

Strategies for Fostering Interaction in Online Classrooms: A Conversation Analysis of Teacher-Student Verbal Interaction in Random Questioning in Pandemic-Initiated Online Teaching

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Abstract: This paper aims to explore how a veteran teacher organizes online teaching initiated by the pandemic and how she deals with the problems in online teacher-student verbal interaction. By analyzing a corpus of 20 audio-recorded online lessons between a math teacher and her students during the COVID-19 pandemic from April 11 to May 10, 2022, four interactional segments are selected as the focus of the study. The results of the conversation analysis of the segments showed that students' modesty, lack of confidence, lack of ability, and network delay are the main factors affecting online teacher-student interaction. By encouraging students to answer questions, enlightening students to give answers, enriching students' answers, and entertaining the teaching atmosphere ("4Es" strategies), the teacher solved the problems successfully. The findings from this study can provide pedagogical experience and implications for practical teaching.

Keywords: Online teaching; Teacher-student verbal interaction; Conversation analysis; "4Es" strategies

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1. Introduction

The global teaching and learning modality has changed dramatically since the worldwide outbreak of COVID-19. Online teaching has become the main education mode during the pandemic and it is likely to become the dominant form of teaching in crisis conditions in the future. Thus, enhancing and improving the quality of online teaching and learning is critical during times of crisis ^[1] and blended teaching is essential after the pandemic. As an important part of teaching, the interaction between students and teachers in an online environment has attracted the attention of more and more scholars and educators.

Since March 2020, primary and secondary schools in pandemic-affected areas had to offer online classes to cope with the interrupted routine school teaching. According to the feedback from local teachers and students,

only in the spring semester of 2022, primary and secondary schools in Shenzhen, Tianjin, Changchun, Harbin, and other regions of China underwent online teaching for more than two months. During the three years of the pandemic, in Harbin, a northeast city in China, primary and secondary school students spent more than half of the time learning online, and online education partly replaced regular classroom teaching. As online teaching and learning continued, more experience was accumulated.

By focusing on the analysis of real-time instructional conversation in online teaching, this paper aims to explore how a veteran math teacher at a junior middle school in Harbin carried out her online teaching, and, in particular, how she organized interactions and handled interactional contingencies to enhance student engagement. In this paper, four interactional segments demonstrating various instructional situations are used as resources for discussing the strategies for fostering interaction in online classrooms. The findings derived from the conversation analysis between the teacher and her students in this study would not only provide pedagogical implications to teachers to deliver effective online teaching but also help to enhance the quality of teacher-student interaction in face-to-face teaching.

2. Literature review

2.1. Online teaching during the pandemic

Research on online teaching during the pandemic shows that most teachers used the mode of synchronous video conferencing ^[2-4] because it allowed real-time meetings and helped maintain the continuity of teaching ^[5], and compared with asynchronous communication, it is closer to in-person classroom teaching. However, schools in the world have reported different struggles with the implementation of online teaching ^[6]. The pandemic-initiated emergency online teaching was a challenge for both teachers and students.

For teachers, the short adaptation time to prepare for online teaching was one of the major challenges ^[6], which included the technical and pedagogical challenges ahead of them. Concerning the technical challenges, the development of teachers' digital competence was crucial ^[7]. Teachers' digital literacy was found to be one of the key factors in organizing online teaching ^[8,9]. In addition, teachers faced internet connection problems, especially with the e-platform server availability issues ^[6]. Concerning the pedagogical challenges, lack of student engagement was teachers' major concern ^[6]. It is hard to maintain students' enthusiasm and attention online ^[10]. Monitoring students' understanding and online examinations became particularly challenging due to the lack of visual contact and nonverbal communication such as facial expressions ^[11-13].

For students, the impersonal nature of online teaching may hinder them from engaging in cognitive activities ^[14]. When studying alone, students found themselves easily distracted at home and had a rather limited attention span ^[12,15-18], and many of them expressed difficulty in maintaining their self-discipline ^[19]. Besides, during online teaching, students found it difficult to find an appropriate time to ask questions or share thoughts ^[13]. Students' online learning was also affected by technical problems, such as an unstable network caused a delay in image reception and asynchronization between the voice and image ^[15,18,20]; Internet connectivity became worse when all family members had to use the internet for work ^[16].

Most studies focus on the difficulties brought by the pandemic to online teaching, and the countermeasures to the problems are mainly suggestions, lacking practical application. There is little empirical research on how to deal with the problems in actual online teaching.

2.2. Online teacher-student interaction

Teacher-student interaction is the interaction between the student and the teacher who plans the curriculum, prepares the lesson, presents the knowledge, organizes discussions, and motivates students ^[21-23]. Interaction

between students and teachers has been studied and proven to be an important part of the online course both for students and teachers [24]. Lack of interaction was the main source of dissatisfaction with online instruction [25]. Students who perceived teacher interaction as frequent and high quality were significantly more likely to complete courses [24]. Unlike face-to-face interaction, teachers faced more difficulties in organizing online interaction. They had to deal with problems such as low technological literacy [26-28], insufficient pedagogical knowledge about online teaching [29,30], and inadequate facilities like computers, phones, or internet access [27,31]. Furthermore, online teaching requires new teacher-student interaction competencies such as the ability to conduct online reviews with individual students [32]. In order to interact adaptively with diverse students, teachers require skills to accurately judge those student characteristics [33-36]. Even experienced teachers reported that they needed support, particularly with examples of good online teaching practices that they could follow [37].

The main form of classroom interaction—verbal interaction, namely conversation between teachers and students—has been shown to significantly affect student learning processes and developments [38-42]. Most of the studies on conversations between teachers and students were conducted before the COVID-19 pandemic and the data generally came from physical classrooms. During the pandemic, studies on online teaching mainly focused on teachers' and students' experiences and perceptions. There were few studies on how teachers organize online interaction, how they carry out conversation, and how they inspire students' participation.

To fill the existing research gap, this paper observes the process of real-time online teacher-student interaction. To fully unleash the potential of synchronous online teaching on secondary students, with an emphasis on teacher-student verbal interaction, this study aims to answer the following research questions:

- (1) How does the veteran math teacher organize interactions in her online teaching during the pandemic?
- (2) What challenges does the teacher face in the verbal interaction with students (mainly in random questioning)?
- (3) How does the teacher solve the problems faced in the verbal interaction?

3. Methodology

The data used in this study came from the live audio recordings of 20 online math lessons during the COVID-19 pandemic from April 11 to May 10, 2022. The words used by the teacher to organize teaching and the verbal interaction between teacher and students were extracted and transcribed, then translated sentence by sentence into English by the author. Through the analysis of the conversational text, this paper discusses how the teacher organizes teaching effectively and enhances the interaction between teacher and students.

3.1. Participants and context

The live audio recordings were taken from online lessons in a private junior middle school during the pandemic when primary and secondary schools in Harbin were shut down and all regular teaching had to go online. The math teacher, Ms. Li (pseudonym provided for anonymity), has extensive teaching experience and has taught in the school for 20 years. The 48 students (males: 26; females: 22) were in Grade 7 with ages between 12 and 13. The names of the teacher and the students are anonymized and all audio recordings are kept confidential and used only for research purposes.

3.2. Data collection

The online lessons were conducted at Tencent Conference, a video-conferencing tool. Each lesson lasted for approximately an hour. Due to prior experiences of using e-learning tools in the first two years of the pandemic, the teacher and her students were basically able to operate the synchronous online teaching tool with relative

ease. During the whole-class sessions, all the students were required to set up and turn on external cameras to show their surroundings, their computer screens, and themselves, which was conducive to teacher supervision. They were asked to mute themselves when not answering questions to minimize interference from background noises. In this case, the teacher observed the facial expressions and class performance of her students through the camera and had live voice interaction with the students to make the online teaching environment as similar to the actual classroom teaching as possible.

Ms. Li interacted with her students directly in Tencent classes and her PowerPoint slides were shared on the screen. To attract students' attention and further engage with them, most of the time she tried to invite the students to answer questions by randomly calling on them, which forced them to stay more focused and engage in the lesson. Compared with taking the initiative to answer questions, there were more problems in the verbal interaction between teachers and students when the students were asked to answer questions by roll call, which is the main way to ask questions in class. Thus, the verbal interaction in random questioning was collected as the research priority.

3.3. Data analysis

The data analysis of this study aims to address the research questions. Hence, the utterances about Ms. Li organizing online interactions were screened from the recordings and counted. To find out the difficulties encountered by Ms. Li in the verbal interaction with her students in random questioning and discuss the coping strategies she adopted, the teacher-student verbal interactions in the recordings were extracted, collated, and transcribed.

For the data analysis, the audio recordings of the verbal interaction were transcribed verbatim according to the transcription conventions of Conversation Analysis^[43]. Each example is presented in the following format (**Appendix 1**):

- (1) The verbal interaction between Ms. Li and the student will be given in Chinese Pinyin (italicized).
- (2) A free translation from Chinese into English will be provided, with the background information being translated into English at the beginning of the excerpt.

4. Research findings and discussion

According to the statistics of the utterances Ms. Li used in the online interaction with her students, the most utterances she used were "Raise your head!" and "Be quiet!" During the online class, it is crucial to observe students through the camera. With the help of the camera, Ms. Li can see the students and remind them in time to raise their heads to keep up. In her online class, students did not turn on the microphone to speak unless they were allowed to, but there were still some students who were eager to answer and disturb others' thinking. In this case, Ms. Li asked them to keep quiet to ensure orderly interactions.

In the online math class, when asked to answer the teacher's questions, some students tried to find reasons to refuse. By judging the characteristics of the students, Ms. Li helped them improve class participation and solved the problems. In the following, four representative excerpts are selected from the data to identify and discuss Ms. Li's teaching practice in verbal interaction with the students.

This section mainly describes and discusses four excerpts extracted from the data. In these teaching segments, Ms. Li encountered different teaching situations: some students were unwilling or unable to interact with her due to modesty, lack of confidence, lack of ability, and network delay.

4.1. Students' modesty

Modesty has been regarded as one of the core values of Chinese culture and influences the communicative behaviors of Chinese^[44]. Chinese substantiate the concept of modesty in daily communication, so it is observed in online teacher-student interaction. In excerpt 1, the student (S7) showed humility in random questioning, and Ms. Li encouraged him to solve the problem.

Excerpt 1: In order to cultivate students' divergent thinking, Ms. Li (hereafter, in the excerpts referred to as T) always asks different students (in the excerpts, referred to as S) to explain their different solutions to the same geometric problem.

- 01 T: *lai, di yi ge fang fa, kai shi:: kan shui de fang fa zui qiao miao. S7↑. (2) S7 shuo hua le, ting. (.)*
Come on, the first method. Go:: Let's see whose method is the best. S7↑. (2) S7 is going to speak, listen. (.)
- 02 S7: *lao shi, wo zhe ge fang fa bu tai hao. (3) hai shuo ma? (.)*
Ms. Li, my method is not very good. (3) Still say it? (.)
- 03 S1: *shuo ba.≈*
Say.≈
- 04 S21: *ni bu shuo, zen me zhi dao?≈*
How do I know, if you don't say?≈
- 05 T: *ni bu shuo wo men zen me zhi dao bu hao ne? lai. (.)*
How do we know it's not good if you don't tell us? Come on! (.)
- 06 S7: *en, na ge, (1) wo xian shi bu tu. (.)*
Well, that (1), I'm going to complete the geometric figure. (.)
- 07 T: *ei, wo men ba zhe ge tu huan yuan. na wo wen ni, S27, lao shi zhe ge fang fa dui bu dui? zhi jie yan chang. (2) yanchang. (3)*
OK, let's restore the geometric figure. Then, let me ask you, S7, is my method right? directly extend. (2) extend. (3)
- 08 S7: *dei yong ge chi yan chang. (.)*
A ruler is needed. (.)
- 09 T: *wo jiu wen ni yan chang dui bu dui ba? (.)*
I'm just asking you, is it right to extend? (.)
- 10 S7: *wo jue de ting dui de. (.)*
I think that's right. (.)
- 11 T: *ai, dui, mei mao bing, ni gei ta yan chu lai jiu ke yi le. hao, na ran hou za zuo ya? (.)*
Oh, yeah, nothing wrong. You can just extend it. Ok, and then do what? (.)
- 12 S7: *ran hou jiu shi zhe guo lai de liang ge jiao (3) she ta men wei α , β . (3)*
And then we got the two angles we folded over and we called them α , β . (3)
- 13 T: *lai, qi ta tong xue zhu yi ting. lai, S7, ran hou.≈*
All right, everybody else, listen to him carefully. Go on, S7, and then.≈
- 14 S7: *ran hou $\angle 1 = 180 - 2\alpha$, $\angle 2 = 180^\circ - 2\beta$, qiu $\angle M$, yong nei jiao he, shi $180^\circ - \alpha - \beta$, $\angle 1 + \angle 2 = 360^\circ - 2\alpha - 2\beta$, (5) jiu shi $2M$. (2)*
Then $\angle 1 = 180 - 2\alpha$, $\angle 2 = 180^\circ - 2\beta$, take the sum of the interior angles, $\angle M = 180^\circ - \alpha - \beta$, while $\angle 1 + \angle 2 = 360^\circ - 2\alpha - 2\beta$, (5) which is $2M$ (2)
- 15 T: *ei ya, S7 guan cha neng li fei chang qiang ye, shi bu shi? shi bu shi guan cha neng li hen qiang? wo dou bu zhi dao ta shi za chu lai de! jiao 1 he jiao 2 yi jia fa xian shi jiao M de 2 bei, suo yi jiao*

1 jia jiao 2 deng yu 2 bei de jiao M.≈

Oh, S7 is very observant, isn't he? Don't you think so? I don't even know how he solved it! Angle 1 plus angle 2, is equal to twice M, so the sum of angles 1 and 2 is 2M.≈

16 S1: *na li bu hao ya? [zhe duo hao ya?]*↑≈
Why isn't good? [What a clever way.]↑≈

17 S43: *[tai zi qian le.]*↑(1)
[How self-deprecating.]↑(1)

18 T: *S7 de fang fa, huan yuan zhe ge tu xing. (4) zhe zhong fang fa hen hao.*
S7's method, restores the figure. (4) That's a very good way to do it.

In line 01, Ms. Li announced that the first method would be given. In order to get the students' attention and give them some time to prepare, she lengthened her voice and said "go." Then she asked S7 (in a rising intonation) to explain his method to others and reminded other students to listen to him carefully and choose the best one. While S7 tried to turn her down politely by saying his method was not good (line 02). Hearing that, Ms. Li realized that it was probably a modest statement, so she let him continue and encouraged him to speak out (line 05). In solving the problem, Ms. Li restored the geometry by extending as S7 said and asked him if that was right (line 07). S7 replied, "A ruler is needed" to extend, which shows he is very cautious. Then in line 11, Ms. Li reiterated that the method was correct and asked the students to pay attention (line 13). When the problem was solved, Ms. Li praised S7 for his observation (line 15) and affirmed that his method was very good (line 18).

In this excerpt, some students turned on their mics and spoke without being asked by the teacher. In lines 03 and 04, S1 and S21 urged S7 to speak out about his method, which is consistent with Ms. Li's thought, so she did not stop them. It is at the urge of the classmates and the encouragement of the teacher that S7 gave his answer. In lines 16 and 17, S1 and S43 expressed heartfelt admiration for S7's approach and pointed out his self-depreciation. The teacher's praise and classmates' admiration confirm that S7's original reluctance to answer the question is due to modesty.

4.2. Students' lack of confidence

In Ms. Li's class, students who lack confidence rarely take the initiative to answer questions. She often pays more attention to such students and invites them to answer questions. When they answer, Li offers them encouragement and enlightenment.

Excerpt 2: S37 is not good at math and does not actively answer questions in class. Here, Ms. Li asks her to solve the problem to see if she has mastered the knowledge.

01 T: *hao, wo men lai zhao tong xue jiang zhe dao ti. S37, hui ma*↑(3) *S37, dian tou yao tou, hui bu hui.*
(1)

Ok, let's get someone to solve this problem. S37, can you↑(3) S37, nod or shake your head, tell us if you can solve it. (1)

02 S37: *en, lao shi wo hui.* (.)
Yes, Ms. Li, I can. (.)

03 T: *(xiao sheng) lai ba, S37, ni jiang ba*↑(.)
£C'mon£ Come on, S37, tell us↑(.)

04 S37: *en, lao shi, dan shi wo jiang de bu yi ding dui a.*≈
Well, but what I say may not be right.≈

05 T: *mei shier, ni cuo le lao shi bang ni gai, ni shuo ba.* (1)

- It's okay. If you make a mistake, I will correct it for you. Go ahead, please. (1)
- 06 S37: *en, jiu shi $\angle ABD = \angle CBE$, ran hou $\angle ACD = \angle PCB$, ran hou $2 \angle PCD = 2 \angle CBD + \angle MAN$, ran hou...jiao \approx*
Well, $\angle ABD = \angle CBE$, then $\angle ACD = \angle PCB$, then $2 \angle PCD = 2 \angle CBD + \angle MAN$, then... angle \approx
- 07 T: *xing, deng huier, lai..., S37, ni she zhe ge jiao shi β , zhe ge jiao shi α , di yi bu jiu shi $2\beta = \therefore 2\alpha + \angle BAC$, dui ba, S37? hao, di er bu shi shen me? ji xu. (3)*
Ok, wait a minute, come on... S37, let's call this Angle β and that one α , and the first step is $2\beta = \therefore 2\alpha + \angle BAC$, right, S37? Ok, what's the second step? Continue. (3)
- 08 S37: *ran hou, en, ran hou shi $\angle PCB = \angle CBD + \angle BDE$. (1)*
And then, well, then $\angle PCB = \angle CBD + \angle BDE$. (1)
- 09 T: *hao, jiao BDE, lai, S37 de dao le liang ge fang cheng, yong liang ci wai jiao dao de, dui ba? na S37 xian zai zen me chu li yi xia? zen me chu li? ni yao zhao $\therefore BDE$ he MAN de guan xi, xian zai bi xu yao xiao diao α he β , lai, zen me xiao? (.)*
All right, Angle BDE, go on. S37 gives us two equations, which are derived from exterior angles, right? Now, S37, how to do with them, how to do? You have to find \therefore the relationship between BDE and MAN, then eliminate α and β . What to do next? (.)
- 10 S37: *e: wo kan yi yan. (2) ying gai yong er shi cheng 2 \approx*
Uh: Let me take a look. (2) Multiply equation 2 by 2 \approx
- 11 T: *fei chang hao, er shi cheng 2 jian 1 shi, dui bu dui? lai, zhe ge cheng 2. $2\beta = 2\alpha + 2 \angle BDE$. ran hou, zuo jian zuo 0, $0 = 0 + 2 \angle BDE - \angle BAC$, suo yi $2 \angle BDE$ jiu deng yu $\angle BAC$. fei chang hao, S37, zhe ge shi dui de. qi shi S37 gei da jia zheng le yi nei yi wai jiao ping fen xian chu lai de zhe liang ge jiao de guan xi shi er bei guanxi, dui bu dui? dui bu dui? \approx*
Very good. Equation 2 times 2 minus Equation 1, right? So, this times 2, $2\beta = 2\alpha + 2 \angle BDE$. And then left minus left, $0 = 0 + 2 \angle BDE - \angle BAC$, so $2 \angle BDE$ is equal to $\angle BAC$. Very good, S37. You are right. In fact, S37 showed us the relationship between the two angles from an inside Angle and an outside Angle bisector is twice, right? Is it right? \approx
- 12 Ss: *dui.*
Yes.

In Ms. Li's online class, students' movements and expressions can be seen through the camera, so she asked S37 to nod or shake her head to indicate whether she could work out the problem (line 01). To Ms. Li's joy, S37 said she could (line 02), which made Li laugh with delight (line 03). But next, S37 said "What I say may not be right" and emphasized "may not" (line 04), which shows that she lacks confidence and is unsure of her answer. Hearing her words, Ms. Li immediately comforted her by saying, "It is okay" and promised to help her at any time (line 05).

When S37 was solving the problem, Ms. Li offered timely guidance. Ms. Li enlightened S37 to use the methods of setting parameters and eliminating unknown quantities (lines 07 and 09). Following the teacher's guidance, S37 found the way to eliminate the unknown (line 10). Then Ms. Li summed up S37's method (line 11) and the other students expressed their agreement (line 12). In the problem-solving process, Ms. Li's encouragement and enlightenment make S37 solve the problem successfully and her fellow classmates' approval increases her confidence.

4.3. Students' lack of ability

Mathematics, particularly geometry, is very difficult for students who lack the skills and ability to solve mathematical problems. It is important for them to do more exercises to accumulate experience in solving problems. In class, Ms. Li consistently provides them with ample opportunities to answer questions, as well as appropriate reminders and prompts to enrich their answers.

Excerpt 3: Earlier, S38 has answered 2 easier questions. Now, he is going to take one last question.

01 T: hao, zui hou yi ge wen ti. (5)

Ok, last one. (5)

02 S38: lao shi, zui hou yi ge, wo bu tai hui. (.)

Ms. Li, the last one, I don't know how to solve it. (.)

03 T: AB he CD ping xing:: ai ya, zhe you sha bu hui de ya? (1)

AB is parallel:: to CD. Well, why can't you do it? (1)

04 S38: a, hui le, lao shi, hui le.≈

Oh, yes, Ms. Li, I can.≈

05 S43: zhe bu quan (deng ma)?↑≈

Aren't they (congruent)?↑≈

06 T: hao, lai kai shi. qi ta ren bie kai mai, S43, kou yi fen. (.)

All right, S38, get started. No mics for the rest of you, S43, take off one point. (.)

07 S38: zhe ge, ta shi yi ge wu bian xing, suo yi nei jiao he shi 540°(.)

This one, it's a pentagon, so the sum of the interior angles is 540°(.)

08 T: a, (5-2)*180 a, bi xu xie, hao, 540. (1)

Ah, (5-2)*180, well, you have to write this step. OK, 540. (1)

09 S38: ran hou yin wei AB // CD, suo yi jiao B deng yu 60°. (3)

And then because AB // CD, Angle B is 60°. (3)

10 T: jiao B shi 60°? tong pang nei jiao, tong pang nei jiao! (1)

Is Angle B 60°? Same-side interior angles, same-side interior angles! (1)

11 S38: a, bu dui. jiao B shi 120°(.)

Oh, no. Angle B is 120°(.)

12 T: jiao B shi 120°, ran hou ba 4 ge jiao jian diao jiu ke yi le. dui bu dui? ying gai yong 540-60-120-150-135, yi suan, deng yu:::

Angle B is 120°, and then we subtract the four angles, right? 540-60-120-150-135, which is equal to:::

13 S38: 75°.

75°.

Beginning his response to the last question, S38 admitted his inability to solve it (line 02). Ms. Li emphasized and elongated the term “parallel” in order to provide a hint for him (line 03). Prompted by the teacher, he proceeded to tackle the problem (line 07). When S38 simply stated that the sum of the interior angles of a pentagon was 540 degrees (line 08), Ms. Li added the calculation process to supplement his answer and reminded him of its necessity (line 08). Then Ms. Li repeated the term “same-side interior angles” in line 10 to indicate S38's answer was incorrect. He subsequently corrected it (line 11). In the end, following S38's idea, Ms. Li wrote out the calculation procedure and he worked out the result (lines 12 and 13). In this excerpt, S38's answers are enriched by Ms. Li's hint, supplement, and correction.

In the above teaching segment, when S38 answered the teacher's question, S43 cut in with an answer (line 05). Ms. Li immediately warned the others not to turn on mics without permission and punished S43 by taking

one point away from her (line 06). As S43's speech interfered with S38's problem-solving process, Ms. Li stopped her in time so that S38 could continue his answer.

4.4. Network delay

Online teaching is greatly affected by the network environment. During Ms. Li's online class, most of the time the network is stable, which can meet the teaching needs. However, there is a network delay once in a while. At this time, Ms. Li uses humorous language to entertain the students, reduce their pressure, and create an active classroom atmosphere.

Excerpt 4:

01 T: *S19, S19, ni zuo wan le ma? (3)*

S19, S19, have you finished? (3)

02 S19: *si lu shi zheng hao le. jiu shi rang wo xian zai jiang, wo ye neng jiang. jiu shi wo mei zen me xie bu zhou. (2)*

I've the idea. If now I am asked to explain, I can. But it's just that I haven't really written down the steps. (2)

03 T: *xing, na ni lai jiang ba. qi ta tong xue tai tou a, kan S19 hui bu hui. lai, ni shuo ba. S36, taitou. (1)*

All right, you do it. Others, heads up. Let's see if S19 can solve it. Come on, S19. S36, look up. (1)

04 S19: $\angle BPC = 180^\circ - \angle PBC - \angle PCB = \beta - \alpha (2)$

$\angle BPC = 180^\circ - \angle PBC - \angle PCB = \beta - \alpha (2)$

05 T: *hao, shi zhe yi si ma? Deng yu $\beta - \alpha$, S19, ni yong de shi na ge san jiao xing nei jiao he ya? $\triangle BPC$, dui ba? zhe shi ta de nei jiao he. \approx*

Okay, is that what it means? $\beta - \alpha$, which triangle's sum of interior angles are you using, S19? $\triangle BPC$, right? This is the sum of its interior angles. \approx

06 S19: *you yin wei (5) wo zhe, lao shi wo zhe bian ka, jiu shi nin de na ge bi you dianer yan chi. (.)*

And because (5) uh, I'm stuck here, Ms. Li, and there is a network delay in what you wrote. (.)

07 T: *a, mei shier, wo kan bu chu lai. ni shuo ba, ni xiang yong na ge san jiao xing? (2)*

Oh, it's all right. I'm not aware of it. So, which triangle you choose? (2)

08 S19: *wo yong de shi $\triangle BCP$ de nei jiao he, ye jiu shi $\triangle BPC \approx$*

I'm using sum of the interior angles of $\triangle BCP$, which is $\triangle BPC \approx$

09 T: *en, wo xie wan le. jie zhe shuo ba, xia mian zen me zheng? (8)*

Well, I've written down. Go on. What's next?(8)

10 T: *ni yan chi, zhe yan:: yan dao sha shi hou ya? (.)*

You, delay? How long will this de::lay last? (.)

11 T: *S19, ni shi wang ka, hai shi ke ba ya? (.)*

S19, is it network delay or are you stuttering? (.)

12 Ss: £C'mon£

13 S19: *yin wei jiao \approx*

Because Angle \approx

14 T: *e, shuo ba. (2)*

Uh, go ahead. (2)

15 S19: $\angle BAC = 180^\circ - \angle ABC - \angle ACB (.)$

$\angle BAC = 180^\circ - \angle ABC - \angle ACB (.)$

16 T: *hao, ni shi san jiao xing nei jiao he de zhong shi fen si a. zhe ge de duo shao a? \approx*

Okay, so you're a big fan of the sum of triangle interior angles. What is it? ≈

17 S19: *deng yu β - α, suo yi ∠ BAC = ∠ BPC (.)*

It's $\beta - \alpha$, so $\angle BAC = \angle BPC$ (.)

18 T: *hao, fa xian mei you, S19 zhe me zuo wan zheng de jiu ba wo men zhe ge tu yong yi zhong fang fa quan jie shi le, jiu shi san jiao xing nei jiao he dou neng yong. yi ge yong jiao A suo zai de san jiao xing nei jiao he, yi ge yong jiao P suo zai de san jiao xing nei jiao he, tong sha. wan neng fang fa, dui bu dui? ↑hao, S19, ni hao ku ya↓ ≈*

Okay, see, S19 did this and solved the problem in one way. It is the sum of triangle interior angles. One is the sum of interior angles of the triangle containing Angle A, and the other is the one of the triangle containing Angle P. Two birds with one stone. One size fits all, right? ↑ Ok, S19, you are so cool ↓ ≈

19 S1: *yi zhao zou bian quan tian xia. (.)*

One move solves all problems. (.)

20 T: *dui, yi zhao zou tian xia. liang ci nei jiao he yi yong, wan shier.*

Yeah, one move solves the problem, sum of interior angles used twice, done.

In the above excerpt, Ms. Li asked S19 to answer the question and required other students to look up at the screen. Looking through the lens and seeing S36 not looking up, she alerted him at once (line 03). In line 06, S19 told the teacher there was a delay in image reception due to the poor network connection. Ms. Li replied that she had not detected his network delay (line 07). After that, the network lag became more apparent. For about ten seconds, there was no response from S19 (line 09). In this case, Ms. Li broke the silence by saying “How long will this delay last?” and elongated the word “delay” on purpose (line 10). Then she made a joke: “Is it network delay or are you stuttering?” (line 11, S19 occasionally stutters). Entertained by the teacher’s words, the students all laughed (line 12). Later, S19 continued his answer (lines 13, 15, and 17). In the course of answering, Ms. Li commented positively by using the expressions of “big fan,” “two birds with one stone,” “one size fits all,” and “you are so cool!” etc. (lines 16 and 18). Another student also gave a high evaluation of “one move solves all problems” (line 19) on his answer. In this teaching process, Ms. Li enlivens the class atmosphere with her wit and humor, and solves the trouble caused by the network delay.

Through the above conversation analysis, in order to cope with the problems, Ms. Li adopted “4Es” strategies: encourage students to answer questions; enlighten students to give answers; enrich students’ answers; and entertain the teaching atmosphere to make the teacher-student verbal interaction go smoothly in online classroom.

5. Conclusion

The online teaching initiated by the pandemic has brought great challenges to teachers and students. At the same time, it also provides more opportunities to observe and reflect on teaching activities. By analyzing the transcripts from naturalistic online classroom conversations, this study reveals the strategies to promote online teaching and improve teacher-student interaction. The results have offered clear answers to the three research questions. Concerning research question 1 regarding organization and supervision of online teaching, external monitoring equipment is essential, which can well imitate the traditional classroom teaching environment and help the teacher control the class and organize teaching. Through the camera, the teacher monitors and views students’ online learning situation in real time, reminds them to pay attention and keep up with the teaching progress so as to play the leading and managerial role in online classroom.

Regarding question 2 about the problems encountered in online verbal interaction between teachers and students, four representative teaching segments are selected by analyzing and summarizing the collected data. The results from conversation analysis of the segments indicate four main factors affecting the online teacher-student verbal interaction: students are modest, students lack confidence, students lack ability, and network delay. As for question 3 about the teacher's coping strategies for dealing with the problems, through the conversation analysis of four teaching segments, it is found that, first of all, the teacher needs to determine the reasons why students cannot answer the questions smoothly. Then according to different characteristics of students, the teacher adopts corresponding strategies in verbal interaction. Analysis shows that the teacher's encouragement and enlightenment can help modest and unconfident students to answer questions boldly; enriching students' answers is conducive to improve students' learning ability; entertaining the teaching atmosphere can relieve the pressure brought by online teaching. In conclusion, the "4Es" (encourage, enlighten, enrich, entertain) strategies are helpful to foster teacher-student interaction in class and promote teaching.

Though the pandemic-initiated online teaching has stopped, the summary and reflection on the online teaching is beneficial to the future face-to-face teaching and blended teaching. The present study attempts to add Chinese materials into online teacher-student interaction literature and share the practice and experience of online teaching in China. More research on this topic is needed to test and confirm the findings.

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Appendix

(1.5)	Numbers enclosed in parentheses indicate a pause. The number represents the number of seconds of duration of the pause, to one decimal place. A pause of less than 0.2 s is marked by (.)
[]	Brackets around portions of utterances show that those portions overlap with a portion of another speaker's utterance.
≈	An approximate equal sign is used to show that there is no time lapse between the portions connected by the equal signs. This is used where a second speaker begins their utterance just at the moment when the first speaker finishes.
::	A colon after a vowel or a word is used to show that the sound is extended. The number of colons shows the length of the extension.
?	A question mark indicates that there is slightly rising intonation.
!	An exclamation mark indicates an emotion.
.	A period indicates that there is slightly falling intonation.
,	A comma indicates a continuation of tone.
↑↓	Up or down arrows are used to indicate that there is sharply rising or falling intonation.
<u>Under</u>	Underlines indicate speaker emphasis on the underlined portion of the word.
(would)	When a word appears in parentheses, it indicates that the transcriber has guessed as to what was said, because it was indecipherable on the tape.
£C'mon£	Sterling signs are used to indicate a smiley or jokey voice.
italics	Chinese pinyin

Appendix 1. Transcription conventions of Conversation Analysis (CA) adapted from Hutchby and Wooffitt ^[43]

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