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Using Online Discussion Forums in Blended Learning Design to Advance Higher Order Thinking

Hiroshi Miyashita, Norine Wark

Abstract: Due to the predominance of test-oriented practice, one major challenge faced in Japanese high school classrooms is the lack of learning activities to develop higher order thinking. The purpose of this action research study was to explore an extracurricular blended learning program created to develop the higher order thinking of English language learners at a public high school in Japan. In this one-month program, 16 participants engaged in online synchronous and asynchronous activities, with English as a medium of instruction and communication, supported by in-person face-to-face sessions conducted in Japanese. Data were collected via asynchronous forums, a post-survey, and my observation notes. Results indicated that participants demonstrated higher order thinking to a certain extent overall in the forums; however, learner-learner interaction was not as highly activated as expected, mainly due to limited social interaction within the forums. These findings suggested that constructivist asynchronous forums can be used to develop the higher order thinking of English language learners in K-12 settings, with appropriate program design, instructor mediation, and content.

Keywords: Asynchronous forums, blended learning, content analysis, higher order thinking, mediation

Highlights

What is already known about this topic:

- Constructivist asynchronous forums can develop participants' higher order thinking through the power of writing, mediation, and reflection.
- Despite the prevalence of emergency remote teaching since COVID-19 in 2020, research in secondary school online discussion forums, especially in Asian countries, is sparse.

What this paper contributes:

- This article suggests that online discussion forums can be utilized in K-12 settings with appropriate program design, instructor mediation, and content.
- This article presents four models for blended learning design that are aimed at helping learners who are not accustomed to online constructivist learning.

Implications for theory, practice and/or policy:

- To facilitate transition from a traditional lecture-based format, this study offers a model program using a constructivist asynchronous forum to nurture active, creative, and critical citizens.
- The effects produced by online discussion forums can be explored in the field of foreign or additional language acquisition.

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Introduction

This article provides a synthesis of a dissertation study that employed an action research approach to improve teaching practice (Lantolf & Poehner, 2011; Miyashita, 2022) at a public high school in Japan. More specifically, the purpose of this research study was to explore the development of higher order thinking among EFL students at this school in an asynchronous forum-based extracurricular blended learning (BL) environment.

Rising consensus in the burgeoning field of online learning is that, with the time to reflect and the power of writing, asynchronous forums are able to offer learners meaningful educational experiences (Conrad & Openo, 2018; Garrison, 2016). Secondly, the face-to-face (F2F) component of an appropriately-designed BL environment facilitates learning for students who are unfamiliar with online constructivist learning.

Research on asynchronous online interaction has been concentrated in North America (Olpak, 2022). Furthermore, few studies have examined the applicability of constructivist discussion forums to the K-12 setting (Sanders & Lokey-Vega, 2020). Therefore, this study sought to yield findings on how to capitalize on the affordances of online and F2F components in a constructivist BL setting to support K-12 learners' development of higher order thinking in Japan. With these thoughts in mind, three research questions guided this study:

> (1) To what extent can higher order thinking be demonstrated among participants in asynchronous online forums?
>
> (2) What factors in students' engagement in asynchronous online forums may contribute to the development of higher order thinking, if any? and
>
> (3) What factors in the blended learning design may contribute to the development of higher order thinking, if any? (Miyashita, 2022, p. 13)

Literature

Educational systems of the past focused on providing students with the basic skills necessary to function in an industrial economy. However, the knowledge-based economy of today requires workers who possess higher order thinking skills (Collins, 2014; Wark, 2018; World Economic Forum, 2023). Sociocultural changes, prompted by evolving demographics, economies, and technologies, for instance, place pressure upon the field of education to transform to meet the needs of this knowledge-based economy (Keller, 2008; Wark, 2018). Therefore, educational institutions are now tasked with creating learning environments that foster independent thinkers who possess the necessary skills, like critical thinking, problem-solving, and learning how to learn, to navigate this complex world (Ally & Wark, 2020; Gabriel, 2007; Glassman et al., 2022; Wark, 2018).

Nevertheless, due to the ongoing prevalence of the pre-existing cognitive-behavioural theory and its test-oriented practices, numerous subjects in Japanese high school settings (Grade 10 to 12 in the K-12 system) lack learning activities designed to develop higher order thinking (Nishino & Watanabe, 2008). Instructional reform, incorporating the proactive, interactive, and authentic learning goals delineated in the newly-revised 2018 government course guidelines, is slow and sporadic in practice, despite initiatives promoted by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT; MEXT, 2018).

The subject, English as a foreign language (EFL), is no exception. Identifying and understanding why Japanese EFL classrooms often lack learning activities to foster higher order thinking begins with an exploration of the socio-political background of the country. First, Japan is a non-English speaking country where students learn English as a school subject. Second, English is crucial for passing

university entrance examinations. Third, EFL policies are derived from neoliberalism, which encourages competition rather than cooperation. Kubota (2011) defines neoliberalism as a revisionist approach to transforming a welfare state into a post-welfare state by using the wisdom of the market to relegate all aspects of a society. English education policy discourse on developing human resources in Japan, emphasizes fierce competition on the global stage, implying that students are national resources (Barrett & Miyashita, 2016).

In addition to being heavily reliant on cognitive-behavioural theory, Japan also lags behind in online/blended learning, according to research conducted during the COVID-19 pandemic (Kittaka, 2020; Nae, 2020). The transition to emergency remote teaching (ERT; Hodges et al., 2020) and quality online/blended learning have not been fruitful in Japan since the pandemic began. Even though Japan leads the world in technological advancement, its educational institutions possess insufficient technological infrastructure and experienced online instructors.

Many parts of the world, including Japan, employ online learning programs emulating traditional F2F lecture-based knowledge transmission or correspondence self-study course formats (Hodges et al., 2020; Wark, 2018). In contrast, a new method of technology-mediated learning in mainstream online learning encourages interaction in collaborative communities to foster knowledge construction (Conrad & Openo, 2018; Garrison, 2016). It is such collaborative, constructivist approaches that appear crucial in mitigating or resolving challenges addressed in the following action research study.

Definitions

Even though the concept of "higher order thinking" is important and popular in education, there is no clear definition of the term. Therefore, for the purpose of this study, *higher order thinking* is defined "as cognitive mental functions of understanding, applying, analysing, evaluating, and creating knowledge, which are voluntarily controlled and facilitated through interaction" (Miyashita, 2022, p. 7). This definition is drawn from the revision of Bloom's taxonomy (Anderson et al., 2001), Bloom's affective domain taxonomy (Krathwohl et al., 1964), and Vygotsky's conception of lower and higher mental functions (LMFs and HMFs; Vygotsky & Rieber, 1997).

The online discussion forum is one form of asynchronous interactions (Hirumi, 2013). In this study, the term, *online discussion forum*, also known as asynchronous online discussion (Fehrman & Watson, 2020), is defined as "a learning activity where participants interact with written language asynchronously" (Miyashita, 2022, p. 13). Online discussion forums usually involve learners' use of discussion boards on an online learning management system (LMS) to facilitate learning together as a group, yet separately at different times of their choosing. (Miyashita, 2022, p. 13).

The term, *blended learning* (BL), currently comprises various definitions (Graham, 2006; Palalas, 2019). For the purpose of this study, BL incorporated the integration of online and F2F classroom learning experiences within a purposeful course design (Garrison & Kanuka, 2004; Garrison & Vaughan, 2008; Miyashita, 2022).

Theoretical Background

Constructivism was the theoretical framework used to design the intervention of this study. From within the various branches of this theory, I drew upon social constructivism for student interactions, and ecological constructivism (Hoven & Palalas, 2016) for the relationship between individual and collaborative learning, and student reflections. In the blended learning program that I designed as an intervention in this study, I interwove reflection intentionally with the collaborative aspect of learning.

Sociocultural theory (Lantolf et al., 2015) and dynamic assessment (Lantolf & Poehner, 2011) guided my instructional mediation in the asynchronous forums to enhance participants' higher order thinking, thus ensuring greater systematic and learner-attuned mediation (Lantolf & Poehner, 2004). Dynamic

assessment is an approach for not only assessment, but also for teaching. Throughout all the mediations in forums, I provided learners with ongoing intervention attuned to learner development based on the zone of proximal development (ZPD; Lantolf & Poehner, 2004), controlling the cognitive demand, while closely examining participants' abilities and motivation in the moment.

Methodology

Research Design

This study adopted an action research approach (Cohen et al., 2018; Greenwood & Levin, 2007; McNiff, 2013). Although there are many forms of action research, it typically is "a small-scale intervention in the functioning of the 'real' world and a systematic, close examination, monitoring and review of the effects of such an intervention, combining action and reflection to improve practice" (Cohen et al., 2018, p. 441). Kemmis (1997) identifies two action research camps: critical theorists and reflective practitioners. The former views action research as part of a larger agenda aimed at transforming education and society, whereas the latter conducts action research to improve professional practice on a local level. This study incorporates philosophies from both camps.

Data Collecting Tools

Online discussion forums, a post-survey, and researcher observations constituted the three data collection instruments adopted in this study. Artefacts, and inquiry and observational data (Hendricks, 2013) were collected. Artefacts included records of asynchronous postings from participants' interactions and contributions.

Study Site and Participants

I implemented this intervention in July-August, 2021, where I worked in a public high school in Tokyo, Japan. All participants were in their second year (Grade 11 in the K-12 system) at this high school. Their participation in the BL program was voluntary. To ensure the quality of this program, I restricted the number of potential participants to 20. Ultimately, 18 participants applied and were accepted. Two participants only attended the synchronous part of the program, so their data were excluded from the study. Thus, this study reports on results gathered from the 16 remaining participants, who attended the asynchronous, as well as the synchronous, portion of the program.

Role of the Researcher

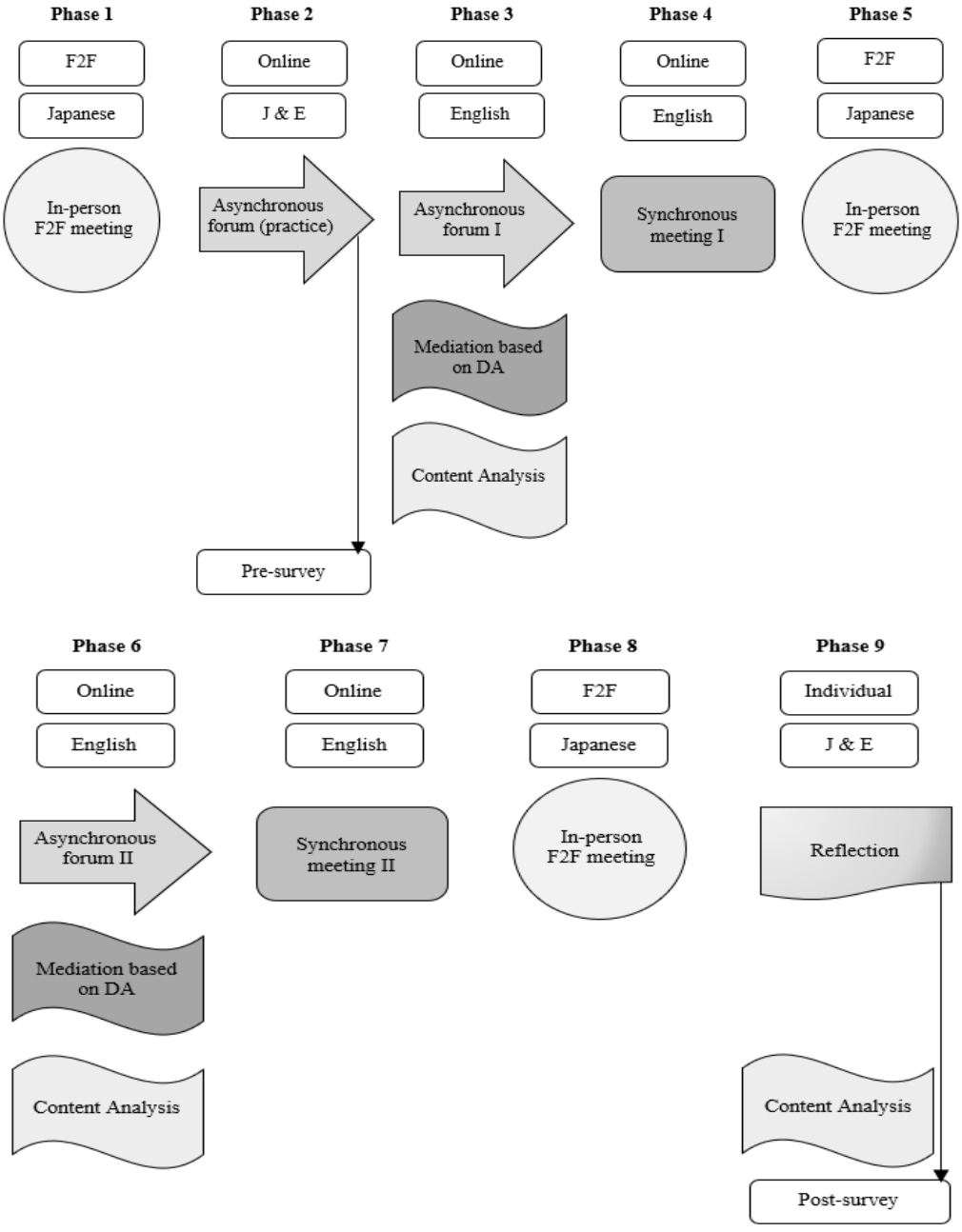
I was an EFL teacher working full-time at the study site. During the study, my roles included that of the researcher, program designer, and primary asynchronous instructor in the BL program. Given these multiple responsibilities, I felt that it was critical to listen carefully to stakeholders' feedback during the design and implementation phases. As stated by McNiff (2013), by employing action research as an investigator, I focused on becoming a self-critical practitioner, reflecting during every step of the cyclical process in this study. I invited an adjunct professor, who worked at universities in the U.S., to join as a co-instructor. He became the primary synchronous session instructor.

Design of the Intervention

The BL program was an extracurricular program. This meant that the program was a supplementary course that students voluntarily completed, rather than being a program that was officially graded and required for participants' graduation. This BL program invited participants to engage in online synchronous and asynchronous constructivist learning activities, which employed English as the medium for communication and instruction. These activities were supported by in-person F2F sessions, with direct instruction in Japanese about program procedure, contents, activities, and technologies. The

online component had three asynchronous forums (one practice and two main forums; each one being five days in length), coupled with two 90-minute synchronous sessions. Although the design for the in-person F2F component initially included a 90-minute meeting at the beginning, middle, and end of the program, only the first one was conducted. Attendance for the second one was optional; no one attended. The third was cancelled because of the COVID-19 pandemic. The program concluded with an explicit period for reflection. Figure 1 delineates the flow of the intervention.

Figure 1. The flow of the blended learning program



Note. From "Developing Higher Order Thinking Through Asynchronous Forums in Blended Learning Design," by H. Miyashita, 2018, p. 55 (http://hdl.handle.net/10791/396). Copyright 2022 by Hiroshi Miyashita.

Instructional Design

The main instructional method adopted by this program was inquiry-based learning. *Inquiry-based learning* is diverse in its definition (Reinmann, 2019), but broadly-speaking, it is a learner-centered approach that attempts to move beyond acquisition-oriented teacher-led learning. Instead, learners are encouraged to pose questions and answer those questions through individual or group inquiry (Laurillard, 2012; Reigeluth & Carr-Chellman, 2009), thus encouraging critical thinking to arise (Oktay & Yüzer, 2023). With its learner-centered inquiry approach, inquiry-based learning shares an affinity to heutagogy (Hase & Kenyon, 2013; Oktay & Yüzer, 2023). In this study, the instructor selected a theme and guiding questions. Participants explored the topic mainly through online discussion forums and reflection. As defined by Teaching English to Speakers of Other Languages (TESOL), the teaching method employed in this program incorporated cooperative language learning (CLL) and content-based instruction (CBI; Richards & Rodgers, 2001).

Course Topic

Under the current socio-political climate in Japan, students typically believe that English is essential to their future economic success. The course topic was designed to encourage students to broaden their perspective, metacognitively, on the value of learning English. Therefore, during the second synchronous meeting, participants used individual presentations to answer this question, “How can learning English be meaningful to me and to the world?” Two preceding asynchronous forums asked students to deepen their thoughts on this question.

Data Collection

Two initial asynchronous forums encouraged student self-introductions and practice, using the Google Classroom forum platform. Once students joined the two five-day forums (Forum 3 and 4), I began interacting with them as the primary instructor/facilitator. Forum 5 was designed for students to post individual reflections on the BL program, rather than interact with each other; I did not mediate this forum. All participants wrote posts in English in these forums. Inquiry data were gathered from a post-survey containing open-ended questions designed to encourage student reflection on the intervention. The use of English or Japanese was optional on the post-survey. All participants chose to respond in Japanese. I translated their answers into English for coding purposes. Observational data was gathered in my field notes throughout the BL program.

Data Analysis

Two data analysis procedures were employed in this study. Forum transcripts and the post survey were analyzed through content analysis (coding). Qualitative interpretive analysis was also used to examine transcript, observational, and post-survey data.

Forums transcripts and the post survey were transformed into quantitative data through coding, using one tested model, the Interaction Analysis Model (IAM; Gunawardena et al., 1997), and two tested taxonomies, the Cognitive Dimension of Revised Bloom’s Taxonomy (Anderson et al., 2001) and Krathwohl’s Affective Domain (Krathwohl et al., 1964). Data reduction is inevitable in coding, but I tried to mitigate the risk of generating only superficial findings by combining multiple coding instruments that fit the purposes of this study.

According to Rourke et al. (2001), it is crucial to select a unit of analysis that meets the purpose of the study. De Wever et al. (2006) presented three levels of classification of the unit of analysis for analyzing forum transcripts: sentence, theme, and message. My unit of analysis was the message, since instructions accompanying the IAM instrument recommended this as the unit of analysis, positing that the message reflected a participant’s cognition and contributions to knowledge construction in a forum

(Gunawardena et al., 1997). In the study forums, the typical message constituted one participant's post, or complete message, added to the forum at a particular moment during a discussion. Cognitive Dimension and Affective Domain data were also analyzed, using the message as the unit of analysis to be consistent. In most cases, a message was coded once; however, some messages were allocated to two or more codes.

To ensure high coding reliability, I engaged a second coder. The second coder and I first read the literature on each of the three coding instruments to better understand the rationale underlying them. Then we began coding slowly together, while taking time to discuss and record detailed descriptions depicting the meaning underlying each code. Throughout the coding process, we read each message and coded it together. We discussed what should be the most appropriate category while coding, and we reached an agreement in all of the cases. Since we coded all of the data together, inter- and intra-reliability was not established. We used NVivo Pro qualitative data analysis software for this part of the analysis.

This quantitative data produced by coding was triangulated with qualitative data, derived from the qualitative interpretive analysis process, to establish reliability and provide a more comprehensive understanding of the phenomena under study (Hendricks, 2013). I took a qualitative interpretive approach for closer examination of forum transcripts, observational data, and data taken from the post-survey. I did not take a quantitative approach to investigate these data because the number of participants and collected qualitative data were not large enough to produce valid statistical results (Cohen et al., 2018). Instead, I closely read all the qualitative data to identify factors that might have enabled or constrained higher order thinking development.

Limitations

This study is limited by a lack of generalizability of its conclusions, since this action research study was employed with a small number of participants within a particular context. Nevertheless, a thick, rich description of the course design, procedures, and research site are provided here to enable transferability to different settings.

Findings

Basic Data

All participants (n=16) and the two instructors contributed posts to Forum 3 and 4. Seven participants (43.8% of all participants) posted messages to Forum 5 (the reflective forum). Finally, 12 participants (75.0%) completed the post-survey.

Data from Forum 3, 4, and 5 were gathered from the 16 participants and me, the primary instructor, on the number of posts, messages, and words. On average, each Forum 3 student posted 2.3 messages; in Forum 4, this average was 1.6. Total word averages per post in Forum 3 was 121.8 words and 121.4 in Forum 4. My total number of Forum 3 posts was 22 and total Forum 4 posts was 24. The average number of total words in one post of mine was 169.9 in Forum 3 and 173.3 in Forum 4. Forum 5 asked students to post individual reflections without interacting; seven students posted to this forum.

Data on the direction of participants' posts (to prompts, to other participants, to instructors, or to others) was also analyzed. In Forum 3, 13 posts (35.1% of all Forum 3 posts), and in Forum 4, 14 posts (56.0% of all Forum 4 posts) were responses to prompts. These numbers, added with the low number of student posts in the two forums, suggested that learner-learner and learner-instructor interaction was limited. Bullen (1997) separated forum messages into two groups: independent (messages responding to a discussion topic, but do not refer to any other messages), and interactive (messages that reference other messages to advance the discussion). Using Bullen's terms, most participants posted independent

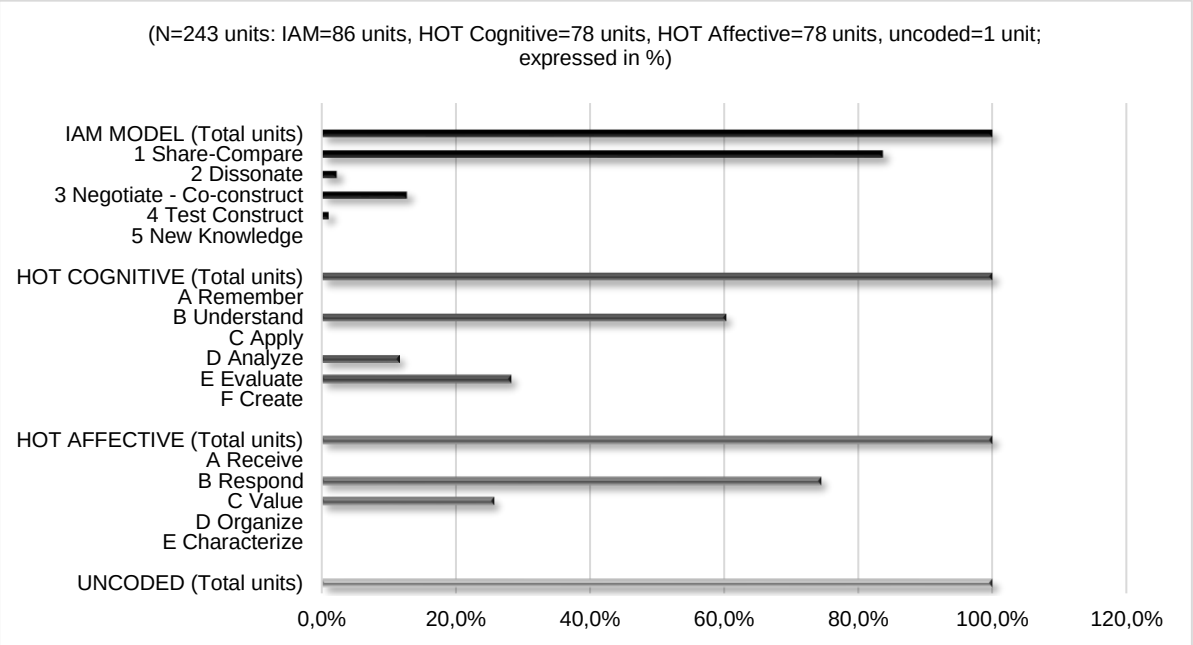
messages when replying to a prompt (n=13 in Forum 3; n=14 in Forum 4). Fewer participants in this study submitted interactive messages directed towards other participants (n=7 in Forum 3 and n=4 in Forum 4).

Forum 3 (The First Main Forum)

Due to the large volume of data collected, only the most salient results are reported here. More results are available on request. Statistical data expressed as percentage are rounded to the nearest tenth of a percent. The IAM had five parent codes, each assigned to one of the following phases: Phase I: Share-Compare, Phase II: Dissonate, Phase III: Negotiate-Construct, Phase IV: Test Construct, and Phase V: New Knowledge. The Cognitive Dimension had six parent codes: (A) Remember, (B) Understand, (C) Apply, (D) Analyze, (E) Evaluate, and (F) Create. Finally, the Affective Domain had five parent codes: (A) Receiving, (B) Responding, (C) Valuing, (D) Organizing, and (E) Characterizing.

A total of 79 messages were posted by participants in Forum 3; eight were double-coded, and one was uncoded (it contained a grammatical correction from the participant's previous post). This yielded a total of 86 IAM units coded from this forum. Seventy-two units (83.7% of all units coded to IAM) were coded to Phase I, two units (2.3%) to Phase II, 11 (12.8%) to Phase III, and one (1.2%) to Phase IV. From the 79 messages contributed by participants in Forum 3, none were double-coded, and one was uncoded in the Cognitive Dimension, producing a total of 78 units. Forty-seven (60.3% of all Cognitive Dimension units) were assigned to (B) Understand, nine (11.5%) to (D) Analyze, and 22 (28.2%) to (E) Evaluate. The Affective Domain generated a total of 78 units. Fifty-eight (74.4% of all Affective Domain units) belonged to (B) Responding, and 20 (25.6%) to (C) Valuing. Figure 2 illustrates the number of units by parent code for each instrument.

Figure 2. The proportion of coded units in Forum 3: Participants



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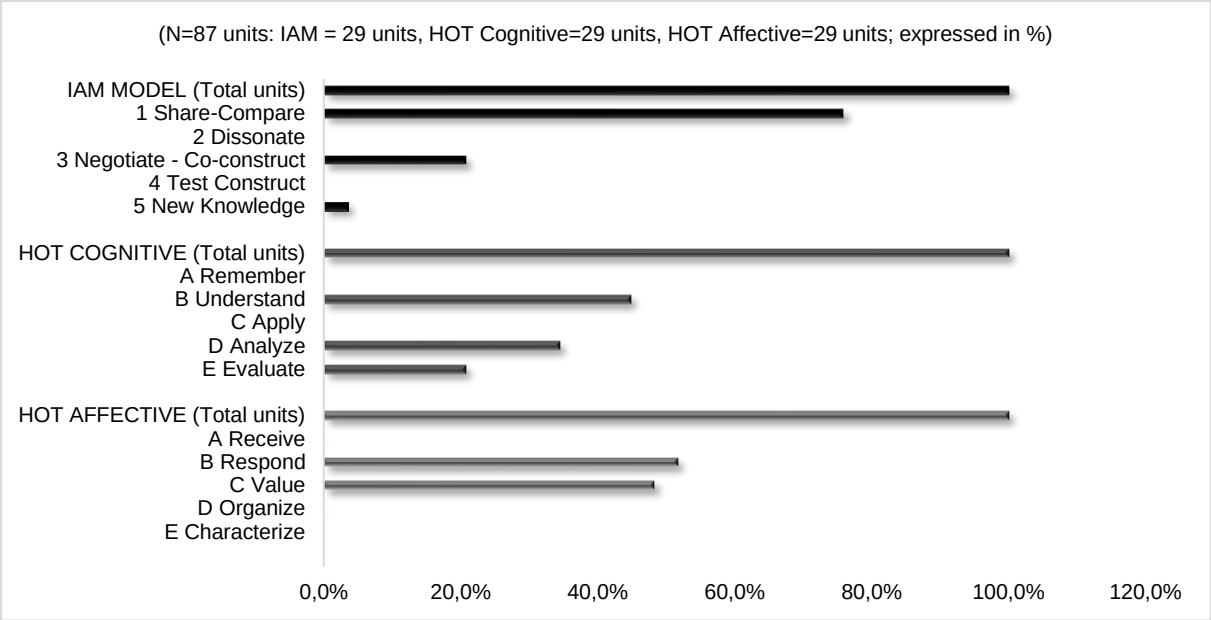
Forum 4 (The Second Main Forum)

A total of 29 participant messages were posted to Forum 4. Since none were double-coded or uncoded, these messages yielded a total of 29 units each for the IAM, Cognitive Dimension, and Affective Domain.

Twenty-two of the 29 IAM units (or 75.9% of all IAM units) were assigned to Phase I: Share-Compare, six (20.7%) to Phase III: Negotiate-Construct, and one (3.4%) to Phase V: New Knowledge. Thirteen of the 29 Cognitive Dimension units (or 44.8% of all Cognitive Dimension units) were sorted into (B) Understand, 10 (34.5%) into (D) Analyze, and six (20.7%) into (E) Evaluate. Of the 29 units coded to the Affective Domain, 15 (or 51.7% of all Affective Domain units) were allocated to (B) Responding and 14 (48.3%) were allocated to (C) Valuing. Figure 3 graphically illustrates the proportion of coded units drawn from participants' messages that were assigned to each instrument and its related parent code.

Figure 3. The proportion of coded units in Forum 4: Participants



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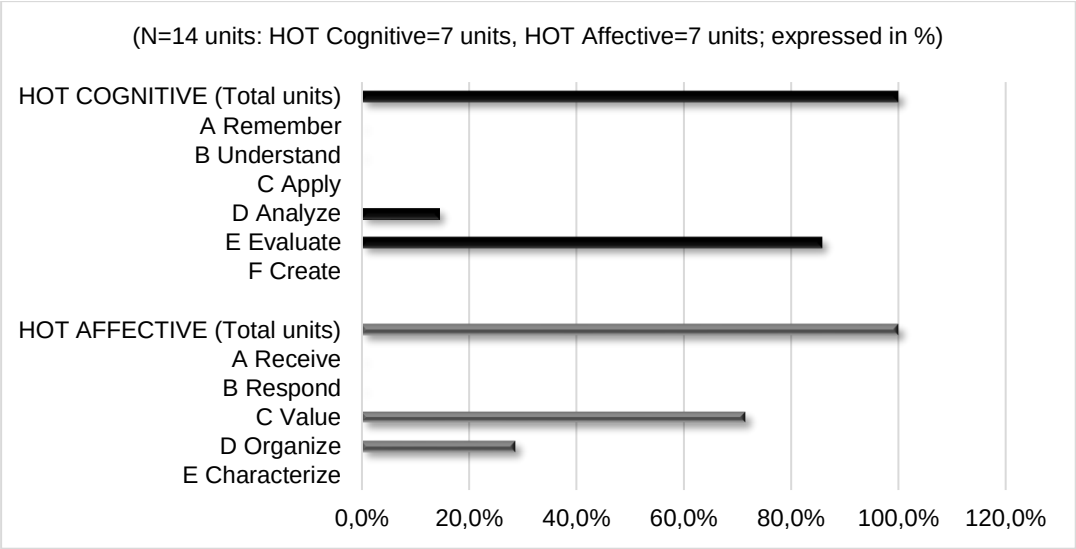
Forum 5 (Reflection Forum)

The IAM instrument was not employed in Forum 5 because students were asked to submit one reflectional post, rather than interact with each other. None of the seven messages that participants posted to Forum 5 were double-coded or uncoded; thus, a total of seven units were each assigned to the Cognitive Dimension and Affective Domain. One of the seven Cognitive Dimension units (or 14.3% of all Cognitive Dimension units) was coded to (D) Analyze and six (85.7%) were coded to (E) Evaluate. Five of the seven Affective Domain units (or 71.4% of all Affective Domain) related to (C) Value, and two units (28.6%) were related to (D) Organize. Figure 4 graphically illustrates the percentage of units assigned to the Cognitive Dimension and Affective Domain instruments and their parent codes.

Figure 4. The proportion of coded units in Forum 5: Participants



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Discussion

Answers to Research Questions

In this section, responses to the three study research questions are given, using results from coding and closer examination of transcripts, the post-survey, my observational notes, and relevant literature.

The first research question asked, "To what extent can higher order thinking be demonstrated among participants in asynchronous online forums?" Based on coding results, it was determined that, although learner-learner interaction was not high overall, participants did demonstrate development of higher order thinking when they engaged in this program. Forum 4 contained more higher category messages than Forum 3. Even though only seven of the 16 respondents contributed to Forum 5 (the program reflection forum that was not interactive), all of their messages belonged to the higher categories in the Cognitive Dimension and Affective Domain. Two participants responded well to various facilitation strategies, thus actively interacting more with other participants and the instructors than other participants did. These two participants generated a greater number of higher order units in all three coding instruments than the other participants did.

Further review of post-survey data, participant transcripts, and observational notes indicated that even the participants who contributed few forum posts may have thought quite deeply, despite the infrequency of their posts. For instance, one participant offered only one Forum 3 post and no Forum 4 post. Yet, in the post-survey, this participant wrote, "After I made a post, the instructor sent me an article that was related to what I said in my post. By reading the article, I was pushed to think about the matter more deeply. It was an interesting experience." The participant went on to say, "It was interesting to think why we learn English, using English. It was a good topic because I was very motivated to learn English." As the instructor, I offered a large amount of feedback on new knowledge, related learning resources, and alternate perspectives to participants in Forum 3 and 4. Thus, this participant's post-survey response implied that, even though some participants were not highly active in the Forum 3 or 4 discussions, they may still have exercised, or potentially developed, their higher order thinking.

The second research question asked, "What factors in students' engagement in asynchronous online forums may contribute to the development of higher order thinking, if any?" This question sought to explore process factors that may have contributed to the results for the first research question.

Interaction was a prime focus of this study. Moore (1989) proposed three kinds of interaction: learner-content, learner-learner, and learner-instructor. Furthermore, sociocultural theory has suggested that learner-content interaction needs to be designed developmentally (Lantolf & Poehner, 2004). Tasks in this program encouraged participants to interact with three forms of content: learning resources, discussion topics, and guiding questions. Over half of the participants (Forum 3 n=13; Forum 4 n=14) responded to instructor prompts containing guiding questions and learning resources; these responses were coded to higher Cognitive Dimension and Affective Domain categories. Post-survey results indicated that all three forms of tasks encouraged participants to think deeply.

In terms of learner-instructor interaction, the instructor employed three types of program mediation strategies: ones that aimed to develop cognitive, affective, and socially-constructed knowledge. Close examination of transcripts indicated that a purposeful, contingent blend of mediation, for promoting participants' cognition, for encouraging and modelling affective expression, and for enhancing social interaction, fostered the development of participants' thoughts in the forums (Garrison, 2016; Vaughan et al., 2013).

Lastly, although learner-learner interaction in Forum 3 and 4 was limited, participant reflections in Forum 5 indicated that they thought more deeply and found constructivist learning to be more meaningful than what Forum 3 and 4 content analysis suggested. Closer examination of Forum 5 transcripts denoted that the foremost reason why participants were reluctant to interact online was that they did not know each other well, due to their limited social interaction. Seven participants (or 43.8% of all participants) suggested that this was one area where the program could be improved. For instance, one participant stated, "The participants were not so close as to express their opinions freely to each other." Further examination of participant transcripts suggested that two participants used various facilitation strategies to develop higher order thinking through learner-learner interaction. This finding supports the notion that participants, as well as instructors, contribute to teaching presence (Garrison, 2016).

The final research question asked, "What factors in blended learning design may contribute to the development of higher order thinking, if any?" The aim of this question was to explore design factors that might help to identify potential reasons for answers to the initial research question in this study. The online portion of this program included synchronous meetings and online forums. Kanuka (2008) identified the value of engaging participants, who are physically separated in space, in real-time discussions during online synchronous gatherings. It appeared that including a guest instructor from abroad in synchronous meetings may have also motivated participants to engage more in activities. All participants who responded to the post-survey (n=12), shared positive thoughts about collaborative, constructivist learning in the asynchronous forums. Lastly, participants posted reflections in Forum 3 and 4, as well as in Forum 5 (the reflection forum) and their post-surveys. Collectively, these findings indicated that ecological constructivism (Hoven & Palalas, 2016) may have been successfully applied in this program.

The post-survey also generated some useful suggestions for improving the F2F component of the program. The post-survey also implied that the initial in-person F2F meeting assisted participants in working comfortably during the rest of the program. Scholars, such as Garrison (2016) and Vaughan et al. (2013), posit that instructors should set the tone for inquiry by sharing operational norms for working together, as well as providing opportunities for learners to become familiar with each other and adopted technologies. These elements were included in the first in-person F2F meeting.

Finally, examination of participants' reflections yielded four organizational factors that may have contributed to the development of higher order thinking. These included: (1) the initial in-person F2F meeting, (2) asynchronous forums, followed by synchronous meetings, (3) asynchronous forums organized to promote developmental growth, and (4) a reflective phase at the end of the program.

Models for Blended Learning

The combination of the aforementioned organizational factors represents a BL model. In this study, the term, model, is applied differently than the terms, theory and framework. While theory and framework are applied as concepts contributing to the creation and expansion of broad knowledge, *model* refers to a systematic categorization that may be readily applied in practice. Halverson (2017) argued that BL research has focused too much on surface-level characteristic; namely, the amount of online and F2F learning rather than what should be aimed at in each component. From a pedagogical standpoint, designers of BL systems should be seeking best practices for how to combine instructional strategies in online and F2F components that take advantages of the strengths of each environment and avoid weaknesses (Graham, 2006).

Graham et al. (2014) divided the nature of the BL models into three categories: explore, explain, and design. Design models were further divided into three patterns: model articulation, model comparison, and model iteration. Design research describes intentional structuring of intervention and instruction aimed at achieving particular outcomes. The following models are useful for designing BL programs for supporting students unaccustomed to developing higher order thinking in an online constructivist learning environment. In that sense, this model is categorized as model articulation.

Purposeful Gathering at the Beginning

The initial introduction to a program is crucial. For participants and instructors who are unfamiliar with the online learning environment, social interaction is easier in an in-person F2F meeting. Four elements should be included in this meeting. First, participants need to understand the aim of the program (Vaughan et al., 2013). Second, they require basic rules for engaging in constructive discussion. Otherwise, participants who are unfamiliar with constructivist learning may cause other participants to feel uncomfortable by, for instance, being rude or aggressive in asynchronous forums. Third, an initial phase is needed for participants to practice asynchronous interaction. This interaction should not be cognitively demanding, so that participants may focus on practicing asynchronous interaction with the use of technologies used in the program. Lastly, participants should use this phase to interact socially. Fun, instructor-prepared activities can facilitate the process of participants learning to know and trust other participants more. Without this beginning phase, participants may find it challenging to interact in the subsequent asynchronous forums of the program.

Purposeful Mixture of İnteraction and Reflection

The organic integration of individual and collaborative learning, by means of personal reflection in this model, mirrors the conceptual notion of ecological constructivism (Hoven & Palalas, 2016). Reflection is essential in the development of higher order thinking (Rose, 2013), while interaction is crucial for constructivist learning. Reflection naturally occurs in asynchronous interaction, yet explicit reflective phases, such as the implementation of guiding questions in a reflective forum at the end of the program, encourage participants to ponder further and reflect at a deeper level on their learning.

Flow from Asynchronous to Synchronous İnteraction

Language acquisition practice suggests that the synchronous meetings, which follow asynchronous forums, should integrate four English proficiency skills (i.e., reading, writing, listening, and speaking) to a higher level. In addition, if participants are asked to give presentations in these follow-up synchronous meetings, they are more motivated to reflect deeply on previous asynchronous discussion forums. This process enables participants to generate a less superficial, more meaningful presentation, even in a second language (Roessingh, 2005).

Developmental Organization of Multiple Asynchronous Forums

The inclusion of multiple, intentionally-designed asynchronous forums in a program can facilitate the incremental development of knowledge, based upon the notion of developmental education (Lantolf & Poehner, 2004). In developmental education, instructions are purposely designed to prepare participants for more complex thinking, instead of waiting for participants to become naturally ready to develop further (Lantolf, 2013). To facilitate developmental education, guiding questions and resources are chosen to build the foundation for a chosen topic in early forums. This prepares participants to discuss more complex issues on a topic in later forums, based upon the foundations that they established in earlier forums.

Conclusion and Suggestions

The literature proposed that learners' higher order thinking could be developed by the practice of writing and reflection in constructivist asynchronous forums (Conrad & Openo, 2018; Garrison, 2016). Yet, although emergency remote teaching was widely adopted since the beginning of the COVID-19 pandemic in early 2020, research on constructivist asynchronous forums in secondary education has remained limited, especially in Asian countries. This action research study has therefore sought to determine whether, or how, a BL program, with embedded asynchronous forums, might facilitate the development of EFL learners' higher order thinking in a Japanese public high school setting.

Study findings are tentative, and generalizations are not viable, due to the context-specific design of the study. Nevertheless, this study indicates that the inclusion of asynchronous forums in K-12 environments–even when employing a foreign language for communication and instruction–can promote the development of higher order thinking, using appropriate program design, content, and instructor mediation.

Content analysis revealed that, despite being unfamiliar with constructivist learning in general and possessing no prior learning experiences in constructivist asynchronous forums, participants demonstrated higher order thinking in the intervention forums of this study. Moreover, the post-survey implied even the less active forum participants found that collaborative constructive learning was meaningful. For instance, one post-survey question asked, "How was the online learning experience compared to regular face-to-face classes at school?" The implication of this question was that participants were primarily learning in a traditional manner in regular F2F classes or emergency remote learning environments. When responding to this, and other similar questions, all participants spoke positively about their collaborative constructivist experience in the BL program.

The study also explored what factors promoted or hindered the development of higher order thinking within the context of the BL program. While the factors discussed in this study were context-specific, some identified factors could be more widely applicable, since many K-12 institutions grapple with similar challenges, like teachers who are inexperienced with online teaching and learners who struggle to learn independently (Halverson et al., 2017). Tentative explanations on how constructivist asynchronous forums can be employed in a BL program have been presented in this study. In summary, each online/BL program must include the appropriate context-specific design, content, mediation strategies, and technologies.

This study was limited by the definition offered for the term, thinking, and its related term, higher order thinking. The affective domain (Krathwohl et al., 1964) and revised cognitive dimension (Anderson et al., 2001) of Bloom's taxonomies, and Vygotsky's notion of lower and higher mental functions (LMFs and HMFs; Vygotsky & Rieber, 1997) were used in this study to capture phases and levels of thinking. Nevertheless, the concept of thinking is profoundly complex; methods to explore thinking to date have been less than fully developed. Thus, the proffered definitions for thinking and higher order thinking in this study are merely temporal. While this study employed tested socio-cognitive and affective domain

instruments and the established method of content analysis, it is acknowledged that there are limits to measuring and understanding human thought.

In terms of future practice, educators are encouraged to identify power relationships that may be imposed upon students when introducing asynchronous forums in programs. Teachers can, consciously or unconsciously, lead learners to particular ideologies in these settings. It should be clearly established that learners have the right to express their own views, without fear of reprisal from other learners or the instructor.

In closing, two recommendations for future research are presented. The first includes a suggestion to explore effects generated by asynchronous forums created to develop higher order thinking in foreign language acquisition programs. While this study examined the development of higher order thinking in a BL program for EFL learners, it did not explore whether, or how, the participants' English proficiency increased. A study that investigates higher order thinking and increased foreign language proficiency might yield new understanding on the relationship between higher order thinking and language acquisition.

The second recommendation concerns the research method used in this study. It is highly recommended that, with appropriate training and support for educators, action research be more widely implemented in schools. Employment of action research can not only improve practice, but potentially change society. Educators are responsible for providing learning environments that are conducive to the development of creative, capable minds equipped for the challenges of a complex world. Online constructivist learning can nurture the development of active, critical citizens who are prepared to shape diverse, inclusive, and tolerant communities (Campbell & Schwier, 2014). The development of higher order thinking is an ultimate educational goal for fostering mature citizens and healthier societies. It is hoped that results of this study, including the contribution of BL models, can facilitate the pursuit of this goal.

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Conflict of Interest

The authors do not declare any conflict of interest.

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The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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