「論文」

Developing Classroom Corpus Tagger for Teachers' Reflective Practice: A Spoken Language Tagger to Compile Classroom Corpora

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Abstract

This study presents a browser-based Classroom Corpus Tagger (CCT): Discourse Tagging Assistant. The CCT tool has been developed to markup speaker tags by clicking the mouse and instantaneously encoding language-use tags for compiling a classroom corpus. Classroom corpus compilation involves attaching tags to each transcribed utterance according to the tagging design. Annotation of the utterances by teachers and students requires multi-layered tags to be attached; this is a time-consuming process and sometimes leads to unexpected human errors. Hence, this study attempted to develop a basic discourse tagging assistant, the CCT, to smoothly attach pre-designed tags to each transcribed utterance, requiring less time and energy than manual tagging of transcripts. A case study was conducted to test the validity as well as the availability of the CCT tool. The results revealed that tagging using the CCT helped overcome the complexities related to manual tagging of transcripts. Moreover, using the CCT reduced the tagging time for the transcribers, as compared to manual tagging which was sometimes erroneous. The application of CCT is likely to lessen the workload of building classroom corpora, and eventually, promote classroom-related research by facilitating reflective practices. This study introduces how we created the CCT and displays an example of how we utilize classroom corpora. Accumulating classroom corpora using the CCT will enhance the opportunities for teachers' reflective practice as well as evidence-based foreign and second language classroom discourse analyses.

1. Introduction

Corpus data collected in the language classroom provide evidence for reflective

practice as a means of developing language teachers' skills. One of the distinctive advantages of reflective practice through corpus compilation is that it enables teachers to thoroughly analyze their statements, including the detailed vocabulary they use. Corpus data reveal the types and tokens of each lexical item, facilitating teachers' awareness of vocabulary usage. Comparing those types or tokens with the general vocabulary list, such as the General Service List and the recently presented CEFR-J wordlist[1)], teachers get acquainted with the vocabulary items that they should use intentionally and to the maximum. Drawing on the specifics of teacher talk, questioning strategies, types of feedback, and wait-time pauses revealed from classroom corpora can also raise the teaching awareness of novice teachers. Transcripts from corpus data can facilitate close qualitative inspections to hone teachers' decision-making skills about what they say in the classroom (O'Keeffe, McCarthy, & Carter, 2007). As Walsh (2013) states, reflections through observation of transcribed data are likely to result in an ongoing process of enhanced awareness, training second language teachers to improve their verbal expressions and enhance their knowledge of the interactional processes. From the perspective of teachers' reflective practices, a compilation of classroom corpora aids in language teachers' development, as the ephemeral spoken classroom discourse is made visible.

While the compilation of corpora provides a variety of research sources, it also involves demanding manual work of attaching tags to categorize the classroom's discourse data. Attaching different tags manually according to the quality of utterances requires considerable time, and the tasks are prone to tagging errors, which hinders the research due to the painstaking correction process. For example, manual tagging of each utterance to compile a classroom corpus in the study conducted by Katagiri and Ohashi (2017) was time-consuming; hence, it took more time to start the research work than they had planned. A spoken corpus developed by Katagiri and Ohashi (2017) served as a teacher training tool to compare the quality of six classes of preservice teachers. While tagged corpora could provide abundant research sources, completing one corpus takes a significant amount of time and energy, delaying examination of the researchers or teachers' utilization of the original corpus. To address this issue, a corpus compiling tool was designed that allowed instantaneous attachment of speaker and language tags during the research process.

2. Literature Review on Corpus Annotation Structure

Since the onset of corpus-based research, many corpora have been accessible online. Along with the different types of corpora, a variety of tools for corpus research are being downloaded or accessed online. For example, corpus annotation in text tagging is made possible by tagger tools with embedded digital dictionaries, such as Biber Tagger (Biber, 2010) and TagAnt (Anthony, 2015). Tagged text files allow quick calculation of vocabulary frequencies and grammatical features, leading to fast processing of the text data which can be utilized for original research. Considering the compilation of spoken corpora, the first step is identifying each utterance by a speaker and attaching speaker tags manually. There have been few computer tools that can instantaneously identify the speaker and the languages of the transcribed utterances in the texts. This is why compilers of spoken corpora, including classroom corpora, take a lot of time to complete an annotated corpus.

Classroom interactions taking place in a second or foreign language class (ESL/EFL) follow a hierarchical structure (Sinclair & Coulthard, 1975). The hierarchical classroom structure—comprising the teacher's utterances and the student's responses—can be represented by Extensible Markup Language (XML). XML allows users to define a machine-readable set of rules for encoding documents. XML also enables the users to create original markup frameworks, describing documents that conform to a hierarchical structure because their lower elements (child nodes) are nested in the upper elements (parental nodes). Katagiri and Kawai (2016) designed an XML schema for showing classroom discourse visually through eXtensible Style Language Transformations (XSLT). Compilation of classroom corpora using the XML format allows search of the required data through XSL. This provides further improved processing in XPath (refer to Katagiri & Kawai [2016] for details regarding the XPath and XML Schema). For these reasons, we propose to use the XML form for compiling classroom corpora.

It is the corpus markup that defines the availability of classroom corpus. Corpus markup refers to a system of codes inserted into a document, stored in electronic form, or transcribed texts to provide information about the text (McEnery, Xiao, & Tono, 2006). Referring to McEnery et al. (2006), markup helps to structure information, separating documents into appropriate sections with headings, sub-headings, and

paragraphs. It also enables the inclusion of meta-information collected for the corpus. The need for markup to build a classroom corpus can be summarized in the following three perspectives:

1. Markup allows a broader range of research questions according to researchers' needs;
2. Pauses and paralinguistic features, such as laughter and gestures, can be identified through markup; and
3. Corpus markup parallels the existing linguistic transcription.

Ohashi (2015) arranged twenty-four different types of tags in annotation design to be placed in utterances according to their attributes. For example, she annotated the utterance character, "What's the date today?" as <teacher><eng><question>What's the date today?</question></eng></teacher>, indicating that the speaker represented by "<teacher>," asked a question (annotated as "<question>") in English (by "<eng>"). Besides speaker tags, activity tags attached to each classroom activity enabled the teachers and the researchers to reflect on their utterances to improve their articulation.

Annotation designs vary according to the researchers' needs. For example, Ohashi and Katagiri (2016) attached additional tags to differentiate explicit or implicit explanations, in addition to speaker tags and language tags, to examine teachers' explicit instructional roles. Ohashi and Katagiri (2016) also translated Japanese utterances into English and annotated the translations with translated language (TL) tags, <TL></TL>.

Compiling a classroom corpus involves placing tags that represent the quality of classroom discourse. The annotation process is time-consuming and an arduous task because each corpus requires coders' judgment on the classroom discourse quality and use of target language followed by the coders' manual annotation, besides transcription of the recorded speech. The annotation design depends on the research purpose. The more tags the annotation design requires, the more time it takes to complete a whole classroom corpus. With the aim of addressing this challenge, this study designed an original tool to attach designated tags to the text smoothly to lessen the burden of manually compiling a classroom corpus.

According to Walsh (2013), and Mann and Walsh (2017), language teachers'

reflective practice occupies a central position and is of considerable significance in professional education. Reflective practice has been conceptualized differently, and no commonly agreed definition exists. The definitions vary with respect to the extent to which the class focuses on interaction or action (Mann & Walsh, 2017). Some reflective practices emphasize the exploration of experiences that lead to new understandings through engagement in repairs and review (e.g., Boud & Walker, 1998; Zeichner & Liston, 1996), while others highlight critical self-awareness (e.g., Bailin et al., 1999). Both quantified and qualified data from classroom corpora can be used as tools for language teachers to conduct reflective practices, the importance of which has been established in teacher training.

One of the influential reflective practice models is the phased steps summarized by Zwozdiak-Myers (2012). The steps are as follows: 1) observations and reflections; 2) abstraction and conceptualization that produce new understanding; and 3) active experimentation, in which reflection turns into repairs, or improved teacher talk. Mann and Walsh (2017) argue that reflective practices are conducted in stages and phases in which novice teachers analyze and evaluate their classes, to make them more effective.

Teacher education literature describes reflection as an essential aspect of professional practice (e.g., Harkin, 2005; Pollard, 2005; Alger, 2006). Considering the object of classroom corpus compilation is to review and develop the current classes to be better; corpus creation facilitates teachers' reflective practices. Reflective practice enables teachers to observe their performance from a socio-cultural perspective, where learners interact with experts, leading them to better understanding (Walsh, 2013). The corpus-based studies of Ohashi and Katagiri (2016) and Katagiri and Ohashi (2018) revealed the effects of social roles involving scaffolding in the classroom, as explained by Vygotsky (1978). They argue that the insights obtained through reflective practices combined with compiled corpora contribute to teachers' training and professional development. The outcomes of compiling a classroom corpus are likely to contribute to the accumulation of recorded classroom spoken data and provide evidence for reflective practice. Integrating corpus data yielding outcomes pertaining to the reflections is likely to assist teaching professionals in gaining a new understanding of their socio-cultural roles. This study aims to develop a classroom corpus compilation tool to help language teachers compile their original corpus that can be used by them for reflective practice.

3. Classroom Corpus Tagger

3.1 Classroom Corpus Tagging Structure

The classroom corpora start with transcription of teacher and student utterances in the classroom. For transcription, meta-information is required to yield details of what was said, by whom, and in which language. Then, to start with, the utterances and interactions between the teacher and students, or among the students in pairs or groups, are transcribed. Thus, the transcripts require the speaker and language tags as their founding information in the classroom discourse hierarchy. The bottom hierarchical rank can extend to higher ranks, according to the discourse quality of the utterances (see Sinclair & Coulthard [1975] for the detailed classroom hierarchical structure). The main tagging of the classroom corpus utilizes the hierarchical foundation that deals with the speaker and the usage of language.

Figure 1 illustrates the hierarchical structural design of the tagged classroom corpus in XML, using a short transcript line, “Hello.” The utterance (i.e., the transcript line “Hello.”) has a start tag and an end tag; in this case, <English></English>. The language tag implies the speaker’s utterance, representing itself, written generically as <speaker></speaker>.

```
<root>
    <body>
      <.....>
        <speaker>
          <English>Hello.</English>
        </speaker>
      </.....>
    </body>
</root>
```

Figure 1. Classroom corpus tagging structure in XML caption

The speaker tags can represent other speaker types, such as homeroom teachers, students, and assistant language teachers. Likewise, the language tags can include other specific language names, such as Japanese, depending on the classroom context. The upper ranks in the hierarchy (depicted as “<.....>” in Figure 1) can have expanded rank names, based on the users’ or researchers’ interests and needs. Some examples are

language activity and language skills, such as speaking and reading, interaction types. Thus, the rank expansion can describe the classroom teaching exchanges as needed.

3.2 Procedures of Developing the Instantaneous Annotation Tool

This section describes the design of the Classroom Corpus Tagger (CCT)[2] Version 1.0 developed in this study. The CCT enables tagging of both speaker and language tags instantaneously with utterances made in the classroom, which significantly reduces the tagging time. Speaker tags are determined instantaneously by the CCT. Language tags can be easily selected by simply clicking on the utterance result line. For developing the language tags, we took advantage of the fact that English is a single-byte character and Japanese is a double-byte character. Moreover, if it is a single-byte character, the tag will be surrounded by <eng></eng>. Similarly, if it is a 2-byte character, it is tagged with <j></j>. In addition, if a sentence contains a mixture of 1-byte and 2-byte characters, <mix></mix> is added outside the <eng></eng> and <j></j> tags. This makes it possible to generate language tags as soon as the characters are entered.

As for speaker tags, there is no unified standard, and language researchers have been assigning them arbitrarily. To cater to this, CCT allows users to freely set their own speaker tags. When the user clicks on the conversation result line, the speaker tags are switched in the order that the user has set in advance. This reduces the burden of tag input for the user.

The CCT can be operated from a personal computer and potential human errors, such as forgetting to enter the closing tag during manual tagging, can be reduced. The current CCT version is downloadable and can be activated in both Windows operating system and macOS. Thus, the CCT operates offline and does not require an internet connection. The programming language used in CCT is JavaScript, and it works on a browser compatible with Google Chrome, Firefox, and Edge (Internet Explorer is not recommended). CCT users just unzip the software file, index.zip, and display the index.html in an HTML browser to activate the CCT program. The CCT startup screen will appear in Google Chrome, one of the recommended HTML browsers that can run on both Windows and Mac. Figure 2 depicts the elements of CCT.

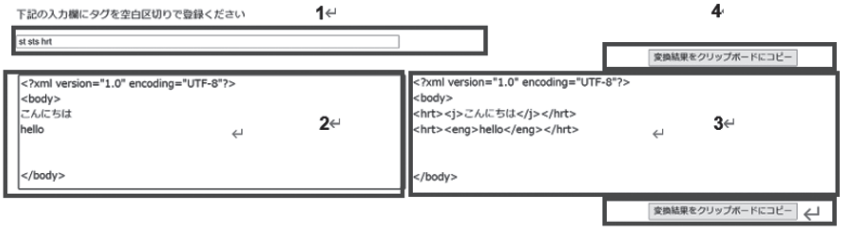

Figure 2. CCT startup screen configuration

Note: Box 1 is speaker tag input box where the Japanese instruction above says, "Please register tag names in the box below spaces." The default values are *st*, *sts*, and *hrt*, meaning st = student, sts = students, and hrt = homeroom teacher. Box 2 is transcription input box. Box 3 is tagged transcription space. Boxes 4 are "Copy conversion results in clipboard buttons" (placed at the top and the bottom of the tagged transcription space, box 3 in Figure 2).

The elements of the CCT are:

1. Speaker tag input box

The speaker tag input box 1 (Figure 2) indicates types of the speaker tags, represented by "hrt", "st", "sts", and "ALT". Users can arbitrarily assign speaker tags according to their needs. For example, if users need to distinguish between individual students —for example between "st1" and "st2" instead of just "st"—they can type in the new tag names in the following manner: The speaker tag can accommodate a maximum of 300 characters, including white spaces, and there is no limit to tag variation. For example, if the tag name is five characters in length, there can be up to 50 different tags (with 49 white spaces in between each name), and if the name contains two characters, there can be up to 100 tags (with 99 white spaces).

2. Transcription input box

The transcription input box 2 (Figure 2) is for entering the transcripts. By entering the text in the area between <body> and </ body>, one can convert it to an XML format. The instantaneously tagged text will appear in box 3 (Figure 2). You can copy and paste the transcribed text created in advance, or you may type in your text directly. Once you start clicking on the XML tagged line in box 3, the tagged lines are fixed, the original

transcript in box 2 will be fixed, and boxes 2 and 3 will not accept any transcript change (i.e., insertion, correction, or deletion). Clicking on box 2 will reset all the speaker tags. We may consider this mechanism to be one of the limitations we need to address for further modification. In this regard, we need to carefully insert the text in box 2. You can enter text of more than 1,000 lines. Additionally, Firefox is faster than Google Chrome, as the transcript lines get incremented due to the browser characteristics.

3. Instantaneous generation of XML tags

When a character is entered in the local text input box, tagged XML is instantaneously generated on the right side of the screen. Figure 3 demonstrates a sample. The upper left box displays the default values of the speaker tag names, st, sts, and hrt. If you enter "Hello." in the lower-left box, the right-hand area will display the tagging result, <hrt> <eng> Hello </eng> </hrt> immediately. The outermost tag, <hrt> is from the final default speaker tag name, hrt. Clicking on the conversion result line cyclically switches to hrt → st → sts → hrt, and so on. When you need to use <st> instead of <hrt>, click on the tagged line, and, you will have the next <st> tag. Similarly, if you want to make it <sts>, click on the same line, and you will replace the current tag, <st> with <sts>. Thus, it is possible to select the desired tags simply by clicking without typing the tag every time you need it.

Language tags are also placed instantaneously according to the entered text (Figure 3). English utterances are tagged with <eng> </eng>, while Japanese utterances are tagged with <j> </j>. If the line includes both Japanese and English utterances, <mix> </mix> will be inserted. For example, entering "Hello" in the transcription input box (the lower-left box in Figure 3), the right-hand area will display "<hrt> <eng> Hello </eng> </hrt>." Thus, the mixed language text with English and Japanese, for example, "Hello こんにちは" turns into <hrt> <mix> <eng> Hello </eng> <j> こんにちは </j> </mix> </hrt >.

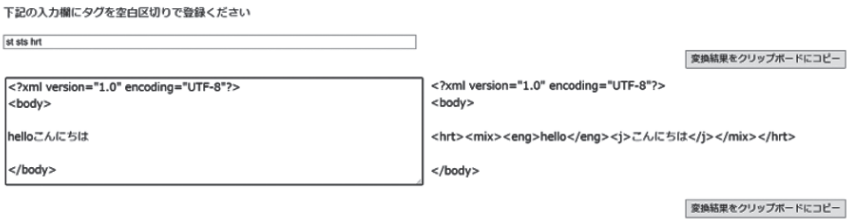

Figure 3. Tagged text displayed in XML tag generation space for “helloこんにちは”

4. Copy tagging results to the clipboard

After feeding the transcript in box 2 followed by adjusting the speaker tags in box 3 (Figure 2), we can copy and paste the tagged transcripts to edit and compile the full-text classroom corpus in the following manner:

1) Press the “copy conversion result to clipboard” button (placed both on the upper and lower right) as indicated by box 4 (Figure 2), to retain the copied information.
2) Paste the copied information into a text editor.

4. Pilot Study: Compiling Classroom Corpora Using the CCT

This section discusses the pilot study conducted to test the CCT’s reliability as a tagger by compiling a mini classroom corpus. The study aims to examine 1) whether the number of vocabulary items in the tagged transcripts (i.e., transcribed classroom utterances tagged by the CCT) is identical to those contained in the manually tagged transcripts, and 2) how the tagging outcomes of the CCT can be utilized.

4.1 Materials and Methods

Five student teachers (four juniors and one senior) at a national university in Japan participated in the pilot test. They signed a consent form showing their willingness to share their English lesson transcripts for the purpose of testing the precision of the tagging process by the CCT. Figure 4 shows the test procedure. The

first two steps involved manual tagging of the classroom transcripts (Step 1) and instantaneous tagging of the same transcripts with the CCT (Step 2). Figure 5 illustrates the tagged samples.

1. Tag transcripts manually in XML format; tag set: (speaker; t, s, ss/ language; mix, eng, j)
2. Tag the same transcripts by the Classroom Corpus Tagger (CCT)
3. Correct tagging errors with an XML document editing software.
4. Extract instructor (student teacher) English utterances using XSL transformation (XSLT).
5. Compare the CCT extraction and the manual instruction.
6. Survey the participant reflections.

Figure 4. Procedure of testing manual and the classroom corpus tagger (CCT) tagging

Raw transcripts [English translation]	➡	Tagged transcripts
-Single language use interaction by the teacher and the student		-Single language use interaction by the teacher and the student
T: そういうとき何するためのもの、じゃあナイフって。[So, what is a knife for?]	⇨	<t><j>そういうとき何するためのもの、じゃあナイフって </j></t>
S: 切る [To cut things.] T: うん、切る。 [Yes, to cut things.]	⇨	<s><j> 切る </j></s> <t><j> うん、切る </j></t>
-Mixed language use by the teacher T: だから [So,] something to cut.	⇨	-Mixed language use by the teacher <t><mix><j> だから </j><eng> something to cut </eng> </mix></t>

Figure 5. Tagging samples

Following the first two steps for tagging classroom transcripts, the tagging errors detected by Editix[3)], an XML document editing software, were revealed in the third step. The manual tagging (Step 1; Figure 4) was prone to XML grammar errors, while the CCT tagging (Step 3; Figure 4) resulted in no such errors. Table 1 illustrates the summary of errors that appeared during manual tagging. The manual tagging resulted in more end tag errors than start tag errors, except for the start tag, *eng* in the transcript M2 for a good reason. Manual tagging is likely to cause errors, and Table 1 suggests that human coders are more likely to miss end tags due to inattention to attaching an end tag, which does not occur in the CCT tagging.

Table 1. Error summary of manual tagging

Manually tagged transcript	Tags (start tag, /end tag)													
	t	/t	s	/s	ss	/ss	mix	/mix	eng	/eng	j	/j	cd	/cd
M1	0	6	0	3	0	0	1	5	4	10	1	3	-	-
M2	0	2	0	0	0	0	0	2	528[a]	5	1	1	-	-
M3	0	0	0	0	0	0	1	0	0	0	0	0	-	-
M4	1	1	0	3	0	5	0	0	1	7	1	4	0	37
M5	0	1	0	0	0	14	1	10	0	5	1	5	-	-
Sum	1	10	0	6	0	19	3	17	633	27	4	13	0	37

Note: t = teacher; s = student; ss = students; mix = mixture of English and Japanese in utterances; eng = English; j = Japanese; cd = audio CD; M = Manually-tagged transcript. a. The participant that coded M2 misunderstood the tagging rule, and misplaced </eng> for start tags.

The next step (Step 4; Figure 4) used XSLT to extract the teacher's English utterances. The XPath to reach the teacher's English utterances; <xsl:copy-of select="body/t/eng"></xsl:copy-of>, extracted the utterances. Table 2 shows the extraction summary.

Table 2. XSLT summary: the number of lines of the teacher's English utterances

Transcript ID	Tagged by		Discrepancy (CCT-Manual)
	Manual	CCT	
1	266	202	-64
2	342	340	-2
3	73	62	-11
4	350	271	-79
5	144	117	-27

Note: XSLT = XSL transformation. CCT = the classroom corpus tagger.

As Ohashi, Katagiri and Oshikiri (2021) implied, the results revealed that more utterances could be retrieved through manual tagging than through CCT tagging. However, the manual tagging did not necessarily encompass the CCT tagging. The XSLT results from either one of the two tagging methods contained lines that did not appear in the other tagging method. Such lines were complementarily distributed in the XSLT results. Table 3 shows the summary of the complementary distribution quantity of the two tagging types.

Table 3. Summary of the complimentary line quantity extracted by XSLT

Transcript ID	Tagged by		Discrepancy (Manual + CCT)
	Manual	CCT	
1	73	7	80
2	6	1	7
3	13	1	14
4	79	0	79
5	31	3	34

The complementary lines, those not appearing in the counterpart tagging method, turned out to be of three types. Table 4 shows samples based on discrepancy types.

Table 4. XSLT extraction discrepancy due to tagging error types

Type	Tagging discrepancy sample
1 (Double-byte non-literal English characters)	T: It's Wednesday. CCT: <t><mix><eng>It</eng><j>'</j><eng>s Wednesday.</eng></mix></t> Manual:<t><eng>Yes, it's Wednesday. </eng></t>
2 (Single-byte characters for transcribing Japanese proper nouns)	T: He is XXX YYY. CCT: <t><eng>He is XXX YYY.</eng></t> Manual: <t><mix><eng>He is </eng><j> XXX YYY. </j></mix></t>
3 (Mis-tagging)	T: １グループで 1 eraser [Translation: One group can have one eraser.] CCT: <t><mix><j> １グループで </j><eng>1 eraser</eng></mix></t> Manual: <eng> １グループで 1 eraser</eng>

Note: XXX = a Japanese first name. YYY = a Japanese family name.

Type 1 tagging discrepancy resulted from the use of double-byte characters for apostrophes and the use of "smart/curly" double quotation marks. Type 2 resulted from different treatments of Japanese proper nouns, such as a person's name, being transcribed as English utterances. The transcriber took Japanese proper nouns to be Japanese, and thus, manually tagged them with <j> and </j>. However, the CCT tagged the Japanese proper nouns with <eng> and </eng>, as the CCT recognized the names represented by single-byte characters. The final discrepancy type, Type 3, resulted from tagging errors caused by manual tagging (Table 4). The error tagging example contains

a Japanese utterance, 1 グループ, indicating one group, with an English utterance, "easier", adding to the manual English tagging count. The manual coder should have initiated the tagging with <mix> followed by <eng>.

The three error types (Table 4) resulted from the use of double-byte character (Type 1), orthographical representation of L1 proper names (Type 2), and by missing tags, mostly end tags (Type 3). However, the discrepancies were narrowed down when we considered (1) the Type 1 error mixed utterances to be English utterances, as such mixed utterances contained nothing but English, and (2) the Type 3 error English utterances to be mixed utterances, (Table 5).

Table 5. Modified XSLT summary: the number of lines of the teacher's English utterances

Transcript ID	Tagged by		Discrepancy (CCT – Manual)
	Manual (initial count – Type 3 error English count)	CCT (initial count + Type 1 error mix count)	
1	263 (266-3)	271 (202+69)	8
2	342 (342-0)	342 (340+2)	0
3	73 (73-0)	71 (62+9)	-2
4	347 (350-3)	346 (271+75)	-1
5	142 (144-2)	146 (117+29)	4

Note: XSLT = XSL transformation. CCT = the classroom corpus tagger.

The errors were attributed to the CCT's tagging, not manual tagging. As for Type 2 errors, an explicit rule for encoding Chinese, Japanese, Korean (CJK) proper nouns can prove helpful in avoiding errors. For example, the CCT users can avoid tagging errors by consistently using Unicode CJK characters in encoding CJK proper nouns, instead of encoding them using single-byte alphabetical characters. Thus, tagging of transcripts by use of CCT can yield classroom corpora with reliable speaker and language tagging.

4.2 Participants' Reflection Survey

We procured information regarding the participants' reflections on the technical issues of CCT and their views on the potential for reflective practice in the development of teacher talk in the classroom. In the section below, we first address the participants' thoughts on the technical issues of CCT, after which we describe the CCT's potential to

train preservice English language teachers.

4.2.1 Advantages of the CCT

The survey first examined the CCT's technical issues. The participants completed a questionnaire on their impressions while engaging in the two tasks; manual tagging and tagging by CCT. The responses revealed that, according to the participants, the CCT is more advantageous than manual tagging in terms of tagging time, the cumbersomeness of nesting XML tagging structure, and the consistency of XML format. The participants reflected that manual tagging took a long time and was quite a troublesome task (participants 1, 2, and 4). Some participants also experienced difficulty locating exactly where to embed the <mix> tags in the nested structure within a single speaker turn (participants 1 and 5).

All the participants testified that tagging through CCT was far quicker than manual tagging, especially the language tags. However, they were bothered when they needed to select the speaker tags. This was partly because the speaker default values were "st," "sts," and "hrt," which forced them to add their own original speaker tags. The added tags involved more clicking to select the intended speaker tags. The individuals doing the tagging were expected to place the appropriate speaker tags in such cases (participants 4 and 5). Besides manual selection, CCT reduced the overall workload.

4.2.2 CCT's Potential for Reflective Practice

The survey also investigated whether the participants could utilize the CCT for their reflective practice. This sub-section discusses the potential use of reflection on the tagged transcript data, although reviewing the video-recorded data can contribute to reflective practice as well. The participants re-evaluated their English lessons by revisiting them again while tagging the classroom utterances. The questionnaire focused on the preservice teachers' reflections on the quantitative and qualitative use of the target language (English), instead of their first language (Japanese). The questionnaire also allowed the participants to express their views on any of the aspects which could not be covered by the survey.

By observing the use of target languages (L1 and L2), on the one hand, four out of five participants reported that they resorted to their first language, Japanese (L1),

rather than the target language, English (L2; participants 1, 2, 3, and 5). Some realized that they preferred speaking L1 when they supplemented the explanation in L2 (participants 1 and 5). On the other hand, one remarked that her students had more difficulty in understanding L2 grammar explanations (participant 5). This participant reflected that she had to switch codes between L2 and L1 by judging the students' reactions.

By observing the CCT tagging, the participants obtained insights into the quantity and quality of their L2 utterances. The majority of participants reflected that they could have spoken more while speaking in L2 (participants 1, 2, 3, and 5). One remarked that the preservice teacher would have spoken less, thus allowing the students more opportunities to speak L2 (participant 4). Another participant suggested that the preservice teacher refined the quality of classroom talk, despite the adequate L2 exposure toward the students during the lesson (participant 1). For example, the teacher would have used easier words and expressions besides being more concise (i.e., used terms less frequently). Another participant commented that the preservice teachers should be more careful while using articles and make a proper distinction between singular and plural nouns when they refer to nouns (participant 2). Another participant confirmed that the teacher's L2 pronunciation and grammar were correct (participant 5).

With respect to the participants' overall impressions of CCT after tagging their classroom transcripts, they were able to improve their understanding of the teacher talk, regardless of the use of language (L1, L2, and L1–L2 mixed language use). The elaborate and explanatory language of the preservice teachers when explaining L2 grammar and language tasks was the first to be noted. Two participants commented that preservice teachers unnecessarily explained the lesson points, which caused unnecessary confusion and resulted in a reduction of the activity time (participants 1 and 5). The participants benefited from observing their lesson transcripts that came out with the tagging. The tagged transcripts helped them understand the patterns of teacher talk, pronunciation, and grammar mistakes made while using L2. One participant mentioned that the understanding would lead to improvement in the classroom teacher talk (participant 5).

5. Discussion and Conclusion

This section summarizes the paper by illustrating the CCT's advantages, its utility in compiling classroom corpora, and its potential application in teachers' reflective practice.

5.1 CCT Advantages and Limitations

The CCT can be used as a tool for compiling classroom corpora that can contribute to the improvement of language classes through reflective practices. The CCT tagging replaces the time-consuming manual tag-attaching task, which facilitates researchers' and teachers' endeavors to compile classroom corpora.

This study highlights the three ways in which the CCT can assist potential users. These significant benefits of using CCT were highlighted by this study:

1) It performs time-consuming tag-attaching tasks with more accuracy in less time.
2) It prevents errors that are likely to occur as a result of manual tagging.
3) It appends more speaker tags than can be attached to the utterances, based on the class environment.

Therefore, the CCT is advantageous as it not only lessens the labor but also the time required for the compilation of classroom corpora once the CCT is supplied with the classroom transcripts. The CCT can assist in encouraging researchers and teachers to increase the use of classroom corpora, which will eventually facilitate teachers' reflective practice, besides providing more opportunities to corpus researchers.

Extracting specific utterances with tags attached by CCT, such as teachers' English utterances extracted by <teacher><eng>, or students' English utterances tagged as <student><eng>, CCT enables us to count the tokens of both teachers' and students' Japanese/English utterances. Tagged classroom corpora created by CCT provide the following information as the source of reflection:

1) Linguistic phenomena such as type and the extent of the language used in class.

2) The ratio of both teachers' and students' talk.

Teachers can use quantified utterances such as types and tokens gained from corpora to compare linguistic phenomena, including the diverse vocabulary usage levels, among different classes and examine the effectiveness of their input.

We are presently in the initial stage of developing CCT, and are aware that we need to expand the current tag set further, to encompass a higher hierarchical classroom discourse structure. As mentioned above, the participants stated that the relatively rich information tagged text allows for qualitative analyses in addition to quantitative comparison among classes. For example, qualitative observation of tagged utterances can examine the type or amount of teacher's talk that facilitates students' English production. Additional tags categorizing different input types are also likely to help investigate the effect of each input type that contributes to students' participation. These are some of the aspects that differentiate the CCT data from video-recorded materials.

As a rule, the CCT assigns <j> to double-byte characters and <eng> to single-byte characters. Therefore, <j> is displayed even if you enter other double-byte character languages, such as Chinese and Korean. Similarly, as long as it is a single-byte character, such as French and German, the tagging result will be displayed as <eng>. Possible tagging errors that occurred could have been avoided by controlling the transcribing method by a text editor. CCT users must note that the CCT is a software program exclusively designed to tag Japanese and English characters. This means that the CCT still requires improvements; which is a limitation of this study that should be addressed in future work.

Further improvements should consider following the text encoding initiative[4)] coding guidelines for speech transcriptions. Multiple attributes in speaker tags should be used to describe utterances' of speakers, and their use of language in tagging. One example might be to encode <sp id="1" who="teacher_1" type ="complete" lang="eng">Hello.</sp> instead of <t><eng>Hello.</eng></t> to specify a speaker, and the language use in one single tag.

Another limitation, but not the last, is that error counting the manual tagging may be called into question. In the pilot study, the five participants individually tagged five different transcripts. We could have obtained a more precise tagging error count caused by human tagging if the five participants had tagged the other four transcripts instead

of just one.

5.2 Application of Reflective Practice

As suggested by existing reflective practice literature, the reflective practice of the participants fostered their critical awareness of the need to improve effectiveness and aided in the development of their classes. The responses to our survey revealed its significance in critical reflection, which was evident in the positive comments. Participants confirmed that engaging in reflective practice through corpus compilation guided the teachers to evaluate themselves and identify their weak points. These findings conform to the findings of previous studies with regard to the benefits of the reflective cycle, in which educators observe, analyze, and develop action plans (e.g., Zwozdiak-Myers, 2012; Mann & Walsh, 2017).

Transcribed and quantified data, gained through the compilation of a classroom corpus, can prove to be a useful medium for prompting reflections for language teachers. Walsh (2013) mentioned that improving classroom interactions through reflective practice can prove to be an effective means for professional development. Thus, the CCT can assist teachers, especially preservice teachers, in corpus building that can provide valuable evidence for their reflective practice, eventually facilitating the effective development of their classes.

Mann and Walsh (2017) also pointed out that reflective practices require appropriate tools for collecting evidence to reflect upon. The CCT can serve as one of those tools, because it enables teachers to compile classroom corpora more easily, compared to other tools, and eventually helps to quantify utterances made by the teachers and students, thereby enriching reflective practice through observation of quantified classroom data. The results of the survey discussed in the preceding section substantiated this. The participants remarked that they were able to reflect on their language use with regard to the L1–L2 ratio, and L2 linguistic errors, such as grammar and pronunciation identified in teacher talks. The CCT provides easy access to numerical values of the transcribed text. The numerical information presents a clue that helps in a better choice of language or instruction in class. Furthermore, such data can supplement video-recorded materials in reflective practice.

This study demonstrates the advantages of CCT such as reduced painstaking manual tagging time required for transcription and also reduced errors associated with

the airtight start-end XML tag nesting structure. The classroom corpora complied in this manner could potentially provide the opportunity to the teachers for reflective practices.

CCT usage for the compilation of classroom corpora creates a pedagogical sequence of initial teaching, followed by reflection (reflective practice), and teaching again after reflection, when improvement will be expected. This primarily satisfies the need for classroom-related research, and also facilitates the professional development of language teachers. For example, quantified classroom data gathered through corpora quickly shows the number of vocabulary items included in tagged utterances; this can be used by researchers to compare different classes, enabling teachers to reflect on the improvement required in their teaching.

Expanding the use of CCT tagging, for example, to include the interactions and different tasks, will allow teachers to contemplate their classroom interactions more deeply and provide a wider opportunity for deep reflection. Such teachers' reflection through quantification of their utterances in a classroom will increase their awareness of what is needed to improve their classes. It will not only facilitate scaffolding but will also provide a more refined language exposure to their future students.

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Notes

1. The CEFR-J Wordlist Version 1.6. Compiled by Yukio Tono, Tokyo University of Foreign Studies. Retrieved from http://www.cefr-j.org/download.html#cefrj_wordlist on 07/03/2021.
2. CCT download is available at: https://drive.google.com/file/d/1uD0MAwhiub1miKt1n-_qSw-Mmzira9Ek/view?usp=sharing
3. We used EditiX XML Editor 2015 for macOS.
4. Text Encoding Initiative guidelines (2014), 8.3 Elements Unique to Spoken Texts, *P5: Guidelines for Electronic Text Encoding and Interchange*, available at https://

tei-c.org/release/doc/tei-p5-doc/en/html/TS.html

References

Alger, C. (2006). 'What went well, what didn't go so well': growth of reflection in preservice teachers. *Reflective Practice, 7*(3), 287-301. https://doi.org/10.1080/14623940600837327

Anthony, L. (2015). TagAnt (Version.1.2.0) [Computer Software]. Tokyo, Japan: Waseda University. Retrieved January 28, 2021, from www.laurenceanthony.net/software/tagant/

Bailin, S., Case, R., Coombs, J., & Daniels, L. (1999). Conceptualizing critical thinking. *Journal of Curriculum Studies, 31*, 285-302. https://doi.org/10.1080/002202799183133

Biber, D. (2010). Biber Tagger [Computer Software]. Flagstaff, AZ: Northern Arizona University.

Boud, D., & Walker, D. (1998). Promoting reflection in professional courses: the challenge of context. *Studies in Higher Education, 23*(2), 191-206. https://doi.org/10.1080/03075079812331380384

Harkin, J. (2005). Fragments stored against my ruin: the place of educational theory in the professional development of teachers in further education. *Journal of Vocational Education and Training, 57*(2), 165-179. https://doi.org/10.1080/13636820500200281

Katagiri, N., & Kawai, G. (2016). Designing XML schema for classroom discourse visual representation through XSLT. *Journal of Hokkaido University of Education (Humanities and Social Sciences), 66*(2), 1-16.

Katagiri, N., & Ohashi, Y. (2017). Analyses of Non-Native Preservice English Teacher Verbal Interactions at Japanese Middle Schools. *International Journal of Language Learning and Applied Linguistics World 15*(4). 1-16.

Katagiri, N., & Ohashi, Y. (2018). Developing Spoken Corpora of Non-Native English Teachers to Assist in English Classroom Interactions. *Official Conference Proceedings of the IAFOR International Conference on Language Learning*, 45-62.

Mann, S., & Walsh, S. (2017). *Reflective Practice in English Language Teaching*. Routledge.

McEnery, T., Xiao, R., & Tono, Y. (2006). *Corpus-Based Language Studies*. Routledge.

Ohashi, Y. (2015). A Corpus-based study on the relationship between the languages used in junior high school classrooms and learners' uptake. *KATE Journal, 29*, 29-42.

Ohashi, Y., & Katagiri, N. (2016). The effects of explicit instructions observed in teacher transcripts and student impression remarks in elementary school. *HELES Journal, 16*, 3-18.

Ohashi, Y., Katagiri, N., & Oshikiri, T. (2021). Developing Classroom Corpus Tagger: A Spoken Language Tagger to Compile Classroom Corpora. *Proceedings of the JAECS 47th Conference* 2021, 43-48.

O'Keeffe, A., McCarthy, M., & Carter, R. (2007). *From Corpus to Classroom*. Cambridge University Press.

Pollard, A. (2005). *Reflective Teaching*. London: Continuum.

Sinclair, J. M., & Coulthard, M. (1975). *Towards an Analysis of Discourse: The English Used by Teachers and Pupils.* Oxford: Oxford University Press.

Text Encoding Initiative. (2014). 8.3 Elements Unique to Spoken Texts, *P5: Guidelines for Electronic Text Encoding and Interchange*. Retrieved from https://tei-c.org/release/doc/tei-p5-doc/en/html/TS.html

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.

Walsh, S. (2013). *Classroom Discourse and Teacher Development.* Edinburgh University Press.

Zeichner, K. M., & Liston, D. P. (1996). *Reflective Teaching: An Introduction.* Mahwah, N.J: Lawrence Erlbaum Associates.

Zwozdiak-Myers, P. (2012). *The Teacher's Reflective Practice Handbook*. *Becoming an Extended Professional Through Capturing Evidence-informed Practice.* London and New York: Routledge.

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