Learner Responses to Language Exchange Activities in a Technology-Mediated Environment in the COVID-19 Era

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Abstract
In response to the pandemic, language teachers around the globe are transforming their face-to-face courses into online courses and developing technology-mediated online activities has become one of the pressing tasks. While the body of research on online teaching addressing current day issues is rapidly growing, research exploring students' reactions to technology-mediated online activities in the COVID-19 Era is still limited. The goals of this paper are to (1) present a technology-mediated collaborative language exchange activity which connected collegiate language learners internationally using VoiceThread (an Internet-based interactive collaboration tool), and (2) report learners' experiences and reactions to this activity along with changes in their motivation and perception of language learning. Five learners of English at a Japanese university and ten learners of Japanese at an American university participated in this study. They were students of a course at each institution in 2020. Learners participated in two asynchronous activities in which they exchanged video comments using VoiceThread. In the first activity, everyone spoke in Japanese, and in the second, English. Then, questionnaires containing multiple choice and short-answer questions were distributed and analyzed quantitatively (descriptive statistics) and qualitatively. Results indicate that most learners had positive experiences in these exchanges, perceived benefits for language learning, increased motivation, and felt connected with students overseas though there were some individual differences. Proficiency level appears to be a factor influencing individual differences. The findings of this study lend support to the claim of previous studies that technology-mediated online collaborative activities facilitate language learning and community building.

Keywords: Technology-Mediated Collaborative Activities, Online Language, Exchange Learning, Learner Responses

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Introduction

In early 2020, foreign language (FL) courses were forced to transition to online teaching due to campus closures of many universities and school systems in the world in response to the COVID-19 pandemic. To cope with the abrupt transition, many teachers had no choice but to employ crisis-prompted remote teaching (Hodges, Moore, Lockee, Trust, & Bond, 2020) instead of planned online teaching. In fall 2020, the end of the crisis does not appear to be near, and many FL teachers are now working hard to transition to planned online teaching. One of the challenges particular to online language teaching is incorporation of speaking activities. As González-Lloret (2020a) noted, the online environment affords us to provide language input easily and thus online FL activities tend to focus on the provision of input, yet we should not neglect speaking activities because "output, interaction, and feedback are also crucial to develop an L2 (Gass,1997; Long, 1981; Swain, 1995; Swain & Watanabe, 2013)" (González-Lloret, 2020a, p.261). While learning from the previous research base is certainly helpful and important, we must also consider our current context of teaching in which students are facing many challenges due to the crisis. Regarding this point, Sykes (2020, p. 207) argues that "a human-centered approach to the research enterprise" is a necessity. In response to Sykes' call for a human-centered approach to research, we examined collegiate FL learners' experiences and reactions to a technology-mediated online speaking activity which we developed by incorporating elements that are known to be effective for FL learning. In the remainder of this paper, first we review studies that report effective elements of technology-mediated online language activities and discuss current issues in technology-mediated online activities. Then we introduce our study, report findings, and share conclusions.

Literature Review

Interaction in technology-mediated language learning activities

As FL teachers endeavor to redesign their face-to-face courses as planned online courses amid the ongoing COVID-19 pandemic, González-Lloret (2020a) reminds us the importance of creating technology-mediated activities or tasks grounded in the findings of Second Language Acquisition (SLA) research that input, output, interaction and feedback all play an important role in second language (L2) development while pointing out that technology-mediated FL learning activities tend to focus only on providing input. Moreover, she advocates the use of technology-mediated collaborative tasks in planned online language courses as they can provide opportunities for output and meaningful interaction while motivating students to learn the target language. Collaborative learning has been reported to facilitate language learning by reducing anxiety and fostering relationship among participants (Panitz, 1999), and authentic communication with real people increase motivation (González-Lloret, 2020b).

Online teacher-run language exchange, which connects learners internationally, is an example of technology-mediated collaborative language learning activity that can facilitate meaningful interactions among participants. Online language exchange activities can be synchronous or asynchronous. While synchronous option may be better for feeling the social presence, an important element of effective online

learning (Lomicka, 2020), asynchronous option may be a more suitable option in certain contexts. As reported by Tabira and Goto (2018), time difference poses difficulties for online language exchange which can easily be solved by making the interaction asynchronous. Guillén, Sawin, and Avineri (2020) explain that asynchronous activities using the recording tool are beneficial for language learning as it can "increase language learning awareness, complexity, and automaticity" (p. 324). Furthermore, asynchronous activities have additional benefits of alleviating *Zoom fatigue* as many people are experiencing fatigue caused by excessive use of videoconferencing as a result of the COVID-19 crisis.

Technology-mediated communication and learner affect

As many of us have already experienced, technology-mediated interaction differs significantly from face-to-face interactions, and we must take these differences into consideration to create effective technology-mediated L2 learning activities. Although video conferencing tools such as Zoom affords us to see each other synchronously, it cannot replace face-to-face human encounters in which we can read each other's body language and engage in conversations easily. Yet, we cannot simply assume that technology-mediated interaction is inferior to face-to-face interactions because technology-mediated interaction enables us to connect with people outside of our classrooms, and provides multiple options to create meanings through linguistic mode (e.g., content of speech), visual mode (e.g., pictures, text layout), and aural mode (e.g., music).

Central concerns of technology-mediated multimodal interaction research, identified by Chanier & Lamy (2017), are to investigate (a) what aspect of learning can be facilitated by technology, (b) by what technology, and (c) the affective experience of learners in technology-mediated interactions. Similarly, understanding affective experience of learners is an important aspect of research in the field of SLA as it is widely acknowledged that learning experience strongly influences FL learners' motivation (Dörnyei, 2009) and that motivational intensity is a prerequisite to learning (Lambert, 2017). Previous language learning studies found that a key element that contributes to effective language learning through technology-mediated interaction is the choice of the tool (e.g., Cheng & Wang, 2018) and that learners' affective experience is influenced by the tool. Satar and Özdener (2008) found that the use of text-based computer-mediated communication tool reduced foreign language anxiety while the use of voice-based tool made no difference to the initial anxiety level. Earlier studies found that video-based interactions were perceived as stressful (e.g., Goodfellow et al., 1996; McAndrew, Foubister, & Mayes, 1996). However, video-based interaction has become a preferred form of communication in technology-mediated learning activities in recent years as video-based communication became significantly easier and more accessible (O'Dowd & O'Rourke, 2019). These studies indicate that learners' affective experiences with respect to the use of tools in technology-mediated interaction change over time, which in turn suggest the importance of understanding how learners of the COVID-19 era experience the use of tools in a technology-mediated learning environment.

Learning context has drastically changed for many, if not all, collegiate FL learners since the spring of 2020. Many students are facing challenges related to the pandemic and struggling with isolation. Due to these hardships, some students are losing their

motivation to study in an online learning environment, which is a conspicuous phenomenon of online learning in the COVID-19 era. It has been reported in the media that the gap between students of higher academic performance and students of lower performance is widening. That is, students who performed well before the crisis continued to do well or even better, while students who did not perform so well before the crisis performed much worse in the online learning environment during the crisis (e.g., Fairfax County Schools Office of Research and Strategic Improvement, 2020). With this situation as a backdrop, understanding the affective experience of today's learners in technology-mediated interactions is imperative in order to guide effective online FL learning.

Thus, what tools are appropriate to learners and how they experience technology-mediated interaction in the COVID-19 era is an area that requires more research. The aim of this study, therefore, is to address this research gap. We developed technology-mediated activities by incorporating elements that promote language learning based on this review of literature, and then investigated FL learners' experiences and reactions to these activities.

Research Question

This exploratory study was guided by the following research question:

How do collegiate FL learners in the COVID-19 era respond to technology-mediated online collaborative language exchange activities?

In particular, we focused on the following three areas of learner responses:
1. Affect (enjoyment, motivation)
2. Perception (language learning and culture learning benefits)
3. Difficulties and preferences (technology and overall experience)

The Study

The study outlined in this paper is teacher-conducted classroom research referred to as action research which "seeks to clarify and resolve practical teaching issues and problems" (Richards & Farrell, 2005, p. 171). Through our action research, we endeavored to understand how learners today respond to technology-mediated online language exchange activities for the purpose of improving our teaching of online language courses. The research was conducted virtually at the two authors' home institutions, Emory University and Soka University after both institutions transitioned to remote learning in response to the COVID-19 crisis. At the beginning of the study, students of both institutions were already familiar with remote learning.

The language exchange activity was designed to promote interaction and use of the target language as a social practice. Among existing technologies, we utilized VoiceThread, an Internet-based interactive collaboration tool designed for asynchronous engagement. We chose VoiceThread because it was already widely used and was accessible via Canvas, a learning platform used at Emory University. In addition, the asynchronous engagement helped avoid complications caused by the time difference as our students were located at several different time zones.

We created two activities, one using Japanese and the other using English so that both English learners and Japanese learners can benefit from the activities. In addition, we were interested in observing changes (or the lack thereof) in learner perception by alternating their role between a fluent user of a language and a novice user of a language. Details of each activity is provided in Table 1 below.

Activity 1: Self-introduction in Japanese
• Soka students posted their self-introduction video comments. • After watching Soka students' video comments, Emory students posted response video comments. • Some students continued their video comment exchanges.
Activity 2: Japanese culture learning in English
• Soka students in consultation with their instructor chose one Japanese culture topic. • Soka students worked together to prepare the content, and one student created a video comment explaining the cultural topic. This group work format was requested by Soka students to reduce each student's workload. • Every Emory student posted video comments to comment on the culture introduction video of Soka students. • Soka students viewed Emory students' video comments

Table 1: *Description of Two VoiceThread Activities*

Methods

Participants

The participants of this study were authors' students at Emory University in the United States and Soka University in Japan. Emory University students (n=10) were novice level learners of Japanese who received approximately 100 hours of formal instruction at the start of this study. Soka University students (n=5) were intermediate-advanced learners of English with TOEIC scores ranging from 500s to 800s. When this study was conducted, students were learning remotely from the United States, Japan, China, South Korea, and Saudi Arabia. To maintain participants' anonymity, details of the participants are intentionally omitted, and pseudonyms are used. The activities reported here were all part of the course activities.

Instrument and analysis

The data source of this study consisted of an online questionnaire and a learning reflection essay. The 52-item questionnaire was composed of five-point Likert scale closed-ended questions and open-ended short answer questions which were designed to elicit information about students' affective responses, perception, and difficulties and preferences. Soka students responded to a questionnaire written in Japanese, and Emory students in English to ensure their understanding of the questions and also to allow them to fully express their opinions when responding to short-answer questions.

The learning reflection essay was an optional assignment for Emory students to write about their learning experience of the entire course. The questionnaire was distributed electronically using Google Forms and the responses were entered and recorded into Microsoft Excel worksheets. Data analysis included descriptive statistics and qualitative content analysis of short answer questions and a learning essay. We did not conduct statistical analysis because the total number of participants was small (n=15).

Procedures

The preparation and execution of our action research took place in summer 2020 as shown in Table 2. After collaboratively designing the framework of the language exchange, we spent a little over one month for preparation. As we chose the learning platform (Canvas) and the tool familiar to Emory University students (VoiceThread), the initial preparation involved creating guest Canvas account for Soka University students, which automatically granted access to VoiceThread. Then, the first author created Canvas and VoiceThread (VT) user manuals in Japanese for Soka students. In addition, the first author of this paper trained one Soka student so that he could teach his classmates how to use Canvas and VoiceThread. The students participated in two language exchange activities in July in successive weeks. After the second activity, Emory students were encouraged to review activity one as a preparation to the listening comprehension section of their final exam. The students responded to the questionnaire a few days after the completion of the second activity.

June, 2020	**Preparation** - Deciding the contents of language exchange activities with a colleague in JPN - Creating guest accounts for Soka students - Canvas and VT training for Soka students
July, 2020	**Language exchange activities using VT through Canvas** - Activity 1 (Self-introduction in Japanese) – **7/24** - Activity 2 (Japanese culture discussion in English) – **7/31**
July-August, 2020	**Reviewing Activity 1 (Emory students only)** - Students reviewed Activity 1 in order to prepare for the final exam listening comprehension questions
August, 2020	**Data collection** - Questionnaire about the language exchange activities – **8/5** - Learning reflection essay about the entire course (comments on VT activities were not required) – **8/6**

Table 2: *Research Timeline*

Findings

The following subsections are organized according to the three areas we focused in an attempt to answer the research question: How do collegiate FL learners in the COVID-19 era respond to technology-mediated online collaborative language

exchange activities? Due to space limitations, we mainly report quantitative data with some qualitative data to provide in-depth information.

Affect - Enjoyment

Quantitative results indicate that the language exchange was highly enjoyable. 12 students agreed and 2 somewhat agreed to the statement 'I enjoyed participating in this activity.' One student selected 'neither.' The response pattern was about the same for the statement 'If a similar activity is offered in my future courses, I want to participate.' 12 students agreed, 2 somewhat agreed, and one somewhat disagree.

It appears from qualitative data that authentic communication with real students made the language exchange enjoyable. To illustrate this point, James wrote in his learning reflection essay: "All the activities we did in class and outside of class were impressive, but personally, **the best activity was communication with students at Soka University**. I have traveled to Japan several times, but I have never communicated with Japanese students. However, through this activity, I even **learned how to communicate with students from all over the world** with different languages, and I could understand their culture." Also, it appears that relationship among students was fostered through language exchange which was the source of enjoyment. For example, Frank wrote in the questionnaire, "I enjoyed it. Everyone was very kind, and I felt like I wanted to interact with those students more. It would have been great if we could meet up."

The student who selected 'neither' and 'somewhat disagree' for the two questions above is Cathy, a learner of Japanese. She consistently provided negative responses in the questionnaire, which sharply contrasted with the responses of her peers. Her primary reason for not wanting to participate in the language exchange was that she did not have the time to do so (5/5, 5 indicating the strongest agreement). Secondary reasons (4/5) include not interested in language exchange, not interested in the topics chosen for language exchange, preparing a video comment was too difficult, and could not understand language exchange partners' opinions or thoughts. As Cathy's L2 speaking proficiency was lower than her peers, based on the observation of the first author, it is possible that language exchange activities were too difficult for Cathy, which made them less enjoyable for her.

Affect - Motivation to learn and communicate using the target language

Quantitative results indicate that most learners' (11/15) language learning perception and motivation changed after participating in language exchange activities. Four learners reported that they did not change. Those who indicated change were asked more questions regarding their perception and motivation. All 11 learners indicated that their motivation to improve their ability to communicate using the target language and learn about the target culture increased. In addition, almost everyone (10/15) realized that they need to deepen their understanding of their own culture. Furthermore, everyone except for Cathy, reported that they now have a stronger desire to communicate with people living abroad, and that they wanted to meet their language exchange partners in-person. This finding is consistent with findings of previous studies claiming that online language exchange can foster relationship. Qualitative results showed strong motivational energy emerged through the language

exchange. To illustrate this point, Alice's comment from her learning reflection essay is shown below:

*One of the things that contributed most to my **motivation** for learning Japanese was **talking to real students** through the VoiceThread assignments. At first, I found it **very difficult** to understand and follow along with what the Soka University students were saying. I tried my best to relate to them, but the language barrier made me feel a large distance between us (not just physically). However, even after just a couple weeks, when I went back to the VoiceThread to study for the test, **I realized that I had learned so much more Japanese already.** I felt that much of the distance between us had disappeared because I practiced and learned more about the language. I wish to continue learning so that I can further shrink this distance between me and people that speak Japanese as a whole. This activity also allowed me to **directly experience how I can use these studies in the future.***

Alice's comment lend support to the findings of previous studies; her motivation increased by talking to real students. Also, Alice commented that the difficulty she had in comprehending her partners' video comments in Japanese motivated her. In addition, Alice's comment showed a benefit of asynchronous communication. By participating in video comment exchanges and reviewing them at a later time, Alice was able to perceive her Japanese proficiency improvement, which seems to have contributed to her motivation.

Perceived benefits for language and culture learning

Most students indicated that language exchange was helpful in improving their communicative competence (14/15) and their Japanese or English abilities (11/15). With respect to specific skills, everyone (15/15) reported that language exchange facilitated improvement of their listening skill. Many students indicated that it facilitated improvement of their speaking skill (13/15) and writing skill (10/15). Regarding culture learning, everyone (15/15) indicated that language exchange helped improve their ability to explain their own culture, and to understand other culture. Qualitative results indicate that students valued language exchange as an opportunity to apply the knowledge they gained in class to real conversation settings.

Difficulties and preferences – Overall difficulties

Quantitative results showed that six students found it difficult to participate in language exchange activities, one neither and seven not difficult. The main cause of difficulties includes making the time for language exchange. In addition, students found understanding their partner's speech and expressing themselves in the target language were difficult. Overall, technology was not the main cause of difficulty.

Difficulties and preferences – Technology difficulties

Regarding technology-related difficulties, we asked about the difficulty level experienced with internet connection, logging into Canvas periodically, and learning to use the video comment function of VoiceThread. The data indicated that Soka students had more difficulty. The mean value of the internet connection difficulty for Soka students was 3.2 and Emory student 1.8, where 5 indicates the highest level of

difficulty. Logging into Canvas periodically for language exchange was difficult for Soka students (mean value 4) while it was not for Emory students (mean value 1.5), which is understandable as Canvas is the learning platform used at Emory and not at Soka. Learning to use the video comment function within VoiceThread was not very difficult for both students. The mean value for Soka students was 2.6 and Emory students 1.7.

Difficulties and preferences – Technology preferences

In response to a question asking about the learners' preference between the video comment tool and the voice comment tool, 14 learners indicated that they prefer the video comment tool and one learner the voice comment tool. This result that most students prefer the video comment tool is consistent with O'Dowd & O'Rourke's (2019) claim that video-based interaction is preferred by learners today. Qualitative data indicated that primary reasons for preferring video comments are that video comments are similar to in-person communication and thus it is possible to feel human connection and also it is easier to understand the interlocutors by looking at their facial expressions, their mouth movements, and gestures. Below is a written response from the questionnaire which represents many students' opinions.

*I think that using video comments **encourages friendship** between people participating in the language exchange activities. Being able to see the person you are interacting with makes the activities much **more personal** despite the online setting and physical distance. It feels less like a homework assignment and more like **a chance to meet new people from different places**. Video comments also make it **easier to convey emotions** and see how these emotions affect speech in different languages.*

Conclusions

This study is one of the first studies that aimed to explore collegiate language learners' experiences and reactions to technology-mediated online language exchange activities in the COVID-19 era. This study makes contributions to the field by revealing collegiate language learners' responses to online learning during the current crisis in which many students in the US filed a lawsuit against their university for tuition reimbursement on the grounds of pedagogical inferiority of their online learning (Anderson, 2020). Findings of this study strongly suggest that online language exchange that utilizes video comments facilitates effective instructed language learning in a remote learning environment. Majority of participants of the present study reported that they enjoyed language exchange, appreciated the opportunity to communicate with students who attend a school where the target language is spoken, perceived language learning benefits by participating in language exchange, and increased their motivation to learn the target language and culture. Furthermore, we found that participants preferred video comments over voice comments because video comments are similar to in-person communication, and that participants felt social presence of their partners.

The study reported here is a small-scale action research and therefore transferability of our findings to other population and contexts may be limited. Yet, it is noteworthy that students in America and students in Japan both responded very similarly to the

online language exchange. Also, we observed that one participant's response sharply contrasted with her peers. As the widening gap between higher performing students and lower performing students in remote learning has been reported, future research may want to look at individual differences in remote learning environment more closely.

Based on the powerfully positive learning experiences of majority of the participants of our study, we advocate for the use of language exchange activities in online language courses but with a caveat that teachers need to pay special attention to individual differences. It is hoped that future research deepens our insights on our understanding of the benefits and effectiveness of language exchange in collegiate online language courses.

References

Anderson, G. (2020, April 13). *Feeling shortchanged*. Inside Higher Ed. https://www.insidehighered.com/news/2020/04/13/students-say-online-classes-arent-what-they-paid

Chanier, T., & Lamy, M.-N. (2017). Researching Technology-mediated Multimodal Interaction. In *The Handbook of Technology and Second Language Teaching and Learning* (pp. 428–443). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118914069.ch28

Chen, N.-S., & Wang, Y. (2008). Testing Principles of Language Learning in a Cyber Face-to-Face Environment. *Journal of Educational Technology & Society*, *11*(3), 97–113.

Dörnyei, Z. (2009). The L2 motivational self system. In Z. Dörnyei & E. Ushioda (Eds.), *Motivation, language identity and the L2 self* . Bristol, UK ; Buffalo, NY : Multilingual Matters.

Fairfax County Schools Office of Research and Strategic Improvement. (2020, November 25). *Study of teaching and learning during the COVID 19 pandemic: Analysis of Q1 secondary marks*. https://interactive.wusa9.com/pdf/Grade-analysis.pdf

Gass, S. M. (1997). *Input, interaction, and the second language learner*. Lawrence Erlbaum Associates.

González-Lloret, M. (2020a). Collaborative tasks for online language teaching. *Foreign Language Annals*, *53*(2), 260–269. https://doi.org/10.1111/flan.12466

González-Lloret, M. (2020b). Using technology-mediated tasks in second langue instruction to connect speakers internationally. In C. Lambert & R. Oliver (Eds.), *Using tasks in second language teaching: Practice in diverse contexts* (pp. 65–81). Multilingual Matters.

Goodfellow, R., Jefferys, I., Milest, T., & Shirra, T. (1996). Face-to-face language learning at a distance? A study of a videoconference try-out. *ReCALL*, *8*(2), 5–16. https://doi.org/10.1017/S0958344000003530

Guillén, G., Sawin, T., & Avineri, N. (2020). Zooming out of the crisis: Language and human collaboration. *Foreign Language Annals*, *53*(2), 320–328. https://doi.org/10.1111/flan.12459

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The Difference Between Emergency Remote Teaching and Online Learning. *Educause Review*. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Lambert, C. (2017). Tasks, affect and second language performance. *Language Teaching Research*, *21*(6), 657–664. https://doi.org/10.1177/1362168817736644

Lomicka, L. (2020). Creating and sustaining virtual language communities. *Foreign Language Annals*, *53*(2), 306–313. https://doi.org/10.1111/flan.12456

Long, M. H. (1981). Input, interaction and second language acquisition. In H. Winitz (Ed.), *Native language and foreign language acquisition* (pp. 259–278). The New York Academy of Sciences.

McAndrew, P., Foubister, S. P., & Mayes, T. (1996). Videoconferencing in a language learning application. *Interacting with Computers*, *8*(2), 207–217. https://doi.org/10.1016/0953-5438(96)01028-4

O'Dowd, R., & O'Rourke, B. (2019). New development in Virtual Exchange in Foreign Language Education. *Language Learning & Technology*, *23*(3), 1–7.

Panitz, T. (1999). *Collaborative versus Cooperative Learning: A Comparison of the Two Concepts Which Will Help Us Understand the Underlying Nature of Interactive Learning*. U.S. Department of Education. Retrieved from: https://eric.ed.gov/?id=ED448443

Richards, J. C., & Farrell, T. S. C. (2005). *Professional development for language teachers: Strategies for teacher learning*. Cambridge University Press.

Satar, H. M., & Özdener, N. (2008). The Effects of Synchronous CMC on Speaking Proficiency and Anxiety: Text Versus Voice Chat. *The Modern Language Journal*, *92*(4), 595–613. https://doi.org/10.1111/j.1540-4781.2008.00789.x

Swain, M. (1995). Three functions of output in second language learning. In G. Cook, B. Seidlhofer, & H. G. Widdowson (Eds.), *Principle & practice in applied linguistics: Studies in honour of H.G. Widdowson* (pp. 125–144). Oxford Univ. Press.

Swain, M., & Watanabe, Y. (2013). Languaging: Collaborative Dialogue as a Source of Second Language Learning. In C. A. Chapelle (Ed.), *The Encyclopedia of Applied Linguistics*. Blackwell Publishing Ltd. http://onlinelibrary.wiley.com/mrw/advanced/search/results

Sykes, J. M. (2020). Editor's Message. *Foreign Language Annals*, *53*(2), 207–208. https://doi.org/10.1111/flan.12469

Tabira, Y., & Goto, S. (2018). Webu denwakaigi sisutemu (Skype) o katuyoosita kyoodoogata kokusaikooryuu puroguramu no kaihatu (keezoku). In *Kenkyuu tyoosa zyosei hookokusyo* (Vol. 33). The Telecommunications Advancement Foundation.

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