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Self-correction Profiles of L2 English Learners: A Longitudinal Multiple-Case Study

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Abstract

Noticing is the necessary attention that learners give to language in order to learn (Schmidt, 2001). Self-correction is evidence of noticing and a tool for language learning. Previous research has suggested that speakers focus on meaning during speech production, and language learners likely need an opportunity post-production to correct form-focused corrections. Some research has found that self-initiated self-correction improves future language performance and that practice improves learners' ability to self-correct. Yet, little is known about how learners use this tool across tasks and over time. This multiple case study describes the self-correction profiles of four adult Arabic L1 learners in an intensive English program. The pedagogical task included a two-minute monologic speech and subsequent correction activity, repeated seven times over three academic semesters, to examine how self-correction might differ during-production from post-production and change with increasing proficiency. We examined three types of self-correction: during-production corrections, abandoned utterances, and post-performance correction notes, analyzing correction focus and outcome. This triangulation revealed different noticing profiles, challenging existing assumptions about language performance. We suggest a multidimensional framework of self-correction: attempt frequency, timing, correction focus, outcome, and change to study language learner self-correction.

Keywords: oral language, self-initiated self-correction, noticing, form-focused, meaning-focused

Introduction

Noticing has been described as the necessary attention that learners give to language in order to learn (Schmidt, 2001). Mackey (2006) operationalized noticing in speaking tasks specifically "as a learner's report indicating a mismatch between the target language form and the learner's non-target-like production or comprehension" (p. 413). In classroom contexts, one goal has been to increase the learner's ability to notice differences (e.g., Swain, 2000) with the expectation that "attended learning is far superior" (Schmidt, 2001, p. 3). Self-correction, as an observable behavior, has been considered evidence of the internal process of noticing or monitoring (e.g., Camps, 2003; Kennedy & Trofimovich, 2010; Kormos, 1999; Mennim, 2003; Mennim, 2007; Smith, 2008). In fact, some research has found that self-initiated self-correction is common (Buckwalter, 2001) and leads to increased modified output (Shehadeh, 2001).

Pica (2008) stated that "…learners' own production can serve as a resource for evidence, as well as a mechanism for important learning processes" (pp. 11-12). Self-correction has been found effective in poster presentations (Stillwell et al., 2010), immediate re-speeches (McCormick & Vercellotti, 2013), and future presentations (Mennim, 2007). Therefore, the motivation to investigate student self-correction is well-founded. This study describes four adult learners' self-correction behavior over three consecutive semesters in an Intensive English Program (IEP) during a speaking task which incorporated a self-correction component. The longitudinal focus on learners' self-correction and the variety of self-correction types studied in this research provide a unique perspective on student self-correction. This article includes description and analysis of all self-corrections made during the speech and post production. After a review of the related previous findings, we detail the methodology of this study. The results are given by participant with patterns across learners described in the Summary and Discussion, and the paper concludes with some implications of the study, limitations and suggestions for future research.

Literature Review

Timing – Post-Production and During-Production

Post-production self-correction tasks have been given to language learners in part because they permit the necessary time to recognize gaps between the performance and the target language norms (Lynch, 2007). With additional processing time, learners can focus on form (Sauro, 2009). Several studies (e.g., Lynch, 2001; McCormick & Vercellotti, 2013; Mennim, 2003; Stillwell et al., 2010) have used a transcription task to facilitate post-production corrections after speaking tasks. Mennim (2003) analyzed the corrections that English language (L2) learners, working in small groups, made after transcribing their practice presentation. Lynch (2001) studied post-productions corrections by pairs of English L2 learners after reviewing the student-made transcript of a dialogic classroom activity. Stillwell et al. (2010) noted correction types made by pairs after a dialogic poster presentation task. McCormick and Vercellotti (2013) studied post-production individual self-corrections after a transcription task of recorded topic-based monologues.

In addition to post-production correction, learners may also monitor their language as they speak, comparing ongoing production with interlanguage, resulting in self-corrections and

abandoned utterances. Levelt (1983) used the term self-repair to describe self-correction during speech production and stated that a speaker's self-monitoring could happen at two stages, before and after articulation. Self-monitoring of inner speech, that is before articulation, has been called covert repair (Kormos, 2000; Smith, 2008), while an overt repair is an utterance that has been articulated and then changed (e.g., Lambert, Kormos, & Minn, 2017). While covert repairs can be clearly identified in the language itself, overt repairs cannot. Post-articulation corrections made during the speech activity have sometimes been called "error repair" (Kormos, 2000) or "retracings" (MacWhinney, 2000). Specifically, Foster, Tonkyn, and Wigglesworth (2000) defined a self-correction as a speaker's identification of "an error either during or immediately following production and stops and reformulates the speech" (p. 368). Although overt self-correction is often toward a more standard-like form, these "corrections" or "repairs" may be incorrect, away from a native-like performance (Buckwalter, 2001; MacWhinney, 2000; McCormick & Vercellotti, 2013).

Corrections are not the only type of during-production self-repair (Buckwalter, 2001). Monitoring of one's own speech may result in abandoned utterances (Crookes, 1991; Levelt, 1983) where a speaker abandons the utterance before completion and begins a new idea. Utterances where the original message is abandoned and replaced by a different message have been called "abandonments" (Kormos, 2000), "false starts" (Foster, Tonkyn, & Wigglesworth, 2000) and "restarts" (Verhoeven, 1989).

Other production phenomena such as repetitions and pausing (Riger, 2003) and partially-articulated words (Kormos, 2000) have been theoretically linked to noticing of errors before and during articulation, but they are not clearly observable as a repair. Moreover, these speech features can serve other linguistic functions. For instance, repetitions in speech may act as a fluency device to restore continuity after a disruption (Clark, 2002). Whereas repetitions and pauses may be connected with fluency and pragmatics, both (overt) corrections and abandoned utterances unambiguously represent noticing during production.

Correction Focus – Post-Production and During Production

Along with the timing of self-correction, researchers have explored what learners choose to correct and categorized data by correction focus. Language learners in instructed contexts tend to focus on form (Kormos, 2006). Mennim (2003) stated that the English L2 learners in his study made grammatical corrections, lexical changes, pronunciation comments, and expansions on context during a post-speech noticing task. Lynch (2001) sorted corrections made by English L2 learners into five correction foci: grammar, lexical, editing, expansions, and mixed, with the results showing about a third of the corrections were grammatical, followed by edits, expansions, and combination corrections, with few lexical changes. Stillwell et al. (2010) used the same categories and reported the same ranking for each correction focus. In their data, the grammatical corrections accounted for 48% of the self-corrections. McCormick and Vercellotti (2013) studied post-production corrections and found an even higher percentage of self-corrections (58%) were grammar-based, followed by general comments, pronunciation-focused corrections, lexical changes, and fluency-based comments. It may be that for certain corrections learners need opportunity and time afforded

by a post-production task to notice the mismatch between the produced form and the target-like form.

Whereas post-production tasks give learners time needed to notice, during-production corrections require monitoring of the output simultaneously with speaking. This increased cognitive load might impact the correction focus. Mojavezi and Ahmadian (2014) conclude that L2 speeches are more likely to be meaning focused. In a study with spoken monologues, Fathman (1980) found that learners self-corrections were meaning-based, with lexical corrections most common. Kormos (2000) investigated the production of several foci of self-correction in dialogic data and reported grammatical corrections were most frequent, followed closely by lexical correction while phonological error corrections were infrequent. Kormos, however, clarified that the rephrasing corrections (which were coded separately from error corrections) were also lexical-focused so that most corrections were meaning-focused. Liu (2009) investigated Chinese L1 English L2 learners' self-corrections during semi-spontaneous monologues using similar categories and found that intermediate learners made mainly form-focused morphological corrections (58%), followed by lexical (20%) and pronunciation (8%). The remaining tokens in Liu's data were inaccurate repairs and were not coded by correction focus.

Overall, previous research has found that post-production self-corrections tend to focus on form, specifically grammar, while during-production corrections focus on meaning, specifically, lexical items. There are few studies which have compared the focus of both post-production and during-production corrections made by the same language learners. One exception, Smith (2012), attempted to compare self-correction captured during- and post-production, but that study used pre-determined categories based on the recasts given to the learner rather than the learner's behavior to categorize the self-correction data.

It should also be noted that in the reviewed studies, the self-correction attempts of all learners were combined, which describes group behavior. Aggregate data may not represent the behavior of individuals within the group (Skehan, 2009). Therefore, case studies are important to add to our understanding of individual self-correction during language development.

Variation in Self-Correction

Self-correction has been associated with improved L2 performance (McCormick & Vercellotti, 2013), but research has also shown that second language (L2) learners vary in their ability to self-correct. It seems quite plausible that proficiency level influences frequency of self-correction attempts. Camps (2003) stated that "…learners who make a large number of errors possess a more limited knowledge of the target language, and therefore are not as well prepared to notice errors and correct them" (p. 239). Van Hest (1996), however, found that advanced learners made significantly fewer during-production corrections. In other words, we might expect that low proficiency learners make many errors but cannot correct them, while high-proficiency learners do not often self-correct, perhaps because they make fewer errors.

Proficiency level may also influence the type or focus of the self-correction. Kormos's (1999) summary of L2 self-correction research noted lower-proficiency students focus on linguistic forms, while more advanced students focus on content and discourse level repair. Mennim (2003) suggested that more proficient students have the freedom to focus on form as well as expansion of content. Stillwell et al. (2010) concluded that self-correction practice improved the students' ability to accurately identify and correct errors. Further, task strategies vary according to proficiency (Riger, 2003). Accordingly, we might expect that correction focus changes or expands with increasing language proficiency and that self-correction outcome should be more target-like with increasing proficiency, either from the increased language knowledge or increased skill from practice. Although the difficulty of grammatical construction does not seem to hinder the number of attempts or the outcome (success) of self-initiated self-corrections (Sato & Takatsuka, 2016), other factors may influence self-correction behavior. Language background (Fathman, 1980) and language performance style (Seliger, 1980) may influence the frequency and focus of self-corrections. Mojavezi and Ahmadian (2014) found that L2 language learners with high working memory made more corrections, including more form-focused corrections. In addition, Mennim (2003) stated that learners may have "individual agendas" which influence student performance on correction tasks, for example, with some focusing more on language forms and others on content. Similarly, Coughlan and Duff (1994) pointed out that participants may perform different activities even given the same task. The findings suggest that self-correction varies by proficiency level, task, and learner.

These studies, however, reported on self-correction data at a single point in time or were cross-sectional rather than longitudinal. To capture self-correction broadly, multiple observations are necessary to build a more complete understanding learners' self-correction behavior. One study, Mennim (2007), analyzed noticing behavior (and speaking performance) at three data points over nine months, but the study focused on improvement in speaking performances of only two students, on a single construction. Little is known about how overall self-correction behavior changes longitudinally within individual learners. Data on self-correction at multiple points across language development are required in order to provide insight into individual factors that contribute to variance in noticing. Kennedy and Trofimovich (2010) have called for more research to illuminate how self-correction is related to language development. This paper, in part, responds to their call. The purpose of this research is to gain greater insight into student self-correction, including attempt frequency, correction focus, and outcome, through the triangulation of self-correction attempts from during-production monitoring and post-production data sources across L2 development.

Methodology

This descriptive, longitudinal, multiple case-study research investigated patterns of self-correction using during-production corrections and abandonments as well as post-production correction notes. The correction focus codes included categories (i.e., vocabulary, grammar, pronunciation, fluency) suggested within the pedagogical activity. When some data did not fit in those categories, we implemented an inductive approach (Ellis & Barkhuizen, 2005) by grouping data by type of language change in the correction to add coding categories.

Participants

The research focused on four participants, chosen for similarity and length of enrollment in a North American IEP. At this IEP, each student was informed of the teaching-research interest of the program, and each participant signed an IRB approved consent form to allow anonymous data to be used for research. Given an expectation of individual differences, we wanted to control for age, first language, cultural background, and initial proficiency (Table 1). The participants were young-adults, two males and two females, with the same first-language (Gulf Arabic) and country of origin (Saudi Arabia) who began the same semester at the low-intermediate level and continued for three consecutive semesters, each performing the speech and self-correction task seven times. All were of average proficiency, within one standard deviation of the mean of all students on the IEP's placement exam for their level, using the Michigan Test of English Language Proficiency (MTELP) converted scores (M = 44.0; SD = 7.1) and the Grammar subsection scores (M = 11.6; SD = 3.5).

Table 1. Participant Demographics and Initial Proficiency Summary

Participant	Gender	Age	MTELP converted	MTELP grammar
1073	male	21	44	14
1077	female	33	46	9
1110	female	28	48	14
1081	male	32	43	10

Data

As part of the IEP's Speaking course curriculum, each student completed a four-step computer-aided self-correction task multiple times during each academic term. During the first step of the activity, after instructions from the teacher and one-minute planning, the student gave a two-minute semi-spontaneous monologue on a given topic. The speeches were semi-spontaneous because students had practiced a variety of topics in class but did not know which of the topics would assigned for the recorded speech, similar to Liu's methodology (2009). All participants spoke about the same topics for the first five speeches, however, in the low-advanced classes, the teachers assigned different topics (Appendix A). During the second step, each student transcribed his/her own speech, with the goal of transcribing exactly what was heard without corrections or omissions following L2 oral data research (e.g., Lynch 2001; 2007). Next, the student used the recording and transcription to make post-production correction notes, following modeled forms. See examples in Table 2. Last, the student recorded his/her post-production correction notes, usually in the suggested form, "I said…I should have said…." Students completed the four steps within a 50-minute class period. The speech recording and the post-production correction notes with its recording were used by the instructors for assessment and feedback.

Data Coding

The speeches were transcribed by a native-speaker, using broad transcription with conventional English spelling with included corrections and abandoned utterances identified. A during-production correction was marked when a speaker changed language in already-produced speech while maintaining the same idea. An abandoned utterance was defined as the participant's ending an utterance before completion to begin a new idea. The data were segmented into sentence-level units for speech, AS-units (Foster, Tonkyn, & Wigglesworth, 2000), and coded for errors. Whenever a during-production correction was made, the last form of the utterance was considered, so utterances with an accurate correction could be error-free. The transcription conventions included: [//] for corrections, [///] for abandoned utterances, < > for a group of words, and [*] for errors.

The students' during-production corrections and abandoned utterances were extracted using CLAN (MacWhinney, 2000) and entered into Microsoft Excel to be coded by correction focus: grammatical, syntax, lexical, pronunciation, or expansion. See Table 2 for definitions and examples. Abandoned utterances were not coded by correction focus because reasons for abandonment were unknown and an error-free utterance could be abandoned (Buckwalter, 2001). Abandoned utterances were simply tallied and included in the self-correction total.

To analyze the post-production data, each self-correction entry was copied into Microsoft Excel and coded by correction focus. Any entry which included more than one correction was duplicated so that each correction could be counted and coded. The post-production corrections were coded using the same categories, as well as two categories not relevant for during-production monitoring: fluency remarks and general comments about the speech. For instance, when a student made style comments (e.g., *I used because many times*) or general comments (e.g., *I don't have a topic*) which were not actually based on an error per se, these were coded as 'comment.' The correction attempts fell into three broad categories: meaning-focused (lexical and expansions), form-focused (grammar, syntax, and pronunciation), and other (fluency remarks and general comments). Some post-production corrections ($n = 6$) described an error in the student's written transcript (e.g., spelling). For instance, one student noted that the word "taxiex" should be "taxies," but the recording revealed no error in the speech, only the student transcript. Such tokens (2.5% of all data) were excluded from analysis.

This study included all attempts at self-correction (e.g., Sauro & Smith, 2010), not just the correct corrections (cf. Liu, 2009), both during-during production and post production. We evaluated the outcome of the self-correction attempt as target-like or non-target, referencing the research transcriptions and the written and recorded post-production notes. Correction attempts were coded as target-like if the change was fully or partially target-like because both indicate that the learner made some language improvement. Abandoned utterances, fluency remarks, general comments (e.g., *I used because many times*), were not coded for correction outcome. Abandoned utterances could not be coded for outcome because, by definition, an outcome is not provided. The fluency remarks and general comments were not coded for outcome because these notes are more subjective. We calculated the overall outcome percentage as the total target-like attempts divided by the number of self-correction attempts, after subtracting the excluded categories from the overall total.

Table 2. Coding of Self-corrections by Language Focus

Focus		Definition	During Production example	Post-production example
Meaning	Lexical	substitution of vocabulary	<try to use> [//] uh try to donate	poor streets> poor communitis
	Expansion	elaboration of the utterance	they have uh enough [//] more than enough uh money	We have …a few buss > in my cuontry we have a few buss
Form	Grammar	morphological or morpho-syntactic change	I get lost <in uh airport> [//] in the airport …	that's will>that will
	Syntax	rearrangement of word order or syntax-focused	<the traffic in my home> [//] uh there's a lot of traffic	the authoriy they > the authority have
	Pronunciation	revision of a segmental or suprasegmental feature	<computer sized> [//] computerized society	perspective>p
Other	Fluency	remark about flow of speech, such as pausing	(n/a)	I pause a lot
	Comment	general remark, often discourse-level	(n/a)	I didn't talk about the disadvantages

Note: (n/a) indicates that these types of self-correction (comments reflecting on the performance itself) were not made during production.

Finally, in order to give context for the frequency of self-correction attempts, we calculated the error-rate of each speech. Error-rate was operationalized as the number of errors per two-minute speech. Following Ellis and Barkhuizen (2005), we considered during-production corrections as a measure of the speaker's orientation to accuracy during performance and not a measure of actual accuracy of the performance (cf. Gilabert, 2007). Although there was some relationship between the number of self-correction attempts and the number of errors in the speech, these measures are not directly comparable. First, as stated, during-production corrections may have resulted in no coded errors in the speech. Second, the abandoned utterances and the fluency and general comments were not directly connected to actual individual errors in the speech.

In sum, the during-production corrections, abandoned utterances, and post-performance correction notes were tallied at each observation, for a total of seven times over three semesters. The during- and post-production corrections were coded by focus, and the outcome of non-comment self-corrections was assessed, forming a self-correction profile for each participant.

Results

Each participant's self-correction behavior is described separately. We first present a summary of the learner's self-correction activity with the number and percentage of during-

production corrections, abandoned utterances, and post-production corrections. Then, we describe the self-correction profiles in terms of:

- attempts and timing of self-correction attempts (during- or post-production)
- correction focus
- outcome of the self-correction
- change in self-correction over time

We report self-correction attempts by correction focus per speech in a table split between during- and post-production corrections, totaled per observation (Obs), and per correction focus. A stacked column chart displays the components that comprise the outcome of self-correction, separated into more target-like and less target-like during-production corrections and more target-like and less target-like post-production corrections, with a line showing the error-rate per speech to approximate the general opportunity for self-correction.

Self-correction Profile -Participant 1073

In total, 1073 made 48 self-correction attempts, of which 58% were during-production and 31% were post-production corrections. 1073 only made five (11%) abandoned utterances, all during the first three observations. As stated in the methodology section, abandoned utterances could not be further analyzed and, therefore, are not included in the tables, which present more details about the participant's corrections.

1073 often made fewer than ten, sometimes fewer than five, self-correction attempts per observation, but the number of self-corrections spiked at Obs1 and Obs5 (Table 3). He made more corrections during-production than post-production. Within his during-production correction attempts, 67.9% were form-focused corrections, and 32.1% were meaning-focused. Post-production, again, the majority (66.7%) were form-focused corrections, 20% were meaning-focused corrections, and 13.3% were other-focused. Of the 29 total form-focused corrections, 22 were grammar-related; specifically, nine were verb-tense focused, and seven of these were clustered in a single observation, Obs5. He made only one fluency remark and one general comment, both in Obs6. (See Appendix B for a breakdown of correction focus details.)

Table 3. During- and Post-production Corrections by Focus over Time for Participant 1073

Timing	Focus	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Total	Percentage
During-production	Meaning	3 1	2 0	0 0	2 0	0 1	1 1	1 0	9 3	32.1% 20.0%
Post-production	Form	2 2	1 1	2 1	1 2	10 3	3 0	0 1	19 10	67.9% 66.7%
	Other	0	0	0	0	0	2	0	2	13.3%
	Total	**8**	**4**	**3**	**5**	**14**	**7**	**2**	**43**	

Note: During-production correction attempts are found in the upper left of each cell; post-production, in the lower right.

1073 had variation in his error-rate, but during most speeches, he produced fifteen or more errors. See Figure 1. At each observation, his self-correction attempts were well below his opportunity to notice, except for Obs5 when his self-correction attempts spiked. Recall that these numbers are not directly comparable as described in the methodology (e.g., during-production correction attempts could lower error-rate). Turning to self-correction outcomes, 78% of his self-correction attempts were coded as target-like. As Figure 1 shows, most of his self-correction attempts were target-like both during- (75%) and post-production (85%).

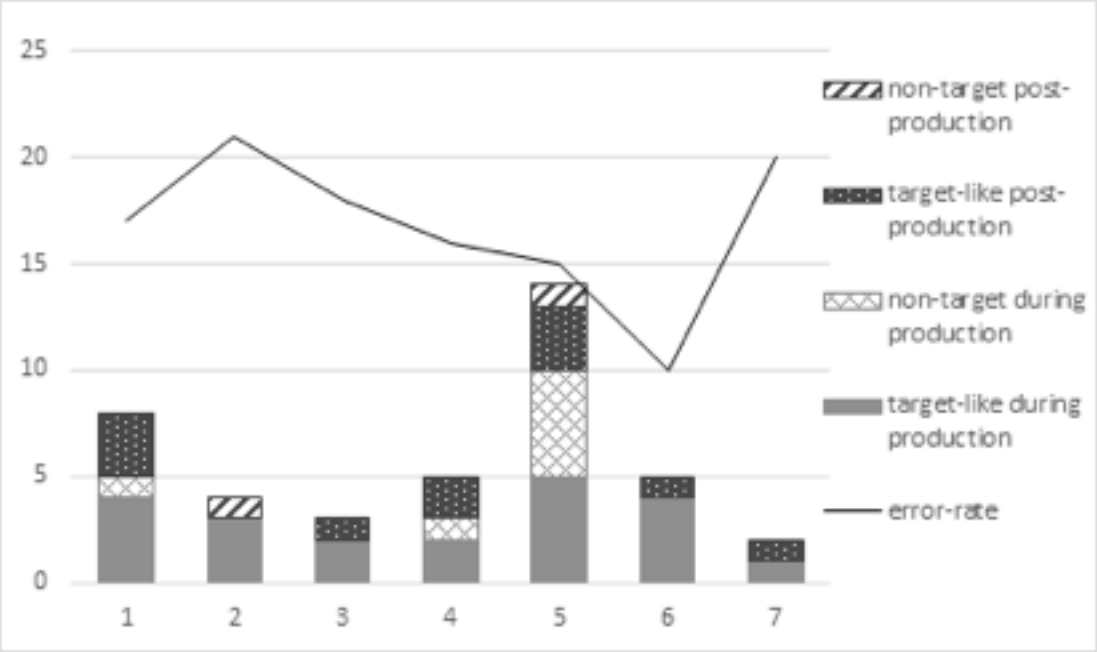

Figure 1. Outcome of Self-Correction for Participant 1073 over Time

Notably, with Obs5, five of his during-production correction attempts were non-target-like. Example (1) from that speech indicates how 1073 was struggling to decide upon correct forms, specifically, the infinitive form in a speech set in the past tense. After producing the incorrect infinitive *to came*, 1073 corrected the verb form to *come here* and then back to the incorrect form *came*.

(1) < I didn'(t) > [//] I don't want to uh enter this university because < I have > [//] I was [*] have ambitious to came [//] < come here > [//] came [*] here in America in the U_S_A

During its post-production correction activity, 1073 returned to the same grammar point and indicated that the infinitive form in Example (1) should be changed to the incorrect form *to came here*.

Overall, 1073's frequency of self-correction attempts was rather low, with both his during-production (with the exception of Obs5) and post-production correction attempts at or below five. Of his few correction attempts, most were form-focused and target-like. There was no

clear indication of change in self-correction behavior for this speaker over time; therefore, we describe his self-correction skill as stable.

Self-Correction Profile -Participant 1077

In total, 1077 made 66 correction attempts, of which 51% were post-production corrections, 44% were during-production corrections, and only 5% were abandonments. 1077's total self-correction attempts ranged from seven to thirteen (Table 4) per observation. She made more post-production corrections at some observations, and more during-production corrections in others. 1077's during-production corrections were form-focused, accounting for nearly 76% of all during-production corrections with few meaning-based corrections. Post-production, 1077 again was form-focused, including grammar (44.1%), syntax-based (17.6%) and pronunciation (17.6%) corrections. With so many form-focused corrections, 1077 addressed a variety of grammar issues: auxiliary use (common during production), verb-tense (more common post-production), copula, subject-verb agreement, plural markers, article use. Interesting, she also made pronunciation corrections, all post-production, tackling challenges such as vowel quality, aspiration, and primary stress. Although she made remarks about her fluency, she did not make any general comments post-production. (See Appendix C for a breakdown of correction focus details.)

Table 4. During- and Post-production Corrections by Focus over Time for Participant 1077

Timing	Focus	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Total	Percentage
During-production	Meaning	0 0	0 1	1 0	1 0	0 0	0 0	2 2	**4 3**	**17.4% 17.6%**
	Form	4 7	4 2	6 2	6 4	1 6	2 5	2 1	**25 27**	**82.6% 58.8%**
Post-production	Other	1	1	0	1	0	1	0	**4**	**23.5%**
	Total	**12**	**8**	**9**	**12**	**7**	**8**	**7**	**63**	

1077 had a consistently low error-rate; to put her error-rate into perspective, she produced less than half of the errors produced by the other participants in this study. Her pattern of self-correction (Figure 2) seemingly followed her need to notice (i.e., her error rate). Overall, 90% of her self-corrections were target-like, and her corrections were target-like most of the time (79%) even during-production. Although six of her during-production corrections were non-target-like, these were often subsequently corrected within the speech. The following example shows 1077 deciding upon the correct present tense singular verb form:

(2) < white cheese **has** > [//] uh **have** [//] &ha [: **had**] [//] white cheese **has** …

All of 1077's post-production corrections were target-like.

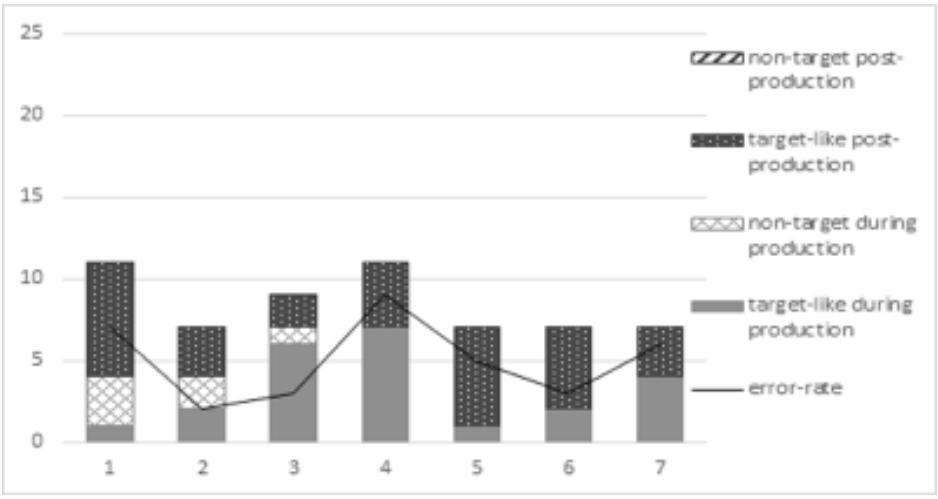

Figure 2. Outcome of Self-Corrections for Participant 1077 over Time

In sum, 1077 had consistently frequent and successful self-correction, attempting corrections during- and post-production. 1077 focused on form, specifically grammar corrections, but she also made multiple pronunciation-focused post-production corrections. 1077 varied in her use of during- and post-production correction across observations, but a pattern did not emerge.

Self-Correction Profile – Participant 1110

In total, 1110 made 44 correction attempts, of which 55% were post-production corrections and 43% were during-production. She made only one abandoned utterance. 1110's total self-correction attempts ranged from three to nine per observation (Table 5). 1110's profile reflects alternations between higher during-production corrections (Obs3, Obs4, and Obs5) and higher post-production correction notes (Obs1, Obs2, Obs6, and Obs7). Most of her corrections were form-focused, both during- (63.2.4%) and post-production (70.8%). (See Appendix D for a breakdown of correction focus details.)

Table 5. During- and Post-production Corrections by Focus over Time for Participant 1110

Timing	Focus	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Total	Percentage
During-production	Meaning	0 1	1 3	1 1	1 0	2 0	1 1	1 1	7 7	36.8% 29.2%
Post-production	Form	0 2	2 1	4 1	2 2	4 3	0 4	0 4	12 17	63.2% 70.8%
	Other	0	0	0	0	0	0	0	0	0.0%
Total		**3**	**7**	**7**	**5**	**9**	**6**	**6**	**43**	

Her during-production form-formed corrections included article changes and auxiliary changes, but verb tense corrections were absent. Example (3) shows 1110 successfully correcting an article during production while not addressing the verb tense error.

(3) couple years ago um I get lost < in uh airport > [//] in **the** airport of New York.

In contrast, half of the form-focused post-production corrections were verb-related, usually tense-related, such as in (4). (Note the verb tense error in the self-correction note when attempting to state I have to say….)

(4) I **get** lost I have to said >> I **got** lost

Broadly speaking, her correction focus was similar during production and in post-production correction notes. She made seven meaning-focused corrections both during-production corrections (36.8% of her during-production corrections) and post-production (29.2% of her post-production corrections). Several of these meaning-based changes involved choosing a more specific lexical item, such as changing *use* to *find* and *have* to *own*, which Kormos (2000) would label rephrasings. She made no fluency remarks or general comments.

1110's frequency of self-correction attempts was similar across observations, seemingly without regard for the errors in the speech, as shown by divergences between total self-correction attempts and error-rate in Figure 3.

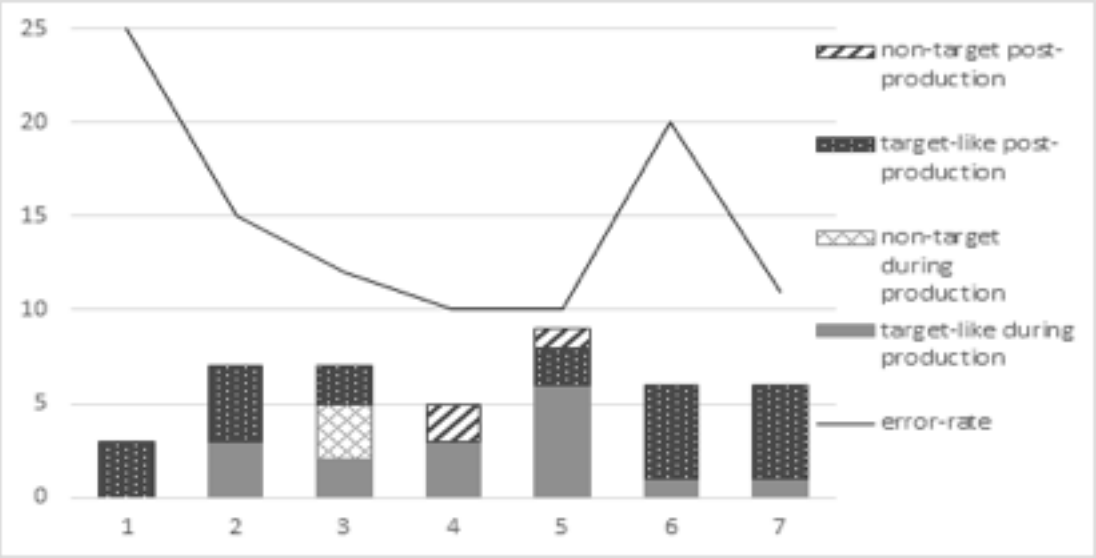

Figure 3. Outcome of Self-Corrections for Participant 1110 over Time

Nevertheless, 1110's self-correction attempts were frequently target-like (86%), but not always. For instance, (5) shows an incorrect post-production correction, changing the verb *get* to the form *got*, perhaps over-generalizing the self-correction shown in (4). In fact, 1110 made five tense-related form-focused post-production corrections on the verb *get* during Obs4 and Obs5, with three of these "corrections" being non-target-like for the context.

(5) thay **have to get** it thay **have to got** it

In sum, 1110 used both during- and post-production corrections as part of her profile, after Obs1. Her corrections tended to be form-focused, and the correction focus was similar during- and post-production. Her corrections, while limited, were generally target-like. 1110's self-correction behavior was stable with relatively few attempts at each observation.

Self-correction Profile – Participant 1081

In total, 1081 made 81 self-correction attempts, of which 60% were post-production corrections, 36% were during-production corrections, and 4% were abandoned utterances.

1081 produced fewer than ten self-corrections at the first three observations and more than ten during the next two observations (Table 6). For the last two observations, both the during- and post-production corrections increased, totaling sixteen and twenty. 1081 often made more corrections post-production.

1081's during-production corrections (n = 29) included many meaning-based correction (55.2%), and these were mainly lexical corrections. Most of these involved replacing prepositions, but also verbs and connectors (e.g., conjunctions, relativizers). The during-production form-based corrections (44.8%) included more noun phrase corrections (e.g., articles, plural markers) than verb corrections (e.g., subject-verb agreement, tense). Post-production, form-focused corrections were most common (46.9%), and verb-focused grammar corrections overtook noun phrase corrections, especially in the later observations. (See Appendix E for a breakdown of correction focus details.)

Table 6. During- and Post-production Corrections by Language Focus over Time for Participant 1081

Timing	Focus	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Total	Percentage
During-production	Meaning	1 0	0 1	1 0	4 0	1 0	4 3	5 1	**16 5**	55.2% 10.2%
Post-production	Form	1 1	1 4	0 1	2 1	2 5	3 2	4 9	**13 23**	44.8% 46.9%
	Other	2	2	4	5	3	4	1	**21**	42.9%
	Total	5	8	6	12	11	16	20	**78**	

1081 created the most post-production correction notes (n = 49), and nearly a third of these were neither meaning-focused nor form-focused, but rather comments about his speech. He made comments about his general use or misuse of language, such as articles (6), and vocabulary (7), rather than attempting to correct specific utterances. Several comments were about the content and presentation (8).

(6) I made some wrong (the a) when I must use them.
(7) I have problem to use vocabulary how and when
(8) I did not orgnize my speech

Overall, only 84% of self-corrections were target-like. 1081's correction outcome might be better understood by considering the first five observations in comparison to the last two (Figure 4). During the first five observations, 1081 made thirteen during-production corrections with eight being target-like (62%). During the last two observations, 1081 made sixteen during-production corrections, with 88% target-like. Correspondingly, the outcome of his post-production corrections increased; at Obs7, his nine form-focused and one meaning-focused post-production corrections were target-like.

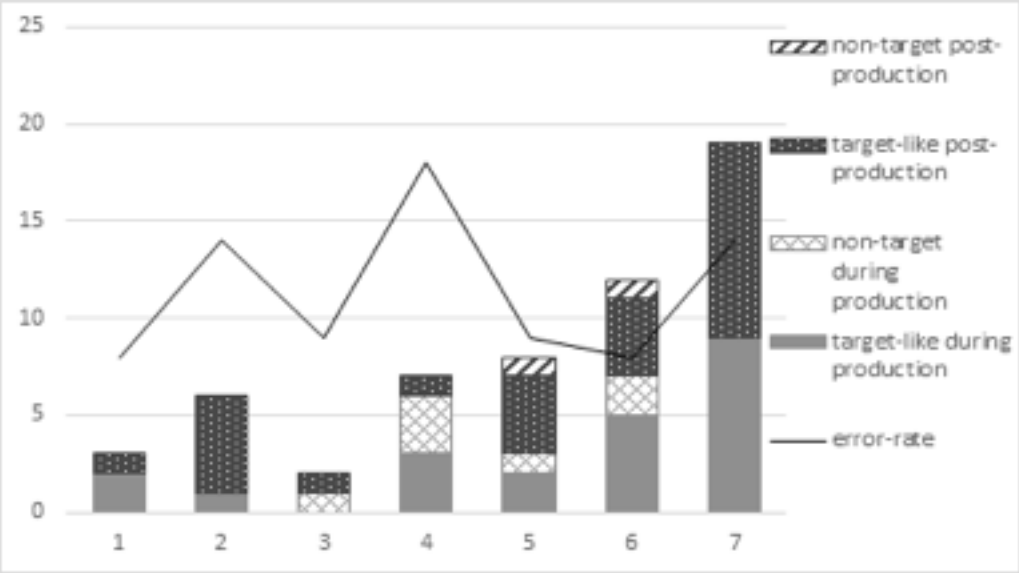

Figure 4. Outcome of Self-Corrections for Participant 1081 over Time

In sum, 1081's profile included more post-production correction notes. Like the others, 1081 made many form-focused corrections post-production, but unlike the other participants, he made more meaning-focused corrections than form-focused corrections during-production. Notably, his self-corrections attempts moved from low frequency to high frequency and from general comments to specific corrections; his self-correction behavior was dynamic.

Summary and Discussion

The focus of this project was to construct a longitudinal self-correction profile of each student based on the triangulation of three noticing behaviors—abandoned utterances, during-production corrections, and post-production correction notes. One commonality was that abandoned utterances were not frequent in this speaking task, and did not strongly factor in these participants' self-correction behavior. The tables and figures in the results section focus on the self-correction performance/skill of each student. Table 7 (which follows) summarizes the results showing the self-correction performance features, revealing that each student's

combination of features represents a different self-correction pattern with varying self-correction attempt frequency, timing, correction focus, and outcome.

First, the study found different profile characteristics in the frequency of self-correction. 1073 and 1110 made few self-corrections throughout the study, and whereas 1110's self-correction was consistently low at each opportunity, 1073 had even fewer self-corrections with a spike only at Obs5. These findings, particularly regarding 1073, may exemplify Camps's (2003) conclusion that error-prone students have difficulty self-correcting. In contrast to the low attempt frequency students, 1077 consistently made many self-corrections, particularly focusing on form, commenting on many errors, despite having relatively few performance errors. 1077's post-production corrections illustrated a consistent engagement in the task. Interestingly, 1081 showed a steep increase in self-correction attempts over time, perhaps reflecting a growing self-correction skill from the repeated practice, as suggested by Stillwell et al. (2010).

Second, in addition to variation in frequency of self-correction attempts, the students' profiles varied with regard to timing. 1073 consistently utilized more during-production corrections than post-production corrections (i.e., during-production dominant) while 1081 utilized more post-production corrections (i.e., post-production dominant). 1077 and 1110 the timing of the self-correction for 1077 and 1110 varied among the observations for these learners, rather than consistently preferring during- or post-production self-correction timing. Overall, post-production corrections were relatively consistent across observation for 1073, 1077, and 1110, but rose over time for 1081. L2 learners are generally expected to have limited attentional resources available for monitoring (e.g., Kormos, 1999, 2000) during-production corrections (e.g., Camps, 2003; Swain, 2000), which implies that during production self-correction would be limited. The results of this study with Arabic L1 English L2 learners do not support the belief that post-production corrections are necessarily more frequent.

Table 7. Summary of Self-correction Performance by Participant

		1073	**1077**	**1110**	**1081**
Attempts		48	66	44	81
Timing		During-production dominant	Balanced during- and post-production	Balanced during- and post-production	Post-production dominant
Correction Focus	During-production	Form	Form	Form	Meaning
	Post-production	Form	Form	Form	Form
Outcome: More Target-like	During-production	75.0%	79.3%	84.2%	75.9%
	Post-production	84.6%	100%	87.5%	92.9%
Change		Stable	Stable	Stable	Dynamic

Third, our results echo previous findings in that these students noticed form-focused issues, overwhelmingly grammatical issues, in their interlanguage (e.g., Lynch, 2001; Stillwell et al., 2010), which is not surprising given the promotion of error-free speech in instructed contexts (Kormos, 2016). Although 1081 created more meaning-focused than form-focused corrections during-production, the others were focused on form both post-production and during production. For instance, 1110 made form-focused corrections at a similar rate during- and post-production. While it may be expected that certain types of corrections, specifically form-focused, need opportunity and time afforded by a post-production task to notice, we did not find a vastly different pattern between during- and post-production corrections. This finding challenges the expectation that learners focus on meaning during production. One possible explanation for this finding is that this speaking task was monologic, although recorded for the language instructors, and this context could have swayed the focus from communication (meaning-focused) to grammar (form-focused). There were few pronunciation corrections, which could reflect the difficulty of noticing pronunciation errors. One caveat is that some during-production pronunciation corrections could have been missed and coded as repetitions; however, since there were also few post-production pronunciation corrections, it is likely that these learners (with the exception of 1077) generally did not notice pronunciation problems.

Fourth, with regard to the outcome of the self-correction, the performance ranged from 78% to 90% target-like outcome. Frequency and outcome was not consistently related, for example 1077 (with high self-correction attempt frequency) and 1110 (with few self-correction attempts) both often produced target-like self-corrections. It would be expected that a written post-production task would have more target-like outcomes as learners have the time to access declarative knowledge of the target language. In fact, each student had a higher target-like rate post-production, but not necessarily more target-like corrections post-production, for example 1073 had more target-like corrections during production. The number of self-corrections in each timing affects outcome percentage. Accordingly, it is unclear if the outcome percentages always reflect meaningful differences. For instance, 1110's target-like outcome was quite similar during- and post-production. We posit that the task was at least partially dependent on students' declarative grammatical knowledge, considering that most corrections were grammar-focused. Even though the placement tests showed that these four students were generally equal in their English proficiency upon enrollment, a review of each student's performance in grammar courses over the three terms revealed differences. 1077 earned higher end-of-term marks than other participants, which may have allowed her to successfully make many corrections, including quite sophisticated improvements. 1081, who had an increase in self-correction, earned higher grammar marks over time. Both 1073 and 1110 consistently earned lower marks in their grammar courses, and these two learners had fewer self-correction attempts. 1110's few target-like corrections may indicate that she only made corrections when she was more confident in the correction. Another contributing factor could be differences of engagement in the task, especially engagement in the monitoring and self-correction components. Since 1077 had many self-corrections, many of which were form-focused, even during production, she may have had higher working memory, given Mojavezi and Ahmadian's (2014) conclusions, or have been more motivated and engaged in the task.

Last, contrary to expectations from the field (e.g., Kormos, 1999; Stillwell et al., 2010; Van Hest, 1996), 1073, 1077, and 1110 had a stable pattern of self-correction, with no clear change in self-correction behavior across developing proficiency. Although 1081 showed a dynamic increase in self-correction and a change in the focus of correction as he progressed through the IEP, the change was not in the expected direction, where lexical, grammatical, and phonological repairs are replaced by discourse-level repair (Kormos, 1999). His self-correction evolved from a discourse-level focus to a sentence-level grammar focus, contrary to expectations about L2 self-repair. 1081's early post-production corrections had the distinction of including many qualitative comments. High-frequency 1077 was consistently oriented at the sentence level correction, again not following the expectation of moving toward more discourse level corrections. In regard to these apparent contradictions, we agree with Kennedy and Trofimovich (2010) that more research must be done to illuminate how self-correction is related to language development.

Conclusion

This paper offers a partial solution of the puzzle on language learner noticing as reflected by self-correction behavior. We suggest a framework of correction attempts, timing, correction focus, outcome, and change over time to explore self-correction in greater depth (see Figure 5.) Other studies have reviewed multiple types of self-correction, though few combined elements to create a self-correction profile, and rarely has self-correction been investigated longitudinally. To capture self-correction broadly, multiple measures are necessary to build a more complete understanding.

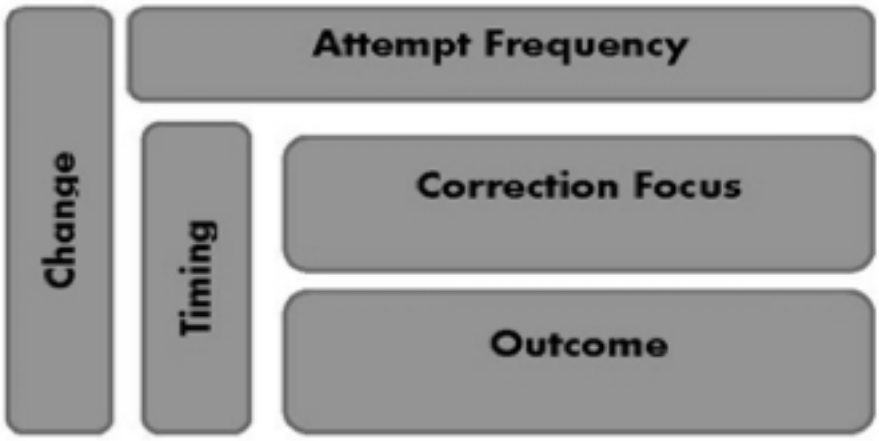

Figure 5. Language Learning Self-Correction Framework

Although the data in our study are limited to four speakers of the same L1, the framework is applicable to all language learners. Replication studies using the framework described in this article would allow cross-linguistic comparison among learner populations. In addition, the curriculum-based topics varied across terms and within the last term, so isolating topic effects was not possible in this study. Because topic may influence student performance (de Jong &

Vercellotti, 2016) and noticing, controlling at least the speech type (e.g., narrative) would be beneficial when considering change over time.

Future empirical research can investigate if and how self-correction skills can be fostered. Since working memory and/or task engagement could have been explanatory in the variation between the learners, future research should include measures of working memory capacity, learner beliefs (which may be stable over time), affect (which likely changes across observations), and time on task; any and all may explain some of the variation in self-correction behavior. As Coughlan and Duff (1994) have cautioned, learners may engage in different activities when given the same task. Lastly, the pedagogical task which elicited the data for this research asked the participants to focus on errors (negative evidence) in their own output. It might be illuminating, however, to study the effect of positive noticing, i.e., the noticing of newly correct linguistic constructions or correctly used new vocabulary (e.g., Mennim, 2007). In any case, future research should view self-correction as a multidimensional skill, as our framework illustrates, to be measured over multiple performances.

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Appendix A

Topics by Proficiency Level and Observation

level	Observation	Topic	participants
low-intermediate	Obs1	childhood meal	all
	Obs2	transportation	all
	Obs3	admired person	all
high-intermediate	Obs4	world problem	all
	Obs5	regret	all
low-advanced	Obs6	media violence	1081,1077
		computerized society	1110,1073
		extravagant lifestyle	1110,1073
	Obs7	internet risks	1081
		rich and poor	1077

Appendix B

During- and Post-production Corrections by Language Focus over Time for Participant 1073

Timing	Focus	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Total
During-production	Lexical	1 1	2 0	0 0	1 0	0 1	0 1	1 0	**5 3**
	Expansion	2 0	0 0	0 0	1 0	0 0	1 0	0 0	**4 0**
	Grammar	2 2	0 1	2 1	0 1	8 3	1 0	0 1	**13 9**
	Syntax	0 0	1 0	0 0	1 1	2 0	1 0	0 0	**5 1**
	Pronunciation	0 0	0 0	0 0	0 0	0 0	1 0	0 0	**1 0**
	Fluency	0	0	0	0	0	1	0	**1**
Post-production	Comment	0	0	0	0	0	1	0	**1**
Total		**8**	**4**	**3**	**5**	**14**	**7**	**2**	**43**

Note: During-production correction attempts are found in the upper left of each cell; post-production notes are found in the bottom right of each cell.

Appendix C

During- and Post-production Corrections by Language Focus over Time for Participant 1077

Timing	Focus	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Total
During-production	Grammar	4 4	4 1	5 2	5 2	1 2	2 4	1 0	**22 15**
	Syntax	0 2	0 1	1 0	1 1	0 1	0 0	1 1	**3 6**
	Lexical	0 0	0 1	1 0	1 0	0 0	0 0	2 2	**4 3**
	Pronunciation	0 1	0 0	0 0	0 1	0 3	0 1	0 0	**0 6**
	Expansion	0 0	0 0	0 0	0 0	0 0	0 0	0 0	**0 0**
Post-production	Fluency	1	1	0	1	0	1	0	**4**
	Comment	0	0	0	0	0	0	0	**0**
Total		**12**	**8**	**9**	**12**	**7**	**8**	**7**	**63**

Note: During-production correction attempts are found in the upper left of each cell; post-production notes are found in the bottom right of each cell.

Appendix D

During- and Post-production Corrections by Language Focus over Time for Participant 1110

Timing	Focus	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Total
During-production	Grammar	0 1	1 1	3 1	1 2	4 3	0 2	0 4	**9 14**
	Syntax	0 1	1 0	1 0	1 0	0 0	0 1	0 0	**3 2**
	Lexical	0 0	0 0	1 1	0 0	2 0	1 1	0 1	**4 3**
	Pronunciation	0 0	0 0	0 0	0 0	0 0	0 1	0 0	**0 1**
	Expansion	0 1	1 3	0 0	1 0	0 0	0 0	1 0	**3 4**
Post-production	Fluency	0	0	0	0	0	0	0	**0**
	Comment	0	0	0	0	0	0	0	**0**
Total		**3**	**7**	**7**	**5**	**9**	**6**	**6**	**43**

Note: During-production correction attempts are found in the upper left of each cell; post-production notes are found in the bottom right of each cell.

Appendix E

During- and Post-production Corrections by Language Focus over Time for Participant 1081

Timing	Focus	Obs1	Obs2	Obs3	Obs4	Obs5	Obs6	Obs7	Total
During-production	Grammar	0 1	0 3	0 1	1 1	1 5	3 2	4 9	**9 22**
	Syntax	1 0	1 1	0 0	1 0	1 0	0 0	0 0	**4 1**
	Lexical	1 0	0 1	1 0	4 0	1 0	2 3	5 1	**14 5**
	Pronunciation	0 0	0 0	0 0	0 0	0 0	0 0	0 0	**0 0**
	Expansion	0 0	0 0	0 0	0 0	0 0	2 0	0 0	**2 0**
Post-production	Fluency	1	1	0	1	0	1	1	**5**
	Comment	1	1	4	4	3	3	0	**16**
	Total	**5**	**8**	**6**	**12**	**11**	**16**	**20**	**78**

Note: During-production correction attempts are found in the upper left of each cell; post-production notes are found in the bottom right of each cell.