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Challenges and responses: A Complex Dynamic Systems approach to exploring language teacher agency in a blended classroom

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This is a qualitative examination of how a Chinese language teacher responded to challenges and developed her agency in a unique teaching and learning environment, termed as the blended classroom. The uniqueness of this classroom lies in its attendance by two cohorts of students at the same time – a face-to-face and an online group. The online group joined the face-to-face group and the teacher via a synchronous online classroom called Blackboard Collaborate. Through analysing data from the teacher's reflection, face-to-face and email interviews and the recordings of her blended class, this research unfolds a semester-long trajectory of her agency development in the blended classroom. Guided by the Complex Dynamic Systems Theory (CDST), we conclude that teacher agency is a system composed of multi-layers of subsystems and it is a product of the constant interaction amongst these interconnected and interdependent subsystems, with certain subsystems playing a more dominant role than others at a given stage of one's agency development. This finding led to our proposal of a framework of teacher agency system. This research advances our understanding of teacher agency as a system in the context of online and blended learning.

Keywords: Complex Dynamic Systems Theory (CDST), teacher agency, language teaching, blended learning, blended classroom

1. Introduction

Language teacher agency, an area of research that has its own features, demands, and challenges, has only begun to attract attention in the last few years. White (2018a, 2018b) comprehensively reviewed research relating to language teacher agency and theoretical approaches to understanding it. She pointed out that teacher agency has received relatively little attention until recently, in comparison to learner agency (White, 2018b, p. 196), and that language teacher agency research has mostly been influenced by the sociocultural approach and the dialogical approach. Both approaches focus on individual aspects of language teacher agency, such as teachers' emotion (e.g., Gkonou & Miller, 2021; Miller & Gkonou, 2018; Shelley *et al.*, 2013; White, 2018a) and identity change (e.g., Kayi-Aydar, 2015; Tao & Gao, 2017). We found that only a very small body of research adopts a Complex Dynamic Systems Theory (CDST) approach to understanding teacher agency (e.g., Hiver & Whitehead, 2018; Larsen-Freeman, 2019). This approach sees language teacher agency as a dynamic system consisting of different interrelated and interdependent aspects (e.g., emotion, identity, beliefs, among others).

In terms of empirical studies, little research has been conducted into language teacher agency development in the context of technology-supported environments. Recent publications relating to online teaching during the pandemic period are largely quantitative in nature, reporting, often through surveys, how teachers responded to the pressure and constraints of rushing into online teaching (e.g., Bryson & Andres, 2020; Damşa *et al.*, 2021; König *et al.*, 2020; MacIntyre *et al.*, 2020; Moser *et al.*, 2021; Scull *et al.*, 2020). Nevertheless, with the recent surge of teaching in online classrooms such as Zoom, Blackboard Collaborate and Google Classrooms, it is of great importance and urgency to understand how teachers cope with challenges and develop their agency when teaching in a synchronous online classroom. However, research on what a teacher really does in the process of teacher agency growth in synchronous online teaching seems to be lacking. Furthermore, to the best of our knowledge, no study has been reported exploring teacher agency in the kind of blended learning environment that this research focused on. We call this environment "blended classroom" in which the teacher conducts the class face-to-face with one group of students and synchronously with the other group of students online, at the same time. This research explores teacher agency developed in such a blended classroom.

2. Literature review

2.1 Understanding agency

This section reviews the different approaches to the understanding of teacher agency in order to provide a background and rationale for our adoption of the Complex Dynamic Systems Theory (CDST) approach in the current study. Agency scholars have attempted to account for the multifaceted aspects of agency from different perspectives and theories. Our review of the agency

literature indicates that studies adopting the sociocultural approach and dialogical approach have dominated agency research.

From the perspective of the sociocultural approach, Ahearn (2001) defines agency as “the socioculturally mediated capacity to act” (p. 112). In line with this approach, van Lier (2008, p.169) also views agency as a “contextually enacted way of being in the world” emphasizing the mediating effect of context in which agency is enacted. Informed by the debates on agency by scholars such as Ahearn (2001), Duranti (2004) and Lantolf and Thorne (2006), van Lier (2008, p. 172) identifies the following three core features of agency:

1. Agency involves initiative or self-regulation by the learner (or group);
2. Agency is interdependent, that is, it mediates and is mediated by the sociocultural context;
3. Agency includes an awareness of the responsibility for one’s own actions in relation to environment, including affected others.

van Lier (2008) stresses the reciprocal relationship between agency and the social, cultural, and interactional environment in which one’s agency develops. While the sociocultural approach to agency has been widely used in research to interpret agency development, it has also been criticized by scholars favouring the dialogical approach for overlooking the individual quality of human beings, such as their emotions, beliefs and sensitivity (e.g., Sullivan & McCarthy, 2004). The dialogical approach is widely adopted in social sciences such as psychology, with an emphasis on maintaining both individuality of parts and the integrity of the whole as reflected in the works of Bakhtin (1990, 1993). It has also been applied to teacher agency research to explore the “lived experience” of agency as termed by Sullivan and McCarthy (2004, p. 292). In comparison to the sociocultural approach, agency scholars in the dialogical approach are more concerned about the impact of individual value systems, feelings and interpersonal relationships on one’s agency development.

Different from the sociocultural and dialogical approaches, the ecological approach emphasizes “the engagement of actors with temporal-relational contexts-for-action” and sees agency as an emergent phenomenon resulting from the interplay between the past (the iteration dimension), present (the practical-evaluative dimension) and future (the projective dimension) (Priestley *et al.*, 2015, p. 626). In other words, this approach concerns more with the emergent actions one is taking in response to the demands of his or her environment, rather than the individual quality that one has. In the words of Biesta *et al.* (2015), agency “is not something that people can have – as a property, capacity or competence – but is something that people do” (p. 626).

It is evident that each of the above reviewed approaches has its own focused concerns. While each approach allows researchers to examine certain aspects of teacher agency development, they also neglect or play down the impact of other factors. None of them give enough attention to the dynamically interactive and co-evolving nature of the different aspects (e.g., beliefs, reflection, environment, etc.) in one’s agency. We found none of these perspectives adequate in explaining the complex and dynamic nature of teacher agency that we

have found in our research. We thus turned to the Complex Dynamic Systems Theory for guidance.

2.2 Approaching teacher agency from the perspective of Complex Dynamic Systems Theory

The multifaceted and dynamic nature of agency calls for a systems view of agency and teacher agency development to explore what one's agency is composed of and how the constituents work together. In fact, a number of conceptual approaches have stemmed from such a systems view to denote particular traits of a living system, such as Complex Adaptive Systems (Lansing, 2003), Complex Systems (Larsen-Freeman, 1997; Larsen-Freeman & Cameron, 2008), and Complex Dynamic Systems Theory (CDST). Among them, CDST is well-known in linguistics and language acquisition theories (Garner & Kaplan, 2019; Larsen-Freeman, 2019).

CDST originated in natural sciences but it has been increasingly used in social sciences to gain an understanding of the complexity of the dynamics of social systems and language learning (see Larsen-Freeman, 1997; von Bertalanffy, 1968; Waddington, 1977; Waldrop, 1992). Complex dynamic systems are described as being living, open and dynamic, consisting of multiple levels of subsystems interacting with one another in a non-linear fashion. Several key features of such systems have been identified, for instance, self-organization, adaptability, interdependency, dynamism and the ability to co-evolve (Cleveland, 1994). Waldrop's (1992) definition of the concept of the edge of chaos best explains the dynamism of a living system:

All the complex systems have all somehow acquired the ability to bring order and chaos into a special kind of balance. This balance point - often called *the edge of chaos* is where [where] the components of a system never quite lock into place, and yet never quite dissolve into turbulence, either. The edge of chaos is where life has enough stability to sustain itself and enough creativity to deserve the name of life. The edge of chaos is where new ideas and innovative genotypes are forever nibbling away at the edges of the status quo, and where even the most entrenched old guard will eventually be overthrown (p.12).

As such, it is crucial to understand that such systems are characterised by their innate ability to always maintain a balance between stability and turbulence, keeping the systems dynamically healthy and vigorous. This approach has been taken up by agency scholars to view agency as an emergent capacity of individuals to be achieved "through the interplay of personal capacities and the resources, affordances, and constraints of the environment by means of which individuals act" (Priestley *et al.*, 2015, p. 23). Larsen-Freeman (2019) also emphasizes, from the CDST perspective, the relational, multidimensional and heterarchical nature of agency. The concept of the edge of chaos is reflected in her conceptualization of agency as being emergent, spatially and temporally situated, and changing through iteration and co-adaptation. Hiver and Whitehead

(2018) employ CDST as a framework to understand four language teachers' agency and identity development. In conformity with Larsen-Freeman (2012, 2013), Hiver and Whitehead (2018) reiterate that CDST is "a new way of thinking which reconceptualizes the objects and phenomena of interest in our discipline in terms of multiple parts interacting together through non-linear processes that lead to striking emergent patterns over time" (p. 78).

Adopting the CDST perspective of teacher agency, this research explores a range of aspects in one's agency development and the constant interaction between these aspects, identifying the aspects that dominate each phase of one's agency development. In so doing, we hope to develop a framework that maps such a dynamic developmental process. We believe that such a framework is urgently needed for a deeper understanding of teachers' agency growth in Technology Enhanced Language Learning (TELL).

2.3 The need for teacher agency studies in TELL

By searching key journals in TELL in the 20 years before 2020, we found little empirical studies on teacher agency development in response to technological challenges, and none has adopted a CDST approach. The study by Kitade (2015) represents the status quo of research into teacher agency in TELL. It discussed how two second language teachers developed their agency in response to the challenges they faced during their 16 years of teaching in technology-supported environments. It confirms the impact of technology on teacher agency development by pointing out language teachers' emerging role as a "mediator responsible to fill the gaps in value around and knowledge of new technologies across communities" (p. 417). This is a role that did not exist in traditional, face-to-face classrooms.

Since 2020, articles and special issues have been published on the impact of online teaching during Covid-19, but only one study on teacher agency emerged, and it is not specifically related to TELL. Adopting a framework built on the relational perspective, Damşa *et al.* (2021) analysed survey responses from 171 academic teachers in Norway and identified transformative actions where "teachers attempted to make sense of available resources, generate alternative solutions, manage constraints or compensate for their underdeveloped digital competences" (p. 36). Importantly, this relational perspective not only allowed their study to investigate the multidimensions of teacher agency (teachers, institutions, resources, infrastructures etc), but also helped illustrate the dynamism in their relationships which led to the emergence of new practices during the pandemic. As informative as it is, this study, which was based on survey responses, does not provide a contextualized understanding of how individual teachers develop their agency step by step in online or blended teaching. This is where the current research can contribute.

As mentioned before, the current study also differs from previous studies in that it is situated in the context of language learning in a blended classroom supported by Blackboard Collaborate (hereafter Collaborate). Similar to other videoconferencing tools, such as Zoom, Collaborate offers synchronous video,

audio, whiteboard and text chat that facilitate real time interactions in the online class. We used it to connect the students learning online with students and teacher in a physical classroom on campus so that both cohorts interacted simultaneously online facilitated by the teacher. We thus call it the blended classroom. Informed by CDST, this research seeks to understand the following two key issues:

1. What are the key constituents of a language teacher agency system, which influence its trajectory in a blended classroom?
2. How do these constituents interact with and act upon one another to advance teacher agency development?

3. Methodology

3.1 Research context and the participant

The participant in this research, under the pseudonym of Yang, had taught Chinese as a second language for three years at the start of this research. In the second semester of 2018, she was required to change to blended delivery for a third-year Chinese language course for learners who were learning Chinese as an additional language at an Australian university. Before 2018, this course had been offered face to face across two campuses (Campus A and B), with the same delivery format and the same learning content and resources. Due to the low enrolment on Campus B, the University decided to merge the classes of 10 students on the two campuses into one using a blended approach, in order to reduce teaching costs while still being able to offer the same number of contact hours for students on Campus B, for equity reasons. The students on Campus B were offered two options: driving to campus A to join the physical class or attending the same class online via Collaborate. Two of the three students drove to Campus A in Week 1 but chose to attend class online for the rest of the semester. This course adopted the flipped classroom approach which required the students to learn the basic contents (e.g., new vocabulary, grammar, and texts) online by themselves before class. In class, instead of teaching these new contents, the teacher would answer students' questions arising from their self-learning and facilitate task completion by students. The tasks, such as role plays, and group discussions, aimed at creating opportunities for students to practice the new vocabulary and grammar learned each week, and improve their communication and interaction skills, with their peers and guided by the teacher. The students thus were required to attend class each week.

Each week, Yang would teach in a computer room on Campus A attended by both cohorts (see Figure 1). The students on Campus A would also log into Collaborate to complete tasks with the online cohort as Collaborate served as a shared learning space. Different from the students online who could attend class anywhere individually, the students on campus also had opportunities to interact with their peers and teacher in the physical classroom if they needed to. Instead of projecting her lecture slides on the big screen in the physical classroom, Yang would upload her slides to the whiteboard in Collaborate. The

rationale behind this pedagogical decision was to allow both cohorts to see, write and highlight the contents on the slides to help with their task completion (see Figure 3 for these Collaborate annotating functions). The whiteboard served as a shared learning space and saved students from switching between their computers and the screen in physical classroom so that they could be more focused and less multi-tasking. The in-built recording function in Collaborate also made it easy for us to record everything happening in the blended classroom, including the whiteboard contents. These recordings were later used by students who could not attend class or those who wanted to re-watch the class later. They were used as one of our data collection methods.

Ethical approval for this research was obtained from the first author's institution (Ref No: 2018/699) and the codes of ethics were adhered to throughout the research.



Figure 1. The blended classroom environment viewed from the online group's angle (On the left, the big video window on top shows the physical classroom and the small video shows the speaker; The box below contains all the names of the participants of the blended class; The last box is the text chat panel, and the largest section on the right is the whiteboard)

3.3 Data collection

As determined by the aim of this research – understanding teacher agency from the CDST perspective, a case study approach (Yin, 2018) was adopted to provide an up-close and in-depth examination of the nuances of teacher agency development. This is because teacher agency is “multidimensional, individually varied, temporally imbued, and both socially and individually resourced” (Vähäsantanen, 2015, p. 1). Feryok (2012) also points out that individual agentive actions are valuable and that “case studies may contribute to professional development not only as a model of personal reflection but also a professional call to action” (p. 95). We thus followed Yang’s agency development for a whole semester and employed a variety of data collection instruments to triangulate our findings. These instruments included semi-structured written reflection, follow-up interviews, video stimulated recall, and email interviews. Transcriptions of unique instances happening in the blended classroom recorded were also used to verify the validity and reliability of Yang’s reflection.

Semi-structured written reflection (hereafter, Written Reflection). This written reflection was the key source of data for analysis. At the end of the semester, a reflection form (see Appendix A) was sent to Yang via Email with a list of questions soliciting her experiences in and reflection on the semester-long teaching. These questions were broad and open-ended serving as a rough guide for her reflection. Informed by the CDST perspective of teacher agency, some of the questions explored the changes in Yang's teaching philosophy and experiences, her self-identity, and her perspectives of blended learning, and others sought her reflection on her initial responses to the change of delivery mode, and to technical and andragogical/pedagogical challenges emerging from her teaching. The rationale for using a written form was to allow Yang sufficient time to engage in a deeper dialogue with herself when reflecting on her semester-long experiences. The semi-structured nature of the form with a range of general questions aimed to stimulate her reflection on different aspects of her trajectory while ensuring not to limit the breadth and depth of such a dialogue. We acknowledge the possibility of recall bias or recall inaccuracy in this post semester reflection. We thus encouraged her to leverage a range of resources to aid her reflection, such as the class recordings and her weekly WeChat [a social media messenger app] exchanges with the course convenor. These WeChat exchanges were characterized by her immediate reflection after each class. We ensure that her reflection was also validated by data collected through the other means discussed below.

Semi-structured follow-up interviews. Two rounds of follow-up interviews with Yang were conducted to substantiate and clarify the data from the Written Reflection. The first was conducted face to face after our initial coding. The second was conducted via videoconferencing to ascertain the accuracy of our second round of coding. We used two types of general questions in the follow-up interviews: (i) What did you mean by...? Could you please provide some examples? (ii) What did you do? How did you do that? Why did you think that should be the way to solve the problem?

Face-to-face video stimulated recall (hereafter Stimulated Recall). After examining the data from the Written Reflection and the interviews, we saw the need to have a more nuanced understanding of Yang's moment-by-moment decisions by watching what happened in her teaching. Together with Yang, we identified 15 critical moments (i.e. episodes) in her agency trajectory in the 50 hours of the blended class recordings. We followed three criteria in our identification of these 15 episodes, that is, Yang's responses to: (i) technical challenges; (ii) andragogical/pedagogical challenges, such as using the appropriate tools, managing both cohorts at the same time, redesigning/facilitating tasks, and coping with (un)expected multitasking in class; (iii) psychological challenges. Table 1 in Appendix A contains the key information (themes, contents etc.) of the 15 episodes. Informed by the stimulated recall methodology (Gass & Mackey, 2000; Lyle, 2003), we watched them with Yang, often pausing a video



segment and asking her why she did what she did, and clarified the unclear points emerging from her Written Reflection.

Email interviews. Email interviews formed the last stage of data collection, which was unstructured and conducted by the first author at the stage of writing up the findings (James, 2016). In total, there were 16 email exchanges for the purpose of further confirming or verifying data collected through the three data collection methods mentioned above.

3.4 Data analysis

Among the four types of data described above, we focused our data analysis on Yang's Written Reflection and the two rounds of interviews as our primary data sources. We used the data from Email interviews for clarification and confirmation purposes. With regard to the 15 episodes of blended classroom interaction, we transcribed them using common transcription conventions (see Schiffrin 1994, p. 422–433). These transcriptions were used, whenever needed, to provide contextual evidence further illustrating Yang's reflection on her agency development.

A thematic analysis (Braun & Clarke, 2006) was applied to the data collected from Yang's Written Reflection and the two rounds of interviews. In the first round of coding, two researchers went through the written reflection and the transcription of the interviews repeatedly and separately, identifying key concepts to develop themes (see Table 2 in Appendix A). The inter-rater reliability for this round reached *kappa* 0.70.

The second round of coding involved constant comparisons of these key concepts and re-grouping and linking them to larger themes (Tie *et al.*, 2019), resulting in inter-rater reliability *kappa* of 0.90. Informed by existing literature on teacher agency and CDST, the two raters finally agreed on seven themes that constructed Yang's agency: her value system, experiences, andragogical/pedagogical competency, reaction, action, environments and reflection. Each contains a number of sub-constructs (see Table 2 in Appendix A).

This data analysis also helped us divide Yang's agency trajectory into three periods in accordance with the challenges she faced and the more prominent factors influencing her actions in dealing with these challenges at specific times. Period 1 was the time two weeks before the start of the semester, focusing on her responses to the request for teaching a blended class. Period 2 referred to the first two weeks of the semester and the rest of the semester was covered in Period 3.

4. Findings

In order to effectively trace Yang's agency trajectory, we present and discuss findings chronologically from Period 1 to Period 3. At the end of each period, we also highlight the key challenges and the interplay of factors impacting Yang's agency development.

4.1 Period 1: Yang's responses to the challenges brought about by the change to blended delivery

In answering the question in the Written Reflection regarding her first reaction when being informed of the change to the blended mode, Yang replied:

I was very **excited** about teaching in this ‘unique’ blended mode as I had never taught this way before. It sounded **feasible** but I was **uncertain** about course design and my adaptation to teaching in this **innovative** mode.

The highlighted words, such as excited, feasible, innovative, in the above reflection evidence her extremely positive first reaction towards the change. She also anticipated:

However, I was still **a bit nervous** in organising my online teaching in conjunction with my physical face-to-face teaching. I **prepared** myself to face a few challenges, such as Internet connections, audio/video accessibility, student disengagement.

Clearly, she was unsure about what she would encounter in this new teaching environment. However, she willingly accepted the potential challenges and took immediate actions. This was evident in her reflection below showing her series of actions to prepare herself for the challenges.

I **had a meeting** with the course convenor and **discussed** a few ways to design this course. After the meeting, I first **worked on** the video clips used previously. Then I **revisited** all the resources I developed for this course in the past years and **highlighted** those that I believed in their usefulness and appropriateness (Written Reflection).

Three key factors seemingly leading to this positive reaction were identified in the synthesis of the data: her past experiences, her strong belief in TELL, and her personality. Firstly, her past experiences included her familiarity with the course content and with using technology in her teaching in the past three years. She had helped design and taught the same course previously, which adopted a range of technologies (Wang & Qi, 2018). These experiences led her give her confidence in the effectiveness of blended delivery, resulting in her ready acceptance of the change.

Secondly, she underlined, on several occasions, her strong belief in the enabling nature of technology in making learning flexible, accessible and equal for all students. The following email response from her demonstrates this belief.

This new design emphasises learning with flexibility and convenience, in addition to learning equality....Throughout the semester, some students told me that they were very grateful for this mode of learning since they did not have to commute to the campus and did not have to give up any learning opportunity.

Thirdly, although only being mentioned in one of the Email interviews, it was evident that her personality also played a part in her positive reaction to the new challenge:

I was also very pleased that I could take this opportunity to challenge myself in a new mode of delivery. Perhaps this reflects my personality that I am not afraid of challenges or being challenged particularly when I have had sound knowledge of something.

In summary, it appeared that the interaction between her experience, her belief in TELL and her personality played a dominant agentic role in her positive response to the possible challenges brought about by the change to blended delivery.

4.2 Period 2: Yang's capacity to act when encountering technical problems

The class recording shows that in her first blended class, she was disconnected from Collaborate twice, but she did not panic but kept telling her students to be prepared for the occurrence of technical problems when learning online. However, masked by her calm facade, was her frustration at the overall slow performance of Collaborate, particularly the slow audio and video transmission. According to her Written Reflection, in her search for ways to improve the performance of Collaborate in Week 2, she found a workshop to be held in Week 4 at the University, on introducing an updated version of Collaborate. Instead of waiting for the workshop, she “**discussed** with the course convenor,” “**tested** the new Collaborate with the course convenor first, and then “contacted students to … **try it out**.” She finally “**decided to switch**” to the new Collaborate from Week 3 onwards after both the students and the convenor confirmed their preference to the new Collaborate. She then “**attended** the workshop in Week 4” to learn more about this new version and classroom facilitation skills and, “**started to experiment** new ideas.”

Yang also reported in Written Reflection that, at first, the course convenor was concerned about the extra challenges that this switch might bring to Yang because Yang had to familiarize herself with the new interface and functions in the new Collaborate and redesign her in-class activities to take full advantage of this new version of Collaborate. In addition, Yang would have to train the students to adapt to this new environment. However, Yang was not deterred by these new demands and challenges as she believed that the new Collaborate could improve students’ learning experiences and outcomes, as she reported in her Written Reflection. As a way of persuading the convenor, she invited the convenor to the new Collaborate and demonstrated her new learning activity designs embedding the new features afforded by the new Collaborate. These series of actions clearly demonstrate her response to challenges: positive, active, reflective, and resourceful. She wrote in the Written Reflection:

I place myself as a learning facilitator or mediator in the student-centred classroom where discussions and activities take place. The role of the facilitator also extends to be responsible for outside class activities and learning design to help students achieve the best possible outcome.

Evidently, it was her learner-centred teaching philosophy that motivated her

constant search for better ways to cater for students' needs, and her belief and expertise in TELL also made her sensitive to new developments in educational technology. It must be pointed out that the workshop on the new Collaborate was not compulsory and was only attended by five other teachers in the whole university, as it was at a time when teaching synchronously online was not the norm in this university and Collaborate was used by very few teachers. The new affordances in Collaborate empowered a more effective environment to develop her agency, resulting in her increased proficiency and knowledge in technology and andragogy. Her teaching innovations below exemplified this process.

4.3 Period 3: Yang's actions in dealing with andragogical/pedagogical challenges

In the Written Reflection, we asked Yang to assess her overall capacity development in blended classroom management skills in terms of task facilitation, multi-tasking, the use of tools in Collaborate and the level of responsiveness to students' needs. A 4-point Likert scale was provided: 1 (*Very low capacity*), 2 (*Low capacity*), 3 (*Medium capacity*), 4 (*High capacity*). Based on her responses, we generated a chart to better illustrate the curves of these skill development over the semester (Figure 2).

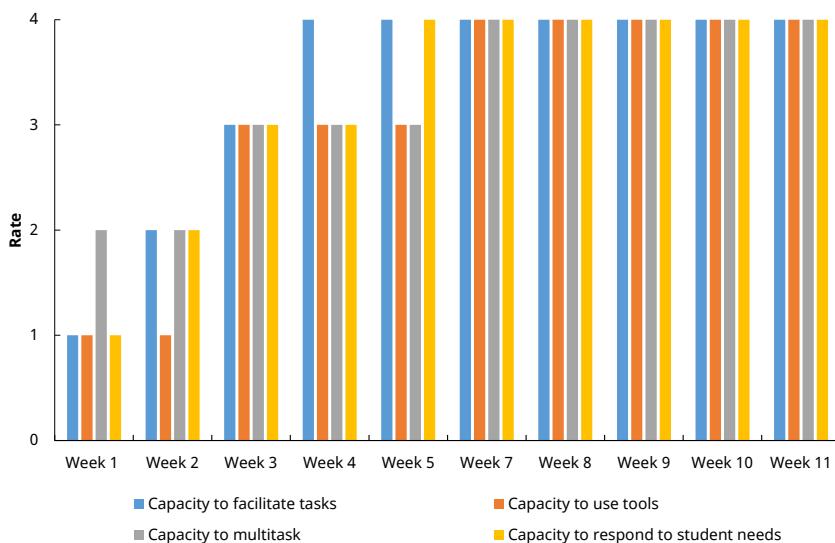


Figure 2. Yang's self-rated agency growth trajectory over the semester (from Yang's Written Reflection)

Figure 2 shows that the first two weeks were a period of uncertainty and nervousness. However, she became more adventurous and innovative from Week 3 onwards as she grew more adaptive to the blended classroom and started to explore its potential. Switching to the new Collaborate catalysed her constant innovation in her teaching as she explained in her Written Reflection:

The change affected pedagogical practices. I noticed a need for a change



for resources and activity design. This is because Collaborate Ultra [the new Collaborate] featured interesting tools that can enhance learning engagement.

In the Stimulated Recall, she specifically mentioned that she was consciously developing her multi-tasking skills and became more fluent in using the Text Chat to respond to individual online students' queries while engaging the class orally. She further explained in the Written Reflection:

I knew which types of task design were appropriate for better engagement. I also knew that what was the best organisation for both cohorts in an activity using a specific tool. These seemed all fell into place in that week [Week 4].

She regarded Week 5 as a turning point in her blended delivery as her agency development became more stable. This stability was sustained to the end of the semester and provided her with more confidence to be more adventurous in experimenting on new task designs and facilitation skills. This was also a period in which she constantly reflected on her teaching as shown in her Written Reflection below:

I constantly reflected on my teaching and cooked new ideas during this period. I talked to the course convenor and shared a lot of my positive and negative teaching moments almost every week on WeChat or in person. This resulted in a very successful outcome as new learning experiences and innovative designs were well received by my students. Most of them believed the blended mode enhanced their learning strategies, efficiency and engagement.

The nexus between her reflection and innovative teaching practice was evident in the above comment. Findings from Stimulated Recall regarding the three rounds of improvement on one task design further provide a glimpse of how her agency grew, mediated by the interplay of her teaching beliefs, the affordances of Collaborate, her past experiences and her ongoing reflection.

There was a weekly speaking task requiring each student to present a three-minute discussion on a certain topic. Traditionally, this task had been found problematic as the class often lost concentration after sitting there and listening to one or two presentations. In Week 2, taking the advantage of the Text Chat in Collaborate, Yang tried to involve the whole class by asking the students to provide feedback in the Text Chat while listening to their peers. However, only four students provided feedback, which contained two smiley faces, one "10/10" and one "very good" in Chinese (see Appendix B for a screen capture of this activity). Yang commented in the Stimulated Recall that she was not satisfied with this minimal amount of peer feedback.

In Week 3, Yang changed the provision of peer feedback to notetaking by asking the students to type what they heard from the presentation, as much as they could. As shown in Appendix C, more specific and varied notes were recorded in the Text Chat, showing a much more engaged class.

In Week 5, Yang further improved this notetaking task, using a PowerPoint

slide with two columns on it (see Figure 3) and posted it on the Whiteboard in Collaborate as a shared space for students to take notes. The column on the left was designated for students to type key contents that they understood, and the one on the right was for students to note down what they did not understand using Pinyin or English. Different from the Text Chat which displayed students' names, the Whiteboard allowed the students to type anonymously using the colour codes only known to themselves as they chose their own favourite colours (see Figure 3). As the Whiteboard is positioned in the centre of the Collaborate interface, it could easily draw the attention of both cohorts of students.

Figure 3 also shows that the Text Chat was only used for general feedback such as “well done” and a “haha” from the presenter to acknowledge her classmates’ feedback. The presenter in this session also opted to paste her script to the Text Chat (see the long texts in Chinese characters) for others to refer to while listening. In the Stimulated Recall, Yang mentioned that she also “typed key words and phrases with English translation and/or Pinyin on the Whiteboard to help students’ comprehension and keep them on task” (see the orange-coloured typing in Figure 3). The notes on the slides also served as a prompt for her to provide more specific feedback to the class after each presentation.



Figure 3. A screen capture of students' note taking in Week 8 (from the class recording)

In the Stimulated Recall, Yang commented:

I changed to this format because I found Chat not as effective as Whiteboard on which all notes can be clearly presented and kept anonymous. I instructed students to colour code their notes which can help them later examine whether they had comprehended the presentation well. This would also help avoid embarrassing anyone if they made mistakes.

The three rounds of improvement of this oral presentation task clearly demonstrate how Yang’s agency grew as the result of the interaction between a desire to improve students’ learning, constant reflection and andragogical/pedagogical innovation.

Yang’s agency growth is also manifested in the change of her self-identity as she reflected in her Written Reflection.

Before this semester, I had always regarded myself as a learning facilitator for students' learning. However, teaching in this blended mode made me realise that students could be co-facilitators ...

I became more aware of the fact that student feedback and needs have made me think out of the box when I planned my teaching. Therefore, in my opinion, teachers and students are co-designers of the curriculum ...

There were several occasions in which Yang and the students co-facilitated task completion in the blended classroom. The following two occurrences exemplify this.

The first is shown in Figure 4 and Table 1. In the Stimulated Recall, Yang explained that she designed the slide with blanks and uploaded it to the Whiteboard in Collaborate so that she could "ask students to voluntarily help me type out the missing words, phrases or information as I explained verbally to the class." Figure 4 shows that after the teacher explained the first sentence orally in Chinese (see Table 1), one student typed 以前 (before) in blue in the first sentence. This was followed by three students typing 一家报社 (a news office) in the second sentence in different colours, upon hearing the teacher's explanation of the second sentence (see Table 1).

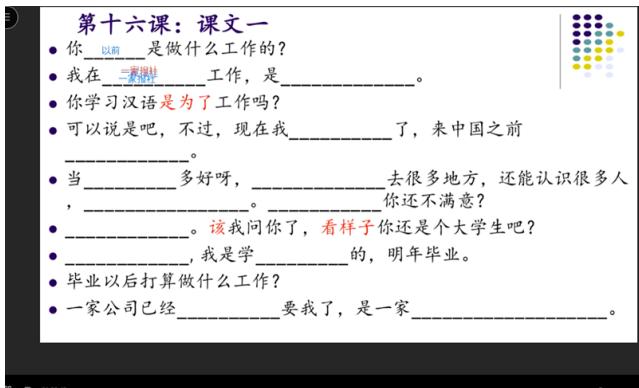


Figure 4. Students acting as a co-facilitator and typing answers on the Whiteboard (from the class recording of Week 8)

Table 1. Transcription of the teacher's speech facilitating the task completion in Figure 4

Teacher	Speech	Translation
Sentence 1	第一个,你以前是做什么工作的? Anyone can just type 以前. See this space? You can just type it here.	The first one, what did you do for a living before? Anyone can just type "before." See this space? You can just type it here.
Sentence 2	然后,你以前是做什么工作的?哦,我在一家报社工作. Anyone wants to type 报社?	Then, what did you do for a living? Oh, I worked in a news office. Anyone wants to type "news office"?

Appendix D presents another example of teacher-student co-facilitation in the blended classroom. Yang reflected in the Stimulated Recall that on that occasion, the online students could not hear her towards the end of that session but were still able to see the Whiteboard and Text Chat, so “I made a very quick decision to ask one student to type out everything I was going to say to the class in Chat.” As shown in Appendix D, User 3 who attended the physical class volunteered to type the conversations for the online students to view.

The above examples showcased the dynamism and co-evolution of Yang’s agency development: How the blended classroom affordances catalysed opportunities for Yang to grow to be a more resourceful and reflective teacher and co-facilitator in the blended classroom. In turn, Yang’s constant reflection and increased familiarity in utilizing what the blended classroom could afford further innovated her teaching.

Overall, the first two periods of Yang’s agency development appeared more eventful and unstable in comparison to the third. The third period was poised on the edge of chaos, where her agency “had enough stability to sustain itself” (Cleveland, 1994) and enough creativity to stay healthy and vigorous. Although the last five weeks in the semester projected an uneventful façade (see Figure 2), reflection and andragogical innovations characterized her teaching from Week 3 onwards as she grew more proficient with the affordances of the new Collaborate and more at ease with the blended classroom.

5. Discussion

The three periods in Yang’s trajectory clearly demonstrate that her agency development was a complex and dynamic process that requires a sophisticated approach, such as a systems approach to understand it. We thus adopted the Complex Dynamic Systems Theory (CDST) and proposed a framework to outline Yang’s agency system developed in blended delivery. Figure 5 illustrates the key subsystems of Yang’s agency system.

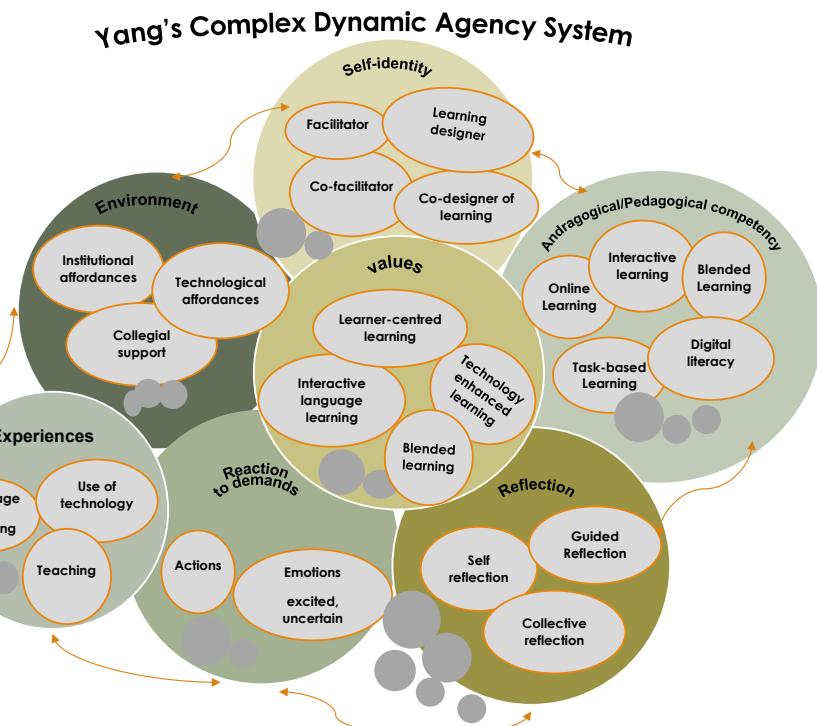


Figure 5. A framework of Yang's Complex Dynamic Agency System

As illustrated in Figure 5, Yang's agency system consists of seven key subsystems (value system, environment, self-identity, andragagogical/pedagogical competency, reflection, reaction to demands and experiences). Furthermore, each subsystem has its own subsystems within it. The grey dots indicate that these subsystems are by no means exhaustive. Due to article length limit, we can only discuss the first two layers of Yang's agency system: the seven key subsystems and some of their subsystems. The arrows in Figure 5 indicate the interaction between the subsystems. Our findings indicate that Yang's agency system embraces all the characteristics of a complex system that have been identified by CDST scholars such as Cleveland (1994), Waldrop (1992), Priestly *et al.* (2015) and Larsen-Freeman (1997, 2019).

5.1 Complexity of teacher agency

The complexity of Yang's agency is characterized by its layers of subsystems. Our findings show that the seven subsystems in Yang's agency were not only something she possessed (e.g., beliefs and competencies), but also what she did (e.g., reflection, reaction and action) and what the environment afforded her. At a micro level, each of these subsystems has its own subsystems. For example, her value system entailed many of her beliefs and philosophies, such as her learner-centred teaching philosophy, and her belief in TELL. The subsystem of environment was also multi-layered in that it could be a wider institutional environment that required her to change to the blended delivery. It could also be the technological environment in which Yang conducted her blended

teaching and developed her pedagogical/andragogical competency. Our findings support Giddens' (1984) structuration theory that sees social structure and agency are reciprocal and equally important. The subsystem of her self-identity consisted of both old and new identities (i.e., facilitator of learning and co-facilitator and co-designer of learning). Multiple subsystems also emerged in her reaction system such as her emotion (e.g., uncertain and positive when facing challenges) and actions to find solutions when encountering problems.

5.2 The interactive, dynamic and co-evolving nature of teacher agency

Our data reveal a constant interplay between various factors that brought about Yang's specific reactions and actions when dealing with different challenges at different periods. This interplay has a temporal quality in that certain subsystems played a more prominent role in certain contexts and at certain periods of her agency development, with other subsystems receding to the background. And those subsystems that stayed in the background might assume a more central position with the change of time and circumstances. For example, at the start of the semester, Yang's past experiences in TELL provided her with an insight into the potential of blended delivery as well as the confidence to embrace such a delivery. However, in the second half of the semester which was characterised by constant teaching innovation, her past experiences and belief in TELL became less central. Instead, blended classroom affordances and her fluency in using the blended classroom dominated her agency trajectory.

Interrelated to all these subsystems is her reflection system. As pointed out by Lantolf and Thorne (2006), agency is not only about one's capacity to act, it also "entails the ability to assign relevance and significance to things and events" (p.143). Not only did Yang constantly reflect on her own, but also reflected together with her students and colleagues; such reflection happened during the semester as well as after the semester when she completed the Written Reflection and was interviewed through stimulated recall and Email.

Overall, her value system emerged to be a key driving force underpinning her agency trajectory. For example, stemming from her belief in learner-centred philosophy was her self-identity as a learning facilitator, rather than an instructor. This belief also led to her later change from a learning facilitator to a co-facilitator of learning and from a learning designer to a co-designer of learning. It was also this belief that motivated her constant reflection on her teaching to meet student needs and to further improve student learning process and outcomes. To summarize, Yang's agency system appeared to be shaped by all these subsystems working together.

Waldrop's (1992) concept of the "edge of chaos" best explains the dynamic stability of Yang's agency system. That is, the subsystems co-evolved with one another and reached enough stability to sustain the system as whole and enough creativity and vitality to deserve the name of a dynamic system. Yang's teaching innovations in Period 3 best exemplifies this dynamic stability.

In summary, CDST provides us with an effective lens to examine the nuances and entirety of teacher agency. Our data leveraged support to the

CDST conceptualization of teacher agency as “an emergent phenomenon” that “represents teachers’ capacity and intentionality to act (physically, emotionally, relationally, pedagogically, and professionally) in accordance with their own values, beliefs, goals, and knowledge within the complex teaching contexts in which they are situated” (Hiver & Whitehead, 2018, p.71).

6. Conclusion

This research has advanced our understanding of teacher agency in terms of both theoretical approaches and empirical practices. Theoretically, we found that CDST made it easier for us to explore teacher agency more comprehensively. Guided by CDST, this research unfolds the trajectory of a teacher’s agency development in blended delivery and reveals its complex, interactive, dynamic and co-evolving nature. This led us to the proposal of a framework that illustrates teacher agency as a system composed of multi-layers of subsystems. This framework sees teacher agency as a product of the constant interaction amongst these interrelated and interdependent subsystems, and that the dominant role of a subsystem plays can be temporal with the change of time and context.

This research also contributes to the empirical studies on teacher agency development in TELL. It is not merely an addition to the research of language teacher agency. Instead, it has qualitatively enriched TELL by investigating how a language teacher developed her agency in a unique learning context – the blended classroom attended by both face-to-face and online students at the same time. In comparison to the traditional face-to-face classroom, the blended classroom appeared to be more challenging in manifolds, both technologically and andragogically/pedagogically. At the same time, it is precisely these challenges that catalyse opportunities for agency growth. This type of classroom is worthy of urgent academic attention, as it will become increasingly important when the demand for flexible learning grows in the post-pandemic era.

Although agency scholars (e.g., Han, 2016; Larsen-Freeman, 2019) have repeatedly warned against overlooking the learning path of individuals, we acknowledge the limited transferability of a single-subject case study. As Feryok (2012) notes in her single teacher agency development study, it is obviously limited, but such a single teacher study allows for a more “fine grained view of the nonlinear and dynamic nature of development....the variability of individual development marks the parameters within which generality can be claimed” (p. 105). We thus need to point out that the framework of Yang’s agency system cannot be applied as it is to map out the subsystems of other teachers’ agency system. However, this framework could be used as a reference when looking at the nuances of agency and key factors that determine the trajectory of teacher agency development. When this research was conducted in 2018, Yang was the only teacher we could find who taught in this particular environment. As blended learning and teaching in a synchronous classroom are receiving unprecedented attention since the pandemic, we plan to conduct another study to further evaluate and improve the framework we proposed in the current

study, but this time we will recruit multiple teachers teaching in the blended classroom, and consider more factors such as race, ethnicity, gender, sexual identities, (dis)ability, socio-economic class, religion and their intersections (Kayi-Aydar *et al.*, 2019).

This research represents a starting point for constructing a holistic framework to understand teacher agency as a system. We believe such a study is more urgently needed than ever in order for us to take better advantage of online/blended learning and delivery in the post-pandemic era when synchronous online and blended learning is fast becoming the norm in higher education.

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Appendix A

Additional information about data collection and analysis

Semi-structured written reflection form

Reflection Questions for Yang (teaching 3011LHS in Tri 2, 2018)

Beliefs

1. What's your teaching philosophy?
2. What's your understanding of Blended learning?
3. What's your understanding of the flipped classroom?
4. As a language teacher, what is your favourite pedagogy/andragogy?
5. Have you undergone any changes in your teaching beliefs after teaching this course in blended mode?

Your experiences in TELL

6. When was the first time that you used Collaborate and in what context did you use it?
7. How familiar were you with the Collaborate classroom before you taught this course in the blended mode (using Collaborate in a computer room with both students on campus and online)?
8. What were your experiences with teaching in Collaborate before you taught the course? Did you like it?
9. What do you think of Collaborate?

Responses to demands

10. What was your first reaction when you got to know that you had to teach in this blended mode, nervous, reluctant, excited? What did you do to mitigate the feeling?

Responses to challenges

11. How did you prepare for your first teaching in Collaborate? Did you try out the tools before class?
12. In your first class, how did you feel when you sat in front of your computer facing both the students in the classroom and online, embarrassed, at ease, weird? Did this kind of reaction disappear in later sessions? In the recordings, you looked quite relaxed and calm teaching in this environment. Is this so?



13. Did you look at the class more or at the screen more?
14. Did you practise in Collaborate before your first blended mode teaching (or before every class using Collaborate)?
15. Did you find it hard to manage the online and in-class students at the same time? If so, in what ways? What did you do to make this type of teaching easier?
16. Why did you change to Collaborate Ultra?
17. How different was teaching in this course in comparison to your previous Collaborate experiences?
18. As you were getting familiar with the blended way of teaching, in what ways did this familiarity affect you as a teacher? Feeling more comfortable, more creative, braver to try different tools? More sensitive to students' needs? More fluent in using tools in class? Responding more quickly to students' questions typed in the text box? Please rate your experiences using this 4-point Likert scale: 1=Very low capacity, 2=Low capacity, 3=Medium capacity, 4=High capacity.
19. Were there critical moments in your teaching that made you change your teaching strategies or encouraged you to use different approaches, tools in Collaborate to deal with these situations?

Ongoing professional development

20. Did you find that you needed to develop new skills/knowledge during this type of teaching? If so, what did you do?
21. Did you discuss any problems you encountered with your colleagues? Can you share some examples?

Identity change

22. Did you notice an identity change when teaching in blended mode in comparison to teaching in face-to-face classrooms?
23. Was there a change in you at the end of the Trimester in comparison to the start of the trimester?



The themes of the selected 15 episodes

Theme	Episode	Lesson	Tool	Content
Initial reaction to challenges	1	Week 1, sessions 1 and 2	Whiteboard in Collaborate	Unexpected challenges in relation to technical issues and task design for the new demands of blended delivery
	2	Week 2, sessions 1 and 2	Whiteboard and text chat in Collaborate	Searching for, and testing a better online classroom (e.g., a new version of Collaborate); reflecting on the technological and pedagogical challenges encountered in the blended classroom
Exploring better online classrooms, and pedagogy	3	Week 3, sessions 1 and 2	Whiteboard, text chat in the new version of Collaborate	Exploring and adapting to the new features in Collaborate with students, developing innovative task designs and andragogical practices
	4	Week 2, Session 1: Lesson 11	Whiteboard in Collaborate	Oral presentation about shopping - new task design: shared class feedback using the text chat
Familiarizing with tools in Collaborate and improving and experimenting new task designs	5	Week 3, Session 1: Lesson 12	Whiteboard and text chat in New Collaborate	Oral presentation about comic characters – re-designing the oral presentation task by providing scaffolding for peer feedback.
	6	Week 4, Session 1: Lesson 13	Whiteboard and text chat in New Collaborate	Oral presentation about travel – re-designing PowerPoint slides clarifying actual steps of providing peer feedback and raising questions in text chat.
	7	Week 5, Session 1: Lesson 14	Whiteboard and text chat in New Collaborate	Oral presentation about personal interests – exploring a balanced use of text chat and the Whiteboard in Collaborate for improving note taking by students while they listened to their peers' presentation.
	8	Week 8, Session 1: Lesson 16	Whiteboard in New Collaborate	Oral presentation about career - re-designing PowerPoint slides so that the students could type on the Whiteboard using different colours and staying anonymous.



Innovation and new design of tasks	9	Week 5, P Session 1: Revision for Lessons 11-14	Whiteboard and text chat in New Collaborate	Re-designing PowerPoint slides for whole class collaboration on the Whiteboard; The text chat was used for other interactions (e.g., socializing, sharing resources, peer support etc.)
Students acted as co-facilitators	10	Week 8, Session 1: Lesson 16	Whiteboard in New Collaborate	Students filling in missing information on the whiteboard while the teacher verbally explaining language in use.
Students acted as co-facilitators	11	Week 8, Session 2: Lesson 16	Whiteboard and text chat in New Collaborate	The face-to-face students were assigned as teacher aides to type in the text chat what the teacher said. This was because the online students could not hear the teacher due to a problem with the audio connection in Collaborate.
Students acted as co-designers of the curriculum	12	Week 8, Session 2: class break time -	Text chat in New Collaborate	Students and the teacher used text chat to socialise and share/exchange resources such as video links and online materials.
Students acted as co-designers of the curriculum	13	Week 9, Session 2: Lesson 17 – a	Poll and text chat in New Collaborate	A student created a poll using the Collaborate poll function to survey the class. Inspired by this, the teacher facilitated a conversation based on the poll results.
Managing physical cohort and distance cohort	14	Week 7, Session 2: Lesson 15	Whiteboard, text chat in New Collaborate; digital handouts,	Paired face-to-face students with the online students to complete a 'find out who' activity. The digital handout was uploaded to the whiteboard for notetaking and discussion prompter.
Peer interaction between face-to-face and distance students in the text chat	15	Week 9, Session 2: Lesson 16	Text chat in New Collaborate	Due to poor audio quality experienced by a distance student, the teacher asked the students to interact with one another using Chinese characters in the text chat to complete a task originally designed for a speaking task.

26 key words/concepts further coded and conceptualised into 7 constructs



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Concepts	Theme
teaching philosophy	Value system
belief	
learner-centred learning	
experience	Experiences
blended learning	
flipped classroom	
face-to-face learning	
pedagogy	Pedagogical competency
facilitation	
reaction	Reaction
excited	
uncertain	
creative	
stable	
confident	
comfortable	
task design	Action
action	
interaction	
environments	Environment
tools	
technology	
Collaborate/New Collaborate	
Learners' needs	Reflection
reflection	



Appendix B

A screen capture of Week 1 oral presentation task in Collaborate

The screenshot shows a Collaborate session. On the left, there's a video player window showing a person speaking. The main area displays a presentation slide titled "第十一课相关内容的演讲". The slide contains the following text:

- 选择:
 1. Weekly questions
 2. Debate topics
- 时间:
一个人三分钟
- 听众:
 1. 请在Chatbox上给你的同学一些feedback
 2. 一个演讲结束, 1-2个同学要提一些问题

Below the slide is a Chat window titled "CHAT" with the following messages:

User	Message	Time
Participant#7	^^	10:27 AM
Participant#9	很好	10:27 AM
Participant#6	10/10	10:27 AM
Participant#9	😊	10:27 AM
Participant#10	謝谢大家	10:27 AM

On the right, a sidebar shows a "Translation of the Chat messages" section with the following translations:

- Participant 9: Very good
- Participant 6: 10/10
- Participant 9: smiley face
- Participant 10: Thank you everyone

Appendix C

A screen capture of Week 3 oral presentation task in the new Collaborate

The screenshot shows a new Collaborate session. On the left, there's a video player window showing a person speaking. The main area displays a presentation slide with the following text:

请在Chatbox上，一边听，一边打出演讲的内容 一个演讲结束，1-2个同学要提一些问题

Below the slide is a Chat window titled "Chat" with the following messages:

User	Message	Time
User 7	1	18:58
User 8	你好	19:01
User 7	木兰 - Mulan	19:45
User 8	不好意思我没听清楚，最大的什么？	21:47
User 3	你要娶她吗	22:01
User 5	木兰啊 不太高 她的优点不会说话而没有脾气 我喜欢木兰 想好的	22:12

On the right, a sidebar shows a "Translation of the Chat messages" section with the following translations:

- User 8: Hello
- User 7: Mulan - *Mulan*
- User 8: Excuse me, I didn't hear it clearly, the biggest of what?
- User 3: Are you going to marry her
- User 5:
Mulan ah
Not very tall
His strong points are not talkative, good tempered.
I like Mulan
Made up his mind ...

Appendix D



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A screen capture of the text chat notes taken by student helpers (Lesson 16 recording)

Translation of the Chat messages	
User 3	医生要读五年，然后三年在医院。一共八年 <i>02.31.08</i>
User 2	我觉得医生和护士应该是最尊敬的工作 <i>02.32.57</i>
User 3	不过他们常常会被abused by the patients <i>02.33.44</i>
User 2	你是觉得医生和护士可以救人命所以很尊敬? <i>02.34.17</i>
User 3	是啊~ <i>02.35.39</i>
User 2	第二个你选了哪个? <i>02.37.09</i>
User 2	科学家 <i>02.37.09</i>