# Flanders Interaction Analysis in the Teaching of "Medical Cellular Biology"

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ABSTRACT: Flanders interaction analysis is an analysis tool for language interaction behaviors in class which can objectively reflect the events happening in class and achieve a quantitative evaluation. First, the coding system of Flanders interaction analysis is improved, and the improved analysis system was applied in observing the class teaching of Medical Cellular Biology, a basic course in Western medicine at Institute of Basic Medical Science, Shanghai University of Traditional Chinese Medicine.
KEYWORD: Flanders interaction analysis; Medical cellular biology

## 1 BACKGROUND

Sukhomlinskii, the well-known educationist of former Soviet Union, believes that the language used by teachers in class [1] determines the efficiency of mental labor of students in class. Teacher's language is a unique tool in terms of its influence on students' mind. But according to Flanders, the US's scholar, it is neither necessary nor possible to record everything happening in class. The research on teaching behavior in class should be selective. Teaching activities are mainly conducted in the form of language communication, so language behavior is the main activity in class, accounting for over 80% of all class activities [2]. Therefore, language behaviors in a class provide ample samples for studying the class behaviors. Language behaviors implemented by the teacher affect, to a no lesser extent, the class teaching behaviors. Furthermore, the language behaviors of students and teachers are explicitly expressed, which makes it convenient for investigators to take notes. Thus, language research is the integral part of class teaching study.

Flanders Interaction Analysis System (FIAS) was invented in 1950s by Flanders, an American scholar, and later evolved into an analysis tool for language interactions in class [3]. This system is the classical quantitative analysis method for class teaching behavior. FIAS is not only a list for evaluating the quality of class interaction, but can also produce a flow chart of class teaching through analysis matrix. Then a report on the quality of class interaction can be obtained [4]. By transforming the myriad of class teaching activities into simple mathematical problems, FIAS can be used to arrive at some mathematical conclusions. Next, the mathematical conclusions are interpreted in light of teaching behaviors to reveal the problems existing in teacher's teaching activity. Suggestions for improvement can be proposed with high diagnostic value [5].

We employ the improved coding system of FIAS to quantitatively evaluate the behaviors of language interactions between teacher and students in the class of Medical Cellular Biology, a basic course of Western medicine. Suggestions for improvement are proposed with the purpose of optimizing the class teaching system of higher universities.

## 2 METHODS

### 2.1 *Revision of the coding system*

It is found through practice that FIAS cannot be used for all language interaction behaviors of teachers. The connotations of the codes must be enriched to adapt to actual class teaching activities. For example, code 9 is added to represent the discussions between students. In the original system, the codes of student language only include those for the language interactions between students and teacher. But in practice, the interactions, discussion and whispering between the students should be also considered. In ineffective language, the pause, silence and confusion coded in the original system should be distinguished, since the former also has meanings. For example, the pause between curriculum contents and the students' thinking are both non-language forms of expression.

 

## 2.2 *Improvement of sampling time*

According to the requirements on record making, the video of class teaching is sampled once every 3 seconds. This is not only a high technical requirement, but also raises other problems. For either teacher or students, any action accompanying language cannot last for 3s. Three seconds are only a start time, but cannot cover the entire span of the action. Thus, 5s is selected as the sampling interval, which more conforms to the characteristics of teachers of universities.

# 3 RESULTS

## 3.1 *Application of improved FIAS in the evaluation of class teaching effect of Medical Cellular Biology*

The improved coding system (Table 1) was used to observe the class teaching of Medical Cellular Biology The whole class teaching process was recorded by video and then coded by FIAS. Sampling was done every 5s. The language behaviors happening within this 5s were assigned with a symbol according to FIAS, which was taken as the record of observations. These symbols represent a series of events happening in a specific sequence in class. Then the relatively accurate information of class teaching with time sequence is obtained.

Table 1 Code-improved FIAS

| Behavior classification | | Specific behaviors | Code |
|---|---|---|---|
| Language used by teachers | Indirect influence | Attitude to students' opinions | 1 |
| | | Praising students | 2 |
| | | No response to students' answer | 3 |
| | | Not agreeing with students' opinions | 4 |
| | | Criticizing students | 7 |
| | Direct influence | Instructing | 5 |
| | | Asking questions or assigning homework | 6 |
| Students' language | | Response | 8 |
| | | Discussion between students | 9 |
| | | Practicing of students | 11 |
| Non-language activities | | Thinking | 10 |
| | | Pause, temporary silence | 12 |
| | | Confusion | 13 |

## 3.2 *Matrix table of medical Cellular Biology*

According to the classroom activities of previous video, we give a specific code to the classroom activities on the basis of Code-improved FIAS (Table 1) each 5 seconds. We can obtain a series of coded data and form the matrix table. The formation of matrix table is extract adjoining two numbers from the series data and then found the datasheet according to the first data as matrix table’s line, the second data as column analysis before a data matrix for the number of rows, a data for matrix table’s column. In accordance with the previous method, we can obtain the all matrix table(Table 2).

Table 2 Matrix medical Cellular Biology

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 合计 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 6 | 0 | 1 | 0 | 0 | 0 | 9 |
| 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 7 |
| 5 | 1 | 0 | 0 | 0 | 116 | 4 | 0 | 26 | 7 | 4 | 0 | 0 | 5 | 163 |
| 6 | 1 | 0 | 1 | 0 | 4 | 9 | 0 | 21 | 3 | 8 | 0 | 1 | 6 | 54 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 |
| 8 | 6 | 0 | 0 | 0 | 26 | 21 | 0 | 30 | 1 | 5 | 0 | 0 | 2 | 91 |
| 9 | 0 | 1 | 0 | 0 | 7 | 3 | 0 | 1 | 138 | 0 | 1 | 0 | 2 | 153 |
| 10 | 1 | 0 | 0 | 0 | 4 | 8 | 0 | 5 | 0 | 8 | 0 | 0 | 1 | 27 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 12 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 |
| 13 | 0 | 0 | 1 | 7 | 5 | 6 | 3 | 2 | 2 | 1 | 0 | 2 | 5 | 34 |
| 合计 | 9 | 2 | 3 | 7 | 163 | 54 | 3 | 91 | 153 | 27 | 1 | 4 | 34 | 551 |

### 3.3 *Analysis of structural analysis of class teaching*

It can be seen from the structural analysis of class teaching of Medical Cellular Biology that the ratio of teachers' language to students' language is equivalent to 241/245 (Table 3).This indicates that in the entire class, students' language is predominant, which conforms to the class design of "instruction + discussion".

Table3 Analysis of the structure of classroom teaching

| | | | Ttime (min) =times*5s | row | Ratio (%) =times/total times |
|---|---|---|---|---|---|
| Teacher’s languages | 1—7 | 241 | 21.17 | 1-7 | 43.56 |
| Student’s languages | 8, 9, 11 | 245 | 22.5 | 8, 9, 11 | 46.31 |
| Silence | 10, 12, 13 | 48 | 4.92 | 10, 12, 13 | 10.12 |

### 3.4 *Analysis of teacher's teaching style*

According to Table 4, the proportion of direct influence of teacher's language is larger in terms of time and ratio. The direct influence of language accounts for about 18.5 min, and indirect influence accounts for 1.83 min. This indicates that the teacher should enhance emotional communication with the students. In the instructing process, the time of continuous instruction is 8.17 min, accounting for a large proportion of total instruction time. The ratio of continuous instruction should be properly reduced. The harmony of class teaching is manifested by the intersection region between row 1-3 and column 1-3. The class teaching generally has a good atmosphere. It is seen from Table 4 that the frequency of intersection region between row 1-3 and column 1-3 is 1, which indicates low frequency of emotional communications between teacher and students. So the suggestion is to enhance emotional communication between students and teacher in class.

Table 4 Analysis of teacher's teaching style

| | Time (min) | | Ratio (%) | |
|---|---|---|---|---|
| | =times*5s | Time (min) | =times/total times | Ratio (%) |
| Indirect influence of teacher's languages | 1, 2, 3, 4, 7 row | 1.83 | 1, 2, 3, 4, 7 row | 3.78 |
| Direct influence of Teacher's languages | 5,6 row | 18.5 | 5, 6 row | 38.08 |
| Instructing | 5 row | 13 | 5 row | 26.76 |
| Continuous teaching | (5-5) sheet | 8.17 | (5-5) sheet | 16.8 |
| Asking questions or assigning | 6 row | 5.5 | 6 row | 11.32 |
| The degree harmonious between teacher and students | Intersection sheet of (1-3) line and (1-3) row | 0.1 | Intersection sheet of (1-3) line and (1-3) row | 1.7 |

### 3.5 *Flow chart of class teaching*

The method for diagnosis of interaction quality in class using FIAS is described as follows: first, the largest number A in row 3, 4 and 5 in the interaction matrix of FIAS is first identified, then the second largest number B in this column is identified. The largest number C is identified from the column where the second largest number is located, and then the largest number D is identified from the row where the largest number C is located. These numbers form a closed matrix. The closed matrix of class teaching falls in the regions of (5-5), (5-8), (8-8) and (8-5). Thus, the class teaching behavior is diagnosed as instruction + training.

Table 5 Teaching characteristics of Medical Cellular Biology

| | (5) | (6) | (7) | (8) |
|---|---|---|---|---|
| (5) | 98 | 14 | 4 | 20 |
| (6) | 14 | 9 | 1 | 25 |
| (7) | 4 | 1 | 0 | 3 |
| (8) | 20 | 25 | 3 | 36 |

## 4 DISCUSSION

The improved FIAS was used for quantitative analysis of class teaching of Medical Cellular Biology. The class teaching follows the pattern of instruction + training. The ratio of teachers' language to students' language is 1:1.06. This indicates that the proportions of teachers' language and students' language are basically comparable, which conforms to the design of "instruction + discussion". Although there is some emotional communication between students and teacher, the frequency of such emotional communication is low. We suggest that the teachers should enhance emotional communication with students in class.

FIAS consists of three parts: 1. A coding system for describing class interaction behavior; 2. A standard for observation and code recording; 3. A table of analysis matrix for displaying data. Using these three tools, the entire class teaching process is recorded for quantitative analysis. In FIAS, the events and the sequence of events are recorded objectively using codes. This method can basically restore class teaching and lay a solid foundation for evaluation. As to the data processing methods, the analysis matrix and curve analysis are adopted, so as to transform the complex class teaching activities into mathematical conclusions, which are then interpreted. In transforming the subjective class teaching behaviors into quantitative mathematical model, a series of quantitative indicators are obtained.

Analysis matrix in FIAS is part of mathematical analysis. The analysis matrix is formed by the following method: two adjacent numbers in data sequence are selected as sequence pair. The preceding data in the analysis matrix is taken as the number of row, and the following data as the number of column. The count is increased in the corresponding cell. The frequency of each category of language behavior is calculated from the analysis matrix; the proportion to total language behaviors is also calculated. For example, the teacher's language in class teaching of Medical Cellular Biology accounts for about 18.5 min; as to the instruction process, the time of continuous instruction is 8.17 min. The frequency of interaction between teacher and students is 1, which is quite low. The teacher should pay attention to emotional communication with students.

FIAS divides teacher's language into direct influence and indirect influence on the basis of the approach to control students [6]. The behaviors of teacher in class can be measured by the usage frequency of two categories of language. Direct influence includes instruction and asking questions; indirect influence includes all behaviors related to

emotions. In the class teaching of Medical Cellular Biology, the direct influence (18 min) takes up a larger proportion in terms of time and ratio. The time of indirect influence is about 2 min, so teacher should enhance emotional communication with the students. In the instruction process, the time of continuous instruction is 9.7 min, accounting for a large proportion of total instruction. So the proportion of continuous instruction should be properly reduced.

The use of FIAS in the quality analysis of class interaction can characterize the interactiveness of teacher and students' language by defining every category of language. Hence, the problems existing in teachers' teaching can be discovered. In spite of the operability of FIAS, there also exist some shortcomings. For example, only the language behaviors of teacher and students in class are characterized. Other influential factors, such as body language, teaching contents and writing on the blackboard, are not considered. Thus, many valuable information is left out. Further research will concern with the coding of these languages.

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