Quantitative Analysis of the Speech of the Teachers and Students in High School English Classroom—Based on Information Technology-based Interaction Analysis System[*]

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Abstract—Through the matrix quantitative analysis of the talk of the teachers and students in high school English classrooms, in indicates that in current English classroom teaching, the amount of the teachers' talk is still higher than that of the students in English classroom teaching, the ratio of indirect impact is higher than that of the direct ones, the ratio of pupil initiation is low and so on. In order to change the situation, it is suggested that English teachers should constantly update teaching ideology, highlight the subjectivity of the students in the classroom learning, constantly improve the classroom interaction, activate students' active thinking, increase the use of indirect impacts, develop the harmonious relationship between the teachers and students, stimulate the motivation of the students, ensure the smooth transition between the teaching procedures, and improve the efficiency of the English classroom teaching.

Index Terms—ITIAS, quantitative analysis, the speech of the teachers and students

I. INTRODUCTION

In Flanders Interaction Analysis System, the talk between the teacher and students is considered as the most important teaching behavior in classroom teaching, accounting for about 80 percent of all teaching behaviors (Flanders, 1970). English class is the core of the whole English teaching activities which are primarily conducted by speech. Speech act is the main teaching behavior in the class and its effectiveness is directly related to the overall effect of English teaching activities. New English Curriculum Standard puts forward new requirements for English teaching in China and whether it can be well applied in English classroom teaching by English teachers has become one of the heated topics among educational researchers.

The related literature reviews show that the majority of domestic empirical researches on verbal interaction between teachers and students focus on discussing their interactive activities. From the perspective of verbal interaction, the relevant research is still uncommon. Some researches focus on a certain specific teaching process such as questioning and feedback of the teacher (Hong, 2010) (Lin & Zhou, 2011). Some empirical researches study the classroom activities of disciplines in elementary school or the comparison of English and other subjects (Hu, 2011) (Zeng, 2005). This paper attempts to reveal the progress and shortcomings of the teachers brought about by the new curriculum standards, based on the classroom videos of four English teachers of different seniority in high school in L area and the quantitative analysis by ITIAS tool.

II. A BRIEF INTRODUCTION OF ITIAS

Flanders Interaction Analysis System (FIAS) (Moore, 1992) is the most famous example in the analysis of the classroom teaching behavior, put forward by an American expert on the classroom Ned • Flanders in 1960. It adopts ten types of behavior code to carry out the research of speech interaction between teachers and students and initiates quantitative research of the contemporary classroom observation. But it is no longer widely used in the later researches because it is found that there is less consideration to the teacher-student interaction and ignorance of the role of the media in the classroom. Chinese scholars Gu Xiaoqing and Wang Wei in East China Normal University made refinement and additions in 2004. Information Technology-based Interaction Analysis System (ITIAS) is the system improved, as is shown in Table 2-1. Although Gu Xiaoqing made improvements for Flanders Interaction Analysis

System, there is still some shortcomings in ITIAS coding system. Therefore, the author makes some adjustments and optimization on the basis of other research results.

The optimization and adjustments of other research results are as follows:

(1) Both the "response (active reaction)" in the original code 10 of ITIAS and "taking the initiative to ask questions" in the original code 11 emphasize students' initiative. The ninth type is defined as "students take the initiative to speak" according to the traditional FIAS.

(2) Considering that the students in the class can take the initiative to ask questions and the teachers will answer those questions, which is a kind of classroom teaching behavior. But it is not encoded in ITIAS. The teacher's answering the students' questions belong to the category of teachers affecting students directly, so this kind of teaching behavior is taken into account to encode.

(3) "thinking" in the original code 14 of ITIAS and "to do the exercises" in the original code 15 of ITIAS are beneficial to the silent teaching. Meanwhile, in the actual classroom teaching, these two kinds of behaviors in many cases are performed alternately, and thus they fall into the same category.

(4) "Teacher manipulating technology" in the original code 16 of ITIAS and "technology affecting students" in the original code 18 of ITIAS are mostly carried out simultaneously in the actual classroom teaching, thus merging into "Teacher manipulating technology" in the new code 14.

Classification		Code	Description
The speech of the teacher	Indirect impact	1	Acceptance of the feelings
		2	Encouragement and praise
		3	Adoption of the views
		4	Asking open questions
		5	Asking closed questions
	Direct impact	6	Imparting
		7	Instruction
		8	Criticism
The speech of the students		9	Answering(passive reaction)
		10	Taking the initiative to speak
		11	Discussion with the partner
Silence		12	Chaos which is not conducive to the teaching
		13	Silence which is conducive to the teaching
Technology		14	Teachers' controlling the technology
		15	Students' controlling the technology

III. THE RESULTS OF THE INTERACTION ANALYSIS OF THE TEACHERS AND STUDENTS IN CLASS

A. Research Design

The research, each lesson is split into samples uninterruptedly every three seconds. Each sample is classified and encoded, which is convenient to use interactive matrix to analyze and obtain accurate data of the whole class teaching. Then it is adopted to describe the classroom activities. In view of this, the research is carried out in a key high school in Linfen City. All English teachers' teaching are recorded in this high school. According to different teaching ages (less than 5 years and more than 20 years), English class of four teachers (two novice teachers and two experienced teachers) are selected by random sampling to study. In this paper, the improved ITIAS classroom behavior code is employed and it is shown in Table 1.

For ease of expression, the element (fine grid) in each row and column of the matrix in ITIAS is called cell (i, j), the sum of each row is called Row (i) =, the sum of each column is called Col (j) = , and the sum of all elements (fine grid) of the matrix is called Total = .

B. Analysis

1) The analysis of the amount of the speech of the teachers and students in the classroom teaching

Classroom teaching is the basic approach and core of curriculum implementation. To implement the principle of student-centered and advocate the students to participate in the teaching activities, teachers must transform the traditional classroom teaching behavior which emphasizes the imparting of language knowledge. As the designer and organizer of the classroom teaching and helper for students, teachers should "make the students achieve objectives and enjoy success with the guidance of teachers by perception, experience, practice, participation and cooperation." according to the task-based teaching model advocated by the new curriculum standards.

TABLE 3-1
THE AMOUNT OF SPEECH IN THE CLASS AND SILENCE

	A	B	C	D
The amount of speech of the teacher	51%	51%	42%	47%
The amount of speech of the students	41%	37%	36%	40%
Silence	3%	2%	21%	9%
Silence which is conducive to the teaching	1%	1%	21%	7%

The amount of speech of the teachers and students in the classroom teaching reflects the proportion of classroom time, which to a large extent reveals who holds the initiative in the classroom. As can be seen from Table 2, the amount of speech of four teachers is larger than that of students. Wherein, the amount of speech of teacher A and teacher B is larger than that of teacher C and teacher D. Seen from video and data, teacher C and teacher D are experienced teachers, in the classroom teaching, they give more time to students for group discussions, presentation and other communicative activities. Therefore, the amount of speech of teacher C and teacher D is larger than that of novice teacher A and teacher B. In addition, from the perspective of the proportion of the total amount of speech of the teacher and students, the highest is the novice teacher A, accounting for 92% and the lowest is the experienced teacher C, accounting for 78%. Combining classroom videos and interviews, the author finds that the reasons are that the lack of teaching experience, fewer classroom activities and more initiative being in the hands of teachers. The experienced teacher C design group discussions, self-learning and other classroom activities.

Table 2 is the statistics for students' classroom quietness, which shows that the length of quietness of the experienced teacher is generally higher than that of the novice teacher. By watching the classroom video, the author finds the reasons include: 1) the teaching pace of novice teacher is past, leaving students short time to think independently, but that of experienced teacher is relatively slow, leaving students more time to discuss and think independently; 2) there is a period of time which is not conducive to teaching. For instance, student don't take the initiative to answer the teacher's questions or they cannot answer the questions quickly enough. In short, from the point of view of the amount of classroom speech, the amount of students' speech is smaller than that of teachers. The time occupied by teachers is more than that allocated to students, leaving little time for students to interact. In addition, quietness can be caused by the cohesiveness between activities, which needs to be further improved.

2) The analysis of the speech act of the teachers in classroom interaction

By observing classroom videos, the author finds that the interaction between teachers and students generally begins with teachers' questions and center on the questions. This part focuses on the teacher question ratio, question types, instantaneous teacher question ratio and indirect-to-direct ratio in the interaction. Teachers' questioning is a very effective way of interaction. The formula of teacher question ratio (TQR) is Row (4) $\times 100 \div \sum_{i=4}^{5} \text{Row(i)}$. High TQR indicates that the teachers use questions to guide students to learn. As can be seen from Table 3, teacher question ratio of teacher A is the highest and that of teacher C is the lowest. The reason is that teacher C save more time to students with small amount of teacher's speech. In general, all subjects guide students to learn by asking questions, rather than only relying on teacher's imparting in the teaching. Teachers in Linfen City perform better in this regard.

TABLE 3-2
TEACHERS' QUESTIONING

	A	B	C	D
The ratio of teachers' questioning	17%	8%	6%	11%
The ratio of the open questions	30%	30%	30%	30%
The ratio of the closed questions	70%	70%	70%	70%
Instantaneous teacher question ratio	82%	80%	87%	76%
Indirect-to-direct ratio	75%	29%	29%	33%

With regard to the ratio of open questions and closed questions, "Foreign studies pointed out that when the complexity level of the behavior is lower, the best ratio of closed questions and open questions is 7: 3; when the complexity level of the behavior is higher, the best ratio of the two is 6: 4" (Gu & Wang, 2004, p.21). Four teachers' teaching are English reading class in high school with relatively low level of teaching design complexity. As can be seen from Table 3, the ratio of closed and open questions is 7: 3 in their teaching, which is reasonable.

The instantaneous teacher question ratio is the ratio of speech time when the students stop talking, the teacher immediately ask them questions to respond to students. The immediate speech of the teacher is directly related to his teaching (questioning and speaking) and in response to the students. The higher the ratio is, the more instantaneously the teachers ask students questions. The Norm is about 44% (Gao, 2007). Such kind of questioning is conducive to strengthen the meaningful instantaneous communication between teachers and students. The formula is $[\sum_{i=9}^{10} \sum_{j=4}^{5} \text{cell}(i, j)] \times 100 \div [\sum_{i=9}^{10} \sum_{j=4}^{6} \text{cell}(i, j)]$. Table 3 shows that the instantaneous teacher question ratios of the four teachers are higher than the norm value, which indicates that four teachers can use questioning instantaneously to offer feedback on the students' response and further guide students to think, thus reinforcing the students' meaning construction process in class learning.

Meaningful praise and encouragement can make students maintain good mood and motivation. In this paper, what the teacher indirect-to-direct ratio reflects is that "In the communication with students, teachers interact with students indirectly by accepting students' emotions, encouraging, praising and accepting students' opinions or interact with students directly by instructing, commanding and criticizing students". It is reflected by the ratio of 1-5 and 6-8 row in the matrix. If the data is more than 100%, it indicates that teachers' indirect interaction can guide students effectively to create harmonious relationship between the teacher and students (Jin & Gu, 2010). According to Flanders interaction

analysis theory, the formula is: $\sum_{i=1}^{5} \text{Row(i)} \times 100 \div \sum_{i=6}^{8} \text{Row(i)}$. As it can be seen from Table 3, the indirect impact of teacher A is closest to 100%. The indirect impact of the other three teachers is far less than 100%. Thus, the four teachers tend to mainly interact with students directly to guide students' behavior.

3) The analysis of the speech act of the teachers in classroom interaction

TABLE3-3
THE INTERACTIVE BEHAVIOR OF THE STUDENTS

	A	B	C	D
Student initiation ratio	10%	3%	1%	3%
Student discussion ratio	27%	28%	28%	0%

The ratio of discussion among students refers to the ratio of discussion among students and the whole amount of speech in class. Table 5 shows that, the four classroom teachers, the ratio of the students' interaction in Linfen City is more than 50% and that of Linfen towns is close to 50%, which shows that the teachers emphasize the students' group interaction and cooperation. In addition, the pupil initiation ratio refers to the ratio of time the students take the initiative to speak and the time of students' speech. The higher the data is, the more courageous the student is to take the initiative to express their views. The norm is about 34.[10]   And the formula is: $\text{Row(10)} \times 100 \div \sum_{i=9}^{10} \text{Row(i)}$。Table 4 shows that the pupil initiation ratios of the four teachers are significantly lower than the norm value, of which the lowest is the teacher C. It indicates that the students participate in classroom interaction with low initiative and the classroom interaction is mainly organized and controlled by teachers. Students' ability to think and participate in the teaching actively remains to be improved.

IV. IMPLICATIONS AND SUGGESTIONS

Through the quantitative analysis of classroom videos, it can be found that the four teachers basically abandoned the traditional teaching method of cramming, strengthened the teacher-student interaction to varying degrees, designed some tasks to organize group discussion, and emphasize the student-orientation in the classroom learning according to the new English curriculum standards. Thus implement the spirit of the English curriculum standards, that is to say, to truly cover the student-oriented development, to carry out effective English teaching, to develop their English communication ability on the basis of students' physical and mental health, there are still problems need to be improved. Specifically, it includes the following aspects:

a) Enhance students' subjectivity in classroom learning

Teaching ideology determines teaching behavior. In terms of the amount of speech of the teacher and the students in classroom teaching, the amount of speech of the teachers are larger than that of the students, of which that of the novice teachers is larger. This means that the teachers still dominate the teaching in the classroom. Therefore in order to implement the spirit of the new English curriculum standards and reflect the subjectivity of students, the teachers not only have good professional quality, but also need to change the teaching ideology. They should offer opportunities for the students to communicate and make the students really have more opportunities to use English in the class and encourage them to perceive, experience and practice in the application and ultimately master English communication skills by designing English learning tasks which are close to the students' life. The teachers should not replace students' learning experience with teachers' imparting for fear of students' making mistakes or affecting the progress of teaching, which may lead to the dislocation of the role of teachers and students. To solve these problems, the in-service training for teachers need to be strengthened to make teachers continue to absorb new teaching ideas and apply the advanced teaching ideology to guide the classroom teaching.

b) Improve classroom interaction and activate students' initiative thinking

English classroom teaching is the core of an enhancement of teaching quality and development of the students' ability. The main approaches of interaction between teachers and students and interaction among students are questioning and discussion. It can be found that there are mainly four types of problems in the classroom interaction between teachers and students: First, among the four teachers, only the teacher indirect-to-direct ratio of teacher A is close to 100% and that of the other three teachers is nearly 35%. These data indicate that most teachers tend to interact with students directly, which is not conducive to establish a harmonious relationship between teachers and students and stimulate students' enthusiasm; Secondly, the ratios of students taking the initiative to speak and raise questions are far below the norm, indicating that students mainly participate in the learning activities passively in the class without high active thinking.

The first problem is the ratio of direct impact is higher than that of the indirect impact. In general, the teachers instill the students with their own views and understanding directly in the communication between teachers and students. Meanwhile, the students are corrected directly. To solve these problems, firstly, the teachers must respect students and communicate with them equally. An equal, democratic and liberal environment should be created in the classroom teaching. The teachers should encourage the students to speak without being afraid of making mistakes. Secondly,

teachers should know that the errors are inevitable in the process of using the target language and different types of errors reflect the different stages in the language learning process. On the one hand, teachers can analyze these errors and design targeted activities to help students eliminate some interlanguage quickly and avoid fossilization; on the other hand, different types of errors should be treated differently in different stages of learning. In a communicative task, teachers and students should focus on the meaning rather than the form. Therefore, the errors which do not affect the mutual understanding do not need to be corrected immediately. Even though the errors need to be corrected immediately, they should be corrected in a tactful manner, avoiding direct manners such as instructions, orders and criticism. Teachers should help students learn to maintain good mood and motivation, relieve students' tension and anxiety and improve students' psychological mechanism with meaningful praise, encouragement, the adoption of students' opinions, the acceptance of the students' feelings and so on.

To increase the pupil initiation ratio and to improve the students' thinking in the class, questions should be provided in advance or arranged in other tasks before class, which allow students to preview with his own thoughts and problems found and then participate in the classroom learning process. Teachers should give the students opportunity to present their learning outcomes and question in the class. Teachers should use the task to guide students to think, propose more profound problems and open a new topic so that students truly become the subject of learning, and the teacher as the organizer, guide and helper, participate in classroom activities, avoid teachers' talking endlessly and students' passively listening and answering. Long period of quietness which is not conducive to teaching will inevitably affect the efficiency of teaching. To solve this problem, teachers should carefully design the teaching process and activities when they prepare for the class; check the teaching equipment before the class. They can provide plenty of opportunities for the students to take the initiative to speak, express themselves boldly and improve the participation of the students in the classroom with the introduction of interesting tasks in class, variations of the organization of classroom activities and improvement of the evaluation.

Although this research only selects the classroom videos of four English teachers of different seniority in the same school, the related data and classroom video show that with the continuous progress of English curriculum reform, English classroom teaching in high school has undergone great changes, but there are still many problems. To solve these problems, measures should be taken to continuously improve classroom teaching, truly implement the spirit of the English curriculum standards and develop the students' communicative ability. Of course, classroom teaching include many factors affecting students' learning outcomes and this research may provide some reference to solve the problems in the classroom teaching.

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