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Detection of Communicative Behavior Patterns AMONG College Students during Lab Practice

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Abstract The aim of this work is to detect the existence of communicative interaction patterns from the conversations among Biology students during lab practice. Observational methodology was used by creating a category system as an observation tool, and continuing with a process of re-categorization. A total of six sessions were observed and each one last one hour. It was used a software called SDIS-GSEQfor the inter-sessional sequential analysis. The results highlight that it is important for the students the use of question-answer (IAE) in its different modalities: in probability of occurrence, first are the categories of Persuading and Proposing, the next significant sequential probabilities are: Evaluating, Confirming, and Confusing; followed in sequential occurrence order by: Arguing, Classifying, Correcting, Clarifying, and Suggesting and lasting in sequential inhibitory occurrence are: Creating an opinion, Directing, and Evaluating. These are the particular ways in which students encourage their participation during laboratory practice, opening their minds to their classmates' feedback, which invites them to revalue their initial questions and answers and encourages new discussion topics and increase learning opportunities.

Keywords: *learning, evaluation, patterns behaviors, categories, SDIS-GSEQ program*

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1. Introduction

Student-teacher interaction is one of the main ways in which the learning can be achieved. In classroom during laboratory practice, interaction takes a special role as it is both a way of learning and the object of study of pedagogy. The first works of research regarding interaction and learning from a socio-cultural perspective based on the description of typical classroom interaction patterns were conducted by Barnes [1], Cazden [2], and Mehan [3]. One of the first descriptions were provided by Sinclair &Coulthand [4]. They describe what turned out to be the basic unit of classroom interaction: the IAE (Intervention, Answer and Evaluation). It is the teacher's duty to obtain information (I) from every student, to determine if each one of them knows the material. This is accomplished with a previously known question-answer to which a brief answer (A) from the student is expected. The teacher then proceeds to evaluate the student (E) with common phrases, like "Okay", "That's correct" or "No, that's not okay". After completing a sequence with a particular student, the teacher is expected to begin another round with follow-up questions directed to the same or to a different student. Many subsequent investigations about classroom interaction have revealed the ubiquity of the IAE pattern in Western education, from pre-school to college [1,2,3,5,6,7,8].

Aside from describing the common speech patterns in the classroom, other researchers has tried to establish links between the IAE pattern of the language use and the development of language. For example it was Kelly Hall [9] who, in a study of the speech in basic linguistics classroom, revealed how the use of IAE often favored the teacher's control over the interactions instead of favoring the understanding of the whole topic. In the same way, Barnes [1] found that the frequent use of the IAE pattern of interaction didn't benefit complex ways of communication between the teacher and the students because it was the teacher the one who decided who will participate, otherwise there could be better feedback if the decision of participation is taken by the students. Barnes [1] reached the conclusion that the extended use of the IAE heavily limits the students' chances to speak with their own words and test their ideas regarding the topic, also in general, restrict the student to the possibility of being more competent during their language classes.

In what looks like the most thorough research of classroom interaction was from, Nystrand et al. [7] who founded that in eighth and ninth grade english classes, the use of IAE worked very poorly within the learning process. In all classes where the IAE pattern was used, it was found that students were less capable of remembering and understanding the actual topic, in comparison to those students who participated in more complex interaction patterns. Besides, it was found that the use of the IAE pattern prevailed among inferior grade classes. This made

the author comment on the significant disparities in the students' opportunities to develop complex knowledge and intellectual skills. The latter lead to the question about the link between IAE and student communication in the classroom.

Although most of the research regarding classroom interaction has been carried out mainly on language courses, some recent studies have confirmed the ubiquity of the IAE pattern in foreign language courses and have highlighted their learning limitations. For example, Hall [10] found out that the teacher uses the IAE pattern more often with junior-high students.

Lin [11,12,13] presents similar results on his study carried out on English classes in Hong Kong. Just like Nystrand et al. [7], Lin found that the IAE interaction pattern happened more frequently in classes formed mainly in low socio-economic levels. Aside from limiting the students' learning opportunities, Lin states that, "It took away form them every chance of developing a real interest in the study of English as a language and culture for communicative and socio-cultural purposes" [13].

In an attempt to discover the specific links between classroom interaction and learning, Wells [14] decided to give a closer look to the three main components of the IAE pattern. While his classroom interaction observations revealed an enthusiastic participation of the students in class discussions, his first analysis shed light on what seemed to be an important number of IAE sequences. After a closer look, however, subtle changes were found in the standard pattern, especially in the third part. More specifically, it was found that when the teachers question the students, they tend not to close the sequence with a limited evaluation of their answers. Quite on the contrary, a follow-up by them is often required, asking the students to create or clarify concepts, taking the students' answers as a valuable contribution to the ongoing debate.

Wells [14] reached the conclusion that when the third part of the IAE sequence contains a teacher's evaluation (E) to the students' answers, the pattern severely limits their learning opportunities. Nevertheless, if, in the third part, the teacher favors the continuity of the students' answers, making them think, clarify their opinions, commenting on someone else's contribution, or linking the new knowledge with their personal experience, there's a chance of them to improve their learning through interaction. Therefore, he concluded that the typical three-part pattern in classroom interaction is not completely good or bad. It depends on the kind of approach by the teachers and the feedback from the students.

Nassaji and Wells [15] offer a deeper analysis on the different options of the parts that conform the IAE. Data comes from a six-year research project in which nine elementary and middle school teachers were involved, along with three college researchers.

This project's main focus was the teachers' contributions regarding the third part of the sequence. It was found that teachers who evaluated the students' answers instead of encouraging them, tended to decrease student participation. On the other hand, teachers who invited their students to enrich their initial responses opened the door to a new debate and new learning opportunities.

In this way, whenever the students' contributions were limited to short answers to the teacher's questions, classroom interaction was not likely to lead to active participation and complex communicative development. On the contrary, student participation would be limited to simple tasks, like memorizing, listing, and labeling. Nevertheless, when the teachers' questions and comments are open, and the students can make significant contributions to the interaction, they also create a more efficient learning environment.

2. Method

The aim of this research is to detect IAE communication patterns with the use of computerized coding among Biology students during lab practice.

2.1. Participants

The study group was formed by third semester Biology students from "Universidad NacionalAutónoma de México". The admission criteria for participants were as follows: a) Being regular Biology students at the University, b) Interest in becoming part of the study group c) Being enrolled in the third semester of the Biology career.

2.2. Tools

Two video cameras and two microphones were used as recording tool to guarantee the best accuracy possible regarding data collection. The two cameras along with the two microphones were installed in the classroom where the study group met. According to the ethical rules approved by the American Psychological Association, the students knew they were being filmed and were pointed out the exact location of the recording devices, which were carefully and discretely placed according to the furniture distribution in the room with the aim of minimizing unnatural reactions from the participants.

It was used the computer program SDIS-GSEQ [16,17] which includes two advanced computing systems as its initials suggest – was also used for this project. On one hand, the SDIS provides a standardized, general format to the sequential data, and on the other, the GSEQ provides a strong description and analysis of the sequential data.

The SDIS-GSEQ is based on an analytical technique developed by Bakeman [18,19] and by Sacket [20,21], inspired by the background laid in the work of Bakerman and Dabbs [22]. Then two perspectives emerge: prospective (contemplating the "forward" sense, just as the behavior occurrence is produced) and retrospective ("backwards" sense) that provide us with a speculative image of the behavior pattern, which allows us to contemplate both aspects of sequential diachronic intensive design.

The observational tool, just as it is perceptive according to the observational methodology standards, was appropriately developed in the way of a category system along with a field format. [23] With the aim of the category systems adjusting to the exhaustiveness and mutual exclusivity (E/ME) requirements, the development of the tool initially involved the transcription of all verbal/vocal emissions of the participants, and later completed with incidental notes taken from the observation of the recordings. A lengthy process of verbal

dimension categorization was then initiated; this process resulted in an important number of different versions of the tool, which were progressively adjusted towards congruence between the name and content of each category and the E/ME conditions [24]. The result was a tool in which 8 dimensions and a total of 19 categories were articulated. All the categories were defined separating the category nucleus and the level of openness or plasticity, and examples as well as counter-examples of the recordings were extracted for each one.

Once the tool was developed, it was put through a re-categorization process, consisting of a category regrouping for each of the eight field format dimensions. The final version is the following: Negotiation = (Persuasion PERS, Proposition PROPOS), Intentional = (Argumentative, ARGUM Control & Suggestion SUGES) , Recapitulation = Reminder, RECOR Recovery, REC) Acceptance = (Conditioned, CONDI), Correction = (Confirmation, CONFI and Imposition IMPOS) Response = (Value VALOR Evaluation, EVAL and Formation FORM) Question = Information, INFO Clarification ACLARA and Confirmation CONFI) Instruction = (Direction, DIRE Correction, CORRE, and Description, DESCR).

2.3. Procedure

To reach the established objective, observational methodology has been used, which is supported by the spontaneity of the behavior being studied and the regular environment in which the lessons took place. The observational design [25] to which this work is adjusted is /ideographic/ follow-up / multidimensional (I/F/M).

To reach the purpose, the application of the delay sequential analysis was planned, in order to detect de possible existence of behavioral patterns. The sequential analysis which is a type of microanalysis, stands out as one of the most appropriate techniques for the analysis of data obtained from human interaction studies. Itwas developed by Sackett [20,21] from the work of Bakerman and Brown [26]. There are numerous publications in different ambits, like sports [27], space analysis [28] clinical psychology [29], or human communication [30] as in this case, being the interaction of the college student during lab practice.

3. Results

Since the aim objective is to detect the existence of possible behavioral patterns in communicative interaction among students during lab practice through their conversation analysis, the ideal technique for data analysis is the sequential intercessional analysis. This analytical technique, proposed by Bakerman [18] and Sackett [20,31], and frequently used in scientific literature during the last twenty five years, aims to detect the existence of solid behavioral structures.

While carrying out the sequential delay analysis selecting the adjusted excitatory remainders (Values > 1,96) and the inhibitory (Values < -1,96) on the R1 to R5 delays (see Table 1), it was observed how the behavioral criteria PROPOS generates a constant link with PERS, alternating with CONF, following the behavioral criteria ARGUM which leads to a linear pattern in delays 1, 2, and 5 with PERS, and later generates PROPOS in delays 3 and 4.

Table 1. GLOBAL ANALYSIS

Conduct Criteria	Delay 1	Delay 2	Delay 3	Delay 4	Delay 5
Pers	pers [6,38] propos [2,28]	Pers [2,24] propos [6,26]	pers [2,19] propos [3,02]	pers [3,29]	pers [3,19]
Propos	pers [4,40] propos [5,28] conf [3,72]	Pers [6,40]	pers [4,04] propos [2,53]	pers [4,27] conf [6,85]	pers [2,06]
Argum	pers [3,66]	Pers [3,43]	propos [4,47]	propos [5,14]	pers [3,19]
Control					
Suges			propos [7,98]		
Recor	recu [22,23]	Eval [2,65]	conf [13,89]		
Recu	eval [2,62]	Conf [12,08]		aclara [3,45]	
Cond					
Conf	pers [3,10]	Pers [2,90]			pers [3,19]
Impu					
Valor	*forma* [-2,42]	*Forma* [-2,19]	valor [2,13]	confi [2,06]	eval [1,99]
Eval	corre [2,22]	*Forma* [-2,03]		eval [2,59]	
Forma	infor [2,03] *eval* [-2,30]	Rorma [3,47]		aclara [2,44]	forma [2,47]
Aclara					
Confi	argum [2,84]			propos [2,31] valor [2,86]	propos [2,07]
Dire	infor [2,23]	Dire [2,26]			dire [2,59] corre [3,23]
Corre		Dire [3,07]			dire [2,16]
Descr		Aclara [2,33] dire [2,16]			dire [2,16]

(Prospective patterns obtained with delays 1 to 5)
[Text in regular font → adjusted excitatory remainders]
[Text in italics → adjusted inhibitory remainders]

The behavioral criteria SUGES keeps a significant positive link with PROPOS in delay 3. Thus, in behavioral criteria RECOR we can see significant predictive alternation with RECU, EVAL, CONF in delays 1, 2 and 3 respectively, in the same way, in the given behavior, RECU, we can observe alternated predictive sequences with EVAL, CONF, and ACLARA in delays 1, 2, and 4 successively. In the given behavior CONF, it is observed predictive alternation with PERS in delays 1, 2, and 5. The behavioral criteria VALOR shows a statistically significant inhibitory link with the conditioned behavior FORMA, which indicates that it will never be generated by VALOR in delays 1 and 2.Afterwards, VALOR links positively with VALOR, CONFI, and EVAL respectively, in delays 3, 4, and 5.

The behavioral criteria EVAL keeps a significant positive link with CORRE y EVAL in delays 1 and 4.

Also EVAL shows a statistically significant inhibitory link with FORMA, delay 2.

The behavioral criteria FORMA predictively links with INFOR, FORMA, ACLARA, and FORMA in delays 1, 2, 4, and 5 respectively and with EVAL in delay 1 in a statistically significant inhibitory way with FORMA in delay 2. The next behavioral criteria is FORMA which is predictively relates to INFOR, FORMA, ACLARA, and FORMA in delays 1, 2, 4, and 5 respectively and with EVAL in delay 1 in a statistically significant inhibitory way. The category criteria INFOR relates positively to FORMA, ARGUM and PROPOS in delays 1, 2, and 5 and with DIRE in delay 2 and 4 in a probabilistically negative inhibitory way. Then it follows the category criterion DIRE, with a positive sequential prediction for the conditioned behavior DIRE in delays 2 and 5 and with INFO and CORRE in delays 1 and 5. The category criteria CORRE presents a predictive significant link with DIRE in delays 2 and 5 respectively. The last category criteria is DESCR which presents a significant positive link with DIRE in delays 2 and 5 and with ACLARA in delay 2.

Based on these results, it is clear that it is important for the students to use question-answer IAE in their different modalities: First, in probability of occurrence, are the categories of Persuading and Proposing, the next significant sequential probabilities are: Evaluating, Confirming, and Confusing; followed in sequential occurrence order by: Arguing, Classifying, Correcting, Clarifying and Suggesting. And last in sequential inhibitory occurrence are: Creating an Opinion, Directing and Evaluating. These are the particular ways in which students encourage participation during lab practice, opening their minds to their classmates' feedback, leading to questions and answers that create new discussion topics and increase learning opportunities.

We agree with Wells [14] who, after taking a closer look to the three parts of the IAE pattern, found enthusiastic student participation, extended in class discussions and approves with what appeared to be an important number of IAE sequences. After a more thorough inspection, he found subtle changes in the standard IAE pattern, especially in the third part. Also found that when teachers ask students and don't close the sequence with a limited evaluation of the student's answers, there's a better participation.

In the same way as mentioned before, the work by Coll and Onrubia [32] presents a series of strategies and discursive resources used by teachers and students in the development of activities and academic content. In all these strategies, it is clear that the role of language is not only to represent and communicate meanings, but also as a tool to negotiate, ask, answer, and develop our own systems of shared meanings, progressively richer, and more complex. The importance of the joint activity the students develop for the creation of new meanings is extended to the whole teaching/learning process, where the educational value of the research participants becomes evident in the evaluation of the learning process results.

This confirms the hypothesis that when the students' contributions are limited to short answers, student participation will be limited to simple tasks, like memorizing and labeling, which promote that the classroom communication won't lead to active participation and complex communicative development. On the contrary, when the teachers' questions and comments are open and the students can make significant contributions to the interaction, not only do they answer the teacher's question, they also create a more efficient learning environment.

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