Symbolic communication is intentional communication that uses learned, socially shared signal systems of propositional information transmitted via symbols.

Observational methodology was used due to the habitual nature of teachers' behavior and the fact that the context is a naturalistic one. The flexibility and rigor of this methodology makes it fully consistent with the characteristics of the study and it has become a standard approach to observational research [4–6], especially in the field nonverbal communication, motor behavior, and dance [7–14]. The empirical results indicate the power of the teachers' illustrative and regulatory kinesics, along with the proxemics used: the regulatory function is combined with the static posture, whereas the illustrative form accompanies movement. The regulatory function makes use of clearly defined kinesic gestures such as emblems and kinetographs, whereas the illustrative function is accompanied by largely undefined kinesic gestures such as beats.

2 The Singular Nature of Paraverbal Communication

Before proceeding it is important to clarify an aspect related to the concepts *nonverbal* and *paraverbal*. In our view the use of the negative prefix implies that the terms "verbal" and "nonverbal" should be understood as being mutually exclusive, when in fact they refer to two forms of communication that go hand in hand with one another. Therefore, and with the aim of respecting the meaning of the concepts under study, we opt to use the concept of paraverbal communication. The communicative reality in which humans live is understood in terms of the linearity and sequential nature of verbal language, which is produced by a single phonatory organ that is unable to emit simultaneous sounds; in other words, we cannot say *a* and *b* at the same time, and, therefore, verbal discourse can be assimilated to the concept of melody. A further issue is that all discourse which is not strictly verbal is characterized by simultaneity. The diverse—and at the same time, bilateral—structure of our corporeity enables us to generate bodily postures (dynamism), gestures (dynamism), and attitudes (meaning) in a simultaneous way [10] and also "…gestures are often subsequently replaced by an increasing reliance upon the verbal mode of communications" [15]. Paraverbal teaching style refers to the ways in which a teacher conveys his or her educational discourse, and this is why it is sometimes associated with the idea of expressive movement [16]. The paraverbal structure of communication will be

addressed here according to four dimensions: kinesics, proxemics, chronemics and paralanguage. All these dimensions of analysis have been considered for many years by key authors in the field [17–19]. In teaching discourse these dimensions can be defined as follows:

(a) *Kinesics*: the study of patterns in gesture and posture that are used by the teacher with or without communicative meaning.

(b) *Proxemics*: the study of how the teacher uses the space in which teaching takes place.

(c) *Chronemics*: the study of how the teacher uses the temporal factors that influence the teaching setting.

(d) *Paralanguage*: the study of all those vocal emissions that are not included in arbitrary verbal language, but which do accompany it.

These dimensions are associated with the study of bodily gesture, the use of space, the use of time, and voice-related paralanguage. Here we outline a theoretical framework for teachers' communicative behavior that delineates kinesic and proxemics dimensions in the Observational System of Kinesic Communication SOCIN and Observational System of Proxemic Communication SOCIN [11], integrating them in an exhaustive and mutually exclusive way. These dimensions can appear simultaneously or concurrently, functioning in an integrated and systemic way. If communication is to be effective, it is necessary to ensure that all the paraverbal dimensions are congruent, i.e., that they seek to transmit the same message, strengthening, confirming, and heightening it in accordance with the educational circumstances [20]. The present study is focused on two of these dimensions, proxemics and kinesics, and the next section provides a more detailed conceptual description of these.

2.1 What Gestures Come From?

It is important to clarify a conceptual aspect that continues to be overlooked in the field of kinesic language based on human motor behavior. Firstly, it is necessary to distinguish between kine, posture, gesture, and attitude with respect to the body.

(a) *Kine*: the basic unit of movement, comparable to the phoneme of verbal language.

(b) *Body posture* refers to the static nature of the body in relation to the position of its various osteoarticular and muscular parts.

(c) *Body gesture* refers to the dynamic nature of the body, without forgetting that each gesture is comprised of multiple micro-postures.

(d) *Body attitude* refers to the meaning that each social group gives to the emotional and expressive ways of using postures and gestures.

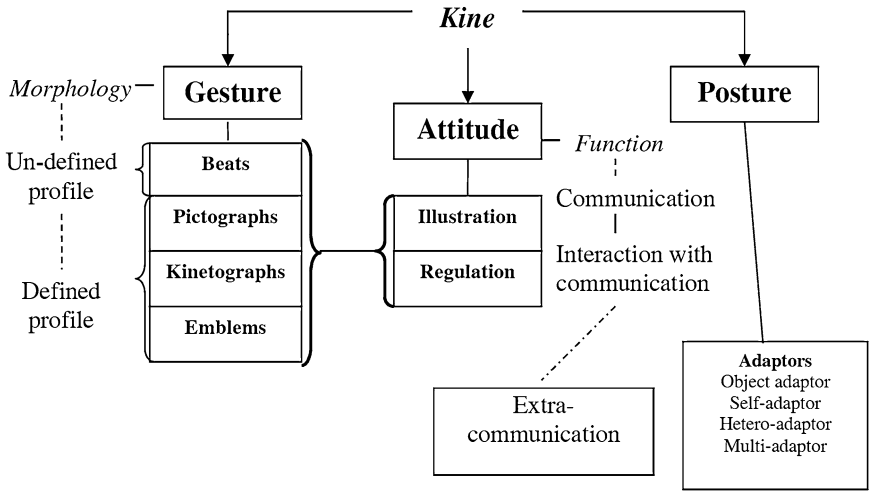

Fig. 1 Relationship between the morphology and function of kinesic gestures

On the basis of this initial clarification, gesture can be regarded as the basic unit of meaning for constructing the paraverbal kinesic observational system. Consider the chart shown in Fig. 1.

Related to the *morphology* of the categories (see Fig. 2) we establish a continuum that encompasses:

(a) Gestures that offer a highly defined profile and which are clearly observable by the receiver.

(b) Gestures with a less well-defined and weaker profile.

A clear example of kines that have their own meaning, and which offer a highly defined gesture profile, is emblems [21].

With respect to their *functionality* we establish a continuum that encompasses:

(a) Gestures with a purely communicative purpose.

(b) Gestures whose purpose is communication with interaction.

(c) Extra-communicative gestures, i.e., those without any explicit interactive or communicative purpose.

2.2 Kinesic and Proxemics Functions

The present paper focuses on how to analyze and optimize the paraverbal communicative fluency of teaching style using SOCIN and SOPROX observational systems [11], an observational instrument that provides a clear analysis of the use of kinesics and proxemics in teaching. Each teacher will have his or her own style of communication and verbal and paraverbal expression, but despite this diversity, gestures are inscribed in the conventions of the society in which a person lives. An individual's

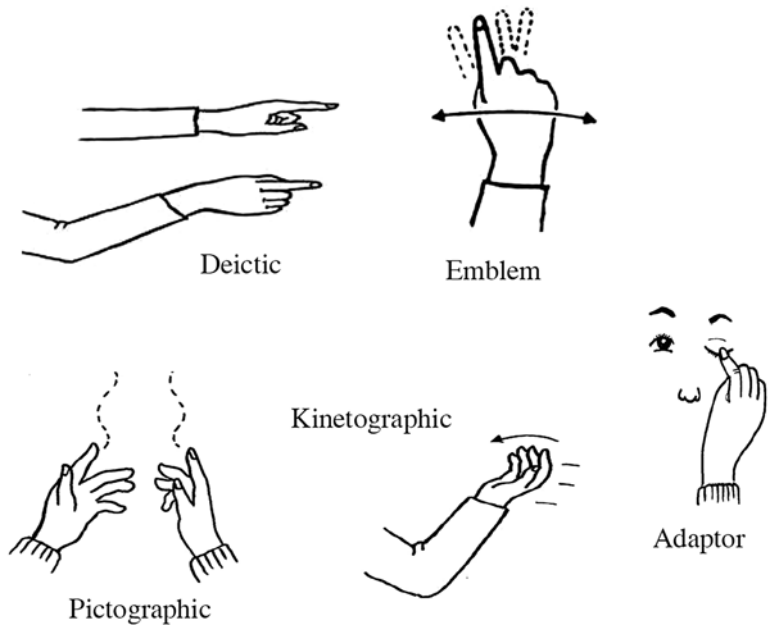

Fig. 2 Examples of gesture morphology: deictic, emblems, pictographic, kinetographic, and adaptor

identity, however unique, is never constructed in isolation as it has to be communicated, and as such it must draw upon social conventions. Thus, paraverbal communication is subject to certain social standards regarding forms of gesture and proxemics that cannot escape the ethnoaesthetics of each historical moment. Therefore, despite the concrete and unique nature of each body [22] it is possible to identify certain kinesic and proxemic functions and morphologies that are sufficiently generalized and which are of considerable interest with respect to teaching. Identifying these features is a central aim of the present study. Given that we use observational methodology [23] in the habitual setting of teachers' behavior, the context is a naturalistic one. In sum, the present study seeks to provide answers to the following questions:

1. Is it possible to codify, in an exhaustive, clear, and manageable way all the possible forms of paraverbal communication used by teachers?
2. How we can obtain behavioral patterns from teachers' communicative competencies that reveal both kinesic and proxemic aspects at the same time?
3. Does teachers' use of proxemics and illustrative and regulative gestures differ between expository situations and interactive ones?

3 Method

The present study continues a line of research being conducted in our laboratory, by means of field studies, since the award of a pedagogical prize. Paraverbal actions constitute an important source of information when the aim is to observe in detail the versatility of human communication. Indeed, people spend less time vocalizing than they do emitting behaviors that are not strictly verbal. In the field of paraverbal communication one is dealing with a type of behavior that despite being very perceivable [24], tends to be largely overlooked due to the sociocultural value that has traditionally been ascribed to it. Within a chain of behavior it is feasible to separate and demarcate behaviors of diverse etiology provided we are referring to discreet and mutually exclusive behaviors. However, in practice this is not always a realistic proposition, since social interaction, as well as interaction between objects, means that many aspects of behavior are interlinked and occur in synchrony, which, of course, is of enormous interest from a conceptual and methodological point of view [25, 26].

One of the inherent features of the optimum form of observational methodology is precisely the absence of standardized instruments. Here, observational methodology was used due to the habitual nature of teachers' behavior and the fact that the context is a naturalistic one. The flexibility and rigor of this methodology makes it fully consistent with the characteristics of the study and it has become a standard approach to observational research [4, 27]. Of particular relevance is its multidimensional nature, which enables it to be adapted to the successive events of paraverbal behavior, as well as to each of its components. In sum, observational methodology can be applied to many different facets of human communication [11, 28–31], and the wide range of possibilities it offers enables us to optimize the demarcation of units or the development of ad hoc instruments such as SOCIN and SOPROX, which combines the field format with category systems. The field format is an open, multidimensional system with multiple and self-regulating codes.

3.1 Design

Here we observed the kinesic and proxemic communication used by teachers in high education courses. Given that the aim of this paper is to present the observation instrument we present a Nomotetic, Punctual, and Multidimensional (N/P/M) [27] design that aims to identify the "intention" of the behavior rather than its extension. Thus, kinesic and proxemic responses are subjected to detailed, in-depth, and specific investigation.

3.2 Participants

Classroom-based lessons on various subjects and taught by four lecturers offering high education courses were recorded. A total of four lessons, each taught by a different teacher, were analyzed. In this study we were not interested in analyzing the individual communicative style of each teacher involved, but rather we sought to identify

teachers' communicative style as a whole. Therefore, the sample used comprised four teaching sessions with a mean duration of 50 min, and this entailed analyzing a total of 1120 observation frames ($\bar{x}$ = 280 frames/session). The procedure was in line with APA ethics and was approved by the university departments involved. The project did not involve any experiments or manipulation of subjects. The results are based on data obtained from recordings from public TV, and adjusted to the Belmont Report (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979) in order to assure that subjects' rights have been protected.

3.3 Instruments

The observation instruments used were SOCIN and SOPROX, which enables the different levels of kinesic and proxemic response to be systematically observed. Kinesic responses were recorded by means of the Observation of Kinesic Gestures (SOCIN; see Table 1), while proxemic gestures were recorded via the Observation of Proxemics (SOPROX; see Table 2). Both systems have been

Table 1
SOCIN: system of observation for kinesic communication [11]

Dimension	Analytical categorization	Code	Description
Function Dimension that refers to the intention of the spoken discourse that the gesture accompanies	Regulatory	RE	Action by the teacher whose objective is to obtain an immediate response from receivers. It comprises imperative, interrogative, and instructive phrases with the aim of exemplifying, giving orders or formulating questions and answers
	Illustrative	IL	Action that does not aim to obtain an immediate response from the receiver (although possibly at some future point). It comprises narrative, descriptive, and expository phrases with the aim of getting receivers to listen
Morphology Dimension that refers to the iconic and biomechanical form of gestures	Emblem	EMB	Gesture with its own preestablished iconic meaning
	Deictic	DEI	Gesture that indicates or points at people, places, or objects
	Pictographic	PIC	Gesture that draws figures or forms in space
	Kinetographic	KIN	Gesture that draws actions or movements in space
	Beats	BEA	Iconically undefined gesture used exclusively by the sender and which usually only accompanies the logic of spoken discourse

(continued)

Table 1
(continued)

Dimension	Analytical categorization	Code	Description
Situational Dimension that refers to a wide range of bodily actions, which usually coincide with parts of the teaching process that cover a certain period	Demonstrate	DE	When the teacher performs in gestures that which he or she wishes the students to do
	Help	HE	When the teacher performs actions with the intention of supporting or improving the contributions of students
	Participate	PA	When the teacher participates alongside students
	Observe	OB	Period of time during which the teacher shows an interest in what is happening in the classroom with the students
	Provide material	PM	When the teacher handles, distributes, or uses teaching material in accordance with the educational setting
Adaptation Dimension that refers to gestures without communicative intentionality in which the teacher makes contact with different parts of his/her body, or with objects or other people	Situational	AF	When the teacher uses an emotionally charged gesture with respect to the students
	Object adaptor	OB	When the teacher maintains contact with objects but without any communicative purpose
	Self-adaptor	SA	When the teacher maintains contact with other parts of his/her body but without any communicative purpose
	Hetero-adaptor	HA	When the teacher maintains bodily contact with other people but without any communicative purpose
	Multi-adaptor	MUL	When several of these adaptor gestures are combined

successfully used in previous research to observe the behavior of expert and novice teachers [11]. These instruments combine the field format (since the investigation is multidimensional) with the category systems (SOCIN and SOPROX), which fulfil the essential criteria of observational methodology as they are exhaustive and mutually exclusive.

SOCIN and SOPROX offer the general communicative structure found in every classroom-based teaching discourse and enables the exhaustive and mutually exclusive observation of the chain of kinesic and proxemic actions that are produced during

Table 2
SOPROX: system of observation for proxemic communication [11]

Dimension	Analytical categorization	Code	Description
Group Dimension that refers to the number of students to whom the teacher speaks	Macro-group	MAC	When the teacher speaks to the whole class/group
	Micro-group	MIC	When the teacher speaks to a specific sub-group of students
	Dyad	DYA	When the teacher speaks to a single student.
Topology Dimension that refers to the spatial location of the teacher in the classroom	Peripheral	P	The teacher is located at one end or side of the classroom
	Central	C	The teacher is situated in the central area of the classroom
Interaction Dimension that refers to the bodily attitude which indicates the teacher's degree of involvement with the students	At a distance	DIS	Bodily attitude that reveals the teacher to be absent from what is happening in the classroom, or which indicates a separation, whether physical or in terms of gaze or attitude, with respect to the students
	Integrated	INT	Bodily attitude that reveals the teacher to be highly involved in what is happening in the classroom, and in a relation of complicity with the students
Orientation Dimension that refers to the spatial location of the teacher with respect to the students	Tactile contact	TC	When the teacher makes bodily contact with a student
	Facing	FAC	The teacher is located facing the students, in line with their field of view
	Behind	BEH	The teacher is located behind the students, outside their field of view
	Among	AMO	The teacher is located inside the space occupied by the students
	To the right	RIG	The teacher is located in an area to the right of the classroom and of the students, with respect to what is considered to be the facing orientation of the teaching space
	To the left	LEF	The teacher is located in an area to the left of the classroom and of the students, with respect to what is considered to be the facing orientation of the teaching space
Transitions: dimension that refers to the body posture adopted by the teacher in space	Fixed bipedal posture	FB	The teacher remains standing without moving
	Fixed seated posture	FS	The teacher remains in a seated position
	Locomotion	LOC	The teacher moves around the classroom
	Support	SU	The teacher maintains a support posture by leaning against or on a structure, material, or person

the teaching process. The instruments described here have a molar structure that is easy to use and readily adaptable to various naturalistic communicative contexts. We believe that the instruments offer greater applicability and flexibility than do other existing tools which, in our view, are hindered by a degree of molecularization that is too complex; for example, the kinesic analyses [32] in the field of nonverbal human communication, or the notation systems [33] provide a considerable amount of information but they are very difficult to use in many natural contexts in which communicative teaching might be observed.

The instrument SOCIN, for kinesic actions, is based on four dimensions (morphology, function, adaptor, and situation). Similarly, the instrument SOPROX, for proxemic actions, is based on five dimensions (group, topology, location, orientation, and transition), each of which gives rise to a system of categories that are exhaustive and mutually exclusive. Observational methodology requires a clear and exhaustive definition of each of the categories included in the observation system or field format. Each of the dimensions, categories, and codes that form part of the SOCIN (Table 1) and SOPROX (Table 2) are defined below.

4 Procedure

The recording instrument used to codify SOCIN and SOPROX was LINCE software [34], an interactive video coding program which allows effective recording processes. It is easy to use and integrates a wide range of necessary functions: coding, recording, calculation of data quality, and the analysis of information in specific formats, thereby enabling it to be directly exported to several applications already used in observational data analysis. LINCE has been designed to facilitate the systematic observation of sport and motor practices in any situation or habitual context in which behavior is spontaneous.

Sessions were digitized to make them available for frame-to-frame analysis and enable them to be coded in LINCE software. The behavior of teachers was observed uninterruptedly across all the sessions, the mean duration being 50 min ($\bar{x} = 280$ frames/session).

Two different observers analyzed all the recordings from observation sessions. In order to control the quality of data [35] the kappa coefficient was obtained (0.94 for all sessions). This coefficient provides a satisfactory guarantee of data quality.

Temporal patterns were detected and analyzed with the *Theme* v.5 software [36]. *Theme* not only detects temporal patterns but also indicates the relevance and configuration of recorded events. The approach is based on a sequential and

real-time pattern type, known as T-patterns, which, in conjunction with detection algorithms, can describe and detect behavioral structure in terms of repeated patterns [36]. It has been shown that such patterns, while common in behavior, are typically invisible to observers, even when aided by standard statistical and behavior analysis methods. The T-pattern algorithm has been implemented in the specialized software package, *Theme* (see www.patternvision.com and www.noldus.com). *Theme* also displays event frequency charts based on the occurrences of recorded events and the frequency of each category independently of the other categories. The detection of T-patterns has proven to be extraordinarily productive and fruitful for the study of the multiple facets or fields of body movement as we have pointed before.

5 Results

Obviously, each teacher has his or her own paraverbal communicative style. However, the objective of this paper is not to compare styles but, rather, to reveal the trends in this dimension of communication among teachers working in a similar naturalistic context. The observation of a natural context requires the use of the abovementioned observational instrument, as well as the detection of temporal patterns (T-patterns) in the transcribed actions. The *Theme* program grouped all the recordings of each teacher (nomothetic view) and derived T-patterns that reveal the trends in kinesic and proxemic paraverbal communication from an ideographic perspective.

In the current data sets, *Theme* detected several relevant T-patterns. As an example, let us consider three T-patterns[1] that are of interest with respect to the generation of paraverbal communicative responses. The T-pattern in Fig. 3 demonstrates dyadic interaction between teacher and student, while the T-pattern in Fig. 4 describes and interaction sequence between the teacher and the whole classroom.

[1] *How to read the pattern tree graph*: The upper left box of Figs. 3 and 4 shows the events occurring within the pattern, listed in the order in which they occur within the pattern. The first event in the pattern appears at the top and the last at the bottom. The upper right box shows the frequency of events within the pattern, each dot means that an event has been coded. The pattern diagram (the lines connecting the dots) shows the connection between events. The number of pattern diagrams illustrates how often the pattern occurs. Subpatterns also occur when some of the events within the pattern occur without the whole of the pattern occurring. The lower box illustrates the real-time of the pattern. The lines show the connections between events, when they take place and how much time passes between each event.

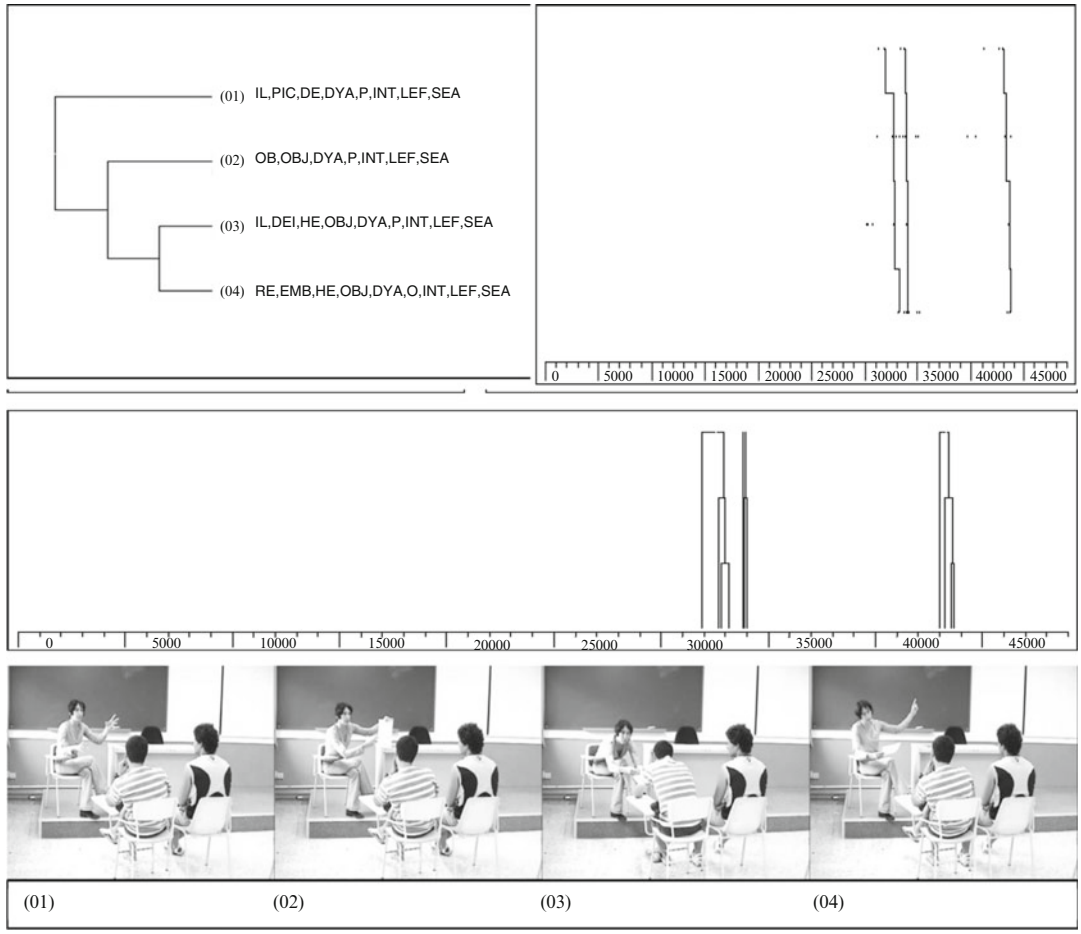

Fig. 3 This relevant T-pattern focuses on interaction with a dyad. It consists of three levels and a sequence of four events, each one of which comprises a complex combination of codes (combinations formed by between five and nine codes), occurring on three occasions during the observation period with the same sequence of events and significantly similar time intervals between each event occurrences. This T-pattern shows how the regulatory and illustrative functions follow one another, and indicates the type of morphology, both in terms of gesture and proxemics, which the teacher uses to accompany these functions. The interpretation that can be derived from the four steps of this T-pattern sequence can be described step by step as follows: (*01*) The teacher begins with an illustrative function (IL), in this case demonstrating (DE) something by using pictographic (PIC) gestures that draw an object or idea in space. He then relates to a partner (DYA) with an integrative (INT) attitude while situated in a peripheral area (P) of the classroom to the left (LEF) of the group and with a fixed bipedal (SEA) posture. (*02*) The teacher begins to observe (OB) what the dyad (DYA) is doing, makes an object-adaptor gesture (OB) and maintains the same proxemic criteria (P) (INT) (LEF) (SEA). (*03*) The teacher begins to offer help (HE) while illustrating (IL) by means of a deictic (DEI) gesture to point; he maintains the object adaptor (OB) and the same proxemic trend. (*04*) The teacher changes to regular (RE) in a dyadic situation (DYA) of help (HE), and is therefore integrated (INT) in a seated position (SEA) to the left of the space (LEF), maintaining an object adaptor (OBJ) and using a well-defined emblem (EMB) gesture

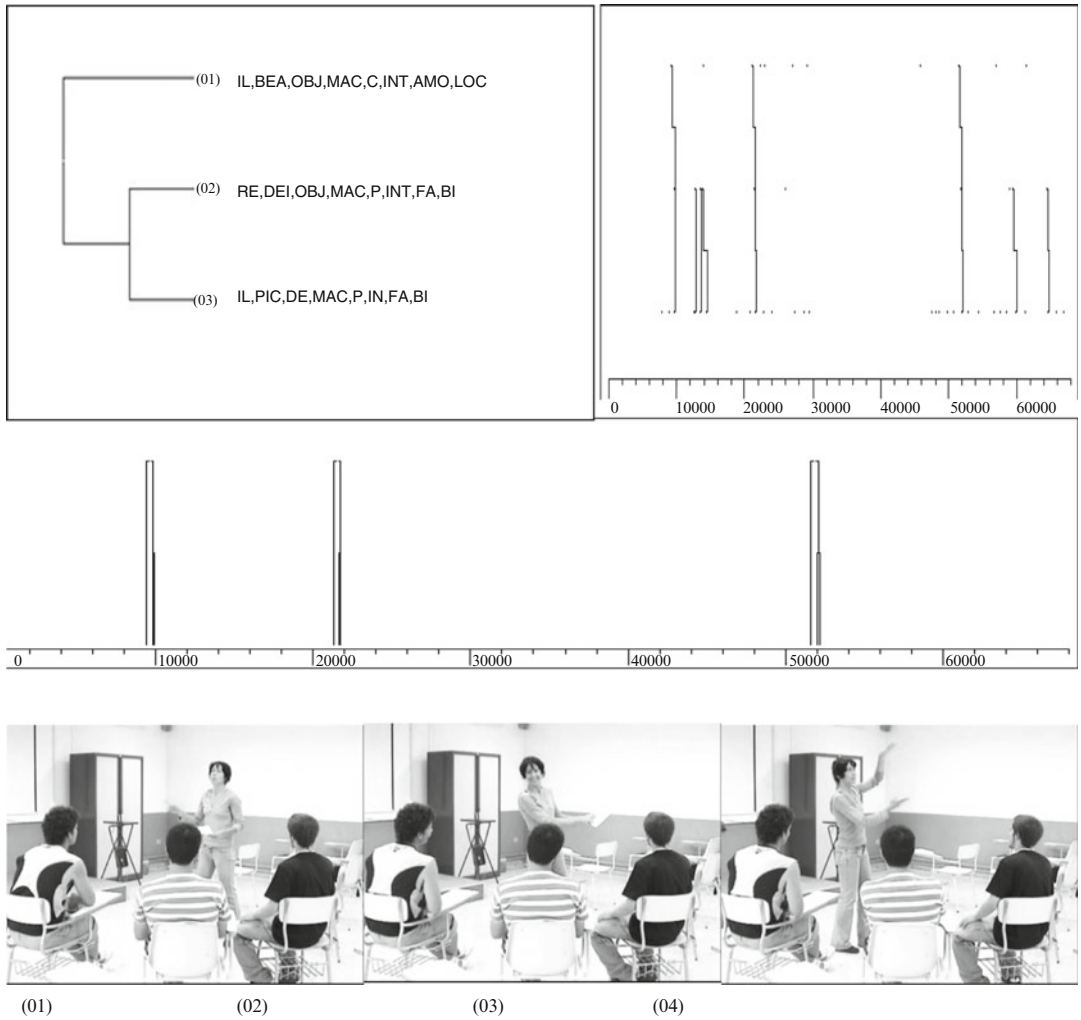

Fig. 4 This relevant T-pattern is related to interaction with the whole class/group of students. It consists of three levels and a sequence of three events, each one of which comprises a complex combination of codes (combinations of eight codes), occurring on three occasions during the observation period with the same sequence of events and significantly similar time intervals between each event occurrences. This T-pattern shows the alternation between the use of illustration (IL) and regulation (RE), as defined previously. As can be seen in (*01*), most illustrative (IL) situations involve expository, narrative, and descriptive phrases that are usually accompanied by gestures whose morphology takes the form of beats (BEA), and also accompanied by locomotion (LOC) or movement by the teacher around the classroom or among the students (AMO). As can be seen in (*02*), situations of regulation (RE), in which the teacher uses imperative, interrogative, or instructive phrases, are usually accompanied by deictic (DEI) gestures and made from a peripheral (P) area of the classroom. In (*03*) one can see another trend in the illustrative function accompanied by more defined gestures, in this case pictographs (PIC) that are usually used when the teacher has a fixed bipedal (BI) posture. It seems that maintaining a fixed posture helps to focus the attention required to make highly defined gestures such as kinetographs or pictographs. The object adaptor (OBJ) appears frequently, except when the teacher begins to demonstrate (DE) (for example, holding a piece of chalk in his hand (OBJ) but then beginning to write with it (DE), or putting it down so as to demonstrate something with his hands more clearly)

6 Discussion

The analysis of the results should be approached on two different levels: (a) with respect to the codes and their combinations; and (b) with respect to the criteria of the observation systems (SOCIN and SOPROX).

(a) Here the results reveal the power of gestures which have an illustrative and regulatory function and are associated with various morphologies, as well as with key aspects of proxemics and the interaction with the group/class. It can be stated that regulatory gestures (RE) are morphologically coded predominantly by means of emblems (EMB) and deictic forms (DEI). Illustrative gestures (IL) are coded through beats (BEA), pictographs (PIC) and kinetographs (KIN). Regulatory gestures (RE) are usually made while the teacher is in a static position (especially bipedal (BI), although also seated (S); however, pictographic (PIC) and kinetographic (KIN) gestures, whether they have a regulatory (RE) or illustrative (IL) function, may also be used during periods of locomotion (LOC). When teachers move around (LOC) they tend to use, above all, illustrative beats (IL). As beats (BEA) do not have their own meaning they can be employed when the attention of others is not focused on the meaning of the gesture but, rather, on the significance of what is being said. Emblems (EMB), deictic forms (DEI) with a regulatory function, pictographs (PIC), and kinetographs (KIN) are usually used from a static position so that recipients are not distracted by any movement (LOC) and, instead, pay attention to the meaning conveyed by the gesture. When a teacher demonstrates (DE) he or she tends to use illustrative gestures (IL), which may be morphologically coded as pictographs (PIC) or kinetographs (KIN), and to a lesser extent as beats (BEA).

(b) As regards the criteria defined by the observation instruments SOCIN and SOPROX the results enable us to highlight a series of trends in both kinesic and proxemic communication, as well as in combinations of the two. The *Function* criterion reveals that most teachers use the regulatory function 30 % of the time, the remaining 70 % corresponding to the illustrative function; in other words, actions that do not require an immediate response such as explaining and providing information account for the largest proportion of time to the detriment of regulatory actions, which do seek an interaction or responses such as asking questions, giving orders, offering help, etc. Concerning the combination of the criteria *Morphology* and *Function* of gestures it can be seen that emblems, deictic forms, pictographs, kinetographs, and beats are used without

distinction in order to convey each function, whether it be regulatory or illustrative; however, gestures that are less well-defined in terms of morphology, such as beats, are more likely to accompany the illustrative function, whereas most emblems and deictic forms, both of which are gestures with a well-defined morphology, tend to accompany more the regulatory function.

In our view the criterion *Adaptation* is of less interest as it refers to extra-communicative aspects and is associated with unconscious contact gestures made by the sender; the results show a highly frequent use of these.

With respect to the criterion *Transitions*, fixed bipedal postures are usually alternated with periods of locomotion as the teacher moves from one area of the classroom to another. Occasionally one can observe support postures, generally in conjunction with tables or chairs, whereas when posture is static in the seated position this tends to be maintained for some time.

Concerning the relationship between the criteria *Function* and *Transitions* the results reveal a common association between the regulatory function and static bipedal postures, whereas the illustrative function is combined with locomotion or movement around the classroom. It appears that when giving an illustration, which does not require a gesture of interaction, the teacher feels freer to move around. In contrast, the regulatory function, which does call for gestures that indicate interaction, seems to require greater concentration on the part of teachers and leads them to fix their posture and thus focus their vision on a single point while asking questions, making comments or giving orders, etc.

With respect to the criterion *Orientation* the predominant position tends to be facing the group. Teachers rarely take up a position behind the group.

The criterion *Group* shows that interaction mostly occurs with the whole group, followed by that with micro-groups and, occasionally, with dyads. However, and as is shown in the T-patterns of Figs. 3 and 4, the combinations of codes in each event are more numerous and varied for interactions with student dyads (Fig. 3) than they are for those with micro-groups or the group as a whole (Fig. 4).

7 Conclusion

In addition to observing the particular style of paraverbal communication associated with each teacher the present study also illustrates the ways in which they tend to use such communication from both a kinesic and proxemic perspective. We can provide

answers according to the questions proposed for this study: (1) The observation instruments SOCIN and SOPROX have been shown to be effective tools for recording in an exhaustive, clear and manageable way all the possible forms of paraverbal communication used by teachers, whether this be kinesic (by means of SOCIN) or proxemic (via SOPROX). (2) As pointed out in the results section it has been possible to obtain trends in relation to each criterion of both SOCIN and SOPROX, as well as combinations of them; for example, observing the relationship between the criterion *Orientation* and *Topology* or *Transitions* enables us to investigate whether there is a significant relationship between the way in which teachers move around, the spatial orientation chosen and the topology used with respect to the dimensions of the classroom and the space in which teaching takes place. (3) Regulatory gestures (RE) are usually made while the teacher is in a static position (especially bipedal (BI), although also seated (S); however, pictographic (PIC) and kinetographic (KIN) gestures. The regulatory function (RE) always appears in the context of interactions between teachers and students, whereas the illustrative function (IL) appears in expositive situations. Although we have seen how both are associated with specific proxemic behaviors, their power resides in their being effectively combined with verbal expression. Thus, for example, the illustrative function of gestures, regardless of whether these are iconically well defined, is interesting in terms of fostering students' learning, but too much illustration can have a negative effect [37].

A complementary and desirable objective for this type of research would be that teachers, via observation of their classes and a debriefing interview, could become aware of their particular style of paraverbal communication. In light of such information, teachers tend to be highly motivated to improve the efficacy of the paraverbal communication associated with their everyday teaching discourse. In this regard, strategies and techniques based on mixed methods research [12, 38, 39] provide different points of reference and indicators that may help new professionals to understand modulate and adjust the development of their self-perception and behavior.

Given the inevitable limits to the rationality and reflective capacities of educational professionals, we are obliged to consider the intentions of teachers, the tasks of whom can be approached through descriptive and qualitative instruments, as well as with data derived from more quantitative observation of their behavior.

For teachers, having an optimum paraverbal communicative style (both kinesic and proxemic) in combination with effective verbal communication is important in terms of the efficacy of instruction. We firmly believe that the optimisation of these communicative styles would have a direct positive effect on students' learning.

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