



# Effects of a *xu*-argument based iterative continuation task on an EFL learner's linguistic and affective development: Evidence from errors, self-initiated error corrections, and foreign language learning attitude

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## ABSTRACT

This longitudinal study investigated the effects of a *xu*-argument based iterative continuation task (XBICT) on an EFL learner's processing of different English linguistic items, overall EFL achievement (EFLA), and foreign language learning attitude (FLLA). The treatment material was taken from a novel, divided into 19 parts, which the EFL learner was asked to read and then extend. pre-test and post-test scores, frequencies of the different types of errors and self-initiated error corrections (SC), and observations of the learner behaviors were collected as data for analysis. Results show significant correlations among the different errors and self-initiated error corrections, suggesting that EFL learning is an integrated system, where errors in one linguistic item can be strong indicators of errors elsewhere. Results also show significant improvement in the EFL learner's processing of past temporal morphemes, overall EFL achievement, and foreign language learning attitude, despite the fact that self-initiated error corrections of spellings are the most frequent while corrections of articles are the least common. These findings suggest that XBITC could be an effective approach in EFL learning but its efficacy could vary with reference to different linguistic items. Some pedagogical implications are discussed.

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## 1. Introduction

The *xu*-argument, which contends that, via *xu* (Continuation) or CEC (completion, extension, and creation) language is learned and high efficiency in language learning is achieved, has been a prevalent foreign language learning theory supported by a substantial body of research (e.g., [Chen & Meurers, 2019](#); [Wang & Wang, 2015](#); [Ye & Ren, 2019](#)). However, very few studies have investigated the effects of *xu*-argument based tasks on EFL learners' self-initiated error corrections, and neither have there been any studies to gauge the learners' EFL achievement and foreign language learning attitudes. These are significant gaps in the *xu*-argument based research, because EFL learning is a dynamic system with interacting variables ([Chang & Zhang, 2021](#)), and as a process of successive approximation, consists of hypothesis formation and revision, enabling us to observe signs of the developmental process ([Crosthwaite, 2018](#); [Ellis, 2018](#)). However, error-correction can not be self-

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initiated by EFL learners at earlier developmental stages (Brown, 2002), neither is it likely to occur in mechanic language drillings (Sato & McDonough, 2019). The source texts in the *xu*-argument based tasks, as a positive input, can enhance the EFL learners' awareness of the gap, which accordingly enables them to resort to self-initiated error corrections to align with the input (Wang, 2018; Zhang & Zhang, 2019); the alignment, in turn, can contribute to their foreign language learning attitudes which are relevant to foreign language learning achievement (Dörnyei, 2019; Sun & Zhang, 2020; Wong, 2020). Nevertheless, related studies to date have merely concerned the ultimate achievement, failing to observe learners' linguistic and affective development that can be revealed by errors, self-initiated error corrections, and foreign language learning attitudes. Therefore, this longitudinal study was carried out, using a *xu*-argument based iterative continuation task (XBICT) as a means to focus on one learner's interlanguage and foreign language learning attitude development.

## 2. Literature review

The *xu*-argument postulates that *xu* constitutes the primary source that drives learning in interaction, and enhances interaction and alignment (Wang, 2016, 2018). Based on the *xu*-argument, continuation tasks have been designed to couple input and output in a rich interactive context, such as integrated reading-writing continuation tasks and integrated reading-translating continuation tasks, among others (Wang, 2016). In order to further enhance the interaction, Wang (2018) designed XBITC ranging from two turns of coupled reading and writing to a novel with successive turns. The learning mechanism underlying XBITC includes incomplete input, incomparability or a gap between the input and the output, and intimate coupling of static L2 learning with dynamic expression of ideas (Wang, 2016, 2020), making it possible for researchers "to study individual complexity dimensions and to explore different degrees of challenge for different dimensions" (Chen & Meurers, 2019, p. 418).

The *xu*-argument technique has spawned numerous studies, confirming the effectiveness of *xu*-argument based continuation tasks in different aspects of EFL learning. Some studies have found that continuation tasks contribute to temporal morpheme processing (Wang & Wang, 2015; Zhang, 2017a; Zhang & Zhang, 2019). Others found alignment effects in EFL learners' writing content and language use (Zhang, 2017b), conceptual and textual information noticing and processing (Ye & Ren, 2019), and noun quantifier learning (Wang, 2019). Still others found that *xu*-argument based tasks could strengthen EFL learners' awareness of morphological-syntactic forms (Jiang & Chen, 2015) and inhibit L1 compensation to make the EFL learners be more nativelike in their way of thinking (Jiang, Chen, & Zhan, 2019). In addition, recent studies have found that XBITC can enhance EFL learners' reading ability (Zhang & Zhang, 2019) and learning agency (Zhang & Zhao, 2020). Despite the supporting evidence, other researchers have pointed out that task factors such as input complexity (Peng, Wang, & Lu, 2018), word classes (Zhang, 2019), and assessment types (Michell & Cappellini, 2019) could affect the potential of continuation tasks. This is evidence that although an effective EFL teaching model can be developed through the *xu*-argument (Ren, 2016), the effectiveness of *xu*-argument based continuation tasks, be they iterative or not, could be subject to different linguistic items with different complexities.

One gap in the *xu*-argument based research is that the majority of the studies conducted so far, to our knowledge, have focused on EFL learners' ultimate achievement, paying very little attention to errors and self-initiated error corrections, from which signs contributing to EFL learners' interlanguage development could be spotted (Corder, 1981; Crosthwaite, 2018). Errors, as well as the specific error types, reflect the developmental process where language learners gradually reconstruct rules and formulate certain types of hypotheses (Dulay & Burt, 1974). Errors and self-initiated error corrections can enable researchers to explore the process of task completion to identify learners' actual abilities (Antón, 2011), and the frequency of self-initiated error corrections could be an important indicator of L2 learners' awareness (Ellis, 2018) because increased frequency of self-initiated error corrections could help the learners to optimally process the linguistic items (Bestgen & Granger, 2011). Moreover, errors mean that the L2 learner might be in the process of acquiring the related items in question (Dulay & Burt, 1974; Lin, 2016), and self-initiated error corrections, as the focus of negotiations, could make the learners determine where linguistic difficulties lie and how to address them (Ewald, 2015; Salido, 2016). Errors, thus, are "a reliable predictor of the quality of EFL texts and that reliability is further improved by sub-categorizing errors" (Bestgen & Granger, 2011 p. 235). Therefore, it is necessary to fill the research gap by subcategorizing and analyzing errors as well as self-initiated error corrections in continuation writing tasks to explore EFL learners' interlanguage development.

There is also a paucity of research on the effects of the continuation tasks on foreign language learning attitude that has a confirmed correlation with goal setting orientation and effort making (Alamer & Lee, 2019; Dörnyei, 2003; Sun & Zhang, 2020). L2 learning, which is a continuum from recreation to reconstruction, can be influenced by affective factors such as foreign language learning attitudes which are closely related to L2 self-confidence and intended efforts (Ellis, 2018). Ellis (2020) further stated that different motives of the participant can result in very different activities for the same task. Hypothesis formation and revision are "often the most powerful predictor of motivated behavior" (Dörnyei, 2019, p. 19) with positive emotions leading to higher attention, more creative thinking, and more successful language learning (Floare, 2020; Yoshida, 2020). Students' EFL achievement and foreign language learning attitudes can also be reflected in their ability to self-correct linguistic errors (Hawkes & Nassaji, 2016; Todd, 2001), and in their possession of metacognitive knowledge to behave and think positively in their EFL learning (Zhang, 2010; Zhang & Zhang, 2013), and together, they may reinforce one another, leading students' language development and learning attitudes into a virtuous cycle to achieve interactional synchrony (Chang & Zhang, 2021; De Bot, Lowie, & Verspoor, 2007; Dörnyei & Ushioda, 2011). Based on the above-mentioned, foreign language learning attitude in the present study is broadly defined as emotions, motives, efforts, and self-efficacy orchestrated

in observations of EFL learners' behaviors in learning. Given that an EFL learner is a set of interactive variables that is closely related to the role of agency (Chang & Zhang, 2021; De Bot et al., 2007), and that positive foreign language learning attitude can stimulate active participation and involvement, it is necessary to fill the gap to observe EFL learners' foreign language learning attitudes during and after the continuation task.

As mentioned above, XBICT requires dynamic use of the previously read texts, due to which the extended content is always creative and can solve the mapping difficulties between static language drilling and dynamic expression of ideas with an enhanced integration of incomplete static input and extended dynamic output (Wang, 2018, 2020). Input-output mapping practice tasks are significantly facilitative of unplanned language use (Shegar, Zhang, & Low, 2013). Thus, the inner-driven agency to creatively imitate the positive input can help EFL learners to align with the enhanced input, which can raise their awareness of the gap (Truscott, 2015), and accordingly enables them to resort to self-initiated error corrections to reduce their errors spontaneously (Rassaei, 2017; Sato & McDonough, 2019). Additionally, XBICT can function as formative assessments from which the developmental process of EFL learners can be observed. Hence, the present study intends to promote language mining in the form of XBICT to explore an EFL learner's linguistic and affective development based on his errors, self-initiated error corrections, and foreign language learning attitudes at different stages of the treatment. Given that attitudes can be related to different aspects of language learning (Jalilifar, Mehrabi, & Mousavina, 2014; Rezaee, Marefat, & Saeedakhtar, 2015), and that the effectiveness of *xu*-argument based continuation tasks and L2 learners' ability to detect and correct their errors can be "affected by the part of speech of the lexical items" (Todd, 2001, p. 91; Zhang, 2019), the present study also intends to investigate the relationships between self-initiated error corrections and errors in different linguistic items.

### 3. Method

#### 3.1. Participant

The participant was selected following the principles of purposive sampling. He was a 17-year-old male senior high school student, whose English level was rather low, as he only received 40 points out of 80 as measured by objective questions in the pre-test that contained reading comprehension, text completion, cloze, and blank filling. Both his performance in regular English classes as observed by his English teacher and scores yielded from regular monthly tests also indicated that he was a poor EFL learner, who did not have strong motivation to learn English. His foreign language learning attitude was so negative that he had never taken the initiative in learning English and never listened to those who ever attempted to offer him advice and help him. Thus, the idea that more attention and individualized teaching would result in increased learning motivation maybe not be applicable for him. Moreover, he was so reluctant to do his homework that he always scribbled it and did not want to correct the errors detected by his English teacher or his parents. During the course of the study, he was not learning English in other ways because he insisted that since he had done XBICT, he ought not to learn English in other ways; otherwise he would have withdrawn from the study, which was additional evidence of his negative foreign language learning attitude.

#### 3.2. Research questions

The present study intends to address the following three questions:

- (1) What are the relationships between the learner's self-initiated error corrections and the different linguistic errors in his extended writings?
- (2) What are the effects of XBICT on different linguistic items as shown in the learner's self-initiated error corrections and errors in his writings?
- (3) What are the learner's overall EFL achievement and foreign language learning attitude during and after XBICT treatment?

#### 3.3. Materials and procedures

The reading materials were from a novel called *Treasure Island* adapted by John Escott to be suitable for senior high school 1st and 2nd graders. It was published by the Foreign Language Teaching and Research Press in 2016 (25th edition, Beijing, China). The original 15 chapters were expanded into 19 according to the plot and the length (the mean length is around 700 words). The novel mostly recounts past events and thus provides a relatively natural obligatory past verbal context for tense-aspect markers (Shirai, 2007).

The treatment was carried out by the first author, following Wang (2018) who proposed using XBICT to intensify the "interactive alignment effect of the task and maximize the task efficacy" (p. 40). To begin with, the participant was asked to read Chapter 1, during which he was allowed to look up unfamiliar words or ask for help, since acquisition can only take place when learners can comprehend the input (Ellis, 2020; Wang, 2018). He was also encouraged to highlight those that he thought useful while reading. Then he was asked to make five judgments based on the content of the reading material, the

purpose of which was to make sure that he had fully comprehended the story. For example, he might be asked to judge whether a statement such as *Dr Livesey likes the old seaman's song* was true or false. If he could not answer the questions correctly, one of the researchers would help him.

Then the participant was asked to extend what he had read, namely Chapter 1, in no less than 150 words (the longer the better), during which he could refer to Chapter 1 at any time. After the first turn of the combination of reading and writing, Chapter 2 was given to the participant to be read and then extended. Totally, 19 turns of this combination of reading with writing were performed by the participant, with each of the reading tasks taking about 30 min and the writing taking about 1 h, according to the time needed for the first combination task. XBICT was performed on consecutive days during the participant's summer holiday, with the whole experiment lasting 21 days, including administering the pre- and post-tests at the beginning and the end of the study.

The day before and after the treatment, the National College Entrance Tests (NCET) from 2017 to 2016 in Zhejiang province were used as measurements of the participant's pre-test and post-test EFL proficiency, respectively. The NCET has been widely used in many empirical studies, proven to be a reliable instrument for testing EFL learners' EFL proficiency (Fan et al., 2018). The components of the test are reading comprehension, text completion, cloze, blank filling, and extended writing, using objective questions with definite answers such as A, B, C, or D, except for the extended writing. The scoring of the objective questions was carried out by the researchers according to the assessment standard published by the test maker.

### 3.4. Identifying, coding and analyzing

Three types of data were collected. The first was the participant's 21 pieces of extended writing (1 pre-writing and 1 post-writing, 19 treatment writing), which yielded a small corpus with a total of 6001 words. The second was the participant's pre-test and post-test proficiency test scores, and the third was behavior observations of the participant before, during and after the treatments without the participant's noticing.

The procedure is as follows. The identifying of self-initiated error corrections was done according to the observations of the raw extended writings as shown in [Example 1](#). Wherever a correction was spotted, it would be labeled self-initiated error corrections (shortened as SC), indicating the participant's awareness of the error's presence (James, 2001). The types of self-initiated error corrections were mainly identified according to the error types spelt out in Brown (2002) and James (2001, p. 104), namely, "in terms of linguistic categories" the types of errors are indicated as to what class and what rank the error should be assigned, and what grammatical system the error affected.

The participant's self-initiated error corrections on past temporal concept expressions, verb collocations, articles, and spellings in the corpus were annotated for analysis because these types of errors were the top four errors in the participant's writings, indicating they were particularly vital signs to his interlanguage development. In addition, the base forms wrongly used to denote past temporal concepts, the errors in verb collocations, articles, and spellings were also annotated. As shown in [Example 1](#), self-initiated error corrections of past temporal expressions, verb collocations, articles, and of spellings were annotated with [SCT], [SCVC], [SCA], and [SCS], respectively. As shown in [Example 2](#), grammatical errors in past temporal expressions, verb collocations, articles, and in spellings were annotated with [TE], [VCE], [AE], and [SE], respectively. All the annotations were semi-manually done using a coding software program called BFSU Coder 1.0 with the help of two post-graduates majoring in Applied Linguistics, who were remunerated as required. Interrater reliability, calculated as a Spearman correlation, reached significance ( $r = .95$ ,  $p < 0.001$ ).

**Example 1.** There **ar** [SCT] **were** many apple trees around her; The old seaman **listened** [SCVC] ^**to** me ...; and **a** [SCA] **the** blind man; The **olp** [SCS] **old** seaman

**Example 2.** I thought it **can** [TE]; ... jumped **out** [VCE] window; I wanted to **helped** [VCE] ...; walked around **lake** [AE]; knift [SE]

For statistical convenience as well as to provide a clear picture of the different self-initiated error corrections and errors, the 21 pieces of writings were divided into five stages. The division was based on the following principles: 1) The pre-writing and the post-writing were from the pre-test and the post-test and hence were treated as stage 1 and stage 5 respectively so as to see clearly the gain of the participant before and after the treatment; and 2) The others such as stage 2, stage 3, and stage 4 each contained 7 pieces of writing according to the temporal sequence of the writings in order to see the participant's developmental process (see [Table 1](#)). The frequencies of errors and self-initiated error corrections were counted with AntConc 3.2.0, and were manually double-checked randomly with reference to the concordance.

Descriptive statistics for self-initiated error corrections and errors are presented in [Table 3](#). It was observed that, in general, the frequencies of self-initiated error corrections and errors in the same linguistic item were different at different stages, and at the same stage the frequencies related to different linguistic items were also different. Chi-square and Log-likelihood Calculator were used to analyze the frequencies and EFL proficiency scores. Observations of the participant's behaviors such as emotions, motivations, efforts, and self-efficacy before, during and after the treatment were described to show whether there were any changes in the participant's foreign language learning attitudes.

**Table 1**

Descriptive statistics of the self-initiated corrections and errors.

Writings	Reading Words	Writing Words	SCT	SCVC	SCA	SCS	TE	VCE	AE	SE
Stage 1	350	203	4	6	0	8	12	8	4	4
Stage 2	4757	1807	17	24	1	42	76	48	23	73
Stage 3	5251	1920	12	16	2	37	39	58	23	59
Stage 4	7037	1863	6	12	1	45	58	52	14	52
Stage 5	335	208	1	2	1	3	1	4	2	3

Notes: SCT = self-initiated corrections of past temporal expressions; SCVC = self-initiated corrections of verb collocations; SCA = self-initiated corrections of articles; SCS = self-initiated corrections of spellings; TE = errors in past temporal expressions; VCE = errors in verb collocations; AE = errors in articles; SE = errors in spellings.

## 4. Results

### 4.1. Relationships between and within self-initiated error corrections and the errors

The correlations between and within the different self-initiated error corrections and errors were analyzed in order to address research question 1 (see Table 2). SCVC is found to be significantly correlated to TE ( $r = 0.600$ ;  $t = 0.004$ ), VCE ( $r = 0.586$ ;  $t = 0.005$ ) and AE ( $r = 0.688$ ;  $t = 0.001$ ). Significant correlations were also found between TE and SE ( $r = 0.577$ ;  $t = 0.006$ ), and between VCE and AE ( $r = 0.583$ ;  $t = 0.00$ ). In general, the analyses reveal positive correlations among the different errors and among the different self-initiated error corrections. Additionally, the analyses also reveal that the errors and self-initiated error corrections are positively correlated with each other. These results indicate that EFL learning is in general an integrated system, with errors and self-initiated error corrections playing a very important role in all aspects of EFL learning, and that errors in one linguistic item are strong indicators of the incompetence of other linguistic items.

### 4.2. Effects on different linguistic items as shown in self-initiated error corrections

The frequency differences as to the participant's self-initiated error corrections in the same linguistic items between stage 1 and the following four stages were analyzed in order to address research question 2 with a focus on self-initiated error corrections (see Table 3).

As to SCT, no significant difference was found between stage 1 and stage 2 ( $G^2 = 1.511$ ,  $p = 0.219$ ). However, the difference between stage 1 and stage 3 was found to be approaching significance ( $G^2 = 3.196$ ,  $p = 0.074$ ), and a significant difference was also found between stage 1 and stage 4 ( $G^2 = 6.342$ ,  $p = 0.012$ ), although no significant difference was found between stage 1 and stage 5 ( $G^2 = 2.001$ ,  $p = 0.157$ ). A similar trend was found with SCVC. No significant difference was found between stage 1 and stage 2 ( $G^2 = 2.598$ ,  $p = 0.107$ ). However, the differences between stage 1 and stage 3 and stage 4 were both found to be significant ( $G^2 = 5.603$ ,  $p = 0.018$ ;  $G^2 = 7.410$ ,  $p = 0.006$ ), although no significant difference was found between stage 1 and stage 5 ( $G^2 = 2.192$ ,  $p = 0.139$ ).

As to SCA, no significant difference was found between stage 2 and stage 3 ( $G^2 = -0.282$ ,  $p = 0.595$ ), stage 4 ( $G^2 = 0.000$ ,  $p = 0.983$ ), or stage 5 ( $G^2 = 1.987$ ,  $p = 0.159$ ). For SCS, similar to SCA, no significant difference was found between stage 1 and stage 2 ( $G^2 = 1.659$ ,  $p = 0.198$ ), stage 3 ( $G^2 = 2.875$ ,  $p = 0.090$ ), or stage 4 and stage 5 ( $G^2 = 1.451$ ,  $p = 0.228$ ;  $G^2 = 2.482$ ,  $p = 0.115$ ).

The analyses reveal different effects of XBICT on different linguistic items as shown in self-initiated error corrections. During XBICT, the participant was shown to consistently pay attention to past temporal morphemes, verb collocations, articles, and spellings to reconstruct his interlanguage. However, the participant's self-initiated error corrections vary, in that significantly and progressively fewer self-initiated error corrections were found for past temporal morphemes and verb collocations, while for articles and spellings the self-initiated error corrections were more stable without significant changes among the different stages. Considering the different longitudinal trends in self-initiated error corrections of different linguistic items at different stages, it could be concluded that XBICT can improve the internalization of the grammatical marker "ed" and verb collocations more, in comparison to articles and spellings.

The frequency differences in the participant's self-initiated error corrections of different linguistic items within the same stage were also analyzed (see Table 3). At stage 1, no significant difference was found between SCT and SCVC ( $G^2 = -0.403$ ,  $p = 0.526$ ) and SCS ( $G^2 = -1.359$ ,  $p = 0.244$ ), or between SCVC and SCS ( $G^2 = -0.287$ ,  $p = 0.592$ ). No self-initiated error corrections were made for articles, and therefore no analysis is possible in relation to articles at stage 1. At stage 2, no significant difference was found between SCT and SCVC ( $G^2 = -1.201$ ,  $p = 0.273$ ) either. However, significant differences were found between SCT and SCA ( $G^2 = 17.229$ ,  $p = 0.000003$ ) and SCS ( $G^2 = -10.935$ ,  $p = 0.0009$ ), between SCVC and SCA ( $G^2 = 26.260$ ,  $p = 0.0000003$ ) and SCS ( $G^2 = -4.972$ ,  $p = 0.026$ ), and between SCA and SCS ( $G^2 = -50.112$ ,  $p = 0.0000000001$ ).

At stage 3, there was still no significant difference between SCT and SCVC ( $G^2 = -0.573$ ,  $p = 0.449$ ). However, similar to stage 1, there were significant differences between SCT and SCA ( $G^2 = 7.925$ ,  $p = 0.005$ ) and SCS ( $G^2 = -13.376$ ,  $p = 0.0003$ ), between SCVC and SCA ( $G^2 = 12.395$ ,  $p = 0.0004$ ) and SCS ( $G^2 = -8.553$ ,  $p = 0.003$ ), and between SCA and SCS ( $G^2 = -38.288$ ,

**Table 2**

Pearson correlations of the self-initiated corrections and errors.

	SCT	SCVC	SCA	SCS	TE	VCE	AE	SE
SCT	1							
SCVC	0.106	1						
SCA	-0.049	-0.208	1					
SCS	0.115	-0.16	-0.032	1				
TE	-0.259	<b>0.600**</b>	-0.292	0.010	1			
VCE	0.164	<b>0.586**</b>	-0.224	-0.020	0.413	1		
AE	0.335	<b>0.688**</b>	0.088	0.072	0.322	<b>0.583**</b>	1	
SE	-0.202	0.350	0.068	-0.160	<b>0.577**</b>	0.308	0.406	1

Notes: \*\* Correlation is significant at the 0.01 level (2-tailed); SCT = self-initiated corrections of past temporal expressions; SCVC = self-initiated corrections of verb collocations; SCA = self-initiated corrections of articles; SCS = self-initiated corrections of spellings; TE = errors in past temporal expressions; VCE = errors in verb collocations; AE = errors in articles; SE = errors in spellings.

**Table 3**

Self-initiated corrections at the different stages.

Compositions	Words	SCT (%)	SCVC (%)	SCA (%)	SCS (%)
Stage 1	203	4 (1.970)	6 (2.956)	0 (0.000)	8 (3.941)
Stage 2	1807	17 (0.941)	24 (1.328)	1 (0.055)	42 (2.324)
Stage 3	1920	12 (0.625)	16 (0.833)	2 (0.104)	37 (1.927)
Stage 4	1863	6 (0.322)	12 (0.644)	1 (0.054)	45 (2.416)
Stage 5	208	1 (0.481)	2 (0.962)	1 (0.481)	3 (1.442)

Notes: SCT = self-initiated corrections of past temporal expressions; SCVC = self-initiated corrections of verb collocations; SCA = self-initiated corrections of articles; SCS = self-initiated corrections of spellings.

$p = 0.0000000006$ ). At stage 4, no significant difference was found between SCT and SCVC ( $G^2 = -2.039, p = 0.153$ ). However, similar to stage 1 and stage 2, significant differences were found between SCT and SCA ( $G^2 = 3.962, p = 0.047$ ) and SCS ( $G^2 = -33.756, p = 0.00000006$ ), between SCVC and SCA ( $G^2 = 10.971, p = 0.0009$ ) and SCS ( $G^2 = -20.348, p = 0.0000006$ ), and between SCA and SCS ( $G^2 = -54.134, p = 0.000000000001$ ). Finally, at stage 5, no significant differences were found between SCT and SCVC ( $G^2 = -0.339, p = 0.560$ ), SCA ( $G^2 = 0.000, p = 1.00$ ), and SCS ( $G^2 = -1.046, p = 0.306$ ). Neither were significant differences found between SCVC and SCA ( $G^2 = 0.340, p = 0.560$ ) or SCS ( $G^2 = -0.201, p = 0.654$ ), or between SCA and SCS ( $G^2 = -1.046, p = 0.306$ ).

These analyses also indicate that XBICT can exert different effects on different linguistic items as shown in self-initiated error corrections. Before the treatment, self-initiated error corrections were equally distributed among the different items except for articles. However, in the following three stages significant differences were consistently found between SCT and SCA, SCT and SCS, SCVC and SCA, and SCVC and SCS. Specifically, the participant's self-initiated error corrections were most frequent for spellings, with articles being the lowest. Given the distribution variations in self-initiated error corrections across different linguistic items in the same stage, it can be concluded that the participant attended to spelling errors the most, while the least attention was given to article errors.

#### 4.3. Effects on different linguistic items as shown in different error types

The frequency differences as to the participant's errors in the same linguistic items between stage 1 and the following four stages were analyzed in order to address research question 2 with a focus on errors (see Table 4).

For TE, no significant difference was found between stage 1 and stage 2 ( $G^2 = 1.105, p = 0.293$ ). However, significant differences were found between stage 1 and stage 3 ( $G^2 = 8.526, p = 0.004$ ) and the post-writing ( $G^2 = 11.240, p = 0.0008$ ), and a difference approaching significance was found between stage 1 and stage 4 ( $G^2 = 3.541, p = 0.060$ ). As to VCE, no significant differences were found between stage 1 and stage 2 ( $G^2 = 0.971, p = 0.325$ ), stage 3 ( $G^2 = 0.465, p = 0.495$ ), stage 4 ( $G^2 = 0.758, p = 0.384$ ), or stage 5 ( $G^2 = 1.458, p = 0.227$ ). The same trend was found for both AE and SE, with no significant

**Table 4**

Errors at the different stages.

Compositions	Words	TE (%)	VCE (%)	AE (%)	SE (%)
Stage 1	203	12 (5.911)	8 (3.941)	4 (1.970)	4 (1.970)
Stage 2	1807	76 (4.206)	48 (2.656)	23 (1.273)	73 (4.040)
Stage 3	1920	39 (2.031)	58 (3.021)	23 (1.198)	59 (3.073)
Stage 4	1863	58 (3.113)	52 (2.791)	14 (0.751)	52 (2.791)
Stage 5	208	1 (0.481)	4 (1.923)	2 (0.963)	3 (1.442)

Notes: TE = errors in past temporal expressions; VCE = errors in verb collocations; AE = errors in articles; SE = errors in spellings.

differences between stage 1 and stage 2 ( $G^2 = 0.587, p = 0.444; G^2 = -2.437, p = 0.444$ ), stage 3 ( $G^2 = 0.750, p = 0.386; G^2 = -0.843, p = 0.358$ ), stage 4 ( $G^2 = 2.388, p = 0.122; G^2 = -0.498, p = 0.480$ ), or stage 5 ( $G^2 = 0.729, p = 0.393; G^2 = 0.169, p = 0.681$ ).

These analyses also indicate different effects of XBICT on different linguistic items. Only the errors in past temporal morphemes significantly decreased with the treatment, suggesting that XBICT may exert significant facilitative effects on the EFL learner's past temporal morpheme processing.

The frequency differences in the participant's errors of different linguistic items within the same stage were also analyzed (see Table 4). At stage 1, no significant differences were found between TE and VCE ( $G^2 = 0.805, p = 0.369$ ), between VCE and AE ( $G^2 = 1.359, p = 0.244$ ) or SE ( $G^2 = 1.359, p = 0.244$ ), or between AE and SE ( $G^2 = 0.000, p = 1.000$ ). However, significant differences were found between TE and AE ( $G^2 = 4.186, p = 0.041$ ) and SE ( $G^2 = 4.186, p = 0.041$ ). At stage 2, significant differences were found between TE and VCE ( $G^2 = 6.377, p = 0.012$ ) and AE ( $G^2 = 29.914, p = 0.00000004$ ), between VCE and AE ( $G^2 = 8.994, p = 0.003$ ) and SE ( $G^2 = -5.203, p = 0.023$ ), and between AE and SE ( $G^2 = -27.369, p = 0.0000001$ ). No significant difference was found between TE and SE ( $G^2 = 0.060, p = 0.806$ ).

At stage 3, a difference approaching significance was found between TE and VCE ( $G^2 = -3.746, p = 0.053$ ), and significant differences were found between TE and AE ( $G^2 = 4.176, p = 0.041$ ) and SE ( $G^2 = -4.110, p = 0.043$ ), between VCE and AE ( $G^2 = 15.633, p = 0.00003$ ), and between AE and SE ( $G^2 = -16.356, p = 0.00005$ ). However, no significant difference was found between VCE and SE ( $G^2 = -0.009, p = 0.926$ ).

At stage 4, no significant differences were found between TE and VCE ( $G^2 = 0.327, p = 0.567$ ) or SE ( $G^2 = 0.327, p = 0.567$ ). However, a significant difference was found between TE and AE ( $G^2 = 28.878, p = 0.00000007$ ). Significant differences were also found between VCE and AE ( $G^2 = 23.284, p = 0.000001$ ) and between AE and SE ( $G^2 = -23.284, p = 0.000001$ ), although no significant difference was found between VCE and SE ( $G^2 = 0.000, p = 1.000$ ).

At stage 5, no significant differences were found between TE and VCE ( $G^2 = -1.927, p = 0.165$ ), AE ( $G^2 = -0.340, p = 0.560$ ), or SE ( $G^2 = -1.046, p = 0.306$ ). Similarly, no significant differences were found between VCE and AE ( $G^2 = 0.680, p = 0.410$ ) or SE ( $G^2 = 0.143, p = 0.705$ ), or between AE and SE ( $G^2 = -0.201, p = 0.654$ ).

The analyses show the various frequencies of the same type of errors at different stages, revealing to some extent the complexity of the effects of XBICT on different linguistic items. Before the treatment, more errors are found for past temporal morphemes than for articles and spellings. However, during the treatment, the differences between the errors in past temporal morphemes and those in spellings became non-significant. In addition, the errors for past temporal morphemes, in contrast to the others, were found to be significantly reducing. Specifically, although there were still many errors in past temporal morphemes, the analysis showed a significantly decreasing trend, which was not found for the other items.

#### 4.4. Participant's EFL achievement and foreign language learning attitude

The pre-test and post-test scores of the participant were analyzed in order to see whether XBICT had enhanced the EFL learner's overall EFL achievement (research question 3 with a focus on EFL achievement). In addition, the participant's behaviors were also observed and analyzed to see whether XBICT had enhanced the learner's foreign language learning attitude (research question 3 with a focus on foreign language learning attitude).

Table 5 showed significant or nearly significant differences between the pre-test and post-test as to the participant's total score ( $\chi^2 = -9.627, p = 0.001$ ) and reading comprehension ( $\chi^2 = -3.209, p = 0.073$ ). For text completion, the cloze test, and blank filling, no significant differences were found ( $G^2 = -1.359, p = 0.243; \chi^2 = -1.097, p = 0.294; G^2 = -1.350, p = 0.245$ ). The results reveal an increase in the participants' overall EFL achievement after the treatment. They also reveal that XBICT may have had different effects on different tasks, with reading comprehension being the most improved in comparison with the others.

Observations of the participant's behaviors reveal that his foreign language learning attitudes gradually changed positively. During the first two turns of the combination of reading and writing, the participant kept complaining and even threatened to abandon the task. Therefore, the researchers had to promise to remunerate him in order to keep him engaged in the study. Even so, the participant still complained repeatedly during the task. However, on the third and the fourth day, the complaints and the negative and even aggressive behaviors of the participant decreased gradually, and on the fifth and seventh day the first author noted that the participant was fully engaged with his reading and writing. Over the following days the participant became so involved in the story that he even tried to find the original version to see what happened at the end; the researcher was forced to hide the original book and the adapted reading materials after each experimental session. The following sessions went so smoothly that sometimes the participant even took the initiative to share his extended stories with the researcher after finishing his writing. Observing a participant's performance of a task is useful for investigating how

**Table 5**

The pre-test and post-test of the participant.

	Total Score	Reading comprehension	Text completion	Cloze test	Blank filling
Pre-test	40	13	4	15	8
Post-test	60	20	8	20	12

minds develop (Ellis, 2020). It was evident that the participant showed increasing motivation and agency towards XBICT, given his positive behavior changes.

What surprised the researchers the most was that on a later date, when the participant came home from school, he told his parent, the first author, that he was not afraid of writing any longer, because when he was writing he felt like the words just ran out of his pen automatically. This may be indicative of the participant's increased foreign language learning self-efficacy and positive foreign language learning attitude for he rarely volunteered to share his foreign language learning experience with his parents before. Later English tests carried out at school also yielded strong evidence for his improved EFL agency and achievement; his English is now ranked among the top students in his class, from being close to the bottom before the treatment. The researchers also noted that his handwriting had improved dramatically when he occasionally volunteered to show his test writings to them, which had never happened before the treatment. Strong desire to gain writing proficiency is an indicator of progress and a source of influence on self-efficacy beliefs (Zhang, 2013). All these signs indicate that the participant's overall EFL achievement and foreign language learning attitude have both been enhanced by XBICT, supporting Bai, Chao, and Wang (2019), Sun and Zhang (2020) and Wong (2020) who found that self-efficacy was positively correlated with EFL achievement, and Chang and Zhang (2020) who found that EFL learners' motivational currents could be influenced by the learning context and goal setting orientation.

## 5. Discussion

The study provides new evidence in favor of the effectiveness of *xu*-argument based continuation tasks by analyzing self-initiated error corrections and foreign language learning attitude. In line with previous *xu*-argument based studies (e.g., Chen & Meurers, 2019; Michell & Cappellini, 2019; Wang & Wang, 2015), and also in line with input-output mapping task study (Shegar et al., 2013) and CDST perspective study (Chang & Zhang, 2021; De Bot et al., 2007), the present study found that EFL learning was an integrated dynamic system where EFL learners' overall EFL achievement and foreign language learning attitudes could both be improved by XBICT as indicated from the errors and self-initiated error corrections in the extended writings. The present study also found different effects of XBICT on different linguistic items in agreement with Zhang (2019). However, in contrast to the majority of previous studies that focused on ultimate achievement (e.g. Jiang, 2015; Wang, 2019; Zhang, 2017b), the present study extends *xu*-argument based research, pointing out that XBICT could enhance EFL learners' linguistic and affective development, as indicated by evidence from errors, self-initiated error corrections, EFL achievement and foreign language learning attitudes, in agreement with Dörnyei (2003), Ellis (2018) and Bestgen & Granger (2011).

The integration of the incomplete static input and the extended dynamic output is the engine of effective learning (Wang, 2020), which may explain partly the reduction of errors in the case of the past tense marker “-ed”. There must be some kind of gap to motivate the exchange of information or opinions in order for acquisition to occur (Ellis, 2020). The preceding reading in XBICT, as previously mentioned, was set in past temporal context, which may function as positive input to make it possible for the EFL learner to notice the gap between his writing and the positive input, enhancing the learner to resort to self-initiated error corrections to align with the positive input (Wang, 2016; Zhang & Zhao, 2020). The effect of text comprehension on writing can also boost the learner to imitate the positive input creatively in his extended writing, because there is always a gap between EFL learners' comprehension and production (Wang, 2017). In addition, the preceding reading input was set in XBICT that contained 19 turns, where the high frequency of the past tense marker “-ed” may also contribute to the learner's awareness of the gap between the positive evidence and the errors in his writings, which might also push the learner to align with the positive input to make self-initiated error corrections.

In addition, XBICT can create an optimal native-like contextualized interactional synchrony for EFL learners where static language drilling and dynamic expression of ideas could make the EFL learner adapt constantly to repair asynchrony to align with the input, enabling him to resort to self-initiated error corrections naturally and spontaneously (Chang & Zhang, 2021; De Bot et al., 2007; Wang, 2020). The previously read incomplete text might function as both scaffolding and motives in the extended writing, which might “assist the learners to engage in target-like behaviors at the initial stage of proceduralization” (Sato & McDonough, 2019, p. 999) because it could test the learner's hypotheses about EFL reconstruction, both in meaning and in form (Wang, 2018; Zhang & Zhao, 2020). In addition, XBICT context might enhance the learner's agency and push him to fully participate in the task and accomplish intersubjectivity, which is very important because incomplete discourses require the inference of missing information from shared knowledge and the contexts of conversation (Ellis, 2020; Young, 2019). Furthermore, XBICT, focusing on one theme with successive turns of coupled reading and writing, might serve as both semantic support and a kind of formative assessment to stimulate the learner to be more motivated and self-regulated and thus put more effort into their study (Hidri, 2018; Xiao & Yang, 2019).

Particular attention is drawn to the different effects of XBICT on different linguistic items that are significantly correlated as shown in Table 2. One possible explanation may be the different perceptual and production complexity of the linguistic items due to their differing salience and markedness. Words with different classifications may involve different cognitive loads (Langacker, 2008; Zhang, 2019), and non-salient linguistic features demand less awareness (VanPatten, 2015). Hence, it is natural for the participant to self-correct more of the meaningful content items, such as spelling errors and verb collocation errors, while ignoring article errors. The temporal grammatical marker “-ed” and articles are both marked features that are without Chinese functional equivalents for Chinese L1 learners (Robertson, 2000). Therefore, they are both likely to be difficult for the participant to notice as well as to process.

However, the participant's processing of the grammatical marker “-ed” was significantly improved in comparison to the articles. This could be attributed to the past temporal obligation context of the present study. Exposure frequency and density is closely related to consciousness raising and morpheme processing (Truscott, 2015), and thus the past temporal obligation context may make the grammatical marker “-ed” more salient, as a result of which the learner could be more conscious of it, and accordingly correct it more often. The more explicit the feature is, the more likely it is that the learners will correct their article errors (Nassaji & Swain, 2000; Zhao & Macwhinney, 2018). Hence, the more implicit input related to articles, in contrast to the explicit attention to past temporal morphemes in the past temporal obligation context, might make it more difficult for the participant to notice and process articles in comparison with the past temporal marker “-ed”. In addition, although articles basically take two or three forms, they can be used in different collocations and carry a good variety of grammatical meanings. The complexity and diversity of their grammatical use can cause difficulty for the Chinese EFL learners (Hitoshi, 2000; Jiang, 2015), which might also explain why the participant was less conscious of articles and accordingly made fewer self-initiated error corrections.

Different from Crosthwaite (2018), who found that error corrections failed to reduce grammatical and lexical errors in writing, the present study found that error corrections in XBICT could improve the accuracy of the learner's temporal morpheme processing. One possible reason for the different results may be the different initiators in error corrections. In the present study the participant's error corrections were all self-initiated, while in Crosthwaite (2018) the corrections were initiated by teachers and peers. Many teacher corrections go unnoticed by students (Lasagabaster & Sierra, 2005), so the teacher-initiated corrections in Crosthwaite's (2018) study may explain part of the failure to reduce the students' grammatical and lexical errors. Besides, in Crosthwaite (2018) the other-initiated and other-repaired corrections were performed in an isolated academic writing task, whereas in the present study the self-initiated and self-repaired corrections were performed out of the learner's own consciousness, willingness, and agency, which are positively related to language learning (Chang & Zhang, 2020; Dörnyei, 2019; Ellis, 2018). Correction effects are closely correlated to the initiator and the executor (Crosthwaite, 2018), and different tasks can yield different kinds of target language use and corrections (Antón, 2011). So, to some extent it could be concluded that XBICT can stimulate more conscious reflections on language form-meaning mapping, and self-initiated error corrections may be an indicator of greater agency in EFL learning in line with Corder (1981) and Zhang and Zhao (2020).

Another possible explanation for the different results may be the different linguistic contexts provided by the teaching treatments in the two studies. In Crosthwaite (2018), the tasks were four quiz sections that alternated between form- and meaning-focused items in contextualized situations. Hence, the interactions with each other, as the author pointed out, were not authentic communicative target language exchanges. In the present study the treatment consists of XBICT that couples incomplete genuine reading input and writing successively under one authentic and consistent theme. Learning takes place in a situated context, which is not a cognitive process in an individual mind-brain, and hence learning is a discursive practice where incomplete sentences can motivate fuller participation and allow growth on the part of the learner (Wang, 2020; Young, 2019).

Still another possible explanation for the conflicting results may be the different coding system and data collection method. The present study coded all the corrections in the writings as self-initiated and self-repaired, since the participant wrote without any instructional contributions from a teacher or peers. In Crosthwaite (2018), however, it was rather hard to tell self-initiated error corrections from other-initiated error corrections, because the context was made more complicated by the involvement of peers and teachers in the quizzes. The ratio of morphemes supplied in an obligatory context and used by an EFL learner cannot represent the learner's accuracy level in processing though they are often used to measure the learner's mastery of various morphemes (Shirai, 2007). In the present study, the data based on errors and self-initiated error corrections in extended writings, thus, could be said to be more scientific and reliable in comparison with Crosthwaite (2018).

Also different from Jiang (2015) and Hitoshi (2000), who found positive effects of their treatment on the learning of English articles, the present study found articles were the least likely to be noticed or self-corrected. The different findings can be attributed to the greater explicitness in the tasks used in Jiang (2015) and the article-focused treatment in Hitoshi (2000). In Jiang (2015), an error correction test was used to assess the learners' article learning, while in Hitoshi (2000) the researcher guided learners to focus on form by providing modifications and inducing modified output within a problem-solving task. However, in the present study the participant was only required to read and then extend what he had read, without highlighting articles in the text read or in the extended writings. Given that the explicitness of the instruction or feedback could be vital factors in EFL article learning (Yucel & Gisela, 2016), it could be suggested that it was the different levels of explicitness in the assessments and the treatments that made the difference. The varying results also indicate that more explicit assessment may be required to further gauge the effects of XBICT on article learning.

## 6. Conclusion

Based on self-initiated error corrections, errors, and observations of an EFL learner's behaviors, we found that: 1) EFL learning was an integrated systematic process, with errors in one linguistic item being strong indicators of the learner's incompetence in the other linguistic items; and 2) XBICT could improve the learner's overall EFL achievement and foreign language learning attitude, although its effect could be different on different linguistic items, providing implications for how effective teaching can be designed through XBICT.

Like many other studies, our study suffers some limitations. It did not differentiate regular from irregular past temporal morphological forms, neither did it differentiate definite from indefinite articles in the analysis. Given that regular and irregular forms relate to dual or single processing systems (Jiang, 2018) and that indefinite articles have been shown to be more problematic for learners than definite articles (Robertson, 2000), future studies should be done to fill these gaps. Another limitation is that the results were obtained from a single participant, indicating that the generalizability of the results is severely restricted. Nonetheless, given the consistency of the research outcomes with other quantitative studies (e.g., Wang & Wang, 2015; Ye & Ren, 2019; Zhang & Zhang, 2019), and the multiple sources of data, the results could be said to be trustworthy. In addition, the participant, different from all his classmates who did regular homework assigned by their English teacher, ranked from being close to the bottom to the top in his class, suggesting to some extent the power of the evidence. Despite this, we recommend that further studies triangulate data sources by utilizing more data collection methods and a bigger sample size to validate our results and subsequent interpretations.

Overall, although our study did not differentiate errors from mistakes, or slips of the pen, which might not reflect the learner's competence in language use, given the difficulties in distinguishing them (Brown, 2002; Edge, 1989), and the fact that depending on the different context "the same error may be evaluated very differently" (Ellis, 2018, p. 60), it can be stated that the present study makes a valuable contribution to the literature on the effects of XBICL on EFL achievement and foreign language learning attitude. The findings have implications for EFL curricula, showing how *xu-argument* based tasks can potentially invigorate learners' EFL achievement and foreign language learning attitudes.

## Author statement

The first author designed the study, collected the data and wrote the first draft. The second author assisted in data analysis, revised the manuscript for subsequent submissions as the corresponding author. By resubmitting this manuscript to *System*, we as co-authors declare that the materials contained in it have not been submitted for publication or concurrently under consideration anywhere else.

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