



Does learning happen? A mixed study of online chat data as an indicator of student participation in an online English course

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Abstract

Student participation, as a significant indicator of class learning, has been investigated from various perspectives. The present research seeks to explore student participation by drawing on text data from the chat box of an online learning platform. The two main research questions concern the main types of student participation indicated by the online chat data as well as how extensively and frequently students had participated online in class. The written text messages of 84 university students in the chat box were recorded in an online English course for three months in consecutive. The findings revealed that students' online chat data generally fell into five major types: students' responses of factual information (62.77%) social interaction (15.74%), phatic communication (9.95%), tech-related messages (7.5%) and class schedule (4.5%). With 89% of participation concerning meaningful interactions and 11% of participation dealing with simple clarification of tech problems and class schedules, the findings suggest a highly active and meaningful online in-class participation. In addition, further descriptive statistics depicted the level of participation in terms of its frequency and breadth. Results showed that the active and meaningful online participation had been persistent over three months with an average of 74.52% regular participating students and average 410 chat messages sent one day. Implications were discussed in relation to the features of student participation.

Keywords Student participation · Online chat data · Online English course

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1 Introduction

Student participation, as one of the many variables depicting classroom learning, is believed to be important for both successful learning and effective teaching. Researchers have examined and measured student participation in various ways across different instructional contexts ranging from traditional physical classrooms to online learning modes such as MOOCs, blended learning and online courses (Araka et al, 2020; Dewan et al, 2019; Khalil & Ebner, 2017). Student participation, on the one hand, has been taken as one of the constituents of a broader encompassing concept of student engagement (Dixson, 2015; Shi & Tan, 2020). These two constructs overlap with each other and sometimes they are used interchangeably (Frymier & Houser, 2016). On the other hand, student participation has also been narrowed down to a separate and more specific construct such as in-class online participation in web-based medium (Dewan et al, 2019; Rocca, 2010). Active participation in class might bring life to the classroom and facilitate lively classroom climate (Rocca, 2010). When students actively participate in learning, they tend to learn more deeply, retain knowledge longer, have stronger communication skills, engage in greater critical thinking, and persist better in college especially in online learning experiences (Bigatel & Malizia, 2018). Thus, student participation has been an important area that deserves research attention. With the wide disparity of research variables, data types and survey methods in the area, very few studies have looked into students' online chat data of online courses. Hence, the main purpose of the present study is to take the online chat data of students as an important indicator of student participation to explore and examine online in-class learning.

2 Literature review

Researchers have attempted to define, describe and measure student participation in various ways, which makes up the main challenges in the field. For example, Burchfield and Sappington (1999) defined student participation as “the number of unsolicited responses volunteered”, which could take up a number of different forms such as students' questions and comments. Dancer and Kamvounias (2005) thought that student participation was an active engagement process that could be sorted into five categories: preparation, contribution to discussion, group skills, communication skills and attendance. Rocca (2010) provided an operational definition that in-class student participation consists of asking questions, raising one's hand, and making comments. Researchers hold that the meaning of participation may vary depending on the context in which it occurs (Heaslip et al., 2013) and it could also differ from teachers' ideas to students' understandings. Teachers seem to have more limited perceptions of student participation, which encompasses students' speaking in class, answering questions, making comments and joining in discussions (Vandrick, 2000) or involves “a form of active learning

in which students publicly discuss the course material (Heyman & Sailors, 2011). In a typical English as foreign language (EFL) context, researchers considered student participation to be playing an active role in all in-class activities ranging from brainstorming, games, quizzes, surveys, group discussions, role plays, simulations, collaborative tasks, presentations, exchanging information (Crosthwaite et al., 2015). The present study tends to agree to this interpretation of student participation as students are encouraged to attend extensive learning activities in class rather than being constrained to only asking-answering questions, speaking and discussing.

This holds especially true when it comes to the particular setting of online courses. Researchers state that student participation has a significant impact on student persistence and retention that play an essential role in online environment. With prolific research in the area, few explanations of student participation in the online environment have been provided. This turns out to be one of the main challenges for researchers in the field. Some researchers viewed online participation from the lens of traditional class participation and highlighted asking questions, responding to questions or joining small group discussion (Handelsman et al, 2005). Hrastinski (2008) defined online student participation as “a process of learning by taking part and maintaining relations with others”. This understanding is more relationship-based and emphasizes the significance of connecting with others as the foundation of online participation. Since online learning develops out of traditional face-to-face instructions in physical classrooms (Huang, 2019), the researcher holds that online student participation features both traditional class participation and online participation and should thus involve both domains.

Therefore, the present study regards online student participation as “learners attend to learning that might persist in numerous ways and through various media in the online environment”. It may incorporate conventional class participation such as asking & replying questions, making comments, discussions, role-plays, dialogues, presentations that are both typical in physical classroom settings and also conducted online in web-based settings (Frymier & Houser, 2016; Hrastinski, 2008; Handelsman et al, 2005; Tsai et al, 2021). Additionally, it also comprises online-specific participation like page views, click-through rate, log data, trace data, online text messages, online posts, winning digital badges and applying student response system, to name just a few. (Cheng & Lei, 2020; Chou & He, 2016; Heaslip et al, 2013).

Once the main construct of student participation is operationally defined, researchers are able to describe and measure student participation in various ways. As a result, these constituent facets have been taken as the major indicators of student participation and make the focal research goals in the literature. A multitude of empirical studies have looked into the indicators in an attempt to disclose the nature and impact of student participation. Researchers have so far examined and measured a wide range of data types in relation to multiple variables by applying different research methods. Table 1 below reviews some latest studies in the area.

Table 1 shows that researchers have taken diverse data types as the indicators to measure and evaluate student participation. These data types range from more web-specific ones like log data, trace data, hits on courses, page views, online posts and comments to more conventional ones like self-report surveys,

Table 1 Empirical studies of student participation in terms of data types, research methods and sample sizes

| Studies | Data types | Research methods | Sample size |
|--------------------------|---|------------------|---------------|
| Kim et al., 2021 | Trace data, log data and final scores | Mixed | 56 students |
| Cheng & Lei, 2020 | Blog articles and comments | Qualitative | 24 students |
| Tang et al., 2020 | Videotaped lessons (hand-raising, speaking-up), data of oral participation, interview data | Mixed | 64 students |
| Theriault, 2019 | Field notes of classroom observations, interview data | Qualitative | 10 students |
| Liu et al., 2019 | Likert scales of learners' perceptions of participation, social network and collaboration experiences, oral reading proficiency | Quantitative | 26 students |
| Ozkara & Cakir, 2018 | Interview data, reflection reports | Qualitative | 30 students |
| Rubio et al., 2018 | Page views, postings, discussion posts, viewing videos online, on-time submission and editing submission | Mixed | 78 students |
| Sedova, 2017 | video recordings of lessons, reflective interview data, sound recordings of group discussions at seminars | Qualitative | 8 teachers |
| Stamm et al., 2017 | The weekly count of instructor and students online posts, irrespective of the content | Quantitative | 7477 students |
| Luo et al., 2018 | Participants' hits on the online courses, final course grades, discussion board grades, group wiki grades | Quantitative | 88 students |
| Frymier & Houser, 2016 | Self-report surveys, numeric data from 7 Likert scales | Quantitative | 674 students |
| Crosthwaite et al., 2015 | Likert scales of self-report survey | quantitative | 141 students |
| Frisby et al., 2014 | Numeric data from 4 Likert scales | Quantitative | 189 students |
| Heaslip et al., 2013 | numeric data from Likert scales of self-report survey, interview data | Mixed | 120 students |
| Latham & Hill, 2013 | 4 Likert scales of self-report survey | Quantitative | 156 students |
| Hew & Cheung, 2010 | Reflection logs, posts from online forums and interview data | Mixed | 62 students |

interviews, field notes and audio/video transcripts of class observations etc. Among them, studies that have examined students' real-time chat data in the chat box of online learning medium are scant. In fact, real-time chat data from the chat box of online learning medium is able to capture the dynamic nature of learner participation and might reflect the real time conditions of learning and deliver the up-to-the-minute information (Kim et al., 2021). In online courses, students tend to spontaneously type in all kinds of text messages in the chat box on the online learning mediums such as ZOOM Meeting or Tencent Meeting. The chat box is an important and essential medium for instructor-learner and learner-learner communication and interaction in online courses. It entails informal and synchronous text messages complementary to video chat and audio chat on the online learning medium. So far studies taking chat data from the chat box of online learning medium are rather scarce. The present study holds that such spontaneous and real-time text messages record the authentic participation in online courses and might indicate in a way the real learning conditions in web-based settings. As a result, the online chat data from the chat box of the online learning medium was taken as the primary data source of the present study and acts as an indicator different from previous literature to examine student in-class participation online in this research.

As to the research methods, Table 1 shows that quantitative, qualitative and mixed research methods are all employed to explore student participation. Depending on different research goals, qualitative methods are utilized to disclose factors impacting student participation or its benefits (Ozkara & Cakir, 2018; Sedova, 2017; Theriault, 2019) while quantitative methods serve to unpack the possible patterns or trends of student participation (Cheng & Lei, 2020; Stamm et al, 2017) or reveal its relationships with other variables (Crosthwaite et al, 2015; Frymier & Houser, 2016).

Regarding sample sizes, quantitative studies generally investigate larger sample size and Table 1 shows that it may surge up to over 7000 subjects. In contrast, both qualitative and mixed-method research commonly take much smaller sample sizes and Table 1 shows that they range from 8 to 30 and from 56 to 120 respectively. By investigating 84 university students and collecting their online chat data in the online English course, the present study intends to employ mixed research methods of both qualitative and quantitative means to depict more specific features of student participation in the online English course.

In sum, the present study attempts to take online chat data as an indicator and explore what characterizes students' participation in the online English course by addressing the following two research questions:

1. What are the main types of student online participation indicated by the online chat data?
2. What is the student online participation level? i.e., how frequently and extensively have the students participated in the online English course by engaging in the online chat?

3 Methods

3.1 Study context

The English course in question is a compulsory EGP (English for general purpose) course for English majors of EFL learners (English as foreign language) at a university. The course aims to develop English language knowledge and communication competence of learners. It covers two academic years of four semesters in the first two academic years at university. For each class of students, there are 2 class sessions a day, occurring twice a week for 16 weeks in one semester. Each session is 40-min in length. Due to the COVID 19 pandemic, the English course was changed from traditional face-to-face instruction in physical classrooms to online course during the semester from March to July in 2020. During these four months, four units were instructed ranging from “Health & Medicine”, “Food & Drink”, “Advertisement” to “Sports”.

The online learning platform where the English course was instructed was Tencent Meeting, an online audio and video conferencing platform functioning very similar to Zoom Meeting. Tencent Meeting allows users to set up virtual video and audio meeting, webinars, live chats, screen-sharing, and other collaborative capabilities. On top of the audio/video conferencing and live chats, the chat box of the platform offers one more option other than just speaking to microphones. Teachers and students can thus communicate with each other by writing and sending text messages in the chat box in class. The chat box is used mainly for presenting informal but spontaneous and natural utterances by students especially when they were not called on for any particular questions, exercises or tasks in class. It is these short text messages, free chats and casual utterances online that make up the primary data source of the present study.

3.2 Participants

Participants of this study were three classes of 84 English majors at the university who had learnt English as foreign language (EFL) and had taken the same English course. They were of the same English majors and of the same academic year at university. Thus, the three classes used the same course books and had the same course schedule as well as the same course evaluation of the English course. Their online English courses were instructed by one teacher on the same online learning platform of Tencent Meeting. The three classes were also similar in class sizes of 29, 27 and 28 students respectively. There were only 6 male students but 78 female students. They were of similar ages of around 20 years old.

3.3 Data collection

The present research has taken the written text messages in the chat box of the online learning platform as the primary data to depict the features of student online

participation in the English course. To collect the online chat data, the researcher had copied the written text messages that the three classes of students sent in the chat box of the online learning platform each time when they had finished their online lessons. The chat data were gathered for 12 sessions every week from April to July. Finally, a total of 145 sessions of valid chat data had been collected during three consecutive months in the semester. The total text data set consisted of 58,191 words.

4 Data analyses

4.1 Coding the online chat data

4.1.1 Coding processes

To code the 58,191-word online chat data, the researcher and one research assistant first had a briefing of the basic principles of coding. Both coders agreed that one line of written utterance sent in the chat box counted as one complete message. This could be either a word, a phrase, a sentence fragment or a complete sentence in the chat box. Then the two coders coded the chat data respectively. The coding processes included the following steps: summarizing the main features depending on the representative phrases and key words from the chat data; combining similar codes; clustering them into themes; comparing, discussing, modifying, merging and finally reaching consensus.

4.1.2 Validity

To ensure the validity of the survey, the present study had taken several strategies to realize principles specified by researchers (Ozkara & Cakir, 2018): collecting long-term information in the natural environment of the online English course, using direct quotations from chat data, gathering detailed and complete information from the chat data, making meanings and explanations based on these data etc. Additionally, the nature of online chat data also added to the validity of the survey in that the on-site recording of the written text messages at the end of each class was unobtrusive and natural, without interrupting either class instruction, participants or the instructor.

4.1.3 Reliability

Regarding the reliability between the two coders, researchers hold that the percentage of reliability between coders must be 70% or more when forming a consensus (Ozkara & Cakir, 2018). In the present study, the two coders had first reached a 95.562% consensus and later a full consensus on coding the data after three rounds of discussions. To ensure the reliability, the researcher and the assistant first had a briefing of coding processes, set off coding respectively, compared coding results, discussed the differences together, made modifications and re-merged, then

ultimately reached a consensus of a final version of the coded data. All the briefing, discussions and conferencing of the two coders took up to 10 h in total.

4.1.4 Descriptive statistical analyses

Upon finishing data coding, the researcher continued to summarize the data with simple descriptive statistics to reveal any possible trends and patterns. A series of data were calculated either by the entire sample, by each theme group, by each student or by each class session as well as their percentages against the entire sample, their frequencies and their fluctuations over time.

5 Findings

5.1 Findings of coding the online chat data

In this section, findings of the present research will be presented according to the two research questions. To answer research question 1 of “What are the main types of online participation indicated by the online chat data?”, coding the online chat data has generated a total of five major themes, namely, phatic communication, students’ responses of factual information, social interaction, tech-related messages and class schedule. Table 2 lists the five major theme groups as well as their sample chat data. In particular, phatic communication encompassed 939 messages of students’ greetings, farewells, and gratitude to the teacher in the online English course. Typical examples were “*Good morning*”, “*Good bye*”, “*Thank you*” plus their variants like “*morning*”, “*thanks*” or “*bye*” etc. These messages all served to establish a mood of sociability and indicated a normal teacher-student relationship in class rather than exchanging concrete information or ideas. Thus, similar messages were coded into the theme of “phatic communication”.

On top of phatic communication, students also attended to the online English class in other ways. For example, replying the teacher’s questions either after being called on or without being called on, responding to the instruction spontaneously, uttering their understandings of the instruction contents and exchanging information briefly with each other in the chat box. All these messages were written and sent in the chat box by students as they kept to the flow of the online instruction in class. They all referred to factual and matter-of-fact knowledge and information that was either being instructed by the teacher or related to the instruction content. Messages in this category were coded as “students’ responses of factual information” and they numbered 5921 in total. Table 2 shows some examples such as “*disease concept, malaria, soup dumplings, carbonated beverage, ad copy, demographic, Petek Phil-lippe, goal keepers, forwards, shin guard*”.

The second larger theme group was labelled “social interaction” with a total of 1486 messages. In this category, messages revealing students’ feelings, attitudes and opinions towards either the instruction contents, their peers, the teacher or even the course were assembled together. Among them, most of the messages expressed students’ feelings, attitudes and opinions towards the instruction contents. For

Table 2 Five theme groups of and their sample chat data

| Theme groups | Sample chat data |
|--|---|
| Students' responses of factual information N = 5921 | <p>“disease concept, disharmony and imbalance, insomnia, food therapy; side effects; B-mode ultrasound; malaria ...”[Health & Medicine]</p> <p>“ingredients; bacon; baked bean; lotus pastry; soup dumplings; wrapper; carbonated beverage; soda water; increase metabolism; snails with garlic in western countries; lotus pastry ...”[Food & Drink]</p> <p>“ad copy, (Coke) ad, solidarity, unity, cleanser, demographic, more luxurious, brands about the car and watch; upscale customers; petek Phillippe, (Evian) live young...”[Advertisement]</p> <p>“direct it with the forehead, goal keepers, forwards, half-backs and full backs, shin guard, have studs or cleats, touchline, goal line, Wolver Hampton ...”[Sports]</p> |
| Social interaction N = 1485 | <p>“terrible, I thought such pills might taste terrible; I think this part is more interesting than hospital department hah-hah; Hahahahaha; hah-hah-hah; what a medicine cabinet hah-hah-hah; Yeah! Lol, hah-hah-hah ...” [Health & Medicine]</p> <p>“what?! beautiful clothes mean a moral fall? never gonna use it!; ...” [Advertisement]</p> <p>“fantastic documentary; Now I feel hungry hahahahaha; a little bit yuck, but really delicious; roasted squid, got it. (*^_^*); i love chicken hah-hah-hah don't like fish; [Food & Drink]</p> <p>“I don't know much about football, a football-blind better not talk hah-hah-hah; Messi is simply amazing ...” [Sports]</p> <p>“Love you soooooo much”</p> <p>“have learnt so much today, again; love you;”</p> |
| Phatic communication N = 939 | “Good morning; Morning; Good bye; bye; See you; see u!; Thank you; thanks” etc |
| Tech-related messages N = 665 | “Sorry, I can't turn on the microphone now; Can everyone hear (the teacher); yeah; I can; Professor, could you show the ppt again; can't see anything, it's (screen) all blank; now it's back (we can see it); Professor, I'm sorry. There are some guests at home now and it is a bit noisy.” ... |
| Class schedule N = 423 | “Good, two weeks are better; where shall we hand in the assignment? someone raised hand; when is the deadline for the assignment; May we have five students for a group?; do we have to prepare ppt for the assignment; Part 3 isn't finished yet.” ... |
| Total: 9433 | |

instance, “terrible; I thought such pills might taste terrible”; “i love chicken; hah-hah-hah don't like fish”; “Messi is simply amazing”. Some messages also revealed student–student interactions such as their emotions and comments on their peers. Examples included.

- S1: “*Jasminum nudiflorum*” (students' responses of factual information)
 S2: “Hahahahahaha too difficult to remember” (social interaction)

In this case, one student prompted the words “*Jasminum nudiflorum*” to respond to the instructional content and then another student followed immediately by making comment on the difficulty of the vocabulary prompted. Then other messages

manifested student–teacher interaction as well where students might express either their appreciations, their affection or their thanks to the teacher. For instance, “*Professor, you have spoken very well the local dialect indeed!*”, “*Professor, how kind you are!*” “*Love you soooooo much!*”.

Then the fourth theme group was “Tech-related messages”. Altogether 665 messages concerning technological problems during the online instruction were gathered in this group. Some were about the failed screen-sharing with the students on the online learning platform. Others were related with learning materials of audios or videos that often got stuck online when they were synchronously shared on the learning platform. Or someone’s microphone or camera did not work at the moment. The most exceptional case was found with one student who apologized for being unable to speak on microphone as some guests were visiting his family at that time. Even though it was a rare case, the incident featured the special online learning conditions when learning venue was blended into life venue during COVID-19 pandemic.

Finally, the fifth theme group of “class schedule” collected 423 messages regarding the schedule of class instruction, assignment as well as course examinations etc. Typical examples include “*Good, two weeks (for preparing the assignment) are better*”; “*where shall we hand in our assignment?*”, “*Part 3 isn’t finished yet*”.

Overall, a total of 9433 messages in 58,191 words of the online chat data were coded into 5 major themes. These themes, namely, phatic communication, students’ responses of factual information, social interaction, tech-related messages as well as class schedule, indicated both the main contents of student participation and the major ways how they participated through the chat box on the online learning platform.

5.2 Results of descriptive statistical analyses of the online chat data

To answer research question 2 about students’ participation level online, descriptive statistical analyses were conducted to summarize the online chat data after coding. To start with, Fig. 1 below shows the percentages of the five theme groups of online chat data. Among them, students’ responses of factual information accounted for 62.77% of the entire data and made up the majority of student participation in the online English course. Social interaction occupied 15.74%

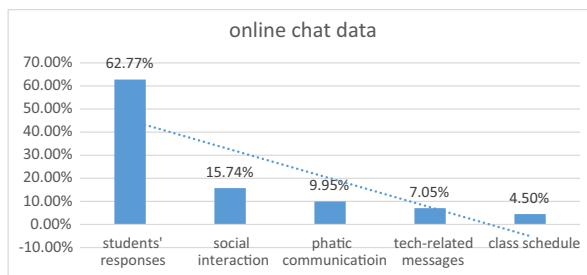


Fig. 1 The percentages of the 5 main themes of the online chat data

and was the second largest group. The percentages of the rest three groups, i.e., phatic communication, tech-related messages and class schedule were 9.95%, 7.05% and 4.5% respectively.

Apart from the percentages of five theme groups, a longitudinal analysis of the statistics helps to unveil further features of student participation. In particular, Fig. 2 demonstrated the total numbers of messages students sent daily in the chat box over three months. The numbers of messages in the chart fluctuated approximately between 237 and 550 with one exception of 716 at the peak. The average number of messages sent one day was 410. After reviewing the instructor’s teaching plan for the contents of the chat data on that particular date, it turned out that the unit of “Food & Drink” was instructed on that day and a video featuring unusual ingredients for barbecued food was played in class. The surging numbers of messages indicated that students were highly active and lively in that session of online class.

On the whole, the average daily messages sent in the chat box over three months numbered 410, indicating that students had been actively involved in class learning and had maintained highly frequent participation throughout the semester.

In similar vein, Fig. 3 displayed the percentages of students who sent messages in the chat box over time. The lowest percentage was 65.49% and the highest percentage was 92.85%. With an average of 74.52% students sending text messages in the chat box a day, data in Fig. 3 suggested that the majority of students (74.52%) had regularly participated in the online English class throughout the three months.

Figure 2 indicated the frequency of student participation which was measured by the number of messages sent in the chat box. In the meantime, Fig. 3 demonstrated the breadth of student participation that was measured by the percentages of participating students against the sample of 84 participants. The two figures combined together suggested the level of students’ participation online, i.e., how frequently students had participated in the online English class by sending text messages to the online chat box and how extensively students had participated in the class. It helped to depict a more comprehensive picture of student participation in the online English course.

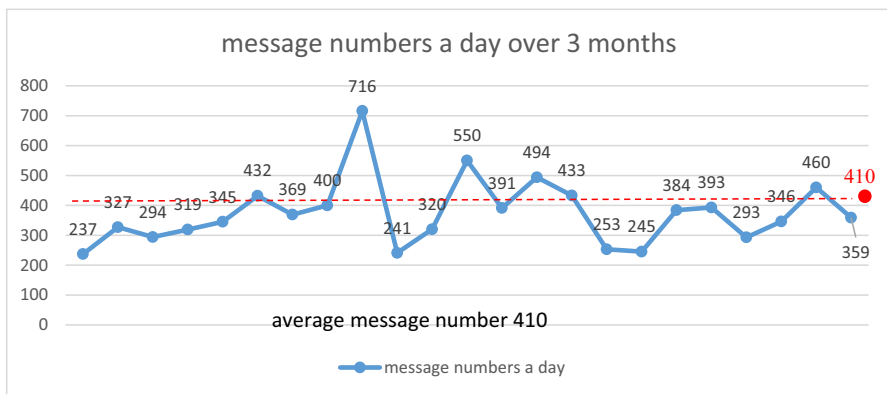


Fig. 2 The total numbers of daily messages sent over three months

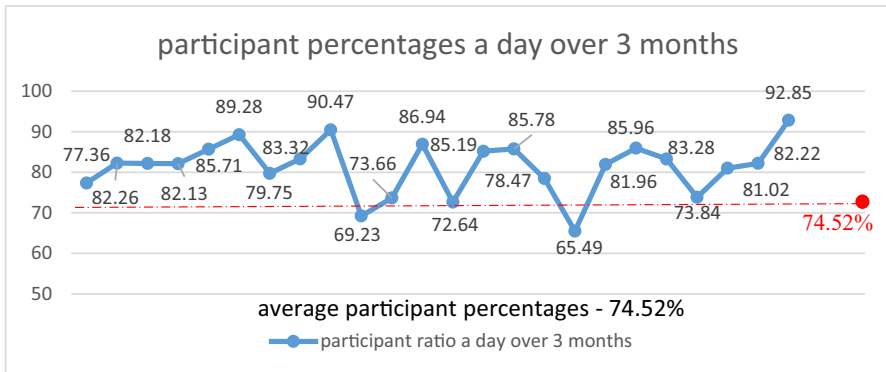


Fig. 3 The daily percentages of participating students over 3 months

To sum up the results of descriptive statistical analyses, around 89% of the student participation indicated by the online chat data in the online English course were concerned about meaningful communications and interactions. It involved students' responses of factual information and social interaction and phatic communication. Furthermore, only 11% of student participation dealt with simple clarifications of technical problems and class schedules. Thus, the findings suggest a highly active and also meaningful student participation in the online English course. In addition, with an average 74.52% regular participating students and an average 410 chat messages sent one day, the present study showed that student participation in the online English course had been active, extensive and persistent over three months.

6 Discussion

In this section, the main findings are discussed in relation to the previous literature. First of all, the present study found that student participation in the online English course was largely characterized by five major types. The most salient group was students' responses of factual information and it indicated the most common way in which students had participated online in the present study. While learning online, participants often sent in the chat box their comprehensions and interpretations of the learning contents such as new words, difficult phrases, complicated sentences as well as other more complex discourse analyses or world knowledge that the teacher was instructing. Messages in this group were largely factual in nature, short in length and closely related to the contents that participants were learning online at the moment. In other words, one major way for students to participate in the online English class and interact with the instruction is to articulate in the chat box their understandings of the subject contents and keep to the flow of cognitive learning in class. In this case, cognitive learning was the major part of the online participation indicated by this group of online chat data.

This finding is quite distinct from previous studies where online dialogue and online discussion are regarded as the most common form of online participation

(Hew & Cheung, 2010; Hrastinski, 2008; Shi & Tan, 2020; Tsai et al., 2021). The present study has found that cognitive learning of factual information and world knowledge might also play a significant role in engaging students in active participation and class learning. This is supported by students' responses of factual information that consisted of 5921 messages and took up 62.77% of the total online chat data. This high percentage suggested that students were lively engaged in the cognitive processes of learning in the online English class. Researchers have found that online discussion might not be sufficient to increase student success in online learning and student online participation could also be significantly influenced by content areas (Chou & He, 2016). Hence, one possible reason for the active online participation indicated by the high percentages of students' response might be attributed to students' interests in the learning contents that could improve their contribution to class. (Rocca, 2010). Learning contents and activity design should be meaningful and authentic so as to capture students' interests and maintain participation (Cheng & Lei, 2020; Hew & Cheung, 2010). Students' interests in learning the instruction contents constitute one of the intrinsic factors that are believed to work better in engaging students than extrinsic factors such as offering badges, grades and certificates (Crosthwaite et al., 2015; Khalil & Ebner, 2017).

Another manifestation for this is the highest number of 716 messages students had sent in the chat box during one session. In this lesson, students learnt the unit of "Food & Drink" which was quite popular with learners. The messages sent in the chat box showed that this lesson began with learning unusual ingredients of food from a documentary featuring barbecue food. A 15-min video clip was shown to students online in class to bring in the topic, familiarize them with the background knowledge and open up discussion of the topic. On watching the video clip and learning unusual food ingredients, students had sent in the chat box the highest number of 716 messages per day during the three months. On the one hand, a large number of messages showed students' understanding of the topic and their background knowledge, which exemplified the first theme group of students' response of factual information. Some examples were presented here:

ingredients of food; seasoning; the flavor; food names; recipes; menus; goose liver; fatty liver; snail; French food; insects; bamboo worm; cicada; bird nest; tonic; pork kidney; tonic soup for kidney; barbecue skewers; this whole episode talks about weird food; kangaroo meat; ...

On the other hand, numerous messages revealed students' feelings of and attitudes towards the topic and the video, which exemplified the second theme group of the online chat data, i.e., social interaction. Examples included.

look yummy after cooked; fantastic documentary; The caption (of the documentary) is amazing; best for those who plan to lose weight; some are acceptable others not; (kangaroo) graze too much (in Australia); can't take insects; hah-hah-hah-hah, gonna bring up my breakfast; professor, please don't ask any question about it, I simply can't watch this part; hah-hah-hah-hah-hah-hah-hah-hah;

Researchers hold that the online environment enables boundless access to extensive learning resources and thus makes it possible to relate learning more to the real world. (Cole et al., 2019). This is in line with the case of 716-message in which the real-world authentic instructional contents and learning activities helped to facilitate participation by moving students beyond simple sharing and comparing information to greater exploration of ideas, attitudes and feelings (Khalil & Ebner, 2017).

Those messages in the chat box that expressed students' feelings, attitudes and opinions have formed the second theme group of chat data, i.e., social interaction. The fact that social interaction took up 15.74% of the total online chat data and made up the second main theme group indicated that on top of cognitive learning, students in this study were also quite active in exchanging their attitudes and expressing their feelings in the chat box while learning online.

Corroborated with previous research, the present study also found that social interaction consists of three dimensions of learner-content, learner-teacher and learner-learner interaction (Moore, 1989). Students were found to respond to instruction content, to the instructor and to each other. They also made comment on peers in triadic interactions or share personal experience and information in classroom participation (Sedova, 2017; Theriault, 2019). On the one hand, researchers think that well-designed online activities contribute to enhanced online interaction and students' participation is closely related to course design and course activities (Chou & He, 2016; Tsai et al., 2021). This is well manifested by the case of 716-message in the present study where the video clip of unusual food had greatly triggered students' interests and motivated them to interact lively online. On the other hand, online interaction can in turn foster knowledge construction and enhance online participation through engaging with others and getting motivated to post and respond to messages. Although researchers don't think that extensive faculty-student or student-student interaction would always translate into student success (Crosthwaite et al., 2015), connecting with others online through interaction constitutes the foundation of online participation (Chou & He, 2016). And lack of interaction with peers and limited social interaction have been identified as the main difficulties and challenges of online learning (Sun, 2014). In fact, previous literature has found that conveying feelings and emotions, either positive or negative, could lead to higher participation. For example, engaging and productive comments can evoke joyful feelings which in turn can drive further participation in ongoing communication, conversation, discussion or other forms of learning activities that follow (Kim et al., 2021).

The third theme group of the online chat data was phatic communication. With 939 chat messages, phatic communication accounted for 9.95% of the total chat data. Small and trivial as they appeared, phatic communication revealed a distinct kind of in-class participation from other types commonly found in the literature (Araka et al., 2020; Dewan et al., 2019). In fact, student participation is seldom measured by way of phatic communication and it is thus rarely investigated by researchers (Rocca, 2010). Although it is content-free and does not exchange substantial information or ideas, phatic communication is regarded as an important social lubricant to share feelings or establish a mood of sociability in classroom settings. Findings of the present study showed that students had constantly made friendly greetings

and farewells to the instructor each class. It implied a positive online class climate where the instructor and students were willing to communicate and collaborate in class (Cole et al., 2019; Frishy et al., 2014). The present study holds that, combined with social interaction, phatic communication also manifests in a way the class relationship that is safe and comfortable and that is supposed to bring forth more active participation and increase classroom engagement (Tang et al., 2020).

The last two theme groups are tech-related messages and class schedule, which occupied 7.05% and 4.5% of the total online chat data. Resembling phatic communication, these two categories, too, reveal a different way for students to participate in class for disparate purposes. In terms of tech-related messages, findings of the present research disclosed that most of them were students' on-the-spot reports or reminders to the instructor about the technical problems of online learning platform. This is also a common unfavorable feature of online learning that often influences online participation (Chou & He, 2016; Ozkara & Cakir, 2018). With the small proportion of messages reporting technological problems, the online learning platform employed in the present study had regularly functioned well and had technologically contributed to the overall success of the online English course. Furthermore, the reminders of technical problems also revealed that students were actually following and participating in the ongoing instruction. In similar vein, the group of class schedule also revealed students' concerns about class timetable and course arrangement. It only accounted for a very small proportion (4.5%) of student participation. Contrary to the present research, previous studies found that in some classes where students were reluctant to participate, 73% of student participation were in reference to simple clarifications of class procedures rather than making meaningful communications or engaging interactions (Rocca, 2010). Actually, both domains of tech-related messages and class schedule have been largely left out in the research area of student participation (Araka et al., 2020; Dewan et al., 2019).

In addition to the five theme groups of online chat data that indicated the major types of students' online participation, the present study also found high level of online participation in the online English course. Previous literature shows that online participation level could be investigated and gauged in various ways. The most common way to measure the online participation level is by quantity of messages and quality of messages (Hrastinski, 2008). In terms of message quality, the present study has found that 89% of the student participation in the online English course centered around meaningful communications and interactions that comprised students' responses of factual information, social interaction and phatic communication. This great proportion of student participation mainly focused on exchanging factual knowledge and concrete information of the instruction contents and sharing their feelings, attitudes and opinions either among learners or between learners and the instructor. In other words, the majority of online participation indicated by the online chat data was devoted either to meaningful cognitive engagement or to affective interactions in the present study. It suggested high quality of online participation of the online English course that is in sharp contrast to previous studies. For example, Rubio et al (2018) found that most of the online participation was related to tracing log data, checking posts & comments and clarifying course schedule. In some studies, 73% of students' participation were in reference to class procedures

or clarification of schedule (Rocca, 2010). In fact, students' online participation can come in multiple forms and participating online class through sending messages to the online chat box is one of them. According to Bigatel and Malizia (2018), indicators of engaged learning online include three dimensions: cognitive engagement, social-emotional engagement and behavioral engagement. It seems that student's participation through online chat in the online chat box have cognitively, social-emotionally and behaviorally engaged students. It is hoped that such quality online participation will facilitate language learning, knowledge construction, and critical thinking in class.

Regarding the message quantity, the present study reported an average 410 chat messages sent one day along time. In addition, an average of 74.52% students had regularly participated in class by sending meaningful messages to the online chat box. Both the message quantity and the numbers of regular participants contributed to an active, extensive and persistent online participation over time. Nonetheless, many previous studies showed that very often only a handful of students participated orally while the majority mostly listen passively (Theriault, 2019). Besides, about 90% of interactions and participation were made by a small number of students but only around 30% were regular participants. In some extreme cases, only 3 questions were recorded per class hour (Rocca, 2010). Such limited participation by limited number of participants makes a notable contrast to the active, extensive and persistent participation by much larger percentages of participants in the present study.

Although the importance of student participation is well-recognized, many students do not participate in online courses for multiple reasons. One of the common reasons is the widely-existing participation apprehension that seems to hold students from necessary participation (Rocca, 2010). Participation apprehension could be mediated through various strategies (Frishy et al., 2014). The high online participation level in the present study suggested that the majority of students had actively and persistently participated in the online chat box and the online chat box seemed to be a safe and comfortable venue for this higher level of online participation.

According to some researchers (Ozkara & Cakir, 2018), students tended to prefer online chat to reduce lack of interactivity in the online environment in that it is regarded as less stressful or less face-threatening but more reassuring and face-safer (Frishy et al., 2014). In other words, online chat box created a safer and more comfortable online class climate for interaction and communication that help to decrease isolation, facilitate in-class participation and ease participation apprehension (Cole et al., 2019). Furthermore, by way of sending short text messages in the chat box, students managed to actively learn the instruction contents, keep to the instruction pace of cognitive learning, stay focused and thus persist better in online class over time (Chou & He, 2016).

In all, the five main groups of online chat data revealed different ways for students to participate in the online English course especially through the chat box of the online learning platform. Most of the chat data were free and spontaneous exchange of information, ideas or feelings rather than the intended replies after being called on by the teacher. Basically, they did not always follow the pattern of IRF script that consists of teacher's initiations, students' replies and teacher's follow-up or feedback. Neither did they necessarily occur with particular groups of at

least three students over a longer time span of more than 30 s, which featured online open discussion (Sedova, 2017). In a way, such text messages were often short utterances that were casual, on-the-spot and unrehearsed. In many cases, the short utterances were not directed at any particular individual or groups. They were more “free chats” among peers than formal speech or public speaking in class that often faces evaluation and judgement from the teacher or the peers (Frishy et al., 2014; Rocca, 2010).

7 Conclusion and implication

In conclusion, the present research has made a few modest contributions. For example, the researcher has provided a workable operational definition of online student participation that features both traditional class participation and online participation as online learning develops out of face-to-face instructions in physical classrooms (Huang, 2019). Consequently, the dimensions and the constituent facets of online student participation are thus extended and more myriad data types could be incorporated as the indicator to examine online student participation. The indicators of online student participation then range from more conventional ones of asking & replying questions and in-class participations to more online-specific participations such as page views, log data, online posts and chat data.

Among them, online chat data has been under-researched. By examining the online chat data, the present study has identified five main types of students’ online participation, i.e., students’ responses of factual information, social interaction, phatic communication, tech-related messages and class schedule in the online English class, which indicates the main contents of online participation. By summarizing the trends and patterns, the researcher has also found that student participation measured by the online chat data turned out to be active, extensive and persistent in class. With active and extensive participation in the online chat box, the findings unravel a third kind of digital participation on top of vocal participation and silent participation in class (Shi & Tan, 2020). In other words, students could be digitally “active and verbal” in online contexts but hesitate to speak up orally in class, which creates a unique phenomenon featuring online learning. This echoes the position of going beyond oral participation as well as identifying more indicators of student participation and more dimensions of student learning patterns (Shi & Tan, 2020).

Some implications can be drawn from the findings. For example, students might participate in online class in more ways than just online dialogues or discussions and online in-class participation could be measured by different means such as online chat data as online technology develops new learning platforms or instruction tools. Furthermore, researchers think that course-related online chat could help students to increase students’ willingness to participate and thus boost interactivity and reduce isolation while learning online (Heaslip et al., 2013). Online chat might relieve students’ worries about negative feedback, decrease pressure of public speaking in front of the whole class, free them from the teacher’s calling-on preferences and ease participation apprehension (Tang et al., 2020). The present study holds that the online chat box of the online learning platform might play a beneficial role in facilitating

the interaction and participation in class as it offers a handy medium to involve students, make them focused and keep them to the instruction flow. One main advantage of the chat box is that it enables the unobtrusiveness of online interaction and participation without interrupting the regular learning activities and class instruction (Dewan et al., 2019). The online chat box might help to create an informal but safe and comfortable venue for students to interact and communicate more freely and spontaneously, which is pertinent to the online environment but quite absent in traditional face-to-face instruction settings. Actually, such an encouraging and supportive climate is necessary for both successful learning and effective teaching in both virtual and physical classrooms (Durrington et al., 2006).

As to how to encourage students to use online chat box to interact more in class, researchers have found that participation tends to increase when it is overtly included as part of the grading criteria and when a participation score is allocated in class assessment (Crosthwaite et al., 2015). On top of similar external stimulus, the researcher holds that students might be more actively motivated to interact in the online chat box when learning contents and instructional pedagogy are more engaging. This is substantiated by the peak message number of 716 in the present study when students were overwhelmingly cheered up by the learning contents in class. The online chat box was then flooded by all exclamations, claims and messages. The combination of both internal and external stimuli will probably work better to spur students to resort to the online chat box for more significant interaction and better class learning.

8 Limitation and future study

Future research is discussed along with the limitations of the research. Due to the nature of the online chat box that is complementary and supplementary to the online learning platform, online chat data carries with itself some restrictions. It is less complete and comprehensive and contributes to only part of the entire learning context for the research. In other words, the inclusion of more diverse sources of data such as other classroom learning activities will help to reveal a more comprehensive picture of online student participation. Additionally, it is also necessary to determine causality and to probe into the complex and dynamic relationships between student participation and other variables like learning achievements, teaching performance and instruction effects especially over a longer period of time. Consequently, these limitations all point to the direction for future studies. For example, how does classroom environment contribute to the patterns of digital participation indicated by online chat data or other types of data, how do teaching behaviors and teacher-student relationship impact student digital participation in class, how do students' individual characteristics affect participation patterns in online contexts, does students' online participation show any gender differences and how are digital devices applied in class to influence students' digital participation. Future studies, thus, will target at more diverse and comprehensive sources of data that can measure student participation and look into the longitudinal and dynamic relationships between student participation and other variables.

Declarations

Conflicts of interest None.

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