

# Methods and applications in language sciences: Recent trends in linguistics

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# Methods and applications in language sciences: Recent trends in linguistics

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# Table of contents

04	<b>A comparative analysis of English for academic purposes teachers' interactive metadiscourse across the British and Chinese contexts</b> Xinxin Wu and He Yang
18	<b>Revisiting L2 pragmatic competence through implicit vs. explicit instructional framework</b> Nan Huang
26	<b>Extending repair in peer interaction: A conversation analytic study</b> Mia Huimin Chen and Shelly Xueting Ye
39	<b>How much vocabulary is needed for comprehension of video lectures in MOOCs: A corpus-based study</b> Ismail Xodabande, Hourieh Ebrahimi and Sedigheh Karimpour
46	<b>Introducing a multimodal perspective to emotional variables in second language acquisition education: Systemic functional multimodal discourse analysis</b> Zhengyuan Liu
55	<b>Meta-analysis as an emerging trend to scrutinize the effectiveness of L2 pragmatics instruction</b> Farzaneh Shakki
61	<b>The contribution of a hermeneutic approach to investigate psychological variables in second language acquisition</b> Qing Chang
68	<b>Looking through goal theories in language learning: A review on goal setting and achievement goal theory</b> Xiaofang Cheng
75	<b>An introduction to retrodictive qualitative modeling as an emerging method on affective variables in SLA research</b> Yulan Gu
81	<b>Enhancing EFL students' engagement in online synchronous classes: The role of the Mentimeter platform</b> Ayat Tarazi and José Luis Ortega-Martín
92	<b>Investigating the modulation of stimulus types on language switching costs: Do semantic and repetition priming effect matter?</b> Qinfang Shen and Yixin Chen
108	<b>The need for ecological momentary assessment in researching emotional factors in language education</b> Xiaodong Li



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# A comparative analysis of English for academic purposes teachers' interactive metadiscourse across the British and Chinese contexts

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This exploratory research compares the interactive metadiscourse use by native English-speaking English for academic purposes (EAP) writing teachers in the United Kingdom and their non-native counterparts in the Chinese contexts. The analysis is based on a self-compiled corpus, including two sub-corpora, which were composed of instructor contributions to classroom discourse: eight sessions of EAP lessons from the Chinese context and eight sessions of EAP lessons from the British context. Adopting an interpersonal model of metadiscourse, the two sub-corpora were compared to examine the similarities and differences in their use of interactive metadiscourse. Findings of the comparative analysis reveal that EAP teachers from both contexts rely heavily on transition markers and frame markers to organize their teaching but differ in particular linguistic realizations. This may indicate the impact of a range of factors such as logical preferences, development order of acquisition, discourse community, and speech community on teachers' interactive metadiscourse strategies. The article concludes with a few implications for metadiscourse research in spoken academic genres.

## KEYWORDS

interactive metadiscourse, comparative analysis, EAP courses, spoken academic genres, discourse community, speech community

## Introduction

English for academic purposes (EAP) courses are primary sources of English language teaching in many higher education institutions of the world. Their major function is to assist academically oriented L2 learners to gain literacies and skills necessary to navigate a diverse range of complex academic discourses and be successful participants in the academy (Lee and Subtirelu, 2015). Therefore, classroom comprehension is of paramount significance for EAP students. However, a

it poses a threat to non-native English-speaking students due to many factors, such as their insufficient knowledge of English lexicon, failure to appreciate the structural organization of lectures, and lack of pertinent cultural backgrounds (e.g., Chaudron and Richards, 1986; Dunkel and Davis, 1994; Lynch, 2011; Deroey, 2012; Nesi, 2012; Nazari et al., 2020).

Over the past decades, a number of researchers have attempted to explore the various ways of facilitating students' classroom comprehension and enhancing teachers' instructional effect (Biber, 2006; Walsh et al., 2011; Riordan, 2018; Nazari and Atai, 2022). Many researchers have noticed the role of metadiscursive resources, including interactive and interactional devices, in classroom teaching. Although Dunkel and Davis (1994) claimed that there is no obvious positive correlation between these discourse markers and lecture comprehension, the majority of studies have suggested that interactive devices, by means of explicitly signaling text structure, have an important effect on both first- and second-language listening comprehension (e.g., Jung, 2003; Jalilifar and Alipour, 2007; Heshemi et al., 2012).

Nevertheless, existing research on metadiscourse has been mainly conducted in a range of written academic genres, such as in research articles (Hong and Cao, 2014; Jiang and Hyland, 2017; Hyland and Jiang, 2018; Li and Xu, 2020), news articles (Makkonen-Craig, 2011; Fu and Hyland, 2014; Peterlin and Moe, 2016), business and commercial genres (Fu, 2012; López-Ferrero and Bach, 2016; Al-Subhi, 2021), and editorials (Khabbazi-Oskouei, 2013, 2016; Shokouhi et al., 2015). By contrast, spoken genres are comparatively understudied, although they have aroused increasing attention. "Speaking has entered the scene much more recently, as in other approaches to academic discourse" (Ädel and Mauranen, 2010, p. 1). To date, very few cross-cultural studies on metadiscourse in spoken academic genres have been made, in particular across the Chinese and British contexts. Such gap of metadiscourse research in spoken academic genres and the crucial role of metadiscursive strategies in facilitating students' comprehension in classroom teaching settings call for an in-depth study on teachers' interactive metadiscourse use in classroom teaching settings, in particular in the EAP teaching context. To this end, the current research is based on Hyland's (2005, 2019) interpersonal model of metadiscourse to make a comparative study of the interactive metadiscourse use by EAP teachers across the British and Chinese contexts.

## Literature review

### The interpersonal model of metadiscourse

Metadiscourse has been conceptualized in either the broad approach or the narrow approach (Ädel and

Mauranen, 2010; Hyland and Jiang, 2022). This research follows a broad approach represented mainly by Hyland, as it is aimed at exploring not only teachers' discourse organization but also their interaction with students in classrooms. Metadiscourse is defined as the cover term for the self-reflective expressions used to negotiate interactional meanings in a text, assisting the writer (or speaker) to express a viewpoint and engage with readers as members of a particular community (Hyland, 2005). In his interpersonal model, Hyland (2005) divided metadiscourse into two broad categories, interactive and interactional metadiscourse, as shown in Table 1. Although Hyland's (2005) interpersonal model of metadiscourse is mainly designed to investigate written academic discourse, this model has demonstrated its robustness and effectiveness in exploring the discourse organization and audience involvement mechanisms in spoken academic discourse, in particular teachers' classroom instructional discourse after slight modification of certain metadiscourse markers (e.g., Lee and Subtirelu, 2015; Zhang, 2017).

### Metadiscourse and English for academic purposes courses

In the past decade or so, an increasing number of scholars have noticed the significance of metadiscourse in spoken academic genres (e.g., Zare and Talakoli, 2017; Qiu and Jiang, 2021; Zhang and Lo, 2021; Doiz and Lasagabaster, 2022; Kashiha, 2022; Nazari and Atai, 2022). In particular, some scholars have investigated metadiscourse use in monologic and dialogic types of classroom discourse (Zare and Talakoli, 2017). For example, by adopting Ädel's (2010) taxonomy of metadiscourse, Zare and Talakoli (2017) compared the functions of personal metadiscourse in academic monologic and dialogic speech, which were represented, respectively, by classroom lectures and discussions. Employing Hyland's (2005) interpersonal model of metadiscourse, Lee and Subtirelu (2015) made a comparison between teachers' use of metadiscourse in EAP lessons and academic lectures. These three comparative studies of metadiscourse use in monologic and dialogic types of classrooms share rather similar conclusions. They all show that interactive metadiscourse is used more frequently in monologic speech events, while interactional metadiscourse is more common in dialogic ones due to their respective discourse functions in the two pedagogical contexts. This sheds new light on our understanding of metadiscourse use in classroom contexts. However, very few studies have been conducted in these aspects, and far more research is still needed.

Furthermore, in light of the aforementioned role in assisting lesson comprehension, interactive metadiscourse seems to deserve more scholarly attention in recent years. Indeed,



TABLE 1 Hyland's (2005) interpersonal model of metadiscourse.

Categories	Function	Examples
<b>Interactive</b>	<b>Help to guide the reader through the text</b>	<b>Resources</b>
Transitions	Express relations between main clauses	In addition; but; and
Frame markers	Refer to discourse acts, sequences, or stages	Finally; to conclude; my purpose is
Endophoric markers	Refer to information in other parts of the text	Noted above; see Figure 1 below; in section 2
Evidentials	Refer to information from other texts	According to X; Z states
Code glosses	Elaborate propositional meanings	Namely; e.g., such as; in other words
<b>Interactional</b>	<b>Involve the reader in the text</b>	<b>Resources</b>
Hedges	Withhold commitment and open dialogue	Might; perhaps; possible;
Boosters	Emphasize certainty or close dialogue	In fact; definitely
Attitude markers	Express writer's attitude to proposition	Unfortunately; I agree
Self-mentions	Explicit reference to author(s)	I; we; my; me; our
Engagement markers	Explicitly build relationship with reader	Consider; note

this has drawn increasing scholastic attention in recent years. For instance, based on a corpus of four English medium instruction (EMI) teachers' interactive metadiscourse use in the Chinese context, Zhang and Lo (2021) examined how different types of interactive metadiscourse expressions are used in university lectures in the science discipline and how these expressions facilitate knowledge construction. They found that transition markers and frame markers were the two most frequently used interactive metadiscourse categories. Within transition markers, the frequently use subcategory marking consequence (e.g., *because* and *so*) indicates that explaining was an important feature of classroom instruction. Frame markers were used as an important means to signal the macro-structure and stage of the lectures. Immediately following this, Doiz and Lasagabaster (2022) investigated four English teachers' interactive metadiscourse in English classrooms in Spain and made a comparison of their research results with those of Zhang and Lo (2021). They demonstrated the overwhelmingly higher frequency of transition markers and frame markers of EMI teachers in Spain against that in the Chinese context and also pointed out some differences in the linguistic realization of specific metadiscourse markers between EMI teachers across Spain and China.

Taken together, such a crucial role of interactive metadiscourse in classroom comprehension, its specific functions in organizing classroom instruction, and the cross-contexts features make it all the more interesting and

worthwhile to explore the intricate nature of English teachers' interactive metadiscourse in various contexts. Following this line of thought, this study concentrates on the interactive metadiscourse (i.e., transitions and frame markers in the present research) used by native English-speaking EAP writing teachers in the United Kingdom and their non-native counterparts in the Chinese contexts and formulates the following two questions:

- (1) How is EAP teachers' interactive metadiscourse different from and similar to each other across the British and Chinese EAP contexts?
- (2) What are the possible reasons for the similarities and variations of interactive metadiscourse use between EAP teachers across the British and Chinese contexts?

## Methodology

### Data collection and corpus compilation

This research is part of a research project in teachers' classroom metadiscourse use conducted across the United Kingdom and China. Prior to the data collection, ethical approval for this study was obtained from the Research Ethics and Governance Committee of the authors' institution to ensure the rights of the participants and the integrity, quality, and transparency of the research. Then a questionnaire was delivered to get access to and select native and non-native English-speaking EAP teacher participants, respectively, for this research in both British and Chinese higher education institutions. Teachers and their students were informed fully about the purpose, methods, and intended possible uses of the research, and what their participation in the research entails. Each teacher participant's classroom teachings, which last for 90 or 120 min, were recorded for two sessions.

These video recordings were then transcribed verbatim to facilitate further analysis. Altogether 16 sessions of eight teachers' classroom teaching, two sessions by each of the four teachers from the British and the Chinese contexts, respectively, were selected for this study. Finally, two sub-corpora including the classroom discourse of four native English-speaking EAP teachers in the United Kingdom (ET sub-corpus) and four in China (CT sub-corpus) were compiled. To calculate the normalized frequency, each teacher's classroom talk was restored in a separate file by eliminating students' talk and the overall information. The total verbatim transcript of their classroom discourse amounts to 70,073 words. By sifting out student talk, the total amount of teacher discourse is 66,035 words. Among them, 32,860 words constitute the teacher discourse in the ET sub-corpus, and 33,175 words in the CT sub-corpus.

## Identification of metadiscourse markers

A corpus-based method was employed in the current research to retrieve potential items of metadiscourse, complemented by a manual analysis of each metadiscourse marker to sift out those irrelevant linguistic items. The concordance tool of AntConc was used to observe the immediate context of each metadiscourse item. In view of the context-dependent nature of metadiscourse markers, each linguistic item was judged by the specific function it performs in its particular context and thus warrants the manual identification of metadiscourse items. Moreover, following Ädel (2010), quoted materials and dysfluencies are excluded from the metadiscourse markers. During this process, the two authors crosscheck part of the identified instances of metadiscourse markers, until a final agreement was achieved concerning the disagreed linguistic items.

The identification of metadiscourse markers also takes into account the findings from Hyland's (2005, 2019) interpersonal model and some other relevant research. This is due to the aforementioned fact that Hyland's research of metadiscourse use mainly focuses on written discourse. Due to the differences of linguistic features between written and spoken genres (Ädel, 2010), as mentioned before, there are inevitably some instances of metadiscourse markers specific to spoken discourse but not included in Hyland's (2005) metadiscourse list. Therefore, the current study also makes reference to reported instances from other metadiscourse research into spoken academic discourse, for example, Lee and Subtirelu's (2015) research into metadiscourse use by EAP teachers and lecturers.

## Data analysis

The procedure of data analysis was followed on the basis of pertinent research questions. The frequencies, distributions, and ranges (representing the number of teachers used particular metadiscourse item) of metadiscourse markers used by teachers in the two sub-corpora are the key information needed for this study. Thus, a quantitative discourse analysis was carried out. First, the raw frequencies of certain metadiscourse items can be generated by importing the coded text into AntConc 4.0 and inputting the metadiscourse markers into the search term tool. For example, in Figure 1, the metadiscourse item *still*, together with its coding mark < *Tconj* >, is searched by clicking the "start" button. After that, by clicking the Concordance Plot tool at the upper part of the software, an overall landscape of the total number of instances used by individual teachers of this metadiscourse item is generated. However, the number of total instances generated before is the raw frequency of *still*. Such frequencies are then normalized against per thousand words to generate the normalized

frequencies of all the metadiscourse items to make them comparable to each other.

## Analytical framework

Enlightened by Hyland's (2005, 2019) interpersonal model of metadiscourse, two categories of interactive metadiscourse, transition markers and frame markers, were selected for analysis in this study. The sub-functional categories or pragmatic functions of these two types of metadiscourse markers and their coding examples are shown in Table 2.

Transition markers mainly refer to conjunctions or adverbial phrases that assist the addressees to better understand pragmatic connections between steps in an argument. Transitions in the current study consist of three pragmatic functions, namely, additions, comparisons, and consequences. An analysis of data reveals that the linguistic realizations of transitions are generally represented by the lexical category of conjunctions and multi-word expressions. Second, frame markers are generally used to mark text boundaries or elements of the schematic text structure, which can be divided into four pragmatic functions. Specifically, they can be used to sequence parts of a text and act as more explicit additive relations, such as *first*, *then*, and *next*, to explicitly label text stages, such as *to summarize* and *in sum*, to announce discourse goals, as in *my purpose is* and *I want to*, and to signal topic shifts, for example, by using *well*, *right*, and *now*.

## Results

### Transitions

#### Additions

The additive function of transition markers generally serves to add some elements to an argument. It is mainly composed of conjunctions and adverbial phrases that help the addressees follow and interpret pragmatic relations between steps in an argument. Table 3 presents the frequencies, types, and ranges of additive markers in the two sub-corpora. In relation to frequencies, teachers in the ET sub-corpus employ additive metadiscourse 15.64 times per thousand words, while those in the CT sub-corpus use additions with 15.43 instances per thousand words. The log-likelihood value (0.05) indicates that there is no statistically significant difference in the use of additions across the two sub-corpora. As for the types of lexical items, teachers in the ET sub-corpus adopt six types, while those in the CT sub-corpus use eight types. In terms of the ranges of these lexical items, they are characterized by the pervasive use of *and* and *also* by each of the individual teachers in the two sub-corpora to introduce an additive proposition. In effect, previous research noted that *and* is so prevalent that it is sometimes



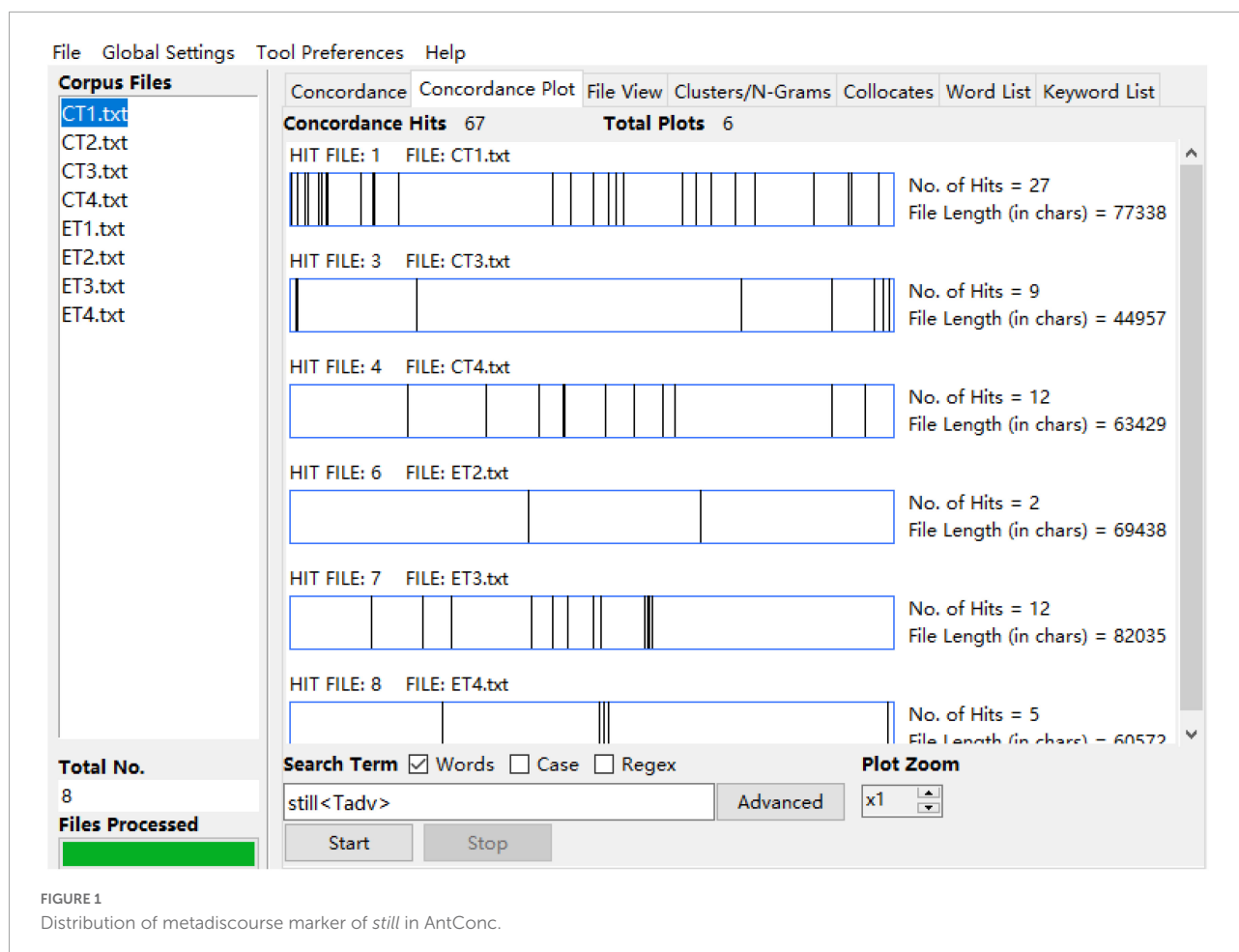


FIGURE 1  
Distribution of metadiscourse marker of *still* in AntConc.

TABLE 2 Pragmatic functions of interactive metadiscourse markers.

Interactive MD markers	Pragmatic functions	Examples with codes
Transitions	Additions	<i>And</i> < Tconj >
	Comparisons	<i>But</i> < Tconj >
	Consequences	<i>As a result</i> < Tconj >
Frame markers	Sequencing	<i>First</i> < Fnum >
	Labeling stage	<i>Overall</i> < Fadv >
	Announcing goal	<i>Want</i> < Fverb >
	Shifting topic	<i>So</i> < Fconj >

left out from rhetorical analysis, being regarded as the default option of “marking conjunctive relations” of addition (Hyland and Jiang, 2018, p. 21).

## Comparisons

Comparative transitions are used with the least frequency among the three transitional devices. They refer to arguments or ideas which are similar to or different from each other. However, no metadiscoursal instance of similarity is observed

throughout the dataset. Some instances such as *similarly*, *likewise*, and *in the same way* are all quoted examples from the informants during the exercise task of classroom instruction. Therefore, comparisons as transition metadiscourse markers in the current research mainly refer to contrastive relations. Table 4 demonstrates the frequencies, types, and ranges of comparisons used in the two sub-corpora. With regard to frequencies, teachers in the ET sub-corpus employ significantly more comparisons than their counterparts in the CT sub-corpus at  $p < 0.0001$ . As for lexical types, teachers in the ET sub-corpus employ altogether 11 types of lexical items, obviously more than those in the CT sub-corpus (three types). This exhibits a slightly different pattern from that of additions, for which teachers in the CT sub-corpus use two types more than those in the ET sub-corpus. In terms of ranges, it is evident that the lexical item *but* appears in each of the eight teachers' classroom discourses across the two sub-corpora. All the other lexical items in either sub-corpus appear in one or two teachers' discourse. This indicates the pervasive use of *but* as a comparative transition among other alternative lexical items. Resembling the use of *and* as the default option of “marking conjunctive relations” of addition (Hyland and Jiang, 2018, p. 21), *but* might be regarded as the default

TABLE 3 Summary of additive transitions in both sub-corpora.

No.	Lexical items	ETs			CTs			Log-likelihood value*
		RawFrq.	NmlFrq.	Range	RawFrq.	NmlFrq.	Range	
1	And	440	13.39	4	331	9.98	4	16.52****
2	Also	26	0.79	4	111	3.35	4	−55.98****
3	Still	19	0.58	3	48	1.45	3	−12.70***
4	Again	26	0.79	4	5	0.15	2	15.78****
5	Further	2	0.06	1	11	0.33	3	−6.77**
6	Equally	1	0.03	1	2	0.06	1	−0.33
7	At the same time	0	0.00	0	2	0.06	1	−2.75
8	Besides	0	0.00	0	2	0.06	1	−2.75
	<b>Total</b>	<b>514</b>	<b>15.64</b>		<b>512</b>	<b>15.43</b>		<b>0.05</b>

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ; \*\*\*\* $p < 0.0001$ .

TABLE 4 Summary of comparative transitions in both sub-corpora.

No.	Lexical items	ETs			CTs			Log-likelihood value*
		RawFrq	NmlFrq	Range	RawFrq	NmlFrq	Range	
1	But	200	6.09	4	98	2.95	4	36.61****
2	Rather than	7	0.21	2	0	0	0	9.77**
3	Yet	5	0.15	2	0	0	0	6.98**
4	Even if	4	0.12	2	0	0	0	5.58*
5	Although	1	0.03	1	2	0.06	1	−0.33
6	Even though	3	0.09	2	0	0	0	4.19*
7	However	2	0.06	1	1	0.03	1	0.35
8	Whereas	3	0.09	2	0	0	0	4.19*
9	On the other hand	2	0.06	1	0	0	0	2.79
10	Though	2	0.06	2	0	0	0	2.79
11	While	2	0.06	2	0	0	0	2.79
	<b>Total</b>	<b>231</b>	<b>7.03</b>		<b>101</b>	<b>3.04</b>		<b>53.54****</b>

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\*\* $p < 0.0001$ .

option for expressing comparative and consequential relations in academic speech contexts.

## Consequences

Consequential transitions mark that a conclusion is being drawn or justified, or that an argument is being rejected. Analysis showed that teachers in the ET sub-corpus use consequences with the highest frequency among the three transitional devices they use. On the other hand, teachers in the CT sub-corpus employ consequences with the second highest frequency. Table 5 presents the frequencies, types, and ranges of consequential lexical items in both sub-corpora. Concerning frequencies, teachers in the ET sub-corpus make significantly more frequent use of consequential transitions than those in the CT sub-corpus at the  $p < 0.0001$ . With regard to lexical types, distinct from their discrepancies in additions and comparisons, both groups of teachers use consequences with six types of

lexical items. In relation to ranges, two lexical items *so* and *because* are used extensively by each of the teachers in both sub-corpora. In particular, *so* is used with predominantly higher frequencies as opposed to other lexical items in both sub-corpora. This may prove that *so* may be deemed as the default form to convey consequential relations between propositions.

## Frame markers

### Sequencing

Sequencing refers to the order of different parts of a discourse or an argument, usually serving as explicit additive relations. It is the second most frequently used frame marker following the shifting topic category. Table 6 reveals the frequencies, types, and ranges of individual lexical items used by teachers in the two sub-corpora. First, it reveals that teachers

TABLE 5 Summary of consequential transitions in both sub-corpora.

No.	Lexical items	ETs			CTs			Log-likelihood value*
		RawFrq.	NmlFrq.	Range	RawFrq.	NmlFrq.	Range	
1	So	495	15.06	4	209	6.30	4	122.36****
2	Because	129	3.93	4	81	2.44	4	11.53***
3	So that	4	0.12	3	17	0.51	3	-8.54**
4	Since	1	0.03	1	8	0.24	3	-6.13*
5	Therefore	2	0.06	1	3	0.09	1	-0.19
6	Thus	0	0	0	4	0.12	2	-5.51*
7	As a result	1	0.03	1	0	0	0	1.4
	<b>Total</b>	<b>632</b>	<b>19.23</b>		<b>322</b>	<b>9.71</b>		<b>105.57****</b>

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ; \*\*\*\* $p < 0.0001$ .

TABLE 6 Summary of sequencing in both sub-corpora.

No.	Lexical items	ETs			CTs			Log-likelihood value*
		RawFrq.	NmlFrq.	Range	RawFrq.	NmlFrq.	Range	
1	Then	163	4.96	4	228	6.87	4	-10.24**
2	First	60	1.83	4	153	4.61	4	-41.12****
3	Second	36	1.10	4	84	2.53	4	-19.29****
4	Last	32	0.97	4	51	1.54	4	-4.21*
5	Next	36	1.10	4	24	0.72	4	2.53
6	Start (s/ing)	22	0.67	4	13	0.39	2	2.43
7	Third	2	0.06	1	29	0.87	4	-27.89****
8	First of all	2	0.06	2	11	0.33	4	-6.77**
9	Begin	2	0.06	1	4	0.12	3	-0.66
10	Firstly	1	0.03	1	3	0.09	1	-1.03
11	Secondly	0	0.00	0	1	0.03	1	-1.38
	<b>Total</b>	<b>356</b>	<b>10.83</b>		<b>601</b>	<b>18.12</b>		<b>-61.11****</b>

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ; \*\*\*\* $p < 0.0001$ .

in the ET sub-corpus use sequencing devices less frequently than those in the CT sub-corpus. Specifically, the log-likelihood value indicates that teachers in the ET sub-corpus use significantly less sequencing devices than their counterparts in the CT sub-corpus at  $p < 0.0001$ . Second, it can be noticed that both groups of teachers use quite similar numbers of lexical types. Teachers in the ET sub-corpus use 10 types of lexical items, while those in the CT sub-corpus use 11. Third, in terms of the ranges of lexical items such sequencing markers including *then*, *first*, *second*, *last*, and *next* are used extensively in both sub-corpora. The high frequency of sequencing markers in the CT sub-corpus is largely due to the larger proportion of these five lexical items. In addition, teachers in the CT sub-corpus also use *third* and *first of all* in considerably high proportions. This evidences previous research that tertiary-level classroom instructions are heavily signposted (Swales, 2001).

Moreover, the relatively high frequency of *first* also resonates with the finding of Yang (2014), who notes that *first/first of all* often acts as an important navigational aid for the students to

“locate learning in time and space” (Walsh, 2011, p. 208). This is also supported by teachers’ varying strategies of initiating a topic, including the use of *start (s/ing)*, *begin*, *firstly*, and *first of all*, which together would account for 2.65 and 5.55 instances per thousand words, respectively, in the ET and CT sub-corpora. However, the current research diverges from that of Yang (2014) in that the overall frequency of these initial sequence markers is still lower than that of *then*. This may demonstrate that there are greater requirements for every following step of the sequences. Furthermore, the thorough analysis of the dataset shows that there are large proportions of teacher monolog in the CT sub-corpus. These successive sequencing lexical items also function as cohesive devices (Halliday and Hasan, 1976) in organizing classroom discourse.

### Labeling stages

As noted above, labeling stages is the least frequently used device among the four pragmatic functional categories realizing frame markers. Table 7 provides an overview of the frequencies,

TABLE 7 Summary of labeling stages in both sub-corpora.

No.	Lexical items	ETs			CTs			Log-likelihood value*
		RawFrq.	NmlFrq.	Range	RawFrq.	NmlFrq.	Range	
1	Conclude	0	0.00	0	5	0.15	2	−6.88**
2	At this point	3	0.09	2	0	0.00	0	4.19*
3	Summarize	0	0.00	0	3	0.09	1	−4.13*
4	By far	2	0.06	2	0	0.00	0	2.79
5	For the Moment	2	0.06	2	0	0.00	0	2.79
6	Sum up	0	0.00	0	2	0.06	2	−2.75
7	All in all	0	0.00	0	1	0.03	1	−1.38
8	In short	1	0.03	1	0	0.00	0	1.40
9	In sum	1	0.03	1	0	0.00	0	1.40
10	Restate	0	0.00	0	1	0.03	1	−1.38
11	Review	0	0.00	0	1	0.03	1	1.38
	<b>Total</b>	<b>9</b>	<b>0.27</b>		<b>13</b>	<b>0.39</b>		−0.69

\* $p < 0.05$ ; \*\* $p < 0.01$ .

types, and ranges of lexical items used by teachers in the ET and CT sub-corpora, respectively. First, the frequency analysis reveals that teachers in the CT sub-corpus use labeling-stage frame markers at a slightly higher frequency (0.39 ptw) than those in the ET sub-corpus (0.27 ptw). The log-likelihood value further shows that there is no significant difference between their frequencies in using labeling-stage frame markers. Second, in terms of lexical types, similar to the aforementioned sequencing category, teachers in the ET sub-corpus employ one type less than those in the CT sub-corpus. Specifically, teachers in the ET sub-corpus use five types of labeling-stage markers, while those in the CT sub-corpus employ six types. Third, regarding ranges, there are no shared lexical items widely used by either or both of the two groups of teachers. This evidences the research of Yan (2010) in that labeling-stage frame markers may not be a characteristic of spoken language, in particular face-to-face communication.

## Announcing goals

Following shifting topics and sequencing, announcing goals rank third among the four pragmatic functions realizing frame markers. Table 8 demonstrates the frequencies, types, and ranges of the lexical items employed by teachers in the ET and CT sub-corpora. In the first place, teachers in the ET sub-corpus use announcing goals with 3.38 instances per thousand words, which is slightly higher than those in the CT sub-corpus. The log-likelihood value (0.81) indicates that there is no significant difference in the use of announcing goals between teachers in the two sub-corpora. Second, teachers in the ET sub-corpus use five types of lexical items, one type more than those used by teachers in the CT sub-corpus. Specifically, the lexical item *aim*, which is used twice by one teacher in the ET sub-corpus, has no instance in the CT

sub-corpus. This may indicate that the difference in using this lexical item could be due to the particular characteristic of individual teachers, but not a pervasive phenomenon. Third, compared with other lexical items, the expression *want to* is used widely and most frequently by every teacher across both sub-corpora. This reveals that *want to* is the most commonly used expression for teachers announcing goals in the classroom teaching process.

## Shifting topics

Among the four pragmatic functions of frame markers, shifting topics is the most frequently used category. The frequencies, types, and ranges of linguistic expressions used by teachers in the ET and CT sub-corpora can be demonstrated in Table 9. First, teachers in the ET sub-corpus use shifting topic markers with 20.97 instances per thousand words, less than those used by teachers in the CT sub-corpus (23.24 ptw). Moreover, the log-likelihood values indicate that teachers in the ET sub-corpus use significantly less shifting topic markers than those in the CT sub-corpus at  $p < 0.05$ . Second, teachers in the ET sub-corpus use nine types of lexical items, compared with eight types used by those in the CT sub-corpus. One lexical item *well*, which is widely used by every teacher in the ET sub-corpus, does not occur in the CT sub-corpus. This might reflect one of the distinctive characteristics of metadiscourse use between the two groups of teachers. Third, in terms of the ranges of lexical items, *okay*, *so*, and *now* are three widely used lexical items by every teacher in both ET and CT sub-corpora. They may represent the common features of teachers' classroom discourse by both native and non-native EAP teachers and in both Chinese and British educational settings. In addition, compared with their sporadic occurrences in the CT sub-corpus, other lexical categories, such as *right*, *well*,

TABLE 8 Summary of announcing goals in both sub-corpora.

No.	Lexical items	ETs			CTs			Log-likelihood value*
		RawFrq.	NmlFrq.	Range	RawFrq.	NmlFrq.	Range	
1	Want to	50	1.52	4	47	1.42	4	0.12
2	Focus	35	1.07	3	22	0.66	3	3.12
3	Purpose(s)	16	0.49	4	21	0.63	2	−0.63
4	Would like to	8	0.24	4	9	0.27	3	−0.05
5	Aim	2	0.06	1	0	0.00	0	2.79
	<b>Total</b>	<b>111</b>	<b>3.38</b>		<b>99</b>	<b>2.98</b>		<b>0.81</b>

\* $p < 0.05$ .

*back to*, and *move on*, are also used extensively by each teacher in the ET sub-corpus.

## Discussion

### Similarities of metadiscourse use across the ET and CT sub-corpora

This section discusses the considerable similarities in metadiscourse use between teachers in the ET and CT sub-corpora, in the sense of both individual metadiscourse categories and individual lexical items within each metadiscourse category.

In relation to individual metadiscourse categories, teachers in both sub-corpora use transitions and frame markers with comparatively higher frequencies than endophoric markers and code glosses. This finding is in line with Yan (2010) and Lee and Subtirelu (2015). It also evinces that teachers in both sub-corpora attach considerable attention to organizing and guiding students through the classroom discourse at both local (realized by transition markers) and global (realized by frame markers) levels (Chaudron and Richards, 1986; DeCarrico and Nattinger, 1988; Zhang, 2017). Both transition markers, such as *and* or *but*, and frame markers, such as *first* or *so*, may contribute to a coherent classroom discourse and help signal shifts in discourse trajectories (Crawford Camiciottoli, 2005). Since students in both contexts of the current study are at the stage of learning language skills, teachers in both sub-corpora are sensitive to students' needs for assistance in navigating through the instructional process. Teachers' use of such interactive markers may serve as signposts to help relieve the cognitive burden on the part of students in processing the classroom instruction that normally lasts for approximately an hour (Cazden, 2001; Bu, 2014). As such, students would benefit from the effort made by teachers in achieving optimal relevance with minimal processing effort in the interpretation of academic information.

In terms of individual lexical items within each metadiscourse category, the first aspect concerns that both

groups of teachers make frequent use of transition markers such as *and*, *but*, and *so*, respectively, to display the additive, comparative, and consequential transitions between discourse segments. In effect, previous research also found that *and* is so prevalent that it is sometimes left out from rhetorical analysis because it is regarded as the default option of "marking conjunctive relations" of addition (Hyland and Jiang, 2018, p. 21). The current research may develop this view and demonstrate that *but* and *so* likewise are so prevalent that they may also be deemed as the default options of expressing comparative and consequential relations in academic speech contexts.

Second, teachers in both sub-corpora use the frame markers *then*, *first*, and *second* with considerably high frequencies to indicate sequencing relations. These sequencing frame markers can serve as an important navigational aid for the students to "locate learning in time and space" (Walsh, 2011, p. 208). This confirms Fung and Carter's (2007) view that discourse markers like *firstly*, *secondly*, and *then* are used frequently in teachers' classroom discourse to signal and segment the logical sequence. However, the current research reports exceptionally higher frequencies of *then* compared with *first* and *second*, which seems to be inconsistent with Yang's (2014) finding that *first* is predominantly widespread in Chinese teachers' classroom discourse, sometimes without using subsequent logical connectors like *secondly* and *thirdly*. Nevertheless, this might be compensated for by other forms of expressions with a similar meaning to *first*, either in freestanding forms such as *firstly*, *start*, and *begin*, or in the multiword expression *first of all* in the current research.

The third feature shared by teachers in ET and CT sub-corpora is the extensive use of framing markers *okay*, *so*, and *now*. These are the top three frequently used lexical items by every teacher in both ET and CT sub-corpora. This is partly in conformity with previous studies (Sacks et al., 1974; Schiffrin, 1987) which found that *okay* and/or *so* are common pre-closing devices to open another round of talk prior to conversational closure. Moreover, Carter and McCarthy (2006) also noted that these frame markers marking shifting topics are commonly used at the opening/closing positions of a topic.

TABLE 9 Summary of shifting topics in both sub-corpora.

No.	Lexical items	ETs			CTs			Log-likelihood value*
		RawFrq.	NmlFrq.	Range	RawFrq.	NmlFrq.	Range	
1	Okay	293	8.92	4	514	15.49	4	−59.21****
2	So	191	5.81	4	171	5.15	4	1.3
3	Now	41	1.25	4	57	1.72	4	−2.47
4	Right	53	1.61	4	10	0.30	3	32.62****
5	Well	52	1.58	4	0	0.00	0	72.58****
6	All right	24	0.73	3	7	0.21	1	10.02**
7	Back to	22	0.67	4	3	0.09	1	16.49****
8	Move on	10	0.30	4	4	0.12	1	2.71
9	Move	3	0.09	3	5	0.15	1	−0.49
	<b>Total</b>	<b>689</b>	<b>20.97</b>		<b>771</b>	<b>23.24</b>		<b>−3.86*</b>

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\*\* $p < 0.0001$ .

They can perform both interactive and social function at the same time in classroom discourse (Walsh, 2006; Fung and Carter, 2007). This enriches previous studies on discourse markers (e.g., Hellermann and Vergun, 2007; Evison, 2009). These signposting devices can function as a lubricant in teacher–student interaction to reduce understanding difficulties, incoherence, and social distance between teachers and students (Yang, 2014).

## Differences of metadiscourse use across the ET and CT sub-corpora

The current research has sought to make an in-depth analysis of two other aspects of variations in metadiscourse use between teachers in the two sub-corpora. The first difference relates to the use of some metadiscourse markers with different functions. The second aspect concerns salient metadiscourse devices which may occur with strikingly high frequencies in one sub-corpus but with very few or no instances in another.

The first difference of transitions and frame markers across teachers in the ET and CT sub-corpora is the use of consequence transition marker *so* in the ET sub-corpus as opposed to the frame markers *first* and *then* in the CT sub-corpus. As mentioned earlier, teachers endeavor to construct a coherent classroom discourse at both the local (realized by transition markers) and global (realized by frame markers) levels. However, results from the current research reveal that the teachers in the ET sub-corpus are more inclined to organize classroom discourse at the local level typically by virtue of consequential relationships. This is realized by the significantly high frequencies of the transition marker *so*. Yet the case is opposite on the part of teachers in the CT sub-corpus, who mainly frame the sequence of the discourse by the frame markers *first* and *then*. This may extend previous research on teachers' classroom metadiscourse use (e.g., Lee and Subtirelu, 2015;

Zhang, 2017) by demonstrating that Chinese EAP teachers and those in the United Kingdom show variations in their logical preferences when delivering classroom instruction. Admittedly, even though transitions and frame markers are employed with varying frequencies in the two sub-corpora, these two categories constitute the major interactive devices.

With regard to the second aspect, an obvious discrepancy concerns the frame marker *well*, which is used as a shifting topic device. It occurs with a relatively high frequency in the ET sub-corpus, however, with no instance in the CT sub-corpus. Such a discrepancy may be explained by the development order of acquisition (Hays, 1992; Cf. Hellermann and Vergun, 2007). In a study on the use of different types of discourse markers by Japanese learners of English in their first, second, or third year of study, Hays (1992) found that while discourse markers *but*, *and*, and *so* are used frequently, very few learners use *well*. This led him to speculate that there might exist a developmental order for the acquisition of discourse markers. Discourse markers that are on the ideational plane have greater semantic weight and are taught and used first, whereas those that are more purely pragmatic, interactional discourse markers appear later in the subjects' speech. This speculation is supported by Trillo's (2002) corpus-based study that compares the use of discourse marker usage between native speakers and L2 learners of English and also finds that learners of English use the discourse markers *well*, among others, with a much lower frequency than native speakers.

## Impact of speech community and discourse community on teachers' rhetorical strategies

The aforementioned two sections illustrated the similarities and differences of metadiscourse use between teachers in the ET and CT sub-corpora and explored their possible reasons,



respectively. Taken together, however, this vast similarities and differences of teachers' rhetorical characteristics may be explained under the constructs of discourse community and speech community.

Based on Swales (1990), a discourse community generally has a broadly agreed set of common goals, and its members share a suitable degree of content and discursive expertise. Following this thought, it is arguable that the EAP teachers in both ET and CT sub-corpora can be regarded as belonging to a specific type of EAP teaching discourse community. Members, such as teachers, in one discourse community may demonstrate more or less similar patterns of behavior in their classroom discourse in order to sustain their professional membership, such as the use of metadiscourse markers to help students navigate through the lesson. This may lead to extensive similarities in their metadiscourse use in classroom teaching.

Specifically, this research demonstrated considerable similarities in interactive metadiscourse use across the two groups of teachers, in the sense of both individual metadiscourse categories and individual lexical items within each metadiscourse category. Such similar features may be due to the fact that teachers' classroom discourse in both sub-corpora, although located in different cultural and educational settings, falls into the same discourse community. That is to say, they both belong to spoken academic discourse or, more specifically, classroom teaching discourse. This is also corroborated by the fact that these both of two groups of teachers are delivering EAP writing courses, which are specifically selected for the present study to reduce the effects of other factors apart from cultural and educational settings. Previous research (Swales, 1990; Arminen, 2005; Abdi et al., 2010; Lee, 2016) has noticed that specific genres can restrict the discourse conventions of communication. Thus, it might be concluded that the norms and conventions of the classroom teaching discourse genre constrain the metadiscourse use of these teachers, irrespective of their variant cultural and educational backgrounds.

Meanwhile, discourse community is often contrasted with a speech community, which is defined as "a group of people who naturally share a language (e.g., native speaker of English) in terms of grammar, lexicon, etc." (Abdi et al., 2010, p. 1670). In other words, a speech community refers to a group of people whose membership is naturally formed due to factors such as geographical locations and largely cannot be chosen. Specifically, this research also demonstrated considerable discrepancies in the metadiscourse use between teachers in the ET and CT sub-corpora in terms of both some metadiscourse markers with variant or roughly contrastive functions, and some salient metadiscourse devices which may occur with markedly high frequencies in one sub-corpus but with very few or no instances in another. In addition to the aforementioned possible reasons such as logical preferences and development order of acquisition, another more general reason

may be that teachers in the two sub-corpora belong to two different speech communities.

As noted by Abdi et al. (2010), people may fall into different speech communities due to their geographical locations and cultural backgrounds, which cause them to share a language and cultural norm that differ from another group of people. Among other factors, the former group of teachers belongs to a part of the Western world in which English is spoken as the first language, whereas the latter belongs to the eastern world in which English is learned and spoken as a foreign language. Such a discrepancy in the speech community may result in concomitant distinctive features to differentiate them from each other. Moreover, previous research (Swales, 1990; Abdi et al., 2010; Lee, 2016) argues that specific genres have a bearing on discourse use, the present research may further demonstrate that variation in speech communities can also lead to discrepancies in patterns of communication.

## Conclusion

The study investigated the interactive metadiscourse use by EAP teachers across the British and Chinese contexts. It corroborates previous research that teachers attach much importance to organizing and guiding students through the classroom discourse at both local (realized by transition markers) and global (realized by frame markers) levels (Chaudron and Richards, 1986; DeCarrico and Nattinger, 1988; Zhang, 2017). Moreover, considerable alignments and discrepancies of interactive metadiscourse use were observed between EAP teachers in the two cultural and educational settings. The alignments were evidenced in both individual metadiscourse categories and individual lexical items within each metadiscourse category, whereas the discrepancies reside in the different uses of some metadiscourse markers with varying functions, or some salient metadiscourse devices which may occur at strikingly high frequencies in one sub-corpus but with very few or no instances in another. Potential reasons such as variation in logical preferences, development order of acquisition, and the notions of discourse community and speech community were also discussed to illustrate these similarities and differences of metadiscourse use by EAP teachers in the British and Chinese contexts. In addition, other factors, such as individual teachers' beliefs about EAP language teaching (Basturkmen, 2012), their coping strategies (Nazari and Atai, 2022), pedagogical knowledge (Shulman, 1986), and language awareness (Andrew, 2001, 2007), may also, to some extent, affect teachers' discursive practices, which are interesting topics but are beyond the scope of the current research due to space limitations.

Admittedly, the research is not without any limitations. First, following the data sampling size of Zhang and Lo (2021) and Doiz and Lasagabaster (2022), this research also selected

four teachers in each side for comparison. Such a small corpus may inevitably result in a lack of rigor in the generalizability of the findings in the current research to the broader native and non-native EAP teachers in the United Kingdom and China, or the transferability of those findings to other contexts. Also, the metadiscourse items identified in this study are by no means exhaustive, but merely representative of the current research. They should also be reconsidered according to specific contexts being investigated in further research. Bearing this in mind, the current research is not intended to be generalizable or transferrable but to be explanatory and illustrative of teachers' classroom discourse in EAP writing courses. Future research may rely on some large-scale corpus to probe into the more generalizable features of teachers' metadiscourse use between teachers in different cultural contexts. In addition, more varied sources of data could be used to triangulate the findings of the current research, such as using stimulated recall or semi-structured interviews, reflective journals, and questionnaires to investigate teachers' and students' perceptions and views of metadiscourse use in classrooms. Having said that, the study presented here has made a useful comparison between the findings of this research and those of existing studies into spoken and written academic genres. Such a discussion situates the results of the current research into a broader academic context and builds up our understanding of teachers' metadiscourse use in classrooms.

## Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Ethics statement

The studies involving human participants were reviewed and approved by the Research Ethics and Governance Committee of the College of Arts and Social Sciences at the University of Aberdeen. The patients/participants provided their written informed consent to participate in this study.

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## Author contributions

XW conceptualized the study, collected the data, analyzed the data, and wrote the manuscript. HY conceptualized the study, analyzed the data, and reviewed the writing. Both authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# Revisiting L2 pragmatic competence through implicit vs. explicit instructional framework

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Successful interaction in the target language requires L2 learners to use and understand the grammatically correct language. At the same time, the language used is expected to produce socioculturally appropriate utterances that it refers to their Pragmatic competence. The latter entails acquiring pragmatic competence, which has proved to be very challenging for L2 learners. This is because they gain limited exposure to the use of language for real communication in an authentic social setting. Moreover, instruction has been found to influence the functional abilities in L2 as it equips the learners with the ability to produce and comprehend L2 in different situations. Focusing on the research conducted on the role of explicit and implicit instruction on L2 pragmatic competence, this study aimed to give a summative description of the empirical studies carried out on teaching pragmatics. The investigation ends up with a conclusion, instructional implications, and suggestions for future research.

## KEYWORDS

pragmatic competence, real communication, authentic social setting, explicit instruction, implicit instruction

## Introduction

As a central component of communicative competence, pragmatic competence takes in the capability to engage in the dynamic and interactive negotiation of meaning. Such a type of negotiation takes place between two or more persons in specific circumstances (Timpe Laughlin et al., 2015). Similarly, LoCastro (2003) asserts that pragmatics concerns the examination of the meaning conveyed between speaker and hearer thanks to their joint actions, which involves both linguistic and non-linguistic cues embedded within socioculturally organized activities. This delineation of pragmatics emphasizes speaker-hearer communication unfolding in a sociocultural setting; therefore, it can be implied that pragmatic competence requires knowledge of linguistics, and social norms, as well as the capability to put to practice these forms of knowledge in social interactions. Pragmatic competence concerns the individual's capability of understanding and making appropriate responses to communicative and linguistic gestures (Farashaiyan and Muthusamy, 2016). Both grammatical knowledge and pragmatic competence enjoy the same status in terms of the contribution they make



to effective communication. As mentioned by Celce-Murcia (2007), the development of L2 proficiency entails the improvement of pragmatic competence. Lacking this ability, a speaker may grapple with miscommunication. Therefore, literature shows that in recent decades, there has been growing attention to the acquisition of pragmatic competence as an essential component other than lexico-grammatical proficiency in the EFL context (Ishihara and Cohen, 2010).

The integration of SLA and pragmatics yields L2 pragmatics. Studies on this construct examine the ways in which L2 learners gradually gain the knowledge of what, when, and to whom they should say something; what factors are contributing to gaining such knowledge; how can such knowledge be studied, taught, and assessed in social settings. These make up the field of L2 pragmatics (Bardovi-Harlig, 2013; Taguchi and Roever, 2017). From this perspective, L2 pragmatics is concerned with examining the association between L2 structure and its use by focusing on how these two abilities are learned and how they cooperate (Hymes, 1972). The results of investigations conducted in China reveal that EFL learners' pragmatic competence is not satisfactory (Liu, 2004; Xiao et al., 2019). Although L2 learners perform well on a test, they grapple with miscommunication in English when they have to take part in authentic conversations. These challenges emanate from their poor pragmatic competence. EFL learners in China have rare opportunities for being exposed to real language use. Consequently, they acquire insufficient pragmatic knowledge, making it challenging for them to comprehend and produce language appropriately. Furthermore, classroom input makes an important contribution to English language learning (Kim and Hall, 2002), so they have proved to be indispensable elements in the progress of pragmatic competence (Bardovi-Harlig, 2013). As a result, it is essential to incorporate pragmatic instruction in language education programs.

Given that L2 learners need to be equipped with pragmatic competence to be able to engage in successful negotiations of meaning in the context of a target language, it is of enormous importance to incorporate effective education on pragmatic skills in language courses (Akutsu, 2012) as a review of the literature shows that an increasing number of investigations have been dealing with L2 pragmatics over the last 30 years (Taguchi and Roever, 2017; Derakhshan and Arabmofrad, 2018; Yang, 2018; Taguchi, 2019; Derakhshan and Eslami, 2020; Malmir and Derakhshan, 2020; Derakhshan and Shakki, 2021; Yang and Ke, 2021; Zhang, 2022). Yet, when it comes to pedagogical aspects, many L2 learning environments, teacher education programs, and textbooks fall short of providing L2 learners with pragmatic instruction and daily interaction skills and sub-skills (Bardovi-Harlig, 2013). Pragmatic knowledge used to be underestimated by many teachers and educators until recently, which is evidenced by the question posed by Kasper (1997) as to whether one can teach pragmatic competence in the classroom? Even though many objections and arguments have

been made in this respect, much-supporting evidence has been collected to consolidate the claim that pragmatics is necessary and can be taught in an L2 setting.

Classroom observations show that L2 learners suffer from a deficiency in pragmatic knowledge, which emanates from exposure to insufficient and sometimes irrelevant input in EFL classrooms (Malmir and Derakhshan, 2020). There has been a controversy over whether or not pragmatics can lend itself to teaching. To this end, some investigations have examined the possible effect of explicit instruction of pragmatic skills and metalanguage on the quality of communication in the target language in classroom settings (Grice, 1975; Blight, 2002; Lee, 2002). The increasing number of studies on pragmatics has revealed that teachers can teach pragmatic competence in their classes (Yazdanfar and Bonyadi, 2016; Alzebaree and Yavuz, 2017). Despite the arguments made by some linguists concerning the difficulty of teaching pragmatics (Krisnawati, 2011), it is highly important to integrate pragmatic knowledge in an L2 classroom. This is, particularly, essential for EFL contexts where instruction is the only means through which learners are exposed to the target language (Nugroho et al., 2020). In the same vein, in the view of Bardovi-Harlig (2013), teaching pragmatics can be useful as it paves the way for the L2 learners' acquaintance with the second or foreign language by providing authentic materials. Therefore, students can experience the actual use of language. In the same vein, Kasper and Rose (2002) maintain that L2 learners would not acquire pragmatic competence by merely being exposed to the target language as they fail to become aware of many contextual factors, which are not noticed given that they are not salient in the context. Consequently, teaching pragmatic competence and socially appropriate language have been put forth as one way to overcome this shortcoming (Bardovi-Harlig and Mahan-Taylor, 2003).

Assumed the results of the formative paper presented by Norris and Ortega (2001) on the efficacy of L2 instruction, meta-analysis came to be prioritized over other research synthesis methods. Some investigations (Norris and Ortega, 2001; Badjadi, 2016; Plonsky and Zhuang, 2019; Yousefi and Nassaji, 2019; Shakki et al., 2021) have been carried out using a meta-analysis format and review studies to address the various topics in the area of pragmatics. Moreover, There has been a growing interest in examining the role of instruction on L2 pragmatics achievement in recent years (Rose, 2005), with the majority of them dealing with three significant questions: (1) can L2 pragmatic competence lend itself to teaching?; (2) can instruction make any contribution?; (3) does the type and method of instruction have any effect? In a nutshell, these studies have shown that although L2 learners find some areas of L2 pragmatics very difficult, L2 pragmatics lends itself to teaching, which has proved to contribute to pragmatic development (Kasper and Rose, 2002; Rose, 2005; Jeon and Kaya, 2006). Moreover, in the past, a large number



of investigations have sought to demonstrate the efficacy of pragmatic instruction, with a growing body of research carrying out quasi-experiments in this regard (Taguchi, 2015). These studies have investigated pragmatics instruction by focusing on various issues, behaviors, and L2 structures. Some articles (Rose, 2005; Jeon and Kaya, 2006; Belz, 2007; Taguchi, 2015; Derakhshan et al., 2020), have presented a summary and meta-analysis of these research findings.

Overall, there is a consensus that instruction will turn out to be more effective than mere exposure to input; however, it should be stated that the effectiveness of L2 pragmatics instruction varies across studies. The foregoing studies have dealt with multiple factors assumed to contribute to the effectiveness of pragmatics instruction; however, very few studies have examined the contribution of different types of instructions in an EFL context. Considering the important contribution of pragmatic competence to L2 learning and the role it plays in allowing the learners to engage in effective communication in cross-cultural contexts, the present study sought to paint a general picture of the studies conducted on the instruction of L2 pragmatic competence. The aim was to provide the researchers with some insights on whether the instruction of pragmatic skills yields any positive outcomes in the EFL context.

## Review of the literature

### Pragmatic competence

Several descriptions of the term “pragmatics” have been presented in the literature, which addresses or highlights the various dimensions of the construct (LoCastro, 2003). For example, Thomas (1995) maintains that both speaker’s intention and statement play an important role in pragmatics, so the exclusion of one leads to the exclusion of the other one. LoCastro (2003) elaborates on the multiple characteristics of pragmatic competence, including its interactional and dynamic aspects. He defines pragmatic competence as the examination of the shared meaning created by speaker and hearer, which involves both linguistic and non-linguistic indicators in socioculturally prearranged tasks. This definition attaches great importance to the speaker–hearer communication, verbal and non-verbal channels (Beebe and Waring, 2004; Wharton, 2009), as well as the sociocultural factors determining the intended meaning in interactional discourse. According to Kasper and Rose (2002), pragmatic competence involves the capability of producing and comprehending statements or speech in sociocultural relations. Barron (2003) describes pragmatic competence as having at one’s disposal the linguistic resources required for comprehending specific illocutions. This requires knowing the progressive facets of speech acts, as well as how to use the particular language’s linguistic resources in appropriate contexts. Consequently, having pragmatic competence has to do

with an interaction between linguistic knowledge and contextual use. This is because producing and comprehending words is highly dependent on grammatical knowledge and contexts.

Pragmatic competence involves the individual’s capability of dealing with different social situations through the use of language. According to Taguchi (2019), the conceptualization of pragmatic competence has changed over the years. This is because pragmatic competence has proved to be a multi-dimensional construct that entails three types of knowledge and skill: knowledge of what to say in a linguistically correct and socioculturally appropriate manner; the ability to engage in interaction to convey the message adaptively and flexibly in line with the changing contexts; and agency to figure out if it is helpful to put to use the knowledge in a given community.

One primary conceptualization of pragmatic competence was initially proposed by Leech (1983) and Thomas (1995). Some researchers have proposed their early conceptualizations of pragmatic competence, focusing on two sub-categories of pragmatics, namely, pragmalinguistics and sociopragmatics. The former is related to grammar that an individual requires for effective communication (e.g., pragmatic strategies and various linguistic forms, among others). Sociopragmatics is concerned with the social aspects related to the culture, as well as the interactive nature of communicative behavior. It is also related to social perceptions driving people’s interpretations. Social connections, observing proximity, the speaker’s and hearer’s rights, and requirements can be adjusted in communication (Taguchi, 2015). The domain of pragmatics covers various topics, such as politeness, illocutionary, proximity, interaction, movements, presupposition and entailment, and discourse, among others (Ishihara, 2010; Derakhshan, 2019).

### Explicit and implicit instructions

Norris and Ortega (2001) conducted a meta-analysis study on the types of L2 instruction, that revealed focused instruction to be more effective. In their study, categorized how pragmatic competence is taught into two groups: explicit vs. implicit treatments. It is claimed that explicit instruction, i.e., various classroom techniques employed to focus learners’ attention on structures and forms, is about to yield more positive outcomes than implicit instruction. The latter refers to methodological possibilities which enable students to infer rules unconsciously (Jeon and Kaya, 2006). Along with Norris and Ortega (2001), these two approaches are different in terms of the degrees of explanations provided in the class. In explicit instruction, learners are provided with rule explanations during instruction. As for interlanguage pragmatics, this has to do with the question of whether or not explicit metapragmatic information helps the learners to grasp and understand the target features more easily (Rose, 2005). Implicit instruction does not include any explanation of pragmatics or metapragmatic rule provision. The

quasi-experimental studies have examined the extent to which these two modes of instruction are effective. To this end, they have compared an explicitly taught group with an implicitly taught group, with a control group sometimes included as well. The Implicit instruction of pragmatic competence has received much less attention than explicit pragmatic instruction. Along the same lines, Fukuya and Zhang (2002) refer to the fewer studies conducted on implicit pragmatic instruction, stating that this concern is understudied both conceptually and methodologically. Implicit instruction entails exposure to pragmatic input and providing no explicit explanation of the rules, i.e., meta-pragmatic information (Takahashi, 2001; Hernandez, 2011; Derakhshan and Shakki, 2020). In the same vein, many investigations have indicated the efficacy of explicit instruction, the significance of metapragmatic explanation, as well as the effect of the implicit intervention (Jeon and Kaya, 2006; Takahashi, 2010; Taguchi, 2015).

## Related studies on instruction

Quite a lot of research has been carried out on the possible role of instruction in the development of pragmatic competence, with the majority of them showing positive outcomes. The bulk of investigations conducted on the effect of L2 pragmatic instruction have mainly examined explicit instruction and implicit instruction about learning outcomes. To this end, they have compared explicit instruction with no explicit instruction (Kasper and Rose, 2002; Takahashi, 2010). Bacelar da Silva (2003) conducted a longitudinal study to examine the function of explicit teaching in the acquisition of polite refusal speech acts. Both sociopragmatic and pragmalinguistic aspects of refusal speech acts were taught by embedding various tasks with metapragmatic knowledge. Results indicated that explicit instruction enhances students' pragmatic competence in refusal speech acts. In addition, Takahashi (2010) conducted a meta-analysis that involved the analysis of 49 studies. The results showed that explicit intervention was more effective than implicit intervention. The investigations covered in this analysis were all experimental, and they used a pre-test and post-test design. They concluded that overall, explicit interventions were found to be more effective in terms of the development of pragmatic features, particularly concerning some sociopragmatic features.

Moreover, Halenko and Jones (2011) conducted a study on 26 EFL learners in China. The results showed that explicit instruction enabled the participants to enhance their pragmatic abilities. This helped them to identify and produce pragmatically appropriate language forms. In their study, Nguyen et al. (2012) sought to examine the possible effect of explicit and implicit instruction on the acquisition of pragmatic competence. The sample consisted of sixty-nine Vietnamese students, who were split into three groups, namely, explicit, implicit, and

control groups. The findings indicated that though the explicit instruction group performed better than the implicit one, students in both groups was more successful than the control group, thanks to the power of instruction. Similarly, Rajabi and Farahian (2013) carried out a study to assess the effect of instruction on the progress of pragmatic competence. The sample of the study was comprised of thirty-four Iranian EFL learners, who were assigned into two groups, i.e., an experimental and a control group. The former had awareness-raising instruction as their intervention. The findings showed that the group who received treatment outperformed the control group. Moreover, both explicit and implicit groups performed much better than the control group in terms of pragmatic performance.

Soler and Pitarch (2010) investigated the impact of teaching on raising pragmatic consciousness concerning the two phases involved in refusal speech acts, namely, planning and execution. Results revealed the efficacy of explicit instruction in channeling the learners' attention to pragmatics. Results also showed that explicit instruction made a shift in learners' attention as they concentrated on pragmalinguistic and sociopragmatic aspects rather than linguistic ones. In a review of more than 58 experimental studies in interlanguage pragmatics, Taguchi (2015) reviewed fifty-eight experimental studies on interlanguage pragmatics. The results showed that explicit instruction of pragmatic features was considered to be more operative compared to implicit instruction. The former focused on the form related to metapragmatic information. Input exposure proved to be inadequate in bringing about learning, even when the input had been highlighted by using enhancement techniques. Explicit explanations of the pragmalinguistic and sociopragmatic aspects of the speech act, along with raising awareness embedded in the tasks led to the learners' metapragmatic awareness. Pragmatic features are more likely to lend themselves to explicit teaching than to implicit instruction (Rose, 2005).

In their review, Plonsky and Zhuang (2019) gathered a total of 50 research papers to examine the extent to which pragmatics instruction was effective. The results reinforced the previous meta-analyses acknowledging the effectiveness of explicit instruction compared to implicit instruction. They concluded that as pragmatics instruction provides ample opportunities for practice, it turned out to be more effective than instruction lacking practice, with longer instruction found to be better than the other one in general. Additionally, Doan (2019) scrutinized the efficiency of explicit and implicit instruction in terms of the learning outcomes regarding the acquisition of apology strategies among advanced L2 learners. The sample was made up of 30 potential participants who were divided into implicit and explicit instructions. The findings revealed that both training groups were far different in terms of their ability to produce speech acts after the treatment. Yet, explicit training was found to be advantageous to learners

compared to the implicit training approach. Derakhshan and Shakki (2020) sought to consider the potential effect of the implicit and explicit instruction of metapragmatics on the Iranian EFL learners' knowledge and their use of apology and refusal. The sample consisted of 49 EFL students, who were divided into three groups as follows: implicit instruction, explicit instruction, and control. The results showed an improvement in the learners' pragmatic comprehension, with the explicit group outperforming the other groups.

## Conclusion, implications, and suggestions for further research

Great importance has been attached to the function of the instruction of L2 pragmatic competence in the language classroom. Research shows that there is a correlation between language proficiency and multiple components, including grammatical knowledge, syntax, morphology, phonology, and semantics; moreover, language proficiency is correlated with pragmatic competence, as well. Having no pragmatic competence would lead to miscommunications; consequently, there should be an emphasis on the incorporation of sociocultural awareness-raising modules in the classroom. As stated by Soler (2001), a foreign language classroom is considered a good place where pragmatic competence can be taught and learned; The application of similar methodologies in EFL contexts enhances learners' ability. Research on L2 pragmatics has revealed the positive outcomes of instruction compared to mere exposure to target pragmatic features regarding improving learners' L2 pragmatic competence (Belz, 2007; Taguchi, 2015).

There are some of the contributions made by this study to the literature; for instance, instruction of pragmatics can help the students to acquire pragmatic competence; given that L2 education programs aimed at enabling the learners to use L2 appropriately and effectively in different interactional settings, so efforts should be made to raise learners' pragmatic awareness. Moreover, learners should be equipped with some beneficial ways to engage in successful communication where there are different interlocutors; therefore, pragmatic competence needs to be an integral part of the L2 curriculum. The majority of investigations indicated that pragmatic instruction is more helpful than no instruction concerning the development of both linguistic and pragmatic competence (Tulgar, 2016). Given the results of the meta-analysis related to explicit instruction versus implicit instruction of pragmatics (Rose and Ng Kwai-Fun, 2001; Takahashi, 2001; Safont, 2005), it is concluded that explicit instruction yields better outcomes as this type of instruction involves the provision of metapragmatic information (e.g., rules of use and examples). The results revealed that EFL learners opted for explicit instruction

as the language learners are rarely exposed to English in an EFL context like China. The effectiveness of explicit instruction may be attributable to its power in focusing learners' attention on the target features. This enabled the learners to focus on the inputs containing it, providing them with more processing space for the exclusive processing of the target feature. In contrast, implicit teaching does not involve a direct focus on the feature in question (Roever, 2009). Provided that learners in the explicit instruction group performed much better on the post-test, it can be concluded that metapragmatic explanations helped learners to have linguistically correct and pragmatically proper statements.

Considering that pragmatic instruction makes an important contribution to L2 development, it is needed to incorporate the modules of pragmatic competence in combination with other language tasks to promote students' consciousness regarding the proper use of the language. L2 input should be included along with other tasks in various contexts. This would make the learning process more meaningful. Elaborating on the importance of preparing and designing lessons, Solak and Bayar (2015) assert that the L2 curriculum must be organized based on a practice-based orientation rather than a conventional theory-based orientation. In these contexts, learners are provided with an opportunity to practice language, going beyond memorizing or mastering the linguistic forms (Eslami-Rasekh et al., 2004). Pragmatic knowledge and competence provide the learners with authentic input, enabling them to make informed pragmatic choices (opting for pragmatically suitable input in an EFL setting where they do not have access to outside-the-classroom opportunities for being exposed to pragmatic samples).

Given the important role of the appropriate use of language along with pragmatic competence in successful communications across cultures (Taguchi, 2015); L2 teachers are usually told to resort to explicit instruction of pragmatic features. They are also advised to present authentic models of L2 so that students can rehearse the appropriate use of language in a socially appropriate situation. Some recommendations have been made for teachers to focus L2 learners' attention on both forms and functions through explicit instruction. Using various types of tasks in explicit instruction, teachers enable the L2 learners to work out the relationship between linguistic forms and functions. Examining the potential contribution made by explicit instruction to learning pragmatic features in an EFL context is of enormous importance in that EFL learners have very limited access to native speakers. Based on the research findings previously conducted, L2 teachers are advised to design tasks aimed at enhancing pragmatics embedded in explicit instruction (i.e., metapragmatic explanations). Explicit instruction allows the students to use the target forms, and to receive feedback from the teacher.

In addition, all L2 instructors must pave the way for students' maximal exposure to the pragmatic features

and students should practice these features in the socially appropriate situation. Moreover, L2 educators are required to have a good knowledge of L2 with an acceptable level of pragmatic awareness so that they can impart such knowledge to their learners in an effective manner. Teachers must have the prerequisite skills to teach these pragmatic aspects. To this effect, they must employ a diversity of tactics during their instruction. Therefore, EFL teachers are advised to raise L2 students' attentiveness to the cultural aspects and serve as a facilitator. Accordingly, materials developers should use a diverse range of authentic appealing materials which encompasses the L2 pragmatic features and metapragmatic information. These features can be incorporated into both tasks and teaching materials.

Curriculum developers need to incorporate materials that explicitly contain various aspects of pragmatics. L2 practitioners also must be cognizant of the research evidence that the explicit instruction of pragmatics improves the EFL learners' awareness, resulting in the build-up of pragmatic competence. This investigation gives some suggestions for the prospective research on pragmatic instruction in China, where such studies are scant. The current study contributes to the current literature by examining several approaches and putting forth some teaching models to prop up pragmatic competence teaching. Language stakeholders need to keep abreast of the latest research on pragmatics so that they can benefit from the latest implications in the instruction of pragmatics in their classes. Constructed on the demonstration of the efficacy of explicit instruction, further research should be done on the effect of methods employed to teach explicitly in this area (methods such as task-based learning or classic methods, among others). As a suggestion for further research, a longitudinal study can be conducted to examine the long-term role of explicit pragmatic instruction on the pace and quality of pragmatic competence. Based on

the insights gained from such a study, teaching approaches can be modified accordingly. More empirical studies can be done in future to study the efficiency of other treatment types than explicit/implicit ones. It might be underlined that comprehending of pragmatic instruction can be exploited by scrutinizing the function of dichotomous interventional teaching methods. Regarding pedagogy, encouraging future paths to improve language learners' pragmatic competence may be established in new areas and similarly in studying the impact of different teaching methods to the progress of proficiency with speech acts.

## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# Extending repair in peer interaction: A conversation analytic study

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Peer interaction constitutes a focal site for understanding learning orientations and autonomous learning behaviors. Based on 10h of video-recorded data collected from small-size conversation-for-learning classes, this study, through the lens of Conversation Analysis, analyzes instances in which L2 learners spontaneously exploit learning opportunities from the on-task public talk and make them relevant for private learning in sequential private peer interaction. The analysis of extended negation-for-meaning practices in peer interaction displays how L2 learners orient to public repair for their learning opportunities in an immediate manner and in so doing, how different participation framework is being utilized to maximize their learning outcomes. As these extended repair practices are entirely managed by learners themselves, they yield both efficient and inefficient learning outcomes. Findings reveal that learners frequently resort to their peers to recycle the focal trouble words for learning opportunities, shifting their participating role from the on looking audience to active learners. By reporting the rather under-researched post-repair negotiation-for-meaning sequence in peer interactions, the study highlights the relevance between on-task classroom activities and private learning, contributing to understanding private learning behaviors in the language classroom and learning as a co-constructed activity locally situated in peer interaction.

## KEYWORDS

peer interaction, conversation-for-learning, conversation analysis, learning opportunities, repair

## Introduction

Constrained by classroom settings and pedagogical designs, conventional teacher-fronted language classes have been criticized for secluding language use from language teaching (Kasper and Kim, 2015). Teaching instructions in teacher-fronted classes are frequently delivered in the form of monolog, IRF (initiation/response/follow-up) and choral repetition (Liu, 2008). Responding to the landmark call for reconceptualizing the second language (L2) learning (Firth and Wagner, 1997), the teaching and learning of L2 are increasingly connected to the real social contexts in which the target language is used (Gardner, 2015). Sequentially, pedagogical arrangements such as conversation-for-learning (Kasper, 2004; Kim, 2012, 2017a,b; Kasper and Kim, 2015; Hauser, 2017a), Talk Time and Language Corner (Gao, 2009)

are implemented to complement conventional language teaching, augmenting L2 learners' exposure to and the employment of the target language. These arrangements offer learners more interactional opportunities and enhance their autonomous learning awareness through maximizing their engagement in simulative real-life interaction (Mori, 2002). The present study reports private learning behaviors in a multiparty conversation-for-learning class. Through the analysis of peer interaction, the paper introduces how L2 learners orient to learning opportunities in private and make use of the possible knowledge asymmetries in peers to maximize individual learning outcomes. The study is mainly informed by three lines of research: classroom discourse; conversation-for-learning (CfL); CA-for-SLA.

A wealth of CA studies has discussed interactional sequences between teachers and students. Given the complexity of classroom discourse, different participation frameworks and interactional trajectories are necessarily distinguished to understand how participants collaboratively construct the orderly classroom activity. The literature on peer interaction in class, however, is relatively sparse. Albeit it has been argued students benefit from interactions with both teachers and peers in the classroom in terms of social and academic development (Chen et al., 2020), there has not appeared "much work that combines fine-grained sequential analyses with analyses of the multiparty design of classroom conversations" (Ahlund and Aronsson, 2015, p. 67). An emerging body of research intends to display the sophisticated designs of different participating frameworks in the classroom by analyzing peer interactions. This vein of research includes how learners retrospectively orient to learning achievements in Content and Language Integrated Classrooms (Jakonen, 2018) and how learners use their L1 to scaffold the off-task peer interactions in EFL class (Stone, 2019).

The research of CfL, upon which the present study builds, has been mainly focused on dyadic interactions between language experts and novices (e. g., Kasper, 2004; Hauser, 2013, 2017a,b). In rare cases, Kim (2017a,b) analyzed interactional practices between two Korean EFL learners and an American language expert, still addressing how learning opportunities are occasionally generated by a language expert for L2 learners. This vein of research has demonstrated how learning opportunities naturally emerge in CfL, and how participants make use of the language and knowledge discrepancy to orient to temporal learning opportunities. In a CfL setting, language becomes the vehicle for communication and the goal of learning. The previous literature has highlighted how language experts scaffold learning for novice learners. Nevertheless, relatively little attention has been given to the participating frameworks in multiparty CfL arrangements and how learners themselves collaboratively assist each other's learning and sense-making.

Employing Conversation Analysis (CA), this study addresses the issue of "schism" (Sacks et al., 1974) or "schisming" (Egbert, 1997) in the classroom by displaying how on-task public interaction

elicits private peer learning activities and how peer talks separate the ongoing classroom interactions. Constructed in the terrain of social interaction, schism refers to the phenomenon that a sole conversation divides into several conversations in a group talk (Sacks et al., 1974). According to Egbert (1997), the transformation from a single conversation to multiple conversations requires sophisticated designs and collaborative efforts. As conversational mechanisms are subject to different designs and uptakes in a multiparty setting, it is significant to understand how interactants mobilize available resources to subdivide a conversation and construct other interactive agendas in minor groups. Although the orderly organization of classroom discourse makes relevant collaborative participation, few studies have discussed the construction of classroom activity regarding schisming and different participation frameworks. To gain an understanding of the construction of classroom discourse, it is significant to consider various designs and participation frameworks in terms of distinct interactional purposes (Coughlan and Duff, 1994).

Based on video-recorded data collected from an interactive English course, the aims of the study are tripartite: 1. to document the relatively under-reported learning opportunities and learning behaviors in multiparty CfL class; 2. to contribute to the understanding of peer interactions, classroom discourse and participation framework in EFL classroom; and 3. to analyze the relevance of post-repair negotiation for meaning (PRNfM) practice for the on-task teaching task and L2 learning. This study highlights the connection between the on-task public activity and the initiation of private peer talk through the close examination of the construction of peer interactions. Especially, it concentrates on private PRNfM sequences that appear upon the completion of a public repair and are unfolded within learners. In line with other research employing learning behavior tracking methodology within the terrain of CA-for-SLA (Markee, 2008), the present study analyzes how L2 learners retrieve key vocabulary in preceding public repair and recycle them in sequential private peer interactions for individual learning opportunities. In so doing, the study showcases how different participation framework is being utilized to maintain the orderly progressivity of classroom discourse and meanwhile, how L2 learners mobilize their agency to learn. Findings of the study suggest the analysis of peer talk is necessary for the understanding of the orderly construction of classroom discourse and the autonomous management of learning opportunities in private.

## Literature review

### Classroom discourse and peer interaction

Teachers and students exchange knowledge in a classroom in two primary ways: direct transmitting knowledge from teachers to learners; conversational approaches (Houen et al., 2018).

While conventional teaching activities in the classroom prefers direct transmission of knowledge, communicative class adopting conversational approaches creates adequate interactional space for learners to be active conversational participants (Durden and Dangel, 2008; Houen et al., 2018). As Seedhouse (2015) has pointed out, classroom interaction is a highly adaptive system, requiring complex designs to sustain order. Students' behaviors in a classroom are prototypically directed by teachers' guidance and institutional practices (Danby, 2002). Within the terrain of classroom communication, analysts have placed great emphasis on the IRF (i.e., teacher initiation-learner response-teacher feedback) patterns or question and answer adjacency pairs between teacher and students (Mori, 2002). Nevertheless, there are various entries to understand the orderly construction of classroom activities. Interactions and learning do not necessarily unfold around teachers' knowledge and questions in class (Houen et al., 2018). For instance, student-initiated questions reflect students' learning orientations and may sequentially alter the course of classroom discourse (Duran and Sert, 2021). When the interactional opportunities are guaranteed, contingent learning opportunities emerge through the natural course of interactions. Hence, the interactive class tends to render a communication-friendly environment for language learners. The key point then goes to the fusion of language learning and using the target language for communication in class.

Despite teachers' guidance, it is relevant to observe the roles that learners play in completing social actions and learning (Merke, 2016). Concerning the complexity of classroom discourse, analytic focuses have been gradually given to peer interactions. The roles that language experts and novice learners play in the classroom are not stationary (Merke, 2016): peers can also perform as the explainer to construct knowledge collaboratively in class (Jakonen, 2018; Stone, 2019). To flesh out the specific features of peer interaction, researchers aim to demonstrate the roles that peers play in the construction of classroom discourse, and the learning outcomes that yield from peer assistance. Research has shown that various factors including proficiency, perceptions of peers and interactional environment significantly affect learners' engagement in peer interaction (Dao, 2020). It has been reported the investigation of peer interaction as an observable phenomenon contributes to the reconceptualization of L2 learning (Eskildsen, 2018; Jakonen, 2018). For instance, when students retrospectively orient to learning achievements as a resource for constructing peer interaction, their learning becomes an observable co-constructed action (Jakonen, 2018). In that sense, the detailed analysis of peer talk makes a better understanding of how learning is contingently situated in peer interaction, and how moment-to-moment private talk is managed by learners without assistance from language experts. Thereby, more research should consider learners' agency, initiatives, and interactional framework in the classroom. In contrast to interactional practices between teachers and students, private interactions within peers in class are infrequently reported. How do learners rationalize public pedagogical tasks in

private? How do learners render each other reciprocal interactional space and assist learning while making use of available resources if they do? How do learners mobilize their agency to learn and manage the classroom discourse? These questions are better answered through the detailed analysis of peer interaction.

In addition to the dichotomy of teacher–student interaction and peer interaction in the classroom (Jakonen, 2018), on-task and off-task interactions are distinguished to explicit different interactional trajectories (Illés and Akcan, 2017). Central to this categorization, on-task interaction refers to interactional trajectories within conventional classroom communication; off-task interactions feature the everyday language use in the classroom. Public interactions following pre-designed instructions and executing required tasks are seen as on-task, while interactions that do not proceed with the current tasks are typically analyzed as off-task (Hauser, 2016; Stone, 2019). While the on-task classroom talk prototypically unfolds around teacher-initiated questions and students' responses (Duran and Sert, 2021), the off-task talk reflects characteristics of real-life interaction (Markee, 2005). When learners perform beyond the conventional interactional sequence in class, the unplanned language use activates both their linguistic and metalinguistic skills (Illés and Akcan, 2017). According to Waring (2012), these moment-by-moment uninvited learner initiatives in class reflect how learners mobilize various resources to manage their learning. Despite the growing studies on on-task interactions, a relative lack of attention has been given to the detailed analysis of off-task peer interactions. The recent exceptions include the studies on L2 learning in the wild (Illés and Akcan, 2017; Eskildsen, 2018), a study about how L1 is used in peer interaction to facilitate L2 learning (Jakonen, 2018), and a report of repair in an off-task talk in a Japan EFL classroom (Stone, 2019). Among these studies, Illés and Akcan (2017) analyzed how off-task interactions in the classroom incidentally link to the language used in the real world and argued for encouraging off-task interactions during the process of L2 learning. Findings from Jakonen's study (Jakonen, 2018) also suggest that the document of peer interactions and off-task talks in language class facilitates conceptualizing how L2 learning unfolds in interaction.

## Conversation-for-learning and learning opportunities

Under a variety of guises, L2 learning is being seen as a pervasive phenomenon embedded in mundane interactions when L2 learners use the target language to do social actions (Wagner, 2015; Eskildsen, 2018). Opportunities for conversation that are limited in conventional teacher-fronted language classes are currently widely accepted as fundamental for L2 learning (Eskildsen, 2018). Restricted by the requirement to fulfil rigidly prearranged teaching tasks and to realize specific pedagogical goals, interactional opportunities are heavily limited in

conventional teacher-fronted language classes (Kasper, 2004; Hauser, 2013; Kasper and Kim, 2015; Illés and Akcan, 2017). Following the call to emphasize the interactional competence of EFL learners (Kasper, 2006; Young, 2008; Barraja-Rohan, 2011), researchers and practitioners argue that language should not be learned in a vacuum. Pedagogical arrangements, therefore, such as language immersion program (Ahlund and Aronsson, 2015), communicative language class (Stone, 2019), language café (Engwall et al., 2021) and conversation-for-learning (Kasper, 2004; Kim, 2012, 2017a,b; Hauser, 2013, 2017a,b; Kasper and Kim, 2015; Zimmerman, 2020) are implemented to augment L2 learners' exposure to and the employment of the target language, offsetting the limitations of conventional language teaching. Although the titles of these arrangements are diverse, they are indeed homogeneous in terms of rendering learning opportunities for learners and establishing a flexible participation framework. Thus, as Kasper and Kim (2015) have argued, these nonformal institutional talks can all be referred to as conversation-for-learning (CfL). Previous studies have highlighted several distinct features of CfL in contrast to the conventional classroom discourse. First, instead of being perfect language models, language experts perform as conversational partners (Hauser, 2017a,b). In another sense, the significance of the non-gate-keeping interactive activities is to provide additional oral practicing opportunities rather than guaranteeing the learning outcomes. Second, communications at CfL prioritize the content instead of the form (Hauser, 2017a; Kim, 2017b; Engwall et al., 2021). Thereby, as interactions in CfL are primarily communication-driven, language experts frequently refrain from their initiations of repair and corrections for the progressivity of conversations (Hauser, 2017a). Third, reciprocal peer interaction is highly recommended and encouraged (Kasper and Kim, 2015). As CfL highlights the significance of "doing" conversations, learners' participation and agency are re-emphasized.

The existing literature on conversation-for-learning (CfL) has shed light on how language learning opportunities are contingently generated in naturally occurring interactions when participants are accomplishing social actions (Doehler and Pochon-Berger, 2011; Kim, 2017b). CfL settings arranged out of the classroom are commonly classified as usage-based due to the target language being mainly practiced for reaching mutual understandings. Learning in these settings is naturally generated without prompting tasks and clear pedagogical goals. Thereby, learners' autonomous awareness and willingness are pivotal for their learning orientations. There are many entries for L2 learners to get access to learning opportunities through conversational practices. For instance, knowledge asymmetries between a language expert and novice learners can generate definition sequences for acquiring new words in the target language (Kim, 2017b). Contingent vocabulary learning opportunities also occur when participants perform negotiation for meaning practices (Eskildsen, 2018). Besides, code-switching and the use of learners' L1 occasion opportunities for L2 learning (Zimmerman, 2020). These CfL studies typically analyze dyadic interactional practices

between an L2 learner and a language expert. The exceptional cases can be found in Kim's (2017a,b) studies in which the researcher investigated a tripartite CfL arrangement. The analyst reported how two Korean EFL learners benefit from communicating with an American native speaker. Still, aligning with other CfL studies, the aim was to investigate how language gaps and knowledge asymmetries between language experts and learners facilitate L2 learning (Kasper, 2004; Hauser, 2013, 2017a,b).

However, the presence of an L1 conversation partner is not necessary for a CfL setup (Kasper and Kim, 2015). As learners can generate reciprocal learning opportunities for each other, learning also frequently occur in peer talk. The analysis of interactive peer activities is thereby significant for the understanding of autonomous L2 learning. Further, interactional practices are subject to the number of co-participants. It is anticipated that multiparty interactions can be significantly different from those in dyadic or tripartite settings. In particular, the presence of other parties may significantly influence the repair sequence (Forrester, 2008; Bolden, 2009, 2011). However, very few CfL studies report the real happening learning behaviors in the multiparty arrangement within peer groups. Therefore, it is still vague why peer interaction is initiated at some time points, and how learning opportunities are managed within peer interaction. CfL arrangements incorporating multi-participants (more than two learners), thereby, deserve closer analytic observations.

Given classrooms are still the core arena for second language learning *per se* (Wagner, 2015), linking language in nature to classroom teaching is omni-relevant. Thereby, language educators and decision-makers are imitating out-of-class learning environments and moving them into the classroom with fewer limitations on interactional topics in class. Against this backdrop, increasing interactive classes seen as hybrids of usage-based interactions and task-based teaching are executed to guarantee L2 learners' exposure to the target language. Under the guidance of communicative language teaching, these classes encourage L2 learners to actively participate in conversational practices so that they can practice the use of the target language and enhance their communicative skills (Wong and Waring, 2020). These interactive language arrangements, to some extent, break the conventional patterns of classroom discourse. Without explicit pedagogical designs and teaching goals, these courses prototypically render only implicit interactive topics to create an interaction-friendly environment. Even though these courses try to imitate natural conversations in the real world, interactions in the classroom are significantly different from ordinary talks. Therefore, L2 classroom interaction should be regarded as a variety of institutional discourse (Seedhouse, 2004). In a classroom "under the guise of free conversation" (Kim, 2017b, p. 2), participants make use of their available language resources to imitate real-life language use, while the main interactional trajectories remain in task-based activities. Interactive language class, then, is better to be framed as a distinctive genre: a hybrid of institutional talk and natural conversation.



Different from sheer usage-based settings, interactive class encourages peer interactions and group discussions but still arranges interactional tasks and activities with the necessary supplement of authentic materials (Wong and Waring, 2020). To distinguish previously reported usage-based CfL outside of classrooms, CfL class is better referred to as institutional (Kasper and Kim, 2015) and instructional (Kim, 2017b). In these CfL arrangements, language experts (LEs) offer guidelines for classroom activities and guarantee the occurrence of language use. LEs, thereby, functionalize differently from conventional teachers. The primary duty of LEs is to offer learning opportunities instead of explicit teaching. Briefly put, teachers in teacher-fronted classes occupy the majority of interactional places; LEs in CfL, instead, prompt learners' use of the target language and provide feedback only when it is necessary. Note that even arranged in the classroom, CfL class is still different from conventional language class for there is no "desired product" being expected (Illés and Akcan, 2017, p. 3).

Different from teacher-fronted teaching, instructional CfL arrangements have a significantly higher tolerance for off-task interaction and peer communication. Therefore, different interactional trajectories should be analyzed to reach a rather comprehensive understanding of the organization of multiparty CfL. Briefly put, participants are expected to observe others' interactions when it is not their turn to talk; they are assigned more space to initiate private talks when they feel necessary. Staying tuned in public activities and initiating individual interactional topics require learners to mobilize various available resources for sophisticated designs. When several interactional trajectories intertwine, co-participants have to collaborate with each other to maintain the orderly progress of multiparty interaction. Alternatively, interactions in a multiparty classroom may result in chaos.

In sum, more analytic attention should be given to interactive details in multiparty CfL in terms of its organization and learners' autonomous learning behaviors. A detailed analysis of peer interactions, thereby, facilitates the understanding of how learning opportunities are contingently generated and managed in private. Given the complexity of multiparty interactions in L2 learning arrangements, the question of how different parties mobilize various resources to stay tuned in interactional tasks and maintain intersubjectivity is barely answered. Thereby, examining different interactional trajectories may contribute to understanding how learners rationalize public talk in private and how different participation framework is utilized for learning and orderly construction of multiparty discourse.

## Reconceptualizing learning in CA-for-SLA

One of the basic tenets of CA-for-SLA is language learning is an observable process that happens in social interactions (Markee and Kasper, 2004). By redefining language learning and use as

social actions, CA-for-SLA studies "inform the teaching of languages in new and radical ways" (Wagner, 2015, p. 76). Conceptualizing learning in CA-for-SLA, learning L2 is now constructed as a temporally observable action (Sahlström, 2018) and a usage-based process (Eskildsen, 2021). While most SLA research is theory-driven, CA-for-SLA studies discard the researcher-centric view, exploring learning behaviors and processes only through learners' displays (Markee, 2008). In another sense, CA-for-SLA aims to understand how learning occasions unfolds in real-time interaction by either tracking learning objects or the learning process (Markee, 2008).

Prior CA-for-SLA research has shown that conventional classroom discourse demonstrates a similar pattern. Much analytic attention has been given to teacher-directed speech or the IRF sequence. In particular, learning as happens in repair sequence has been discussed in many CA-for-SLA literature. This strand of studies highlights how learners learn the target language and accumulate knowledge through participating repair sequences between learners and language experts. In contrast, relatively little analytic attention has been given to learning behaviors beyond repair and the IRF sequence. To date, a growing body of CA-for-SLA research aims to deconstruct the organization of classroom discourse by analyzing how interactions among different co-participants unfold in the classroom. The analytic focus is to examine how co-participants utilize different participation frameworks to construct the orderly organization of classroom activities. For instance, a very recent study shows how teachers manage classroom arrangements through discursive practices (Klattenberg, 2021). Similarly, this line of research prototypically examines the interactional process between teachers and students (e.g., Klattenberg, 2021; Van Der Ploeg et al., 2022). Although students' active participation is acknowledged, the literature on how learners manage their learning remains sparse. Thus, studies that examine learning from learners' perspectives and emphasize learners' agency are in need in the terrain of CA-for-SLA.

## Methodology

### Setting

The research took place in three CfL classrooms at a university in Macau. To meet the language requirement needed for English-medium education, the university arranged a weekly interactive English course to amplify learners' exposure to and the application of English. In each of the chosen classes, there were two language experts (LEs) and eight language learners (LLs). To create a communication-friendly classroom, students frequently sat in a circle or in two lines (Figure 1). Activities were not rigorously arranged and pre-planned so that more interactional opportunities and space can be offered to students. The underline tenet was learning opportunities will naturally emerge from both classroom activities and interactions.



## Participants and data collection

Data were drawn from 10 h of videotaped CfL classes in which two language experts (LEs) Dan (a native speaker of English) and Miranda (a Chinese proficient L2 user of English) participated. In total, 24 first-year university students with relatively low English proficiency levels (A1–A2 CEFR) aged between 18 and 20 participated in the study. They all spoke Mandarin and/or Cantonese as their first languages. Informed consent forms were obtained from all participants before the recording. Considering the complexity of multiparty interactions, two cameras were set in different corners of the classroom to capture as many non-verbal actions as possible. Additional two audio recorders were placed to assist in recording participants' verbal productions.

## Data analysis

This research follows the canonical CA methodology (Sacks et al., 1974) that is subject to the construction of social orders through the scrutiny of talk-in-interaction within its most proximal contexts. From the very beginning, empirical CA research relies on the technology of recording to collect data in terms of naturally occurring interactions. Further, the modern utilization of video-recording devices facilitates capturing and preserving both verbal and non-verbal details in real-time interactions. The analytic goals of CA are then extended beyond the sheer examination of talk and language but to the human actions manifested by talk (Seedhouse, 2004). Through analyzing both vocal and non-vocal behavioral performance as interactive resources that interactants display in interaction (Mondada, 2019), CA studies present how social members systematically generate meaning in the process of accomplishing social actions.

As even seemingly trivial details in daily life can be crucial for the orderly construction of social interaction, CA transcripts mark talk-in-interaction in meticulous details and prepare it for retrospective scrutiny. Data analyzed in the present study come from about 10 h of videotaped classes, which were transcribed primarily following the classic transcription conventions developed

by Jefferson (2004) with embodied actions and the onset of actions were marked (Mondada, 2018; Greer, 2019; see Appendix A). For ethical concerns, pseudonyms were assigned to participants in the transcripts. To make the recorded data accessible to both analysts and readers, details in recorded interactions including stress, silence, intonation, gaze, and posture were marked meticulously in transcripts. Actions were further taken to guarantee the quality of transcripts to the maximum: as one of the researchers transcribed the data, the other contributed to checking the accuracy.

Sequential analysis of data also followed the CA conventions: the analysis process was data-driven and did not start with any theoretical assumption. After a collection of similar interactional instances was established, the analysts identified patterns that were performed as normative. A total of 42 instances of peer interactions were identified in this 10-h dataset. We then highlighted the occurrences of private peer interactions and explicated how learning opportunities were contingently occasioned by public repair sequences.

## Recycling on-task words in private peer interaction

Drawing upon Heritage's (2012) notion of the epistemic gradient among interactants, language experts are saliently more knowledgeable (K+) than less knowledgeable (K-) L2 learners. However, individuals' epistemic stances are not invariable: they may alter from moment to moment due to interactional achievements (Heritage, 2012). Then, the conceptualizations of K- and K+ can delineate the knowledge discrepancy between learners and experts or the possible individual epistemic change from less knowing to more knowledgeable. Figures 2, 3 display different referents of K- and K+ employed in the present study.

In classroom contexts, teacher-directed interactions are prototypically prioritized. As learners who do not hold interactional floors are expected to observe classroom activities mutedly, entering such a language arena that is dominated by language experts is both challenging and motivating for L2 learners (Illés and Akcan, 2017). Despite language expert-directed interactions, there are moments when learners spontaneously

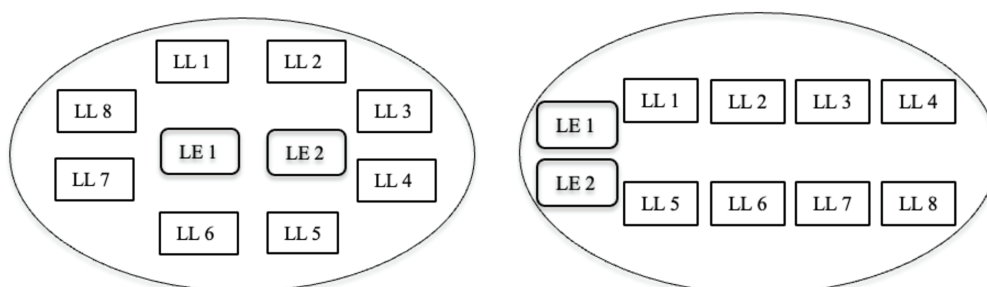


FIGURE 1  
Classroom arrangements.

initiate negotiation for meaning practices in private. Excerpts below display how public interactions are relevant for other participants and how onlooking learners mobilize interactional space in peer interactions for their learning opportunities.

## Efficient peer interactions

Prior to Excerpt 1, language experts ask learners to describe their characters. Before the focal scenario, several learners have given their words such as shy, outgoing, and hardworking promptly, and it now comes to Francis' turn.

### Excerpt 1. *pathetic*

Language Experts: Dan; Miranda L2 Learners: Francis; Alvis; Johnny; Tom

01 DAN Francis  
02 FRANCIS pa(0.3)patetic  
03 DAN What? pathetic?  
04 FRANCIS [hehhehhh  
05 (LLs) [hehhehhh  
06 DAN [hehhh okay]:  
[turns back and writes  
down the word on the whiteboard  
07 MIRANDA [fReally?f  
08 FRANCIS [hhe[heh  
09 DAN [PATHETIC  
10 MIRANDA you really want to use it?  
11 FRANCIS Yea[hhh  
12 MIRANDA [okay  
13 DAN All right (2.1) S[0: Alvis ((...))  
14 JOHNNY [°what?°  
[leans to Tom and  
whispers  
15 TOM picks up the phone and types ((in the  
word to the phone dictionary))  
#fig 4  
(10.4)  
°holin° ((Cantonese))  
pathetic  
17 JOHNNY adjusts his torso and sits upright on  
the seat

Dan (LE) assigns the turn to Francis (LL) by summoning his name (line 01). Francis renders the word “*patetic*” (line 02). He initially pronounces the first syllable “*pa*” and stops for a 0.3-s before he self-repairs the word to “*patetic*,” revealing his slight unsureness and difficulty in pronouncing (line 02). Dan prompts ratification and subsequently recasts the problematic word as “*pathetic*” in the same turn (line 03). Given it is somewhat unexpected to hear people depicting himself as pathetic, both LEs (Dan and Miranda) initiate repair attempts (respectively in line

03, line 07, and line 10) to offer Francis interactional floors to either ratify or reject the proposal of “*pathetic*.” After three attempts to confirm with Francis (line 04, 08 and 11), both LEs acknowledge the word: Dan formally writes down the word on the whiteboard (06); Miranda registers with “*okay*” (12).

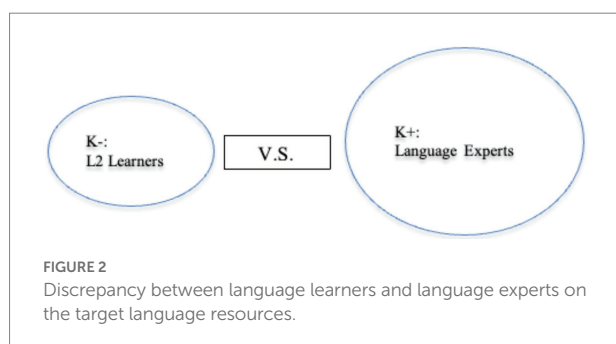
“*All right*” as a concluding mark, the sequential sizable 2.1-s pause, and a “*so*” in the same turn (13) display Dan’s sophisticated design to close the current sequence and his tendency to advance tasks with another recipient (Alvis). Overlapping with the prolonged “*so*,” nevertheless, a third party learner (Johnny) in the audience initiates a private “*what*” in line 14 to his peer (Tom) sitting next to him, onsetting a personal peer behavior (Hellermann and Cole, 2009). The abrupt initiation of “*what*” disjoints the main “immediately preceding talk” (Schegloff, 2000, p. 207). As an open-initiator for repair, “*what*” does not target or locate any specific repairable item or component in the proceeding sequence (Drew, 1997). Tom’s prompt action of picking up his phone, however, demonstrates his analysis of the prospective trouble source. The quick action of resorting to a dictionary indicates Tom’s K- knowledge with “*pathetic*” and demonstrates his orientation to update his stance to K+. Consider their positions as in Figure 4: Johnny is leaning on Tom, looking at Tom’s phone screen. The change in Johnny’s body position demonstrates his heightened concentration. Occupying a lengthy 10.4-s pause, both Tom and Johnny silently stare at Tom’s phone screen. The statuesque frozen action reveals both participants regard the dictionary as the authority (Norris, 2020).

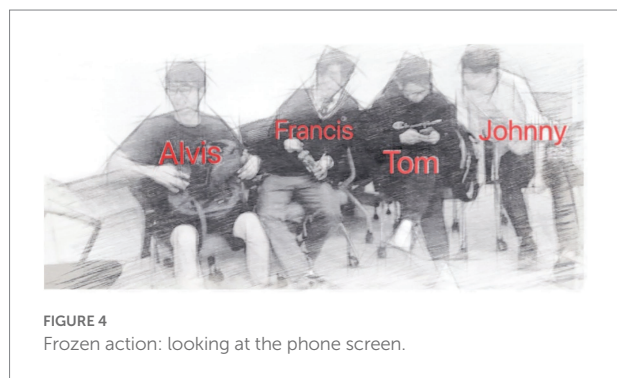
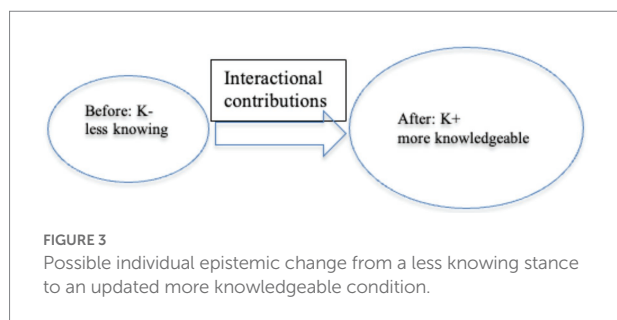
Instead of resorting to salient K+ participants (Dan, Miranda, and Francis), Johnny (K-) initiate private peer talk to address his understanding difficulties. He cooperates with Tom (K-) to solve their problems locally within intimate peer interactions. Now consider the below Excerpt 2.

### Excerpt 2. *ruins*

Language Experts: Dan; Miranda L2 Learners: Summer; Riven; Alex; Tymon

01 DAN [what's the name of the famous ruins  
of a church in Macau  
|gazes on Summer  
(1.2)  
02 SUMMER English name?  
03 MIRANDA Yeah  
04 SUMMER Again? (.)again say it?  
05 DAN <the na:me of a famous ru:ins of a  
chur:ch in Macau>  
06 (1.3)  
07 SUMMER san:(.)santo Paul[:?  
08 DAN [Yeah! Saint Paul!  
09 RIVEN lin ngo dou zidou ((Cantonese))  
even I know it  
12 DAN All right!|ne[xt question (0.7)  
|gazes on his prompting  
question sheet  
13 |who's turn  
|turns to Miranda  
14 ALEX [°ruins°  
|turns to Tymon  
15 TYMON |°yeah ru:ens°  
|nods  
16 ALEX °shi shenme° ((Mandarin))  
what is it  
17 TYMON °yizhi ba°? ((Mandarin))  
relic huh?  
18 ALEX Oh:!!DASANBA ((Mandarin))  
((the Chinese name for the Saint  
Paul ruins))





In line 01, Dan issues the question and selects Summer as the recipient. Given the analytic focus of the study is on peer interactions, detailed analysis of LE–LL interactions from line 01 to 13 is excluded. Starting from line 14, Alex selects his peer (Tymon), initiating a private interactional trajectory. The onset of the private talk overlaps with but does not interrupt the public interactional task. Alex retrospectively targets the word “ruins” embedded in the proceeding repair sequence and resorts to a third party (Tymon) to negotiate for the meaning. The repetition of “ruins” (line 14) fails to specify his designs to Tymon, who reiterates “ruins” as his receipt (line 15; Green et al., 2009). Sequentially, Alex builds on Tymon’s turn and explicates his question by asking what it is (line 16). Tymon renders an L1 referent with an uncertain question maker “*ba*” (line 17). The subsequent occurrence of elongated “*Oh*” (line 18) as a change-of-state token (Heritage, 2010) registers Alex’s information receipt, indicating that Alex’s epistemic stance has been updated: alter from “not-knowing to knowing” (Sidnell, 2009, p. 105).

Instead of resorting to interlocutors in salient K+ stances, Tymon tackles his understanding problem with peers. Excerpt 2 demonstrates how public repair occasions unprojected learning opportunities for onlooking participators. It presents how the seemingly peripheral learner draws himself and a peer into a local learning opportunity by initiating private peer interactions and changing their participation role from the onlooking audience to active interlocutors. It shows peer interaction facilitates the learner to acquire the meaning of the focal word and retrospectively comprehend the initial question in the beginning line. Alex, in line 18, eventually renders a Chinese referent for the question Dan inquiries in line 01.

## Inefficient peer interaction

The analysis in this section delineates an instance in which learning opportunities are initially oriented to but are sequentially abandoned in private. It shows how the private interaction closes without a notable agreement and salient learning outcomes.

### Excerpt 3. *enthusiasm*

Language Experts: Dan; Miranda L2 Learners: Terry; Richard; Simon; Alex

01 DAN what is *enthusiasm*?  
 02 TERRY <en:fusi:azum> is a:(1.3)a:::(0.8)  
 03 feeling: em  
 04 (0.9)  
 05 MIRANDA mm hm?  
 06 (0.6)  
 07 TERRY and  
 08 (5.6)  
 09 MIRANDA a feeling about what  
 10 (1.1)  
 11 TERRY about a:(2.1) something (4.1)-something  
 12 you (.)you like (.)you (0.9) emm will  
 13 (0.9) you will:::(2.6) an:d(6.1)  
 14 fo:::(1.1)-focus on that(.)h[hhheh  
 15 [Yeah  
 16 DAN I like this one (0.2) would you please  
 17 say it again?  
 18 (2.3)  
 19 TERRY enthusiasm is a feeling (0.5)nei(0.3)  
 20 en: abou::t(1.4)like something to focus  
 21 on it  
 22 DAN yeah yeah I accept that yeah enthusiasm  
 23 (0.3)em enthusiasm means that you get  
 24 very excited about something and  
 25 overtaken by something (0.5) if you’re  
 26 very enthusiastic about being a pilot  
 27 that means every night you practice  
 28 you work very hard an:d (0.3) or::it  
 29 can just mean emotionally (0.3) you know  
 30 some people they work very hard but they  
 31 don’t like it (0.4) anyway good job  
 32 RICHARD |na bushi reqing ma? ((Mandarine))  
 isn’t it passion  
 |turns to Simon  
 33 SIMON |reqing is passion.  
 |shakes head  
 34 ALEX I don’t know a  
 35 RICHARD shiba (.) bu guan le ((Mandarine))  
 it should be whatever

Dan initiates a public talk about “*enthusiasm*” in the beginning line with Terry. While Terry attempts to explain “*enthusiasm*” (line 02–04, line 07, line 11–14, and line 19–21), Dan and Miranda scaffold Terry’s utterance. Now and then from line 05–17. From lines 22–31, Dan clarifies the meaning of “*enthusiasm*” to scaffold learners’ interpretation. It is quite salient here; Dan closes the talk around “*enthusiasm*” by “*anyway good job*” (line 31). In the most immediate next turn, Ricard (LL) initiates a disjunctive question to his peer (line 32). Given that both “*enthusiasm*” and “*passion*” are frequently translated to “*reqing*” in Chinese, the initiation endorses Richard’s orientation to a rather vague understanding of “*enthusiasm*” and his attempt of providing a candidate understanding of enthusiasm as passion. In contrast to the *wh*-question, disjunctive questions convey an assumption to a larger extent by offering a candidate understanding (Svennevig, 2008). In another sense, Richard seeks to confirm his understanding of “*enthusiasm*” as “*reqing*” from his peer. However, the proposal of referring “*enthusiasm*” to “*passion*” is sequentially rejected by the selected peer Simon (line 33). Shaking his head and linking what Richard has uttered (line 32) to a synonym “*passion*,” Simon

rejects Richard's proposal of equalizing enthusiasm as "*requing*" or "passion." The disaligning discussions of enthusiasm, further, draw another learner (Alex) into the private interaction. Alex self-reports his stance toward the negotiating sequences by clearly uttering an "*I do not know*" (line 34). There may be different interpretations of Alex's account. One may agree that either he confuses about the meaning of the focal word, or he intends not to be involved in possible further discussion about the word. In either case, Alex's reaction fails to support the progressivity of the private interactional task. Richard, then, self-closes the private interaction he initiated with a "*forget it*" and a "*buguanle* (whatever)" (line 35) which indicates that the peer interaction around "*enthusiasm*" is abandoned. Notably, before he concludes their negotiation, Richard repeats his stance, which still sticks to his original understanding of the word. The "*shi ba* (it should be)" in line 35 conveys that Richard adheres to his initial understanding of the focal word. His peers, both Simon and Alex, however, fail to advance each other's understanding in the private negotiation-for-meaning sequence. In this episode, participants' knowledge and understanding are not saliently updated to a K+ stance. Albeit peer interaction offers temporal learning opportunities, it yields only invalidate learning outcomes. This peer interaction is then classified as inefficient in terms of learning outcomes. Nevertheless, it still presents how a temporal learning opportunity is managed in private peer interactions.

## Concluding discussion

Drawing on CA-for-SLA, this study has analyzed instances that showcase how private learning practices are contingently occasioned in CfL class and how learners manage learning opportunities within peer interactions. Reported instances in the study present how public repair practices elicit private negotiation for meaning practices in peer interactions. What is clear is that the extracts presented above involve learner-initiated private interactions that build on public repair practices. Learners repeatedly retrieve focal trouble words embedded in prior repair sequences for their private learning opportunities. The detailed analysis has demonstrated how the on-task repair is extended, managed, and completed in private peer interactions without language experts' guidance. L2 learners orient to their peers to tackle understanding problems and learning opportunities. Through peer interactions, learners make the knowledge gaps that they identify from on-task activities relevant for individual learning. The process changes their participation framework from the onlooking audience to an active learner, revealing how L2 learners maximize their agency to locate an interactional niche for private learning opportunities.

This study extends prior work on learning orientations and behaviors in multiparty CfL arrangements. Instead of resorting to language experts, learners make use of the inconspicuous knowledge asymmetries within the peer group for their private learning opportunities. Aligning with Kim's (2017b) observation, learners demonstrate a preference for vocabulary learning. In

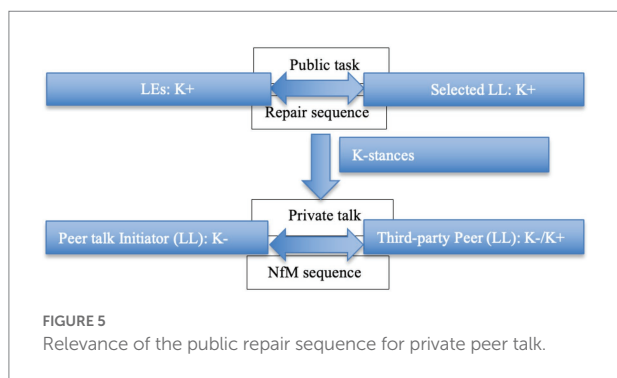
contrast to the previous literature about the role that K+ language experts play in scaffolding learning (Hauser, 2017a,b; Kim, 2017a,b), the study highlights the occurrences and features of peer interaction in multiparty CfL. It presents peer interaction as a dynamic process in which co-participants exhibit their agencies to manage their learning. Thus, it highlights the importance of extending the analysis of L2 learning behaviors to peer interactions. It also demonstrates how different interactional trajectories simultaneously unfold in multiparty CfL settings for L2 learning.

The co-existence of multiple interactional trajectories addresses the rather under-reported schisming (Egbert, 1997) phenomenon in the classroom. The finding of this study shows that L2 learners display their sense-making of public on-task talk within an immediately sequential PRNfM sequence. When the on-task repair triggers understanding problems, onlooking participants request peers' extra information and assistance to remedy (Svennevig, 2008). The delicate beginning point of peer interaction indicates L2 learners' efforts to balance the orderly construction of classroom discourse and their orientations for learning. Extracts presented show that learners initiate peer interactions at a time point when the learning opportunity is being abandoned by others. In addition, initiators of peer talk intend to close private interactions in minimal turns so that the private interactional trajectories rejoin the public class activities promptly. The rather short but multi-faceted PRNfM sequences endorse learners' efforts to sustain the overall orderly construction of the classroom. For instance, the initiator of the peer talk, in Excerpt 3, self-closes the private sequence without yielding efficient outcomes. Instead of being interruptive and distracting, peer interaction frequently facilitates the orderly progress of classroom activities. The argument is also supported by Excerpt 2 in which the focal learner makes use of the information he acquires from his peer in the PRNfM sequence to understand the prior public task.

Pertaining to the changing participation framework, the study showcases how seemingly peripheral learners in the preceding interactional tasks attend to the contingent learning opportunities by co-constructing peer interaction. Selected excerpts to display the relevance of public repair for the peripheral audience: the public repair between assigned learners and LEs occasions other (the third party)-initiated-another (the third party)-repair sequence in private peer talk. Different from the widely reported other-initiated-other-repair practice, Forrester (2008) refers to the aforementioned interactional practice as "other-other repair," in which a third party is an initiator and another third party acts as the repairer. Figure 5 depicts how the public repair sequence is made relevant for the private learning opportunities.

Although hearers' epistemic stance is highly relevant to the speaker (Heritage, 2012), it is almost impossible for speakers to check upon every participant's understanding from moment to moment in a multiparty context. The analysis showcases the relevance of public repair for the onlookers' sense-making (Bolden, 2009, 2011). As public repair highlights knowledge asymmetries, onlooking learners self-check their epistemic status.





When onlooking learners identify themselves in a K- stance, they do not instantly compete for the interactional floor or interrupt the proceeding public on-task talk. Instead, they wait until the sequence is closing and there are salient signs for the unfolding of a new sequence. The entry points of private peer interactions endorse the audience's efforts to sustain the orderly organization of the current interactional tasks and their sophisticated designs for the most imminent time point to orient to learning opportunities. Thereby, PRNfM sequence as an intersection between public talk and private learning reveals how learners rationalize their learning opportunities in private. By lowering the volume and selecting recipients from the onlooking audience, participants simultaneously prioritize on-task talk and initiate a private interactional trajectory. Thus, initiators of peer interaction set up a new private participation framework for themselves and designated peers, which alters the participating role from a silent onlooker to an active interlocutor and learner.

By presenting the features of underlying peer interaction, the current study reveals the complexity of classroom discourse by showcasing the co-existence of multiple simultaneous interactional trajectories. That is, several diverse interactional trajectories intertwine each other. When public classroom activities occasion private interactional trajectories, peer interaction presents its close relevance to the on-task talk. The study, thereby, rejects conceptualizing the tacit moment-by-moment co-constructed peer interaction as off-task. In contrast to the rather simplified dichotomy of classroom discourse as on-task and off-task as documented in Illés and Akcan's (2017) and Stone's (2019) research, the study shows how the seemingly "off-task" peer interaction is indeed closely attached to primary classroom activities and facilitates learners' autonomous learning. To summarize, extended repair in private peer interaction constitutes a venue for understanding the orderly construction of multiparty classroom interactions.

While Jakonen (2018) acknowledges the retrospective practices for learning in separated peer talk, the present study highlights occasions of vocabulary learning in the most proximal PRNfM sequence in private. Thereby, peer interaction as a multi-layered activity requires more analytic attention. While student-initiated questions reflect their learning orientation (Duran and Sert, 2021), peers' responses to these questions demonstrate how

learners comprehend and process each other's learning opportunities. As learners demonstrate a similar pattern to initiate private learning-oriented sequences upon the completion of the public repair, this small collection of instances also contributes to explaining the very central "why that now" question in Cfl classes. While public repair offers salient learning opportunities, repair that is not adequate for participants' sense-making elicits private peer interactions.

Methodologically, the research supports other CA-for-SLA studies by presenting how the employment of CA makes the temporality of learning observable in the learning process. As CA explicates the process of constructing shared knowledge, it provides researchers with an analytic tool to understand the construction of an interactive language classroom. Instead of focusing on learning outcomes, CA-for-SLA tracks the dynamic process of learning. In another sense, through the lens of CA, the study presents L2 learning as a dynamic, temporally observable, and co-constructed process. It reveals the minute ways in which the order of classroom discourse is managed. Although co-participants utilize different participation frameworks for individual interactive agendas, they closely observe the progress of other interactional trajectories.

Despite pedagogical and methodological implications, the study has its limitations. First, due to the limitations of recording devices, some interactional moments of the private talk were unclear to the analysts. That is, even if the cameras captured participants' non-verbal movements, the audio quality was, to some extent, disappointing. The research then had to exclude those excerpts from the analysis. It would be helpful for future research to use wearable cameras and microphones for better audial and visual quality. Second, further research may consider longitudinal learning achievements through tracking learning objectives. As the present study reports only temporal learning orientations, it would be significant for other studies to examine whether the learning outcomes yielded from peer interaction are sustained over time.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.



## Author contributions

MC: conceptualization, methodology, data collection, data analysis, and writing—original draft and revision. SY: data analysis, visualization, and writing—revision and editing. All authors contributed to the article and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Appendix A

### Transcription conventions

Transcriptions are primarily based on [Jefferson \(2004\)](#) with minor adaptations.

nods	embodied actions in unnumbered sub-tier in gray font.
<i>reqing</i>	Chinese words transcribed in italics.
	locates the onset of the action.
#fig	the exact moment at which a screenshot has been taken.



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# How much vocabulary is needed for comprehension of video lectures in MOOCs: A corpus-based study

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Over the past years, Massive Open Online Courses (MOOCs) have emerged as new competitive advantages in the digital economy of higher education globally. Accordingly, an increasing number of individuals are attracted to these new learning environments for developing their knowledge and skills in a variety of subject areas. Despite these developments, research on linguistic features of MOOCs lectures as the main mediums for delivering the course contents remained limited. To address this gap, the present study analyzed a corpus of MOOCs lectures with around 4.45 million words to determine the size of vocabulary knowledge needed for 95 and 98% coverages. The findings revealed that sufficient coverage of the course contents requires knowledge of the 5,000 most frequent words in English. Nonetheless, achieving adequate coverage level requires a much larger vocabulary size of around 9,000 most frequent words in English. The study also found that widely used word lists for general and academic vocabulary (i.e., the GSL/AWL) fail to support MOOCs learners with sufficient vocabulary knowledge for adequate lexical coverage. Based on these findings, the study draws a number of implications for preparing non-native English speakers to use MOOCs effectively and setting research-informed vocabulary learning goals in instructional programs and materials.

## KEYWORDS

MOOCs, lexical coverage, lexical profile, vocabulary, corpus linguistics, word lists, video lectures, self-regulated learning

## Introduction

The last decade has witnessed a significant increase in the number of Massive Open Online Courses (MOOCs) as a competitive advantage in the digital economy of higher education (Guerrero et al., 2021). In this regard, it has been estimated that about 950 institutions are offering such courses for a large number of individuals around the world (Shah, 2020). Being publicly available via internet technology, these distance learning platforms provide participants with various affordances for knowledge development in different subject areas, while giving them the opportunity to decide on their learning pace,

place and time (Otto et al., 2018; Fischer et al., 2020; Castaño-Muñoz and Rodrigues, 2021). Additionally, MOOCs are different from traditional formal systems as some gate-keeping requirements including educational background, previous accreditation, and fees are not compulsory for the participants. However, despite these attractive features, learners need to be autonomous in dealing with the content of the courses (Alonso-Mencía et al., 2020), which means that they mostly have to rely on their own abilities in self-directed learning mode (Zhu, 2021). As a large proportion of learning materials are delivered through video lectures in English, understanding these lectures is essential for successful participation in MOOCs.

Previous research shows that academic discourse in general might be challenging for most non-native speakers of English (Hyland, 2009; Dang, 2022), and insufficient vocabulary knowledge is among the important factors that contributes to inadequate comprehension of spoken academic English (Evans and Morrison, 2011; Dang and Webb, 2014). Moreover, although vocabulary demands of academic lectures has been investigated in the literature (Dang and Webb, 2014; Dang et al., 2017), a recent study revealed that MOOC lectures are generally different from traditional university lectures, as they are more abstract, non-narrative, highly informational, low in persuasion, explicitly referential, and formally planned (Yu, 2021). Consequently, given the paucity of research into linguistic features of MOOC lectures, it is not clear how much vocabulary is needed for understanding the content presented in such videos. To address this gap, the present study analyzed a large corpus of video lectures systematically collected from 194 MOOCs in the Coursera platform. More specifically, the study aimed to determine the level of English vocabulary knowledge needed for comprehending MOOC video lectures in English. Research in this area is significant as the findings can inform instructional programs in preparing learners for these emerging and rising educational environments. Furthermore, non-native speakers of English who are interested in lifelong learning with MOOCs might find the result helpful in setting their own vocabulary learning goals, which is in line with supporting and facilitating autonomous learning through MOOCs (Zhu, 2022).

## Literature review

In studying the relationship between vocabulary knowledge and comprehension, finding out the number of words that the readers (or listeners) should know for reasonable understanding of the text is a fundamental consideration (Laufer, 2020). Accordingly, lexical coverage, which is operationalized as the percentage of known words in a given text has been employed extensively in determining the vocabulary size needed for the comprehension of written or spoken discourse (Rodgers and Webb, 2016; Nurmukhamedov and Webb, 2019). Research in this area indicated that knowing 95–98% of the words in a text is necessary for having an acceptable comprehension level (Nation,

2006; Laufer and Ravenhorst-Kalovski, 2010; van Zeeland and Schmitt, 2012). More specifically, the 95% coverage has been regarded as the threshold for minimum comprehension, while the 98% figure is the optimal lexical coverage, which is necessary for adequate (or unassisted) understanding of texts (Laufer, 2020). Studies on lexical coverage also aim to determine the number of words corresponding to minimum or optimal thresholds (Schmitt et al., 2017). In this regard, it has been estimated that the 98% threshold in understanding written language requires knowing around 8,000 word families in English (Nation, 2006).

Over the past years, a growing number of studies investigated the vocabulary demands of spoken English (Webb and Rodgers, 2009a,b; Dang et al., 2017; Tegge, 2017; Nurmukhamedov and Webb, 2019; Nurmukhamedov and Sharakhimov, 2021; Dang, 2022; Ha, 2022; Phung and Ha, 2022). For example, to determine the vocabulary size needed to understand movies in English, Webb and Rodgers (2009a) analyzed the scripts of 318 movies with around 602 running hours and 2,841,887 words. The findings of the study revealed that the knowledge of the 3,000 most frequent word families is necessary for 95% lexical coverage, while for 98% coverage one must know at least 6,000 word families plus marginal words and proper names. Similar results were reported for vocabulary demand of TV programs in English, as 95% comprehension requires having knowledge of 3,000 most frequent vocabulary in English (Webb and Rodgers, 2009b). Nonetheless, TV programs are reported to be more lexically demanding, and 98% coverage needs knowledge of 7,000 word families (Webb and Rodgers, 2009b). In another study, Tegge (2017) investigated the lexical demands of English songs by analyzing two corpora with 408 and 635 pop songs, respectively. The source for the first corpus was US billboard charts, while the second corpus was made of songs selected by language teachers. The results pointed to considerably lower demand of song in terms of vocabulary knowledge compared to other written genres in English. With respect to the songs used by language teachers, the study found that knowledge of the 2,000 most frequent word families is sufficient for 95% coverage, however, 98% coverage required 4,000 words. The general picture provided by these studies shows that the knowledge of the most frequent vocabulary in English (i.e., 3,000 words) is essential for minimum comprehension threshold of movies and songs in English.

Previous studies also explored the vocabulary profile of spoken language used in academic and educational contexts. In this regard, Nurmukhamedov and Sharakhimov (2021) studied vocabulary demand of listening to English podcasts for language learning. Accordingly, it was found that the most frequent 3,000 word families plus proper nouns, marginal words, transparent compounds, and acronyms account for 96.75% of all words in the 1,137,163-word corpus compiled from the transcripts of 170 podcast episodes. In order to reach 98% coverage, podcasts listeners need the additional knowledge of 2,000 word families. Phung and Ha (2022) reported similar findings for the vocabulary knowledge needed for the listening section of the International English Language Testing System (IELTS). Moreover, the study



indicated that the knowledge of the most frequent 2,000 words in English based on General Service List (GSL; West, 1953) and vocabulary items in the Academic Word List (AWL; Coxhead, 2000) is needed for 95% coverage. With respect to academic spoken English, Dang and Webb (2014) analyzed a corpus of 160 lectures and 39 seminars compiled from four disciplinary areas of the British Academic Spoken English (BASE) corpus. The study found that AWL accounted for only 4.41% of the corpus, which is considerably lower than the 10% coverage provided by this core academic word list in most academic discourse (Coxhead and Byrd, 2007). Additionally, the study found that 4,000 word families and proper nouns and marginal words provide around 96% coverage of academic spoken English, and knowledge of 8,000 words results in 98.00% coverage. Recently, Dang (2022) studied the lexical demand of conference presentations. The corpus contained 565,758 words developed from conference presentations in 20 academic subject areas, and the study found that the most frequent 3,000 words in English covered 97% of the presentations.

The expanding body of research related to lexical demands of spoken English in various contexts shows that vocabulary knowledge required to attain comprehension varies in different discourse types. This observation makes it necessary to analyze the lexical profile of MOOC lectures to establish the size of vocabulary needed for understanding the content presented in these emerging learning platforms. Additionally, without investigating the lexical profile of MOOC lectures, it is not easily possible to appreciate the value of corpus-based word lists for vocabulary learning and instruction. Accordingly, despite the wide spread application of the GSL (West, 1953) and the AWL (Coxhead, 2000) in addressing the vocabulary learning needs of language learners, the extent to which these lists support minimum and adequate comprehension thresholds in MOOC lectures remained unexplored. Moving along these lines, the current study addressed the following research questions:

1. How much vocabulary is needed for 95 for 98% coverages of MOOCs lectures?
2. What is the total coverage provided by the GSL and AWL in MOOCs lectures?

## Materials and methods

### Corpus

Following the widely used criteria for corpus building in terms of balance, representativeness, and size (McEnery and Hardie, 2011), transcripts of video lectures were systematically collected from 194 courses offered in the Coursera website for analyzing lexical coverage in the MOOCs. As for balance, the classification proposed by the Coursera was employed and courses were randomly selected from each of the 10 categories including (1) business, (2) computer sciences, (3) data science, (4)

information technology, (5) health, (6) personal development, (7) physical science and engineering, (8) social science, (9) arts and humanities and (10) math and logic. One category, namely the language learning courses was excluded due to contents of the courses which were related to teaching different languages. The 10 sub-corpora were also balanced in terms of number of words, and each contained around 440,000 words with only small variation among the categories. With respect to representativeness, the study used Coursera platform which is one of the main MOOC providers (along with Udacity, edX, and FutureLearn). Additionally, as estimated in 2021, a large number of universities around the world (i.e., 150) offered around 4,000 MOOCs through Coursera website (de León, 2021). As for size, it has been argued that to ensure having a large sample of language use, a corpus should have millions of words (McEnery and Hardie, 2011). Accordingly, the corpus compiled for this study contained 4,448,604 words which is larger in size compared to the corpus used for developing the AWL (Coxhead, 2000).

### Corpus analysis software

In order to analyze the MOOCs corpus, the current study used AntWordProfiler (Anthony, 2021). The AntWordProfiler is a recently developed freeware for vocabulary profiling of texts. The tool works with a variety of input formats including Microsoft Word (.docx), TEXT (.txt), and PDF. After adding target corpus files into the AntWordProfiler, the software compares the loaded corpus against vocabulary lists and provides complete statistics for the words in the corpus. The GSL and the AWL are the default word lists in the software, however, users can add their own base lists for the analysis of the different corpora. In order to answer the research questions, the MOOCs corpus was profiled against British National Corpus (BNC)/Corpus of Contemporary American English (COCA) word lists (Nation, 2012), and GSL/AWL base lists.

## Results

The results of the lexical profiling of the MOOC lectures based on BNC/COCA lists (Nation, 2012) are summarized in Table 1. Accordingly, the most 1,000 common words in English cover a significant proportion of the words in the corpus (i.e., 80.48%). The second base list provided 7.29% coverage, and 2,000 most frequent words in English totally accounted for 87.77% of words in the corpus. The coverage for the third base list were lower the first two, and this list covered around 5% of the words in lectures. Taken together, the 3,000 most frequent word families in English based on BNC/COCA lists provided 92.85% coverage of the corpus, and there were around 13,000 word types (i.e., unique orthographic forms) identified by the corpus analysis software. Beyond these high frequency words, the coverage of the subsequent BNC/COCA lists dropped significantly. The analysis

TABLE 1 The lexical profile of MOOC lectures based on BNC/COCA lists.

Statistics					
Level	Token	Token%	CumToken%	Type	Group
1	3,580,032	80.48	80.48	4,632	999
2	324,152	7.29	87.77	4,249	997
3	226,104	5.08	92.85	4,218	1,000
4	64,462	1.45	94.3	2,883	991
5	37,601	0.85	95.15	2,252	948
6	26,006	0.58	95.73	1,916	920
7 to 25	84,511	1.89	97.62	9,145	6,484
31 to 34	67,541	1.52	99.14	4,983	4,459
0	38,195	0.86	100	12,103	12,103
Total	4,448,604			46,381	28,901

TABLE 2 The lexical profile of MOOC lectures based on GSL/AWL lists.

Statistics					
Level	Token	Token%	CumToken%	Type	Group
1 <sup>st</sup> GSL	3,622,025	81.42	81.42	3,794	998
2 <sup>nd</sup> GSL	183,362	4.12	85.54	3,069	970
AWL	236,547	5.32	90.86	2,656	569
0	406,670	9.14	100	36,862	36,862
TOTAL:	4,448,604			46,381	39,399

also indicated that knowledge of the 5,000 most frequent word families is needed for achieving 95% coverage. However, the 98% coverage requires much larger vocabulary size. Accordingly, considering the coverage of proper nouns, marginal words, transparent compounds, and acronyms (base list 31 to 34), this level of lexical coverage needs knowledge of 9,000 words. Additionally, around 12,103 word types that accounted for 0.86% of the corpus were beyond the base lists.

The results for the lexical profile of the MOOCs lectures based on GSL/AWL base lists are represented in Table 2. The findings indicated that the 1,000 most frequent words in English based on the GSL provided 81.42% of the running words in corpus. However, the coverage of the second GSL list was significantly lower compared to the first list, and the items in this list accounted for only 4.2% of the words in lectures. Moving to academic vocabulary, the AWL provided 5.32% coverage in the corpus. Overall, the GSL/AWL base lists accounted for 90.86% of the tokens, and 9,519 word types in the corpus. Around 9% of the words in MOOCs lectures were beyond vocabulary items in GSL/AWL.

## Discussion and conclusion

The first research question was concerned with the amount of vocabulary needed for 95 and 98% coverages in

MOOCs lectures. The findings indicated that for minimum comprehension threshold, MOOCs participants should know 5,000 most frequent word families in English based on BNC/COCA base lists (Nation, 2012). This vocabulary size amounts to around 13,000 word types. This finding is incongruent with earlier studies that investigated the lexical coverage in spoken discourse (Webb and Rodgers, 2009a,b; Tegge, 2017; Nurmukhamedov and Sharakhimov, 2021), and the present study indicates that MOOCs lectures are more demanding lexically. Additionally, data analysis revealed that even a larger vocabulary size is needed for adequate comprehension threshold. Accordingly, to achieve 98% coverage, a vocabulary size of 9,000 words seems necessary. This is partially in agreement with Dang and Webb (2014) who found that such level of lexical coverage in academic spoken English requires around 8,000 word families. Moreover, data analysis indicated that MOOCs need considerably larger vocabulary size compared to conference presentations (Dang, 2022). Overall, the study supports the earlier observations in terms of different nature of language used in MOOCs and highlights the need for more research language used in lectures (Yu, 2021).

The second research question explored the coverage of the GSL (West, 1953) and the AWL (Coxhead, 2000) in the corpus of MOOCs lectures. The findings indicated that general service vocabulary accounted for 85.54% of the corpus, and academic

vocabulary provided around 5.32% coverage resulting in a cumulative coverage of 90.86% for the lists. The findings are congruent with [Dang and Webb \(2014\)](#) who reported 85.49% coverage for the GSL in British Academic Spoken English (BASE) corpus. However, the AWL accounted for more words in MOOCs lectures compared to 4.41% figure reported for BASE corpus ([Dang and Webb, 2014](#)). Findings of the current study also differ considerably with [Phung and Ha \(2022\)](#) that explored the lexical profile of listening test of IELTS, as the total coverage of the GSL/AWL in MOOCs lectures is significantly lower compared to 95% coverage in their corpus. These differences might have resulted from a number of factors. First, IELTS listening section is intended for testing English for academic studies and contains listening tasks in different levels of difficulty. This lowers the number of words needed for 95% comprehension. On the other hand, MOOCs are delivered by faculty members in a variety of disciplines and the language used in lectures is more authentic, abstract, and informational. Second, the BASE corpus analyzed by [Dang and Webb \(2014\)](#) was smaller in size compared to the corpus compiled for this study. The size of the corpus significantly impacts the occurrence of the words beyond high frequency vocabulary ([Nation, 2016](#)). Given that the AWL items by definition are those words beyond the GSL, this might have resulted in higher coverage. Additionally, the BASE corpus is based on lectures in two universities (i.e., University of Warwick and the University of Reading), while the corpus of MOOCs used in this study was based on courses offered by a large number of universities around the world. Although such diversity results in a more representative corpus, an inevitable outcome is having a less homogenous data base that impacts the lexical profile of the lectures.

The findings of the study have some implications for English language teachers and MOOCs learners. First, the study revealed that adequate understanding of lectures in English requires a large vocabulary size. This is specifically important for non-native speakers of English as their vocabulary growth and development takes considerable time spanning over several years ([Webb and Chang, 2012](#); [Rahmani et al., 2022](#); [Xodabande et al., 2022](#); [Zakian et al., 2022](#)). With the growing appeal of MOOCs for delivering high-quality education for diverse populations and life-long learners around the world, there is an increasing need to prepare learners for dealing with the vocabulary demands of the video lectures. Among the various pedagogical interventions used for addressing vocabulary learning needs of foreign language learners, technology assisted vocabulary learning holds considerable potential ([Lin and Lin, 2019](#); [Xodabande and Atai, 2020](#); [Hao et al., 2021](#)). Accordingly, incorporating various technologies to augment vocabulary knowledge development might be a practical strategy for dealing with vocabulary demands of MOOCs. Second, the findings revealed that relying on well-established pedagogical word-lists such as the GSL and the AWL is not sufficient for vocabulary knowledge needed for MOOCs. Therefore, language

teachers need to raise the awareness of the prospective MOOCs learners with respect to this issue and aim to addressing the vocabulary learning needs more systematically. Relatedly, the study shows that setting vocabulary learning goals based on BNC/COCA lists ([Nation, 2012](#)) which are developed using more contemporary and large corpora might result in more lexical coverage as the first three base lists accounted for around 93% of words in the lectures. Consequently, there is a need for developing vocabulary learning materials to teach vocabulary items in the BNC/COCA word lists. Third, although the vocabulary demand of MOOCs is higher relative to other spoken academic discourses, training learners in strategies to deal with unknown vocabulary in listening might contribute significantly to reducing the number of vocabulary items needed for sufficient comprehension. In this regard, previous research indicated that although 95% coverage is “relatively high and stable,” the 90% coverage might be also regarded “relatively high” for listening comprehension ([van Zeeland and Schmitt, 2012](#), p. 474). Given that the 3,000 most frequent words cover a considerable proportion of the corpus; this vocabulary size might be regarded as the first step in preparing learners for self-regulated learning with MOOCs. Additionally, to ensure this relatively high coverage (i.e., 90%) MOOC learners might benefit from strategy training in terms of dealing with unknown vocabulary in context ([Pavii Taka, 2008](#); [Szudarski and Barclay, 2021](#)).

The study had some limitations. First, only one platform is used for collecting video lectures in MOOCs. As there are some other main MOOCs providers (edX, Udacity, FutureLearn, etc.) that offer online courses from prestigious universities and institutions, the corpus analyzed in this study might not be representative of the contents offered in other platforms. This consideration should be accounted for in interpreting the results and there is a need for more research in this line of inquiry for having a more transparent picture of vocabulary demands of MOOCs. Moreover, although a large corpus was compiled and analyzed in this study, the size of the corpus significantly impacts corpus-based vocabulary studies ([Nation, 2016](#)). Accordingly, considering the difficulties associated with compiling spoken corpora ([McEnergy and Hardie, 2011](#)), larger and more balanced corpora are needed to investigate the coverage provided by base lists beyond high-frequency vocabulary in MOOCs. Despite these limitations, the study provided valuable insights with respect to lexical profile of MOOCs and the size of vocabulary needed for understanding the contents. Future research might consider addressing these issues and also investigate the challenges faced by those participating in MOOCs in terms of insufficient vocabulary knowledge.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

All authors contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships.

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# Introducing a multimodal perspective to emotional variables in second language acquisition education: Systemic functional multimodal discourse analysis

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A systemic functional theory applied to multimodal discourse analysis (SF-MDA) is related to the theoretical and practical meaning extraction from the data showing how multiple semiotic resources are used in different modes of discourse ranging from textual, printed, and electronic texts to visual language and those existing alive as embedded in reality. In the present paper, we provide an introduction to the SF-MDA approach and then justify how it can benefit the second language acquisition (SLA) domain and more specifically the exploration of L2 affective variables. We will show how the SF-MDA approach fits in with the complexity and dynamic systems theory (CDST), and is capable of revealing the nuances of the developmental nature of the affective variables involved in language learning. The exemplary works of research in the SLA domain using the SF-MDA approach are reviewed here as well as those exploring L2 affective variables. The further benefits of this approach will be emphasized at the end along with the implications it can have for the CDST-led line of research in applied linguistics.

## KEYWORDS

systemic functional multimodal discourse analysis, semiotic resources, complexity and dynamic systems theory, visual language, affective variables, second language acquisition

## Introduction

The new technological advancements, in particular, in the area of computers, education, and related stakeholders have been seeking to integrate visual or aural elements into SL/FL programs. This has made it possible for learners to gain easier access to multisemiotic resources than before (Wang and Hemchua, 2022). Undoubtedly,

regardless of any subject at school, an attempt has been made by the material developers to incorporate multimodal resources during the last 30 years (Unsworth, 2001). Along the same line, the semiotic approach attaches great importance to the functional role of images as potential vehicles of cultural elements accompanied by texts and pedagogic tasks; that is, these pictures are not merely decorative elements (Derakhshan, 2021). The semiotic perspective focuses on the potential resources of textbooks and can be used as a tool for figuring out how much and how the books can represent the cultural elements. Based on this approach, culture is an outcome of a dynamic process created in educational settings. This process unfolds as a result of interactions between students and instructional materials, highlighting the processes learners undergo in this context (Kiss and Weninger, 2017).

As pointed out by Kramersch (2013), the semiotic perspective is based on the postmodernist view and analyses the inclusion of cultural dimensions in learning materials in a dynamic manner. It also draws on interactive, multimodal considerations. Indeed, this approach views culture as a discourse, or what is known as a social semiotic construction. Using a flexible procedure, this approach probes the development of particular cultural meanings by integrating the texts, tasks, and pictures, using semiosis for achieving curriculum goals, and highlighting the cultural elements. These resources make it easier for the learners to read and understand the cultural contents (Chen, 2010; Derakhshan, 2021). A systemic functional approach to multimodal discourse analysis (SF-MDA) entails employing practical and theoretical approaches to analyzing textual input, three-dimensional materials or other activity types marked by a combination of semiotic qualities (e.g., written and spoken language, mathematical symbolism, visual input, architecture, gesture, sculpture, or other physiological modes) for meaning-making (O'Halloran, 2008). The systemic functional theory is appropriate for the provision of theoretical foundations for multimodal discourse analysis (MDA) as, most importantly; it is a theory of social semiotics that sees meaning largely contingent on context (Halliday, 1978). Until now, the systemic functional theory has acted as an insightful theory of language (e.g., Martin, 1992; Halliday and Matthiessen, 1999; Martin and Rose, 2003; Halliday, 2004). Influenced by the language of displayed art and Kress by O'Toole (1994) and the reading images: the grammar of visual design by Van Leeuwen (1999), attention has been more increasingly attracted to SF theory applied for MDA (e.g., Lemke, 1998; Royce, 1998; Van Leeuwen, 1999, 2005; Iedema, 2001, 2003; Kress and Van Leeuwen, 2001; Unsworth, 2001; Martin, 2002; O'Halloran, 2004, 2005; Ventola et al., 2004; Martinec, 2005; Baldry and Thibault, 2006; Bateman, 2008). The foundation of SF-MDA further development and the subsequent issues are related to the systemic functional theory quality.

Thus, the multimodal aspects of emotions from an SFMA perspective can be realized in terms of experiential, multimodal, and textual functions. The main advantage of SF-MDA is the meta-functional principle established by Halliday (1978, 2004) considered the foundation of theorizing about the interaction of semiotic resources meaning-making (e.g., Van Leeuwen, 1999, 2005; Baldry and Thibault, 2006; Kress and van Leeuwen, 2006). That is, compared to other approaches to multimodal analysis such as MDA, SF-MDA is unique as it categorizes the multimodal aspects of classroom interactions into three main functions. One of the main advantages associated with SF theory has to do with the metafictional principle developed by Halliday (2004). This principle lays the groundwork for postulating the way in which the interaction of semiotic resources yields meaning. Here, these concepts need to be clarified: semiotic elements, modality, and multimodal resources (Kress and van Leeuwen, 2006). O'Halloran (2011) maintains that semiotic resources help the students to make meaning. Some of these resources are as follows: language, pictures, and music. Modality refers to the sensory channel used for communication (e.g., visual, auditory, tactile, and kinesthetic). There is a close interrelationship between these two concepts. For example, the L2 classroom should take advantage of a variety of semiotic resources, such as language and digitalized pictures, films, and the instructor's gestures and body language (Levasseur and Sawyer, 2006). These semiotic elements improve the learners' capabilities, including their visual, aural, and/or kinesthetic sensory stimulation. Therefore, multimodality has been used as a term with a broad sense involving several semiotics and modalities (Rowse and Collier, 2017). According to the meta-functional rule, the semiotic assets both set the stage for ideational meaning-making (i.e., logical relations and experiential meaning) and pave the way for establishing social associations (i.e., inter-individual meaning). Such meta-functions are activated within the discourse structure, considered as a textual semiotic meta-function.

The meta-functional principle acts as a platform of exploring the uses of semiotic assets and analyzing how semiotic resources are implicated together in discourses of multiple modes to serve certain purposes (e.g., for meaning-making in school coursebooks, to encourage a customer to buy a certain property, to encourage people to act violently apparently for some other reason) (O'Halloran, 2008). What matters in SF-MDA is the meaning value of semiotic assets shared among different levels (i.e., phonology and lexicogrammar, graphology/typography, setting, and discourse semantics) and the theoretical investigation of the coordinated meaning of semiotic alternatives in some discourse marked by multimodality (O'Halloran, 2008). Multimodality is concerned with several approaches taken to represent the communication of things by resources other than language. Here, multiple

communicational modes such as picture, body language, and movements, among others, or integration thereof are used (Jewitt, 2011). Indeed, linguistic and visual modes of semiosis are fundamentally different. For example, a linguistic resource, i.e., a text, is usually arranged syntactically as a chain that is sequentially processed, with meaning-making progressing progressively. SFL requires the analysis of the sequential parts (i.e., the lexical items, sets of words, clauses, clauses, and paragraphs), which constitute several stages in textual development (O'Halloran, 2008). SFL involves the individual's ability to interpret texts with respect to the context where these texts are created and received. Indeed, SFL views context as a factor consisting of three language registers: field of discourse associated with the experiential meanings in question; tenor of discourse that attaches great importance to the formation of social relations and functions; and mode of discourse, which is concerned with how semiotic forms are arranged and presented. The latter is manifested in texts through the application of thematic elements. The integration of these modes contributes to the organization of the informational function of a text, making it a coherent whole (Alyousef, 2020). As one of its important advantages, SFL conceptualizes language as one of the multiple interrelated semiotic systems which makes a contribution to the development of intersemiotic theory. Other systems include mathematics, animation, poetry, mimicking, and music, among others. Such a framework should accommodate new forms of communication (Unsworth, 2006).

For example, the SF-MDA approach contributed to the investigation of the functional properties of language, optical input and arithmetic symbolism of discourse (O'Halloran, 2008). It also deals with theorizing how visual, linguistic, and interactional symbolic alternatives work together for reality construction in ways that go beyond the superficial uses of mere linguistic assets (O'Halloran, 2005, 2007). Moreover, SF-MDA tries to link multiple disciplines which are from conventionally different domains. The SF-MDA perspective can significantly contribute to the conceptualization and analysis of multi-modal semiotics (O'Halloran, 2008). As with Systemic Functional Theory, in the case of SF-MDA, a combination of resources, including system networks and meaning represent the meanings associated with semiotic resources. Here, the meanings also unfold metafunctionally (Lim, 2021). Since classroom interactions in language classes have a multimodal nature and emotions arise out of these multimodal interactions, the multimodality underpinning these emotions should be taken into consideration. In the second language acquisition (SLA) domain, SF-MDA can be effectively used to explore multimodal classroom learning experiences, as will be addressed below.

## Review of the literature

### Contribution of systemic functional-multimodal discourse analysis to second language acquisition domain

Derived from Martin and White's (2005) appraisal theory, SF-MDA has its roots in Halliday's (1985) systemic functional linguistics including textual, interpersonal, experiential, and meta-functional inputs. SF-MDA has recently been used in the applied linguistics field (Peng et al., 2017; Erfanian Mohammadi et al., 2019). Multimodal experiential meaning is categorized as contexts, the participants involved, and the process (Hood, 2011; Lim, 2011). By process, we mean the participants' conditions (e.g., sitting, standing), the process of their behavior (e.g., whether they are showing enjoyment or boredom), their interaction with learning resources (e.g., tasks and activities), and their physical responses (e.g., facial expressions, nodding).

Multimodal interpersonal meaning is divided into engagement, attitude, and graduation. Attitudes can be considered to be either negative or positive. Engagement is context-dependent. Several body expressions such as the thumbs-up show positive attitudes and several others such as thrusting a hand forward with the palms shaking show a negative attitude (Lim, 2011). Besides, engagement primarily involves the movement of hands to open or close the space for the negotiation for other voices (Lim, 2011). The speed of the semiotic resources helps to express graduation. It involves fast or slow movements of the body (Hood, 2011). If graduation is fast, it shows energy, urgency and dynamism. If it is slow, it shows deliberateness and emphasis (Lim, 2011). What is meant by multimodal textual meaning is the pointing and rhythm of gesture. The former entails specificity and directionality both. The latter has to do with the interfaces that display information (Lim, 2011). It points to directional goals, probably a particular student in class or the entire class during a certain task or teaching/learning experience. Also, the pointing specificity is related to using hands, fingers, or things in class in different processes of teaching or learning.

There have been a number of studies in the SLA domain, which have used SF-MDA in different aspects of language learning. The exemplary works of research will be reviewed here. We will see that though this body of research is still limited in number, the findings have been truly valuable to the SLA theory and practice. This approach will be fit for investigating the nuances of the developmental nature of L2 affective variables, which have attracted the attention of SLA researchers more than ever before in recent years (Larsen-Freeman and Cameron, 2008; MacIntyre and Gregersen, 2012). Especially, with the advent of positive psychology in SLA

studies (Dörnyei and Ryan, 2015), newer positive emotions such as enjoyment in foreign language learning have also joined the line of inquiry. Relevant studies will be exemplified here.

## Exemplary systemic functional-multimodal discourse analysis studies in second language acquisition

Peng et al. (2017) used the SF-MDA to investigate the multimodal resources of willingness to communicate (WTC) in English as a foreign language. These researchers first drew attention to the multimodal nature of human communication marked by the processing of different semiotic qualities. Using the SF-MDA, Peng et al. (2017) examined the dynamics of WTC in EFL classes in China. The data collection modes were video-recording of classes as well as student journal writing and stimulated recall interviews. The semiotic assets explored included gesture, language, and gaze. The discourse semantic features were found, analyzed and contrasted to discuss the nuanced differences. The present findings emphasize the essentiality of language teachers' recognition and coordination of multimodal semiotic resources to improve Students' classroom participation and WTC.

Similarly, Erfanian Mohammadi et al. (2019) examined how Teaching English as a Foreign Language students (TEFL) benefited from material and non-material semiotic assets together while engaged in the process of constructing tasks and activities for the class. They also analyzed the semiotic assets of these students such as their gestures, language, looks, using the SF-MDA. To this aim, they used an ethnography and video recorded the interaction patterns of six TEFL students who were designing materials to improve the intercultural competence of language learners about a certain general topic. The research findings showed that the participants interacted with each other as they were developing the materials. In the analysis, human semiotic resources were included as well as digital devices and also non-human assets. Besides, when they were engaged in sharing their mental processes, they also communicated positive attitudes and created some negotiation expanding space using gestures with both slow and fast graduation. The way they stared was also engaged, directed at the members of the group and also at the objects while they were designing tasks and activities for class.

Furthermore, Bayat et al. (2020) explored the enjoyment construction potential of a teacher's multimodal negative feedback based on SF-MDA. These researchers videotaped the English language teacher's provision of corrective feedback through multimodality with the help of non-verbal and verbal semiotic assets including posture, gaze, and gesture and monitoring the emotional experiences of language learners for several sessions. They also held interviews in the form

of stimulated recalls with several learners and gathered their written journals about how they experienced enjoyment when they received the multimodal negative feedback scenarios from the teacher. SF-MDA was used to analyze the teacher's multimodal corrective feedback. Interview and journal contents were also analyzed. The results showed that the teacher's use of multimodality in the negative feedback added to the depth of enjoyment by drawing the Students' attention to errors, raising their awareness of the correct forms, and raising the significance of the negative feedback.

In addition, Purwaningtyas (2020) examined the effective use of visual input in EFL textbooks using the SF-MDA. The framework employed in this study was derived from Kress van Leeuwen. The focus was on the visual representation of an EFL Indonesian book. The analysis revealed that presenting female characters visually was 70% more than the male. As for social roles, the proportion of jobs portrayed in the textbook held by men and women was to the same degree. This research aimed to examine the meaning of the incorporated employment of semiotic assets in the textbook, including the representation of visual images. This research recommended to the textbook user that the appearance of visual images can enhance the text or written content in the textbook. The findings also suggested that textbook publishers be more sensitive about the written material as well as the visual symbols used not to cause a kind of misunderstanding among the users of the textbook.

Moreover, Lim (2021) employed the SF-MDA approach to investigating the association of gesture and language the teacher used, in interacting with students, and the emergent meanings created multimodally. This study discussed the mechanisms that combined gesture and language for meaning-making by developing the concepts that were created originally for the associations of language and image. Analyzing and interpreting the teachers' multimodal choices in the lesson led to suggesting the emergent concept of structured informality, which provides a way to facilitate how teachers can develop an efficient experience of learning for their students through multimodal assets.

## Promises of systemic functional-multimodal discourse analysis for investigating L2 affective factors

Mode refers to any semiotic resource which conveys a specific meaning. When it comes to the emotions emerging out of L2 classroom interactions, these semiotic resources can take different forms, both verbal and non-verbal, reflecting a specific emotion within the context of interaction. The existing literature on SF-MDA employed in the SLA domain shows a wide gap in the investigation of L2 affective variables. There are for sure, many more affective variables involved in language



studies than WTC and foreign language enjoyment. It should be noted that these affective variables are no longer seen as traits but should be viewed from a dynamic stative perspective. This means that emotions in classroom interactions cannot be necessarily predicted based on certain conditions but the situational contexts of these interactions determine what and how emotions emerge in these contexts. Also, it is worth noting that the multimodal perspective to L2 classroom interactions should not be necessarily generalized to all contexts. Holding a culture-bound view of this multimodality can provide deeper insights into how emotions are dependent on the culture of the interlocutors involved in L2 classroom interactions. There are certain reasons why SF-MDA can and need to be used more in the inquiry of affective variables in an L2 learning context, as explained below. It should be noted that the interactions in L2 classrooms are dynamic and context-dependent. An EFL or ESL classroom is marked by the interactive development of many psychological and emotional factors. The multimodal perspective to emotions in L2 classroom interactions is not limited to any specific emotions and can be applied to all emotions in this domain. Every session, the teacher and students and the students with peers engage in different interactive tasks and activities, which can vary from one-on-one exchanges to more extensive interactions, for example, between the teacher and the whole class. These interactions can be the origin of different emotions that show emergent patterns and a fluctuating nature. The existing research in SLA, largely influenced by the complexity and dynamic systems theory (CDST) has drawn attention to the significance of tracing the developmental nature of different affective factors (e.g., enjoyment, boredom, anxiety, etc.) which can be involved in the L2 learning experience. A dynamic approach to these affective variables requires more ethnographic and longitudinal studies to be capable of tracing the complex dynamic interactions of these constructs.

As described by Dewaele and Li (2020), the SLA domain has entered its third phase of inquiry (i.e., the dynamic phase), following the general and domain-specific phases. This new phase is expected to benefit from innovative research methods which are compatible with this dynamic shift and which are capable of revealing the causes of changes in the fluctuating development of the emotional traits. The third phase of SLA research, known as the dynamic turn, shows concerns for both positive affective variables (e.g., motivation, self-confidence, grit, foreign language enjoyment) and negative constructs (e.g., demotivation, anxiety, boredom). That is, the multimodal approach to emotions in SLA can be also viewed from an inter-individual perspective. This means that each individual language learner expresses his or her own specific multimodal functions of emotions in classroom interaction. This new turn in the SLA research needs new research designs to be compatible with the CDST to approach language learners' affective variables. Another

factor which should be considered in the application of SF-MDA is the distance and status of the interlocutors in classroom interactions. That is, the multimodal functions of L2 emotions can be constructed differently whether they interact with their teachers or their classmates. A number of qualitative and quantitative research methods have been suggested for investigating different cognitive, affective and behavioral variables involved in language learning (Hiver and Al-Hoorie, 2019). Among the innovative CDST-consistent research methodologies, SF-MDA is one with a truly functional approach to classroom discourse marked by multimodality. As SF-MDA often requires multiple methods of collecting data (e.g., interview, ethnography of communication, journal writing, etc.), this approach to research is capable of showing nuances of variation in the trajectory of changes within different variables or emotions experienced by L2 teachers and learners in the natural experience of language learning embedded within the dynamic network of interactive forces in an L2 class. With the shift from a mono-modal perspective to emotions in SLA to a multimodal one, video-recording tools of classroom observations should be incorporated into research on these emotions.

## Conclusion

As already noted at the beginning of this paper, the association of discourse analysis and multimodality goes back to Kress and van Leeuwen's multimodal discourse (2001). SF-MDA sees the concerns of discourse analysis to be inherently multimodal and reckons that this multimodality should be addressed in any study of discourse. The systemic functional theory, which is the theoretical foundation of the SF-MDA, is marked by amenability and adaptability (Martin, 2002). Yet, it should be reminded that though the higher-level principles of the systemic functional theory can be used for analyzing multimodal texts, the systems for visual input and other semiotic assets are not the same as those for language. The SF-MDA goes beyond the mere extension of the well-known SF-approaches that have been mainly proposed to model discourse and grammatical systems of language (O'Halloran, 2008), and entails the generation, and incorporation of different but complementary approaches and models for investigating multimodal meaning-making.

When used in the SLA domain, SF-MDA can be hoped to represent a more realistic, all-inclusive analysis of multiple modes of interaction that language learners involve in. The kind of communication that language learners have in class helps them practice the language they are learning and also develop interpersonal communication skills. The CDST reckons that not only the learning occurs through this complex and dynamic network of interactions, but also the affective constructs emerge out of this complexity. Thus, analyzing the teacher-student



and student-student interactions in L2 classes through the SF-MDA approach can show how language learners experience different intensities of certain affects in different moments of the multimodal interactions. SF-MDA allows researchers to learn more about L2 learners' experience of affective variables in the immediate learning context through assessing the individual Students' perceptions, emotions, evaluations, and thoughts as they are engaged in the one-on-one, one-on-whole class or group-based communicative tasks and activities. SF-MDA manages to capture affect, experience, and behavior in the real time through several methods of data collection. Thus, it gives SLA researchers a way to extend their knowledge of language learners' perceived emotions they can explore and describe and to better make sense of how students and the different aspects of the learning environment hand in hand form such experiences.

This paper showed why SF-MDA could be of particular value to educational investigations and the SLA line of research by allowing researchers to formulate and answer new research questions about how language learners, their peers, and their teacher, all involved in the language learning context, develop certain emotions. SF-MDA, thus, helps us to better make sense of how several modes of input and interaction influence learning and the other relevant outcomes. The present paper pinpointed the value of the innovative SF-MDA approach in seeking answers to new and interesting questions which can assist SLA researchers and practitioners to explore nuances of the systematic and dynamic variation of affective variables as they actually emerge out of the multimodal interactions in an L2 class.

It is noteworthy that the SF-MDA and other similar innovative approaches to research are well adapted to the CDST requirements of inquiry. Thus, they are expected to be used more in the present era, heavily influenced by the complexity and dynamicity of human cognition, emotion and behavior emerging out of the multimodal interactions. SLA domain should also keep up with the ever-growing movement, and is expected to benefit from the power of the SF-MDA approach in tracing the dynamicity of the L2 affective variables, which are mostly under-researched in the dynamic phase of the SLA research. Finally, it should be reminded that the distinctive feature of the SF-MDA is multimodality at its core, which is becoming more and more interesting to researchers in the applied linguistics domain. In its underlying theory, the SF-MDA has the significant role of actors within a network (compatible with the CDST). This approach can be used to explore how L2 learners take advantage of textual and non-textual semiotic assets to develop and express their emotions when they have engaged actively in classroom tasks and activities. Furthermore, the semiotic approach places emphasis on the functional role of photos which can serve as vehicles of cultural knowledge integrated with texts and pedagogic tasks. They are more than decorative tools (Derakhshan, 2021). Consequently, the semiotic assets of the L2 learners such as their

language, the way they look, their facial expressions and body gestures can be analyzed in depth using the SF-MDA approach, and can significantly contribute to the existing literature.

Regarding the pedagogical implications of the outcomes of the SFMA studies, language teachers can foster embodied or multimodal classroom interactions in the setting of their classes with a focus on how emotions emerge out of these interactions. Moreover, given the stative and situational nature of L2-related emotions, they should be sensitive to how and what emotions are reflected in the momentary student-student and teacher-student interactions. Furthermore, L2 learners' awareness should be raised on how they can make congruence between their gesture and their emotions and how they can interpret their interlocutors' emotions in dyadic classroom interactions by being sensitive to their non-verbal feedback. With respect to the limitations of this review, it should be mentioned that this review has been mainly developed from a methodological perspective but the arguments for the application of SF-MDA in L2 affective variables can be also developed from different perspectives.

## Suggestions for further research

Paying attention to the multimodal aspect of emotions in the L2 context should be seen as an inseparable aspect of researching these emotions. This means that exploring different aspects of L2 emotions in future studies should be carried out with a multimodal lens. The main implication of this study for those who engaged in the language teaching or learning experience is the recognition of the multiple modes of communication in an L2 class, which can be explored or analyzed hand in hand. Indeed, the emotions that L2 learners develop emerge from these multimodal language learning episodes. The affective variables that develop from this multimodal learning experience are not stable. Rather, they are changing meaningfully in response to different modes of feedback received from the teacher, peer, or other elements of the environment of learning. It is worth investigating these patterns of emergent emotions as they actually occur in class by recording them for future analysis. These changing patterns in the emotions in the live experience of classroom learning can have different causal mechanisms, which can be explored using SF-MDA as well. For example, getting to know why certain modes of feedback (provided by the teacher) fail to motivate low-achievers in class is worth investigating. Or, for another instance, seeing what modes of corrective feedback can work best to prevent social aloofness or boredom is worth investigating too. The findings from the SF-MDA approach to L2 affective variables can be used to make EFL/ESL teachers better aware of the multimodality of communication in L2 classrooms, the effectiveness of considering this multimodality in motivating students to learn L2 better, to better adapt the

session content and the tasks and activities included to preclude negative emotions and contribute to the positive ones.

EFL/ESL teachers can be better prepared to see different patterns of, for instance, enjoyment or boredom in class from different students, and not to use the same modes of interaction for (or do not expect to see the same modes of interaction from) all students. Until now, many language learning emotions are still unexplored through the SF-MDA approach (e.g., anxiety, passion for learning, boredom), which need to be investigated systematically, functionally and dynamically, to further enrich the dynamic phase of the SLA line of research. The findings will hold promises for a more realistic conceptualization of learning with all human and emotional aspects of learning realized through multimodal communication in an L2 class.

MDA has been categorized as a branch of discourse analysis, which examines language together with other modes of communication (e.g., pictures, body language, sounds, and icons). Consequently, one can use SF-MDA as an effective analysis framework of analysis since it involves several functions and systems used to create meaning through various resources. Therefore, it can be concluded that the SF-MDA is capable of investigating the multimodality of communication, which is the main purpose of language use. It can reveal how affective variables also develop naturally out of these multimodal language-mediated interactions in class. It closely monitors language learners' language, gestures, looks and interactions within the interactive tasks and activities embedded in classroom learning. It often uses multiple ways of data collection such as interviews, videorecording, stimulated recalls, journal writing and the like to ensure the inclusion of all details possible and not to miss any important point in the analysis. The authentic moment-by-moment tracing of how language learners develop a certain emotion (e.g., boredom, enjoyment, etc.) while involved in communicative tasks and activities in an L2 class can have different implications for the SLA domain too.

A brief look at the related literature on SF-MDA in SLA research shows that the existing body of research on L2 affective variables is still in its infancy. Moreover, the few studies conducted so far using the SF-MDA approach in examining some L2 affective variables have only emerged within the past 5 or 6 years. Therefore, we can conclude that the use of SF-MDA has been only recently taken seriously in the SLA domain, and still has a long way ahead in research. Since SF-MDA has been recently introduced to the field of SLA, some researchers interested in the investigation of L2 emotions might be still unfamiliar with the procedures of this methodological approach. Thus, they need to improve their literacy in the use of this method. However, the results of the limited SF-MDA studies conducted to explore L2 affective variables have made significant contributions to the CDST-guided line of research in SLA domain, especially in the dynamic phase. SF-MDA, with its distinctive advantages and the use of ethnographies, is capable of delineating the complex growth and the fluctuations

of language learners' emotions during the actual experience of language learning. Therefore, we can hope to see more SF-MDA studies in near future to explore different aspects of language learners' emotional experiences emerging from and within communications. Why SF-MDA is matched with the dynamic studies of L2 affective variables and what promises it holds for the domain were already addressed. A number of research questions were also suggested which can all be used to direct the future line of SF-MDA studies. Here are several exemplary research questions that can possibly be addressed in SLA research to explore L2 affective variables from the SF-MDA approach:

- What is the L2 learners' multimodal expression of (affective variable e.g., boredom, enjoyment, anxiety) during a certain task or activity in class?
- What is the teacher's multimodal feedback to reduce or remove a negative L2 affective variable (e.g., anxiety, boredom, stress) expressed by students in a certain task or activity?
- What are the multimodal manifestations of a certain positive affective variable (e.g., enjoyment) in student-student pair or group works in class? How can the teacher feed into this expression of positive emotions?
- What are the multimodal manifestations of a certain negative affective variable (e.g., boredom) in student-student pair or group works in class? How can the teacher reduce this expressed negative emotions without being obtrusive?
- Which aspect(s) of the multimodality of expressing L2 affective variables are more culture-bound in a certain context? And why?
- Is there any cross-gender difference in the use of physical gesture in expressing a certain emotion in an L2 class in (a particular country)? Does it have any cultural root(s)?
- What compensatory strategies can be used to increase the multimodal aspects of interactions in L2 classes especially in EFL settings with a far different cultural roots from the L2 culture and context?
- What is the attitude of preservice L2 teachers toward the relationship between the multimodality of L2 class resources (tasks, activities, materials) and the varying degrees of emotions they raise in language learners?
- How can the multimodality of the learning materials influence the further intensification of language learners' positive emotions (e.g., motivation, high self-confidence, foreign language enjoyment)?
- How can the multimodality of the learning materials influence the lowering of language learners' negative emotions (e.g., boredom, anxiety, stress)?
- How can multimodality be used in the design of language tests so as to minimize the affective filters and maximize the positive emotions?

- How can learner-developed multimodal materials, tasks or activities be incorporated in class events so that the affective filter is lowered and the positive emotions are intensified instead?
- How can multimodal classroom learning input be incorporated so as to motivate cultural minorities in class (among students) and to increase their willingness to communicate?
- How can the teacher possibly model the best advantages taken of the multimodal semiotics in an L2 class so that students feel safe to follow?
- What inhibitions and limitations can possibly be set to the extended use of multimodal semiotics in L2 classes in developing countries (possibly by the curriculum designers or educational policy makers)?

Exploring these research questions can even require mixed designs. Thus, quantitative and qualitative lines of inquiry are both needed to explore the functionalities of language use in real communication, and also, as we contend, for the communication rehearsed in L2 classrooms. As the emergence and development of affective variables are marked by dynamicity, either the quantitative or qualitative approach (or even the mixed approach) taken should be compatible with the CDST-guided line of research. Also, SFMA can contribute to the understanding of unexplored emotional phenomena such as emotion contagion like enjoyment contagion (see Talebzadeh et al., 2020).

## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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# Meta-analysis as an emerging trend to scrutinize the effectiveness of L2 pragmatics instruction

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How efficient is instruction in pragmatics? We have attempted to answer this question through meta-analyses. Considering the plethora of studies conducted in L2 pragmatics instruction, it is still challenging for researchers to keep up with the literature, so aggregating the findings across multiple studies and comparing their results systematically in various dimensions can be pivotal to deciding whether this kind of research is effective or not. This review paper delineates the previous meta-analyses and reviews conducted in the field of instructed second language pragmatics in EFL/ESL context to explore the importance of conducting meta-analyses and to recommend some suggestions and pedagogical implications for further studies.

## KEYWORDS

meta-analysis, review, pragmatics, instruction, research

## Introduction

For centuries, researchers have known that the inevitable existence of sampling error in single studies may lead to variation in the results of the studies. This variation seems to be a weakness in methodology and that is why all studies recommend more research in that field of research (Hunter and Schmidt, 2004). Taking this problem into account, the only solution to sampling error is the cumulation of findings from different studies. Meta-analysis as a solution to this problem was posited by Glass (1976), and “it refers to a quantitative review of the research on the effect of the certain treatment on a response variable” (Li, 2010, p. 312). According to Hall et al. (1994), the aim of meta-analysis is to “summarize and add new knowledge” (p. 24, 25). Furthermore, a meta-analysis arranges a clear explanation of the findings of every study using a numerical index of effect size and it mixes these results of the previous single studies to come to the conclusion across rudimentary research. Since its commencement, meta-analysis has become widespread in psychology, education, and biomedical sciences as a way of using statistics to combine the results of primary studies to check the effectiveness of a variable (Hedges, 1992).

Due to its advantages over the previous approaches used (the vote-counting method, the “cumulation of *p*-values” method, and the narrative method), meta-analysis has been considered an emerging method of research (Borenstein et al., 2021). Meta-analytic studies started long ago, though the first draft had not been released until the 1930s. There were two different kinds of meta-analysis at that time, one of them dealt with



the combination of estimates, and the other concerned the combination of hypotheses (Crombie and Davies, 2009). Due to the fact that this innovative trend has not been adequately addressed in language learning and it has been mostly used in medical issues, the benefits of this research method is worth mentioning. First, meta-analysis is done rigorously; consequently, the danger of bias can be overcome and this contributes to detecting significant and notable results of studies (Derakhshan and Shakki, 2021). Second, unlike individual studies, meta-analysis can provide a lucid picture through the meta-regression technique in which instead of too few participants, aggregated data is used. Last but not least, the transparency of meta-analysis can be another advantage that helps readers to identify the rationality of the decisions taken through the process of finding the effect sizes (Crombie and Davies, 2009).

Considering its advantages, meta-analysis is becoming prolific; as a result, applying it in language studies has been recommended (Oswald and Plonsky, 2010). One of the essential factors in language learning is instruction that was analyzed for its effectiveness numberless in the last decades. Following the seminal research of Norris and Ortega (2000), which was on the effectiveness of instruction, the supremacy of meta-analysis compared with other research methods has been recognized and identified. Since then, the amalgamation of studies has been carried out so far through meta-analyses on different subjects such as corrective feedback (Russell and Spada, 2006; Yousefi and Nassaji, 2019), the effectiveness of negotiated interaction in SLA (Mackey and Goo, 2007), construct validity of language aptitude (Li, 2016), the process writing approach (Graham et al., 2012), and form-focused instruction (Kang et al., 2019). Reviewing the meta-analyses that were carried out, it was found that the instruction of pragmatics has received scant attention, and it was only analyzed regarding one of its features namely the speech act by covering many moderators in an Iranian context (Shakki et al., 2020, 2021, 2023). This paper reviewed previous studies to pave the way for future studies in instructed second language pragmatics.

Pragmatics was described by Morris (1938) as “the study of the relation of signs to interpreters” (p. 6), and it has been considered very fertile ground for research. Crystal (1985) also spotted that the process of language use by which coding and decoding by interlocutors happens has a vital role in pragmatics research. Similarly, Mey (2001) states that “Pragmatics studies the use of language in human communication as determined by the conditions of society” (p. 6). He elucidates that “the use of language needs to be negotiated between the users of language themselves in their social and communicative relations and linguistic interactions” (Mey, 1993, p. 315).

As a vital and indispensable component of language competence, pragmatics has increasingly come to the fore. Learners of Second Language (L2) experience significant difficulty in learning pragmatics, mostly due to the complexity

of pragmatics, which involves more than just focus-on-form(s). The vista of pragmatic competence has been revamped from one-to-one association within form, function, and context of use, and it is now believed that the form–function–context correspondences are not fixed among individuals (Taguchi, 2015). In addition, adult learners, unlike children whose pragmatic and linguistic competence grows at the same time, face many challenges in the process of pragmatic development because of their first-language interferences.

Reviewing the previous findings on pragmatics illustrated slow pragmatic development in a realistic setting (Taguchi, 2019). The majority of scholars believe that pragmatic features, like other language skills such as grammar and vocabulary, should be included in classroom pedagogy (Shakki et al., 2016). Researchers examined the effectiveness of different instructional methods, such as input- and output-based instruction, explicit and implicit teaching, meta-pragmatic discussion, and teaching within the zone of proximal development (ZPD) (Vygotsky, 1987; Alcón-Soler and Martínez-Flor, 2005; Kasper and Roever, 2005; Martínez-Flor and Alcón-Soler, 2005; Rose, 2005; Cohen, 2008; Takahashi, 2010a,b; Taguchi, 2011, 2018, 2019; Birjandi and Derakhshan, 2014; Derakhshan and Eslami, 2015; Culpeper et al., 2018; Derakhshan and Arabmofrad, 2018; Blyth and Sykes, 2020; Derakhshan and Eslami Rasekh, 2020; Derakhshan and Shakki, 2020; Irshad and Bukhari, 2020; Malmir and Derakhshan, 2020; Tajeddin and Alemi, 2020; Derakhshan and Cohen, 2021; Derakhshan and Malmir, 2021; Derakhshan et al., 2021; Hernández, 2021). The findings from previous studies show the positive effects of instruction and its superiority.

Moreover, some scholars carried out systematic reviews and meta-analyses on pragmatic instruction (Jeon and Kaya, 2006; Plonsky and Zhuang, 2019; Yousefi and Nassaji, 2019; Shakki et al., 2021) and claimed that teaching pragmatics is believed to be more effective for L2 pragmatic features. Considering the substantial prominence of Interlanguage Pragmatics (ILP) in learning and teaching, and in order to check the effectiveness of pragmatic instruction, meta-analyses are recommended to bridge the gap and to check whether the amalgamation of studies that have been carried out so far are in harmony. Through meta-analysis in this area, some variables that can predict the effectiveness of pragmatic instruction, especially the speech acts of request, apology, and refusal, can be found. Finally, the purpose of the present study is to summarize the conducted review and meta-analyses studies in the area of L2 pragmatics instruction to date to establish its importance for future research.

## Review of the literature

### Instruction of pragmatics

Interlocutors need to know each other's intentions and the appropriate ways of using English in each new situation, so

there is a need for instruction in order to have successful communication (Sánchez-Hernández and Alcón-Soler, 2020). Individuals must be instructed about how to interpret the meaning in the context and how to have better negotiations. Instructed second language acquisition as a subcategory of second language acquisition occurs as a result of combining the teaching of some materials in the classroom with independent study to help students learn how to use the target language in everyday life. Second language instruction is a context in which teachers try to guide and facilitate the process of learning by assisting learners to achieve a better proficiency level.

Kasper and Rose (1999, 2002) found that pragmatics was amenable to being taught, and that instructed groups often outperformed non-instructed groups. This represents what was elucidated by Ellis (2008) about instruction, the more input, the more opportunities to produce output and better language learning. In order to avoid any misunderstanding, instruction as a pivotal factor can be assumed and has its roots in the noticing hypothesis. Regarding the instruction of pragmatics, which was considered to be effective during past decades (Alcón-Soler and Martínez-Flor, 2005; Taguchi, 2011, 2015, 2019; Culpeper et al., 2018; Blyth and Sykes, 2020; Derakhshan and Shakki, 2020; Derakhshan et al., 2020), Rose and Kasper (2001) stated that all pragmatic features, namely hedges, speech acts, and address markers, are amenable to instruction, and this claim was analyzed by many scholars (Bagherkazemi, 2018; Derakhshan and Arabmofrad, 2018; Kaivanpanah and Langari, 2020; Malmir, 2020) and is supported by the results of this review paper. Recent years have witnessed a plethora of studies on the effect of instruction on different pragmatic features (Jeon and Kaya, 2006; Plonsky and Zhuang, 2019; Shakki et al., 2021; Matsumura, 2022), and it pinpoints the advantages of meta-analysis over other methods of research to assess this effectiveness.

## Empirical studies

After Kasper's plenary talk, which inspired the investigation into the effectiveness of instruction, several reviews and meta-analyses have been carried out on instruction and instructed pragmatics. Norris and Ortega (2000), for instance, used 49 studies that were published between 1980 and 1998. They planned to ascertain the effectiveness of instruction through focus on forms and focus on form studies. They concluded that the explicit groups (focused L2 instruction) performed better than the other counterpart. This study was among the first meta-analyses done on the effectiveness of second language instruction.

Moreover, Jeon and Kaya (2006) carried out the first meta-analysis in instructed pragmatics approximately 14 years ago by using only 13 studies prior to 2003. Their results demonstrated that explicit and direct instruction provides a dramatic difference over no instruction group. Considering the

effect sizes, Cohen  $d$  was 0.70 for the experimental vs. control group in explicit, though it was 0.44 for the implicit group. For pretest, posttest in the explicit group  $d$  was 1.9, whereas the implicit instruction was  $d = 1.01$ . Since the number of studies utilized in their study was limited, further meta-analyses were proposed.

Almost 5 years later, in another paper, a review article was written by Taguchi (2015) on the development of pragmatic instruction over the past three decades. She employed 58 studies in her paper and she also found that instruction is more beneficial than non-instruction. Taguchi believes that explicit instruction is more beneficial than implicit, though through some activities and consciousness-raising, it can be promoted.

A year later, and in a similar way, Badjadi (2016) used 24 studies to determine the impacts of second language pragmatics' instruction related to comprehension and production outcome measures. The effect size change was from small to large and it corroborated the effectiveness of instruction. In addition, Plonsky and Zhuang (2019) distributed two research questions to see the effectiveness of instruction and to check the moderator variables that may predict this efficiency. They utilized 50 studies and their results also are in accordance with the previous meta-analyses in which the importance of explicit instruction was accentuated over implicit instruction. They reported  $d = 1.52$ , which is quite a large effect size for the overall effectiveness of instruction. They also believed that the instruction of pragmatics by providing some opportunities is more effective than instruction without opportunities. Furthermore, they stated that longer instruction and role play produce larger effect sizes than their counterparts.

In another study, Yousefi and Nassaji (2019) analyzed 39 studies from 2006 to 2016 on the effects of corrective feedback and instruction on L2 pragmatics. The findings of their study showed a larger effect size for computer-assisted instruction in comparison with face-to-face intervention. Taking comprehension into consideration, it produced a larger effect size than the production of second language pragmatic. Moreover, the intermediate learners and longer treatments both generated larger effect sizes than other language proficiency levels and shorter interventions.

Furthermore, Shakki et al. (2020) also reviewed 54 studies carried out on the instruction of pragmatics from 2000 to 2020 in an Iranian context, and they reported that request was the most frequently instructed speech act in the last two decades which has been used in 29 studies. They also found Multiple-Choice Discourse Completion Test (MCDCT) to be the dominant data collection method in Iranian studies, and the most recurrent treatment type used in Iran was found to be explicit/implicit vs. control.

By the same token, Derakhshan and Shakki (2021) conducted a meta-analysis on the effectiveness of the instruction of request in the Iranian context. Using special

inclusion/exclusion criteria, they selected 17 primary studies and the analysis corroborated the effectiveness of instruction in L2 pragmatics in an Iranian context. They found that gender and treatment type can be considered moderator variables for this effectiveness. The results showed a larger effect size for males ( $g = 3.09$ ) than females ( $g = 1.10$ ), and explicit ( $g = 1.53$ ) rather than implicit ( $g = 1.20$ ). The overall effectiveness of instruction was found to be  $g = 1.48$ , which is positive and large for teaching request.

Recently, the latest meta-analysis by [Shakki et al. \(2021\)](#) was conducted on the effectiveness of instruction for the speech act of apology. Among 31 studies, they used 12 primary studies to check their research questions. The medium effect size was found in this study for the overall effectiveness of apology instruction, and the research design ( $g = 2.39$ ) was the variable that moderates this productivity and it is assumed to be the predictor for this efficiency. However, the treatment types also generated medium and large effect sizes for the instruction of apology in pragmatics.

A critical look at the studies conducted revealed that they have used a limited number of papers based on their inclusion and exclusion criteria, and most of them have selected some of the variables to check their moderating roles. It seems that among all studies, the effectiveness of instruction with the variety of effect sizes ranging from 0.07 to 1.52 has been approved, and generally explicit instruction generates larger effect size than implicit instruction. A limitation of this study is that it has only focused on the papers in which pragmatics instruction was analyzed to see whether meta-analysis is effective enough in this field to be used for further research. Other review papers could be carried out on other aspects of pragmatics or other research topics to pave the way for further studies.

## Conclusion and suggestions for further research

Meta-analyses presented a summative description of the primary studies that have been done so far, and the findings revealed the effectiveness of the variables and identified the factors that moderate this efficiency. It could resolve the difficulty of determining whether the research conducted was successful or not, and could be taken into account as innovative and emerging trends for future publications. Meta-analyses aim to generate quantitative estimates of primary studies by combing data to identify the effect sizes. Since the larger sample size brings greater reliability, meta-analyses are also very reliable and precise in conclusion by increasing the generalizability. Considering the empirical studies, previous meta-analyses can help researchers to perceive the magnitude of the effect sizes better, and they could lead to identifying vital trends and conclusions that could influence policymakers' decisions and

future research. Among the implications and strengths of meta-analyses, model testing, high statistical power, and moderator analyses can be carried out, which make them more replicable and systematic than qualitative and traditional reviews.

Although doing meta-analyses has been found to be fruitful, one of the pervasive problems in using them is missing data or unpublished papers that are not available to researchers, so it is recommended that researchers contact people who are experts in the field to see whether they have any unpublished papers, or whether they know of any conferences occurring. Furthermore, researchers are advised to avoid including even one bad study in meta-analysis, because instead of solving the problem of variance, the study could ruin the entire sample ([Field and Gillett, 2010](#)). Thus, defining clear and precise inclusion and exclusion criteria is also advisable.

The number of meta-analyses investigated pragmatic instruction which was a concern in this study is scant; therefore, more meta-analyses need to be done to have pivotal pedagogical implications for second language pragmatics and future research. While searching in previous meta-analyses for speech acts, we were surprised to find that there are some speech acts, such as threats, condolences, congratulations, and challenges, that have received scant attention, so future studies could be conducted in these neglected areas. The only meta-analyses carried out on the effectiveness of speech acts ([Derakhshan and Shakki, 2021](#); [Shakki et al., 2021](#)) have examined requests and apologies. Researchers could also check other treatment types, comprehension, and production of pragmatics, and could also take into account other factors such as the gender, age, and proficiency level of the learners to lead to better outcomes and to check their effectiveness.

In addition to speech acts, which are a vital feature of pragmatics, other variables, such as implicatures and routines, could also be a new research area for future studies. This paper may also be useful for researchers whose areas of interest are meta-analysis and pragmatics. They could conduct meta-analysis to check the moderator variables that are helpful predictors in teaching pragmatics, and could also work on data collection methods other than WDCT and MDCT, such as role play, to assess whether they are more reliable for the instruction of pragmatics. Another suggestion would be to focus future meta-analysis on different levels of proficiency.

## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# The contribution of a hermeneutic approach to investigate psychological variables in second language acquisition

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Qualitative research and more specifically a hermeneutic approach to interpreting communications in L2 classes has much to contribute to the accumulation of psychological knowledge about L2 learners. The modern social hermeneutic approach helps to address questions that are quite relevant for explaining contemporary developments in L2 educational strategies and policy-making. It can be used alone or in combination with quantitative methods of data analysis to analyze how certain psychological variables (cognitive factors, affective factors, and personality traits) emerge from the social interactions that occur within the ecologically situated nature of classroom language learning. The purpose of this conceptual review is to provide an introductory overview of the hermeneutic approach and discuss how it can be effectively used in L2 studies to explore the emergence, development, and causal mechanisms underlying the psychological variables in the interactive context of L2 classes. Also, suggestions will be explained with respect to the contributions of the method to L2 psychology, educational psychology, and second language acquisition domains.

## KEYWORDS

hermeneutics, modern social hermeneutic, psychological variables, second language acquisition, qualitative research, quantitative methods

## Introduction

On broad terms, hermeneutics is defined as the art and science of interpreting texts, which has been around for problem solving since Plato and Aristotle from old Greece (*cf.* Grondin, 1994; Hufnagel, 2000; Joisten, 2009). The roots of the term lie within the Greek word *hermeneuein*, with different meanings including 'to explain', 'to describe', 'to translate' and 'to clarify, and it entails different ways of interpreting written content, especially texts related to the religion, law, and literature (Lueger and Vettori, 2014). The roots of the hermeneutic approach can be also traced back to Schütz' phenomenological theory, which points to the already-existing nature of perceptions in the form of integrative structures of

meaning (Schütz, 1972, 1982). Viewed this way, the current experiences are hardly separable from prior experiences. These experiences are mostly gained and formed within human communication and interactions with other individuals and are added to the socially shared stocks of knowledge and experience that already exist (Vettori, 2018). From a social hermeneutics perspective, the main goal is understanding the building up of realities in particular historical and social settings and how they are exactly formed (Vettori, 2018). Applied to the educational setting, the hermeneutic approach allows for excavating the dynamics of teaching and learning by scrutinizing the instructional context, and the breadth of meanings in which the instructional plans are made to affect the interactants' perceived reality (Lueger and Vettori, 2014).

At the core of the hermeneutic approach lies the significance of context and interaction. Hermeneutics is interested in the meaning structures that should be interpreted and inferred from the contextual associations through which they are revealed. It is also noteworthy that hermeneutic approaches do not pursue an objective reality or a single right meaning, yet instead critically explore if a particular reconstruction may be considered a relevant and sustainable theme or not, and also if it is capable of holding its status against the other relevant alternatives. That is to say that though the outcome of routine behaviors is contingent on their normality assumption, the hermeneutic approach sees this normality assumption as the beginning point of reflexive and critical investigations. Thus, enquiring questions from diverse points of view turns into a main constituent element of a hermeneutic method (cf. Gadamer, 2004). In recent years, L2 scholars interested in the domain of psychology of language learning and teaching have applied some innovative approaches to explore different aspects of psychological factors involved in the process of L2 language learning and teaching (Derakhshan, 2022). However, the use of the approach is still in its fledgling state and it is believed that this method can provide deeper insights into the underpinning factors involved in the emergence of these psychological variables. The purpose of this paper is to review the contribution of a hermeneutic approach, especially the modern hermeneutic approach, to the investigation of psychological variables in second language acquisition (SLA).

## Background of the hermeneutic approach

The hermeneutic approach is among the most popular regularized frameworks in qualitative research, which acts as a reliable methodological foundation and relations to different theoretical conventions, including phenomenology (which emphasizes the association of abstract phenomena and the social context accommodating these phenomena: cf. Husserl, 1999), institutionalism (according to which the categorization of behaviors and socially constructed common amounts of knowledge are at the core of social communication) and modern

systems theory (in which communication is viewed at the core of all social systems cf. Luhmann, 2013). The social hermeneutic approach stemmed from socialization and education research projects, and got very well received in institutional research and organization studies. It later on was further developed in international educational research. As the social hermeneutic approach highlights the reconstruction of the relevant values, norm and logics interaction systems of social structures and processes, it addresses questions that are quite relevant for explaining contemporary developments in educational strategies and policy-making (Lueger and Vettori, 2014).

The social hermeneutic approach helps to understand the growth of controversial issues, socially oriented discourses embedded in socially complicated spheres which include a wide array of participants and various points of view such as an educational setting (Vettori, 2018). It helps to investigate the integration of well-established educational plans in wider historical and social settings (e.g., investigating the informal and formal needs of students with various backgrounds to satisfy while learning something, and unraveling the strategies that result from meeting these needs; or evaluating the prerequisites for change in relation to official educational and academic norms (Rammel and Vettori, 2021). It helps to change the basic values, assumptions and norms which represent themselves in instructional settings, learning designs and technologies. It helps to analyze the association of various educational levels in terms of acquisitional development and cultural adaptation, and explore students' construction of reality and perception patterns and assess their effect on their relationships and educational plans (Lueger and Vettori, 2014).

## Distinctive features and types of hermeneutic approaches

At first, almost all hermeneutic attempts were based on a feature called the hermeneutic circle, which described the recurrent interaction of the interpreter's previous estimations about the meaning of a text and his/her refinement and edition throughout the interpretation procedure (Gadamer, 2004). Put it simply, making sense of a text as an entirety is possible just in association with its individual constituent elements and the other way round. Despite the fact that the main criticism of the circularity concept is its inherent metaphoric dubiety (cf. Shklar, 2004), two basic principles are established by the hermeneutic circle which still may be considered the main features of social hermeneutics too. The first point is the need for the interpreter to constantly doubt his/her present interpretation condition, and should doubtfully investigate each strand of analysis (Rammel and Vettori, 2021). The second point is that to make sense of the text, one cannot just rely on the text itself. Rather, the interpreter needs to refer to the socio-historical and literary contexts in which the text has been produced. Seen this way, we can see why the hermeneutic approach is of interest to educational and social

scientific domains (Vettori, 2018). That is because the hermeneutic approach involves an in-depth context analysis according to the original texts and goes beyond just a simple text analysis.

Accordingly, several types of hermeneutic approaches can be thought of, for instance, the sociology of knowledge hermeneutics (Soeffner, 2004a, 2004b), objective hermeneutics (Oevermann et al., 1979; Lueger and Hoffmeyer-Zlotnik, 1994; Reichertz, 2004), genre analysis (Bergmann and Luckmann, 1995), the documentary method (Bohnsack et al., 2010), and life-world analysis (Honer, 2004). All these varieties are largely in debt to the conventional hermeneutic circle. Yet, each has somehow moved in a different direction away from the fundamental model of interpretation. Modern approaches to social hermeneutics move away from attempts to make sense of a text by fluctuating between the whole text and the different constituent elements it is comprised of (Rammel and Vettori, 2021). The modern varieties typically begin with the deconstruction (another distinctive feature of this approach) of the source text. The purpose of this strategy is the generation of new insights and the reduction of the threat of assigning the new findings altogether to certain fundamental presumptions. The myriads of existing approaches also show that these varieties may not be either standardized or used to address a research problem in a similar fashion (Lueger and Vettori, 2014). With this respect, the hermeneutic approach may be seen as a shared framework of methodology which renders principles and ideas available of how to deal with the meaning aspect of social events systematically (Knassmuller and Vettori, 2009). Furthermore, different varieties of the hermeneutic approach share a number of distinctive features as summarized here.

One distinctive feature is a focus on extensivity, with the aim of reconstructing and taking into account all possible interpretations. There is no fixed and prescribed regulation on how to interpret a particular event, and since the overlay of several layers of meaning and connotations imply that arriving at a uniquely true interpretation of a statement is hardly possible, formulating appropriate questions for a text, and assuring not to overlook or exclude any meaning alternative that may be relevant are two of the major prerequisites of an interpretation process guided by the hermeneutic approach. Another distinctive feature is the deconstruction of the source text, which entails breaking it in more manageable parts and setting some criteria for the validity of each strand of analysis to constantly check the interpretations (Oevermann, 2002). Unlike the classic hermeneutics and what was formerly introduced as the hermeneutic circle, the modern hermeneutic varieties refrain from dealing with the text as an entirety, in which every former reading oscillates between particularism and holism. This oscillation gives way to the hypotheses being tested and formulated in each consequent reading. The other distinctive feature is the sequentiality principle, which means perceiving the internal structure of the text as several sequences the particular time order of which is a major cue for the underpinning structures of meaning. This feature relies on the belief that

meaning structures also adhere to a sequentiality principle (*cf.* Oevermann, 2002). According to Lueger (2010), just a method that follows this sequentiality principle can interpret how actions and interactions are organized.

## A modern hermeneutic approach to SLA

Whereas classic hermeneutics mostly dealt with interpreting philosophical or literary texts, modern hermeneutics turns the focus of interpretation to the non-verbal and verbal aspects of communication too as presuppositions, pre-understanding and semiotics (Rammel and Vettori, 2021). Modern hermeneutical approach can be coupled with the acquisition of four language skills including reading, writing, listening and speaking, to improve language learners' comprehensive and interpretative outlooks (Seth, 2020). Language learners can use this approach and incorporate private discourse with the modern hermeneutical method to foster better quality and more effective communication marked by integrated prior knowledge, cognitive and linguistic skills altogether (Seth, 2020).

To discuss how a hermeneutic examination of the language learning process is related to the theory and practice of L2 teaching, one relationship can be thought of as rooted in the fundamental concern of hermeneutics with coming to a clear understanding, as a common purpose of L2 researchers and teachers. As convincingly discussed by Ochsner (1979), hermeneutics can adopt a key role in theory development and research methodology design in the SLA domain. The introduction of diary research as beneficial method of research in SLA confirms the increasing popularity of Ochsner's argument. In a more well-reputed relevant investigation, Bailey (1983) reckons that awareness of the procedures of both hermeneutics and empirical science can offer researchers all they need to explore the mechanism underlying the SLA accounted for by these two points of view that complement each other. Since a goal of diary works of research is to facilitate a more comprehensive understanding of SLA *via* self-reflection and introspection with the learner being engaged in learning process of L2, Bailey refers to this research method as emergent from the convention of hermeneutic science.

As an example, Murphy (1989) discusses how hermeneutics is related to the listening skill process in L2. In an article that firmly locates the first language speech communication discipline in hermeneutics, Stewart (1983) draws attention to four main ideas at the core of the hermeneutic science of modern times. An awareness of these core ideas can result in a philosophically rich point of view toward the listening skill in language acquisition. The four core ideas included a fusion of horizons, play, linguisticity, and openness. Meanings are reckoned to be open which implies that the interpreter takes part in the generation of interpretations when language is used. When speakers speak, they do not elaborate on the content which is easily directly decoded by listeners. Only during interactions with speakers, listeners are perceived as complicit in meaning production. The messages

emerging from speaker-listener interactions are dependent on historical, situational, linguistic and cultural settings.

In a review of the past twenty-five years of teaching second language listening comprehension, Brown (1987) pinpoints that language is entirely derived from, encoded and decoded as contextualized. An emphasis of hermeneutics on openness further proves this idea. It proves that in relation to all kinds of human knowledge (literature, history, science, law, music, etc.), all interpretations are naturally context-dependent and historically oriented. The perceiver cannot be separated from the act of perception. The same goes for the outcome of something perceived. Besides, hermeneutics contends that all human interpretations are inevitably tentative, conditional, and prone to changes in present or future time (Vettori, 2018). What we produce or comprehend (both production-based and comprehension-based language skills) does not result from a closed or fixed system. Rather, it is prone to constant growth and change. Correctness, truthfulness, and accuracy are not what is basically the matter. What actually happens during language-mediated communication is a message co-construction among interlocutors. Speakers and listeners are actively engaged in a collaborative process of meaning-making. In the hermeneutic convention, the perceiver's subjectivity is viewed as a major dimension of the comprehension process (Murphy, 1989).

## Hermeneutic approach to psychological variables in SLA

SLA research has witnessed a shift in recent years from negative psychology to positive psychology (MacIntyre and Gregersen, 2012; MacIntyre and Mercer, 2014; Derakhshan, 2022; Wang et al., 2022). Negative psychology deals with excessive concern with the affective filter and the perceived impeding effects of such variables as L2 anxiety on language learning but positive psychology welcomes research on both negative and positive affective factors in the process of L2 learning (Dewaele and Li, 2020). Rich (2017) highlighted the potential benefits of different forms of qualitative research including social hermeneutics to enrich positive psychology, by noting several forms of qualitative research. Gergen et al. (2015) drew attention to three approaches to qualitative research which could provide deeper knowledge than could be provided by the quantitative approach and presented their implications for positive psychology. Among these three approaches to qualitative research was hermeneutics and social understanding.

Four qualitative methods subsumed under the social hermeneutic approach, which could adequately contribute to positive psychology are the auto-ethnography, narrative, performative and phenomenological methods (Creswell, 2009, 2013; Denzin and Lincoln, 2011). Wertz (2015) provided an insightful review of the phenomenological types and their uses in positive psychology. Among famous psychologists who used the phenomenological and narrative types of data in his investigations,

occasionally from sources of biography, we can mention James and his original volume entitled as the "Varieties of Religious Experience" (James, 1997). Also, Csikszentmihalyi (1990) used another variety of hermeneutic approaches which led to the production of rich data. This researcher mixed open-ended and semi-structured interviews with data obtained from quantitative surveys, and managed to make more experience-based, context-specific psychological investigations than were possible in standard quantitative methods. Varieties of the hermeneutic approach have the advantage of allowing for realistic and lived-experiential data collection from more naturalistic contexts (Rich, 2017).

Other researchers and especially philosophers, for example, Crease (1997), have combined phenomenological methods and analysis of performance, which adds a further dimension to hermeneutic approaches. Performance approach is a less frequently used variety of hermeneutics in positive psychology (Rammel and Vettori, 2021). One application can be to use public performances in an attempt to enhance associations with the audience or with the realistic experience of the target population which may, otherwise, be embedded in cultural or social worlds differing from the performers (Lueger and Vettori, 2014; Vettori, 2018). However, again at last researchers can effectively mix qualitative methods including performance, with quantitative methods, as probably in evaluation inquiries (e.g., Martens, 2014; Patton, 2015), to find out, for example, whether the audience of a performance about teaching a certain technique (e.g., stress management technique) actually alter their behavior afterwards or not. Some fields of study appear to make better use of these hermeneutic varieties than the SLA domain. For instance, the strengths-based social work movement (Saleebey, 2012) has been historically better receptive of different approaches to methodology and has managed to see practical implications and induce positive social variation (Rich, 2017).

Besides positive psychology that has affected SLA research in recent years (see Dewaele and Li, 2020), the effect of the social constructionist approach is comparatively as strong. The socio-constructivist view of language learning favors qualitative and interpretive research following the hermeneutic approach because of the concern with the social construction of meaning and the underlying mechanisms accounting for this process (Willig, 2019). The second language (L2) researcher or teacher shows interest in how language learners develop certain psychological traits (e.g., growth mindset, L2 grit; see Elahi Shirvan et al., 2021a, 2021b) within the social interactions involved in classroom-based language learning and how these classroom interactions construct specific manifestations of social reality. Students are viewed as actors whose mind and behavior are developed in the social context of classroom learning which is comprised of discourses (i.e., how things are talked about) and social effects (i.e., how things are done) that influence and shape how students develop different positive or negative emotions. More specifically, language learners engage in different social interactions throughout their language learning within the ecology of their classroom. Social



constructionist L2 researchers employ different approaches of discourse analysis to interpret how these social interactions affect the emergence of different learner personality traits or affective variables. Hermeneutics interpretive process and qualitative research has, thus, many promises for exploring L2 psychological variables.

## Exemplary works of research

Cilliers and Flotman (2016) investigated the psychological well-being in master's students. They described this psychological variable as a contributing factor to having a productive, enjoyable, and meaningful experience in student life. The goal of their study was to offer a qualitative account of the psychological well-being levels of junior students affiliated with a part-time master's degree coursework in Industrial and Organizational Psychology so as to enhance an empathetic interpretation of their experiences. These researchers sought to achieve an understanding of how these master's students' experienced psychological well-being could help university the relevant departments at the university to facilitate the proper and adequate psychological support to students and the improvement of their resilience in productively and effectively fulfilling their first-year academic life and maybe their master's degree as well.

To conduct this study, Cilliers and Flotman (2016) did some qualitative research within a hermeneutic interpretive framework. They collected their data from a focus group of 10 participants selected conveniently. A thematic content analysis was used which led to the extraction of eight themes. These themes were then interpreted in association with the existing psychological well-being literature. The major findings showed that student distress which was induced by job demands resulted in an overwhelmed languishing feeling. To the contrary, student eustress caused by job-related resources could result in a sort of flourishing, together with locus of control, optimism and self-efficacy. As for the pedagogical implications, university industrial and organizational psychology faculties could use the findings for a better and more in-depth understanding of their students' experiences of psychological health, which can contribute to the students' timely and successful completion of their education. This research contributes to the literature about master's students' actual positive and negative experiences and psychological health that is often neglected by university faculties to be idiosyncratic.

Though the above-mentioned study was not conducted in SLA domain, it can be replicated in L2 studies, as the focus was on using hermeneutics in investigating a psychological factor. The next exemplary work of research has been done among English as a foreign language teaching (EFL) teachers and is, thus, more relevant to the field.

In their research, Ramezanzadeh and Rezaei (2019) focused their research on English language professors in higher education, and their experiences of fostering their learners' authenticity. Based on Barnett's (Barnett, 2007) authenticity theory as the

perceptual theoretical framework, authenticity was explored as an authentic voice in this research instead of an inherent quality of the materials produced by native speakers. Interviews and personal documents were used for data collection. The interpretation process of modern social science hermeneutics was used for data analysis. Three major themes were found, including critical knowledge in the ELT domain, reflective and dialectical praxis, as well as a localized and flexible curriculum. In fact, the results of this research trespassed the exclusive border of non-native and native L2 speakers. The results also showed that the development of perceived authenticity in English language learners requires a climate receptive of for inclusion and diversity besides ontological, practical and epistemological spaces. Moreover, the research participants showed that authenticity can be grown in their students *via* critical knowledge that may be gained from discourses with not just the majority of voices but also those being marginalized. The empowering implication of these findings point to the promising contributions of the hermeneutic line of inquiry into L2 psychological variables.

Also, very recently, Elahi Shirvan and Taherian (2022) applied the modern hermeneutics approach to explore the actualization process of the potential affordances for foreign language enjoyment (FLE) within the ecology of an L2 classroom. Having collected their first-round interview data from an L2 language teacher, these researchers started their encounter with the transcripts of the interviews to extract the range of thoughts underlying the actualized affordances for FLE. Secondly, they came up with the identification of the main themes regarding the way the FLE affordances are actualized in the ecology of the classroom. Thirdly, they categorized the emerging themes and; finally, illustrated the summary of the established themes.

## Conclusion

To help L2 teachers and researchers who seek to recognize and effectively satisfy the psychological needs of their language learners, the sharp-eyed lenses of hermeneutics to delve into cognitive and affective factors, and the inner speech can allow for a better conceptualization of the underlying processes of how student think and feel in class while engaged in language learning (Murphy, 1989). Hermeneutic methods in investigating psychological variables provide the chances of connecting society and academia more broadly in ways hardly ever seen before with the quantitative approach. These forms of qualitative research may help to bridge the existing gap between psychologists and techniques among community members including performance-based research and action research are exemplary hermeneutic methods that can pull both groups close to each other (Bringle and Duffy, 1998; Schutt, 2014).

Hermeneutic methods, contrary to many quantitative research methods, are also more likely to facilitate efficient communication among the overall public, because the members are barely literate in graduate level quantitative methods or statistics (e.g., Creswell,



2009, 2013). We can expect to predict positive psychologists efficiently share the results of a hermeneutic-guided positive psychology to many audiences, and the findings can have evident implications for social variation, both on the individual scale and on the family scale, and on the sociocultural scale (e.g., *Psychology Day at the UN*, 2014). Perceiving the benefits of some hermeneutic positive psychology can be translated as hard work. According to Gergen et al. (2015), the power of tradition is not negligible. The structures of the organization are strong. Though the quantitative approach to investigating L2 psychological variables has been dominant, maybe here is a position marked by the relative youth of positive psychology, which can be considered a positive point concerning the potential research approach and the associated shifts of disciplines (e.g., Kuhn, 1962).

What maturing positive psychology has to offer is still being discovered, and maybe a work of research like the present study can act as a turning point in prospective research. L2 psychological investigations can be more than prediction and measurement, and may entail attempts to promote understanding, criticism of formerly presumed truths, and inquiries that can have evident social implications. What the forthcoming decade can be expected to hold for hermeneutic-driven line of inquiry about L2 psychology is still indeterminate, yet there can be hopes that certain major changes are to happen to the realm of research.

## Suggestions for further research

Investigations of L2 psychological variables especially influenced by positive psychology and the socioconstructivist approach in recent years have been mostly quantitative in type. Thus, there seems to be a need for employing qualitative hermeneutic approaches to accumulate and analyze psychological knowledge about language learners. Considering the situated nature of the development of L2 psychological variables, the hermeneutic approach seems to be fit for collecting real-life in-depth data from language learners as they actually experience the process of language learning. There are many positive and negative psychological variables that can be explored in depth through the varieties of hermeneutic approaches (e.g., phenomenology, momentary assessment, etc.). Some of them have been explored more before in the history of psychological L2 studies, such as L2 motivation and anxiety, while some have been only confined to the past few years. Examples are L2 grit, growth mindset, passion for learning and so on. Some have been just borrowed from other domains for the SLA studies, and have not yet been defined domain-specifically (e.g., L2 compassion).

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Another point to consider is that more longitudinal studies are needed in SLA research to explore the process of L2 psychology development or co-development throughout an entire course in class-based interpersonal relationships (see Kruk et al., 2022). Changes are not expected to occur out of classroom interactions and overnight. The details of the teacher-student and student-student relationships especially in interactive tasks and activities should be examined to see how they can lead to the formation of certain psychological variables, personality traits, emotions, attitudes and so on (see Xie and Derakhshan, 2021). For sure, such longitudinal studies, which can be qualitative and hermeneutic in type, need innovative research approaches that are compatible with the dynamic approach to language learning. Researchers interested in these innovative approaches are suggested to read Hiver and Al-Hoorie (2019).

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The author confirms being the sole contributor of this work and has approved it for publication.

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# Looking through goal theories in language learning: A review on goal setting and achievement goal theory

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A growing interest can be seen in the studies on the motivation related to second/foreign learning in recent decades. All in all, research verdicts designate that academic motivation plays a key function in the extent to which students are successful in their research. One of the dimensions of academic motivation is goal orientation, which accounts for why learners carry out achievement activities. This type of goal is indicative of the importance one attaches to success concerning a performance standard. Furthermore, goal setting is deemed as a significant cognitive interface that connects motivation to motivational behavior. Indeed, goal setting is an inseparable part of L2 learning that has caught the attention of many researchers. It functions as a booster of motivation and success in various fields. Goals render the activities purposeful, providing individuals with directions. Moreover, goal drives them to invest more resources and effort, pushing them to persevere in learning. The new versions of motivational theories emphasize social-cognitive components underlying motivated behavior. Therefore, they are more inclusive than traditional ones. Achievement goal theory (AGT) has been developed as a motivation-related theory in recent decades. This theory serves as an effective framework to account for motivation associated with social achievement and learning environments. It also deals with the outcomes concerning cognitive and behavioral aspects. Another theory related to motivation is the Goal setting theory, which functions as a cognitive mediator between motivation and second/foreign learning behavior. It also impacts the students' application of strategies. Drawing on the recent conceptual developments, this review seeks to make a contribution to the related literature on theories of achievement goals, i.e., AGT and goal setting associated with the L2 context. Such a review has pedagogical implications for EFL stakeholders.

## KEYWORDS

academic motivation, cognitive interface, motivational behavior, achievement goal theory, goal setting, language learning

## 1. Introduction

Despite L2 learners' efforts to make relevant adjustments to the target language, they struggle with multiple challenges related to the complex nature of language and its multilayered structure. In their study, [Adwani and Shrivastava \(2019\)](#) sought to pinpoint the factors contributing to the complexity of SLA. They took into account five variables, one of which was motivation. These authors believe that L2 teaching has turned a blind eye to motivation. They asserted that the entirety of the learning process is impacted by the learners' motivation. As long as the learners lack motivation, they would experience no vitality (life) and enthusiasm in class ([Adwani and Shrivastava, 2019](#)). The study tried to uncover the extent to which motivation as an important variable influences the learning process. Undeniably, motivation involves the individuals' attempts combined with his/her thirst for acquiring or learning a skill in general and an L2, in particular, driven by the positive perceptions of L2 learning ([Achmad and Yusuf, 2016](#); [Usman et al., 2016](#); [Pishghadam et al., 2021](#)). In other words, L2 learning-related motivation is an indicator of the extent to which an individual devotes his/her resources to learning the target language due to the internal driving forces and the enjoyment one gains from doing the task ([Rubrecht and Ishikawa, 2012](#)). In [Wolters and Rosenthal's \(2000\)](#) view, motivation serves as a driving force that inspires an individual to engage in an activity or to persevere to achieve a goal. Motivation in the educational context is concerned with the reasons and the justifications a learner has for accomplishing a desirable outcome.

Several factors other than efforts are involved in motivation. The motivated individual allocates time and energy toward the goal, but the individual making effort is not necessarily motivated. Learners' motivation can impact the learning outcomes in L2 classes ([Ulfa and Bania, 2019](#)). It would be insightful to examine how learners make progress in learning EFL/ESL, as well as the failures they have in learning an L2. This is likely to influence their motivation and their learning styles in the context of L2 learning ([Dörnyei, 2005](#)). Closely related to motivation constructs, the concept of goal construct and its relations to motivation and L2 learning have caught the attention of researchers in recent years. They assert that goals can serve as the initiator and monitor of the self-regulatory processes associated with L2 learning ([Rose et al., 2018](#); [Zheng et al., 2018](#)). Goals are considered a core variable of research conducted on L2 motivation and at the outset, goal theories were introduced in the field of psychology. The goal is concerned with the motives or purposes that an individual has in the learning process. Goal constructs play an essential role in the majority of social-cognitive models of motivation ([Dörnyei, 2005](#)). Based on Goal theory, goals are viewed as cognitive manifestations of what people are seeking to fulfill, along with their aims for performing the task. Therefore, goals are considered cognitive constructs, which are deemed to be accessed by a person; unlike the constructs accounted for by psychodynamic theory, goals are conscious motives. Contrary to some models of motivation, goals

are not considered dire needs or motives, either ([Deci and Ryan, 2000](#)).

According to [Locke and Latham \(2002\)](#), a review of the literature reveals two main goal theories dealt with in motivational studies, namely, goal setting theory and goal orientation theory. The former was put forth by [Locke and Latham \(1990\)](#) in the context of industrial and organizational psychology with a focus on the workplace which is a significant basis of task motivation. Based on this theory, individuals should set goals as human acts are driven by the goal and these goals inspire the actions and behaviors. Following this theory, there are two aspects to goals, namely, internal and external ([Dörnyei, 2005](#)). The internal aspect is related to ideas, and the external aspect is related to the object or situation pursued. The internal ideas act as guidelines for accomplishing the goals. According to the goal-setting theory, goals are characterized by the features, which make them different. These features are as follows: specificity and commitment, and difficulty ([Locke, 1996](#)). The goal orientation theory contrasts with the goal setting theory; that is, the former emerged as an outcome of the classroom context, which can account for students' learning and performance ([Dörnyei, 2005](#)). Based on this theory, there is a close relationship between a person's performance and the stated goals. As mentioned by [Dörnyei \(2005\)](#), L2 learning goals are typically known as orientations. However, according to [Gardner and Tremblay \(1994\)](#), there is no explicit connection between 'orientations' and various goal theories commonly used in educational psychology.

Achievement goal theory is a motivation-related theory frequently used to examine learners' motivation and achievement ([Hulleman et al., 2010](#); [Wirthwein et al., 2013](#)). For instance, [Sins et al. \(2008\)](#), for example, conducted a study to verify a conceptual paradigm that accounts for the relations between several learner's variables, including achievement goal orientation, self-efficacy, cognitive processing, and achievement in a specific task involving deep collaboration. The test included a computer-based modeling task involving collaboration aimed at testing the model in terms of mastery-approach goal orientation, performance-avoiding goal orientation, self-efficacy, and achievement. As expected, the results revealed a significant positive effect of mastery-approach goal orientation on achievement. It is worth noting that this effect was moderated by the participants' employment of deep processes. The results also showed no significant relationships between performance-avoidance goal orientation and surface processing. There was no correlation between surface processing and achievement, either. In addition, in a study, [Juned et al. \(2021\)](#) investigated the possible relationship between students' achievement goal, their perceptions of teaching practices, and English academic achievement. The sample of the study was made up of 50 learners who provided information through the questionnaire concerning their achievement goal and how they conceived of English instructors' teaching practices. The correlation analysis revealed a significant relationship between the mastery approach and English achievement scores. Also, perceived teaching practices indicated no significant relationship between



teaching practices and English achievement. The results showed the important role of learners' motivation in academic achievement in the quality of learning. Lu et al. (2022) used a process-based model to examine the relationship between learning goal orientation (LGO) among university students with their academic performance. A longitudinal study reveals that students who have high LGO in their first month after entering the university generally have higher academic self-efficacy and seek more feedback. Moreover, initial levels of feedback seeking are positively related to academic performance *via* the linear change in academic self-efficacy over time.

In the context of educational and motivation psychology, AGT is one of the essential frameworks which helps researchers to gain a conceptualization of learners' motivation. It also allows them to inspect the role of motivation on L2 learners' participation, learning, and performance in classes (Senko, 2016; Elliot and Hulleman, 2017). Indeed, this theory integrates several variables including personal and contextual motivational factors (e.g., Kaplan et al., 2002; Urdan and Schönfelder, 2006). Based on this theory, in scholastic circumstances, one's motivation is influenced by his/her goal orientations, which refer to how achievement is observed and competency is assessed (Dweck and Leggett, 1988). Literature defines achievement goals as the driving forces pushing learners to specifically participate in, focus on, and respond to a wide range of achievement tasks and situations (Meece et al., 2006). The goal plays an essential role in enabling the researchers to work out the learners' academic achievement and learning (Pintrich and Schunk, 2002).

A mastery goal, also known as a learning goal refers to the learners' attempts to obtain knowledge or skills. This type of goal has to do with the enhancement of competence through gaining mastery over a task. In contrast, a performance goal, also known as an ego goal, is deemed as a competitive goal by which an individual tries to appear better than others (Pintrich, 2003; Ross, 2008). Indeed, this type of goal involves a comparison between competence and other individuals (Jiang and Zhang, 2021). One can subdivide performance goals into the following: performance-approach and performance-avoidance goals. These two subcategories are concerned with the learners' beliefs in their ability to do something well or in their beliefs in their inability to do so (Berger, 2009; Van Yperen et al., 2014).

A review of the literature shows that modern motivational theories are different from traditional ones, attaching enormous importance to the social-cognitive components driving motivated behavior (e.g., goal setting and AGT). Notwithstanding many investigations conducted on these theories, as well as their use as a useful motivational technique in various domains, (e.g., Locke and Latham, 1990; Schunk, 1996; Bandura, 1997; Page-Voth and Graham, 1999; Schunk and Ertmer, 1999; Zimmerman, 2008; Mikami, 2017), few studies have sought to examine the effects of these theories on L2 learning and teaching (e.g., Haynes, 2011). The literature provides evidence that these theories are important though they have been disregarded when it comes to FL/SL learning contexts.

## 2. Review of the literature

### 2.1. Goal setting theory

A motivation-related theory called GST (goal-setting theory) was set. From this theory's perspective, a goal is viewed as the driving force to power people's behaviors, which shows the direction an individual needs to take. Based on this theory, behavior or action is driven by an aim, seeking to obtain a particular standard of proficiency, within a pre-determined timeframe (Locke and Latham, 2002). As a result, in its narrow sense, a goal is described as the intended end-state that has a precise and proximal nature regardless of the hidden intents or motives for particular actions. Within 12 years (1990–2002), a multitude of investigations sought to demonstrate that difficulty and the level of goals are the two main factors that determine the level of achievement goals. Indeed, goal difficulty is linearly related to task achievement (Locke and Latham, 2006). Goal setting theory has to do with the relationship between goal determination (goal setting) and behavior, with learners' selection of goals, the degree of motivation for fulfilling the goals, and the likelihood of the fulfillment of the goals being in the spotlight (Locke and Latham, 2006). This theory is composed of two main components as follows: the individuality and difficulty of the goal, and the effort one needs to fulfill the objectives (Locke and Latham, 2006). As pointed out by Locke and Latham (2002), goal-setting theory refers to a direct relationship between written goals and performance. Indeed, goals give researchers important standards through which they can make a comparison between work. Thanks to these efforts, the individual receives feedback on his/her competence, which contributes to the enduring motivation for learning. Based on GST, the individual makes the most effort in the face of moderately difficult tasks. Such goals, i.e., challenging ones, inspire individuals to do their best (Locke and Latham, 2002). Goal setting increases the learners' motivation, helping them to reinforce their self-regulation (Locke and Latham, 2006). This, in turn, empowers them to be committed to learning. Scholars have concluded that learners can use goal setting as an effective inspiring tool, which contributes to positive attributes, including intrinsic motivation, positive self-image, and academic performance (e.g., Latham and Locke, 2006; Schunk, 2009).

### 2.2. Achievement goal theory

Achievement goal theory, which is also known as normative goal theory, has been cited as one of the outstanding theories of motivation developed in a social-cognitive setting. This theory places emphasis on learners' intentions for persevering in various learning activities (Meece et al., 2006). Drawing on the conceptualizations of motivation and achievement-oriented behaviors, AGT theory focuses on the driving forces pushing a student to achieve an already stated outcome. It also has to do with the goals that drive the learners to display



achievement-oriented behaviors (Maehr and Zusho, 2009). Furthermore, as mentioned by Pintrich (2000), present theories about goal orientation deal with the standards or criteria constructed by the learners whereby they can assess the extent to which they are successful in performing a task. One should make a distinction between this theory and the other social-cognitive theories associated with the construct of motivation (e.g., Expectancy-value and self-efficacy). Indeed, AGT theory attaches great importance to the goals set by individuals during the development of their competence (demonstration or development of competence). In this context, the perceptions of one's capability or the attributions made by the learners regarding their academic performance are very important (Meece et al., 2006).

Achievement goal theory is closely concerned with two goals; mastery and performance (Kaplan and Maehr, 2007). The mastery goals are adaptive and efforts should be made to enhance such goals at both the learner and classroom levels. The mastery goals are concerned with enhancing competence through hard work, while the performance goal is related to demonstrating competence in a domain, which allows the individual to outperform others. Considering the emphasis placed on the attainment of competence, both goals fall into one category, i.e., competence-related goals (Elliot and Church, 1997). Mastery goals belong to the value-intrinsic quadrant, while performance goals belong to the value-extrinsic quadrant. Mastery goals emanate from the internal driving forces though they can be impacted by instructors' behaviors. In their pursuit of mastery goals, learners seek to increase and improve their competence. Meanwhile, they do their best to understand and master the learning material, obtain knowledge, or develop a new skill (Covington, 2000). External variables (e.g., instructor's perceptions or family's behaviors) can impact performance goals. In their pursuit of performance goals, learners are obsessed with how others judge or compare them in terms of their ability. They want to know whether others perceive them favorably, seek to do better than others, and demonstrate one's capabilities to others. They are always seeking others' positive comments on their performance (Covington, 2000). Having a performance goal in their minds, people compare their competence against an interpersonal standard. Put it another way, they compare themselves to others.

A positive relationship exists between mastery goals and several learner variables including, self-image, task value, the type of cognitive strategy used by the individual, and self-controlled learning (Ross, 2008). On the contrary, other types of goals, namely, performance-avoidance ones are destructive, dealing with the prediction of adverse learning outcomes (Hulleman et al., 2010). In their study, Deci and Ryan (2000) showed an association between mastery goals and intrinsic motivation, whereas they found a relationship between performance approach and extrinsic motivation. As a result, the learners having a high level of intrinsic motivation are expected to set mastery goals, while the learners with a high degree of extrinsic motivation set performance goals.

### 3. Conclusion, implications, and future direction

The impact of the learning environment and learner's traits on performance and learning outcomes can be explained in the light of goal orientation (Pintrich and Schunk, 2002). The features of the goals set by the learners can potentially impact their cognition, emotions, and behavior in various contexts (e.g., performance-based assessment and testing). Although learners' successful performance is largely assessed in terms of scores and grades, teachers can channel their teaching efforts in a positive direction by being aware of their student's goal orientation. This approach would result in a positive mood and atmosphere in the L2 classroom. Setting specific goals is impacted by a variety of factors (e.g., sense of competence/ability and social variables). The goals also can be seen as a window into the effect of various classroom structures and school settings on learners' level of motivation and learning. Instead of emphasizing perceived capability and causal attributions, the goal theories associated with motivation deal with the different types of goals people seek to fulfill in achievement situations. Indeed, behavior is regarded by goal theorists as structured, focused, and directed toward the fulfillment of particular goals (Pintrich and Schunk, 2002). The AGT is deemed an essential approach to examining the impact of goal structures and class setting on the learners' level of motivation and achievement (Anderman and Wolters, 2006). This theory deals specifically with goals individuals set for the development of competence. It also concerns the learners' motives and intentions for taking part in various learning tasks. Based on this theory, goals signal the stated purposes, motives, and/or the purposes which drive people to get involved in achievement activities. Various goals influence learners' cognitive, affective, and behavioral aspects differently. The scholars working in the area of achievement goals concentrate specifically on the aim associated with the enhancement or demonstration of competence. Indeed, goal setting can be viewed as a useful tool that one can use in the EFL classroom to motivate learners to improve their performance. This theory can be especially used in environments where there is a strong focus on students' performance on tests and motivation plays an essential role. Goal setting allows the learners to control their own learning by setting targets perceived by them to be relevant to L2 success.

It follows that goal setting can be used as an operational method teachers may use in the EFL classroom for the purposes of motivating learners to improve their L2 performance. Goal setting is expected to be useful in contexts where great importance is attached to learner performance on tests so that their successful test performance is highly motivating to them. Indeed, the teacher must make it clear to the students that goal setting is mainly aimed at driving students to go beyond their current limitations; that is, they do not have to compete with their peers, particularly, if test scores function as criteria for the assessment of goal attainment. Moreover, following the goal-setting theory, individuals who show a strong commitment to challenging yet, achievable goals have a successful performance on goal-relevant tasks. Indeed, people whose goals are

challenging and achievable make more arduous efforts compared to individuals with no such goals. Based on this theory, being committed to a challenging yet achievable goal is essential for improving motivation and performance. Goal commitment is inevitable in that a motivated individual makes more effort to fulfill the goal, which, in sequence, results in better performance. Research findings reveal that a strong commitment to a goal results in higher performance on the part of people and teams (Brown and Latham, 2000; Knight et al., 2001). Setting a learning aim can be very beneficial to the students, and they are deemed an effective way to enhance performance (Burton et al., 2010). Based on the review of the literature, it can be concluded that in line with Goal's theories, all actions are driven by a purpose. Setting a goal based on a choice is a requirement for the occurrence of action and, goals must be sought with effort and seriousness. Therefore, setting the appropriate goal as well as the provision of timely and specific feedback can bring higher achievement, successful performance, a high degree of self-efficacy, and self-regulation (Schunk, 2009). This paper seeks to provide insights into how goals and goal-oriented efforts play a role in successful L2 learning. Due to the efforts made by students, the goal-related issues have important implications for the conceptual development undertaken by goal theorists; moreover, they can be helpful to educational practitioners who seek to improve the quality of education.

Given that goal setting has been shown to function as a powerful strategy to enhance L2 acquisition, L2 educators and instructors should develop an intervention program to facilitate learners' goal setting in L2 classrooms. Such programs encourage the learners to set challenging goals (demonstrating goal difficulty), divide them into practical action plans (a reflection of goal specificity), and reach the collective outcomes in an L2 setting. As revealed by related literature (VandeWalle and Cummings, 1997), goal orientation is composed of both dispositional and situational elements. This implies that knowledge of how goal orientation functions make it possible for the teachers to develop strategies to determine learners' goal orientations effectively. This review of related literature shows that an examination of the impact of goals and relevant processes associated with L2 learning can yield positive outcomes, including finding about L2 learners' motivation. This helps them to have successful experiences regarding L2 learning. In line with the relationship between goal theories and L2 education, the following recommendations can be taken into account by L2 researchers and practitioners who find goal constructs in L2 education settings appealing and instructive. It is recommended that L2 learning researchers take into account the important role played by these theories in L2 acquisition. Accordingly, it is suggested that prospective studies examine the impact of each one of the theories on L2 learning and progress. Based on AGT, achievement goals have a forward-looking perspective, and are deemed as cognitive manifestations of intended outcomes (Hulleman et al., 2010). Indeed, such goals channel individual behavior in a targeted way. Here, the individual's perceptions of competence play an essential role. As a result, achievement goals provide

scholars and practitioners with a way to work out the reasons for the learners' engagement in achievement settings.

It is revealed that there are several benefits associated with adopting the mastery goal approach: learners can become self-confident and gain satisfaction with learning tasks. This approach places emphasis on enhancing learners' abilities, acquisition of new skills, fulfillment of challenging tasks, and benefitting from learning resources. A performance goal perceptive focuses on the significance of possessing a higher level of abilities compared to others. Learners' achievement is dependent on whether they outperform others, or whether they surpass the normative performance standards. Learners who focus on goal orientation seek to acquire the prerequisites including new knowledge to gain mastery over the skills, along with boosting their ability. These learners tend to do challenging tasks, making use of learning strategies for achieving positive outcomes. They always persevere and make efforts, having positive perceptions of learning and spending a rather long time to accomplish the tasks enthusiastically (Church et al., 2001). To them, intelligence is not a fixed ability. This implies that effort and hardworking, as well as self-regulation, are the main features of mastery-oriented learners (Anderman and Patrick, 2012).

This study has several implications for the stakeholders in the setting of L2 teaching and learning. L2 teachers need to take into consideration the individual differences in their classes. These differences are closely related to the degree of motivation, particularly, regarding the L2 learning process. Put it another way, the current review reaffirms the essential role played by motivation in realizing L2 learning success. Other players such as material developers and educators are advised to think through motivation an essential contributor to L2 learning. Indeed, motivation can play a role in preparing the learners. Therefore, teachers do well to use the relevant instruction strategies and textbooks to improve learners' motivation. Moreover, goal setting and goals can be influential in the context of L2 learning and teaching. They can induce positive attitudes among the learners. That is, this study reached the conclusion that L2 learners with clearly set goals for learning are more likely to obtain their academic goals than students with no goals. Consequently, educators need to raise the learners' awareness about the essential contribution of goals to L2 learning. This allows them to keep up with their goals during their learning. In addition, goals function as guidelines showing students the right learning path. Learners need to use strategies should they fulfill their goals. Despite the positive outcomes concerning challenging goals (such as actualizing the learners' potential), it is helpful to set goals given the students' present level of ability. This is because failure to take into account the abilities may result in disappointment and frustration, which, in turn, leads to a decrease in motivation. As a result, when it comes to L2 motivation, goal setting is very essential and it cannot be disregarded. Both teachers and learners can set goals. As far as teenager L2 learners are concerned, they can set their goals by following the guidelines provided by their teachers or parents. Goals should be specific because students need to grasp the significance of goals, as well as the importance of making efforts

to achieve the goals. Given the positive effect of students' engagement in goal setting on their performance, teachers should emphasize implicating them in the development of goal setting (Azevedo et al., 2002). This is because learners find the goal set by themselves more relevant and meaningful.

Thanks to the development of AGT, researchers have access to an effective explanatory framework according to which goals are deemed as changeable personal traits; moreover, as pointed out by Schunk et al. (2008), goals are shaped under the influence of both teacher and learning context. ESL instructors always seek to devise ways to enhance and assess L2 instruction and learning in schools. The aim is to make and maintain learners motivated in English learning. The prospective research can shed light on the types of teaching strategies teachers use to improve learners' achievement goals and academic success. Prospective studies can focus on the empirical examinations of the following: the impact of multiple types of learning goals and how they can be integrated with performance goals (e.g., learning goals should be prioritized followed by performance goals), various kinds of goal framing, the potential relation between goals and cognition (such as goal classification, and macro goal research).

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The author confirms being the sole contributor of this work and has approved it for publication.

## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# An introduction to retrodictive qualitative modeling as an emerging method on affective variables in SLA research

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Investigating second language acquisition (SLA) via a complex dynamic systems theory (CDST) involves much intuition, and operationalizing the dynamic constructs is hard in research terms. In the present study, we contend that the commonly used quantitative data analysis methods such as correlational works or structural equation modeling fail to examine variables as part of a system or network. They are mostly based on linear rather than non-linear associations. Considering the major challenges of dynamic systems research in SLA, we recommend that innovative analytical models such as retrodictive qualitative modeling (RQM) be used more. RQM manages to reverse the usual direction of research by actually beginning from the end. More especially from certain outcomes and then moves backward to find why specific elements of the system led to one outcome rather than the others. The analytical procedures of RQM will be elaborated on and also exemplified in the SLA research, more specifically for investigating language learners' affective variables. The limited body of research using RQM in the SLA domain is also reviewed followed by some conclusive remarks and suggestions for further research into the variables of interest.

## KEYWORDS

retrodictive qualitative modeling, L2 affective variables, complex dynamic systems theory, emerging theory, qualitative modeling

## Introduction

Retrodictive qualitative modeling (henceforth RQM) is a framework for research influenced by the conceptual research of David Byrne, who was a social complexivist. RQM found its way into second language acquisition (SLA) research first by Dörnyei (2014) as he invited researchers to adopt a dynamic perspective in their exploration of the psychological constructs related to language learning see Dörnyei and Ryan (2015). Thus, given this invitation, researchers in the field of SLA felt the need to apply methods which can be compatible with the complex and dynamic systems theory (CDST) (Hiver and Al-Hoorie, 2019). One of these methods was RQM as this research method aims to explore how cognitive, affective, or behavioral patterns that are complex and attractor-governed appear in dynamic, self-organized developmental process. Also, it can be considered a research template based on case studies in the field of SLA whose unit of analysis is a complex system (Byrne, 2013; van Geert and Steenbeek, 2014). In particular, as the unit of analysis in RQM is marked by complexity, in this method, there is an inherent focus on the situated context-dependent nature, and time-scaled variation as well as multicausality, which can provide



deeper insights into the dynamic trajectories of affective variables in SLA research. Hence, regarding the application of the method in the current and future SLA studies, RQM can be conceptualized as a method of investigating complex dynamic constructs or behaviors which begins with an emergent cognitive, affective or behavioral construct of interest and goes back into time. Initially, it can sound strange but the underlying belief is that, in the analysis process, we look back at the reality, as the prefix RETRO implies, significant interpretive layers of reality emerge (Byrne, 2010). This looking back at the reality gives more tangible explanations with respect to the real-time experiences of language learners in their classroom ecology see Larsen-Freeman (2016), which is another support for the significance of the method in SLA research.

More specifically, RQM differs from other, dominant, methods of analysis in the field of SLA which take a more variable-centric perspective and look forward in an attempt to predict empirically the kind of emergent patterns or try to make forward-looking suggestions for what may occur (Byrne and Callaghan, 2014). The order of this procedure is reversed in RQM. Therefore, the first step is to identify the attractor states or the outcomes of a given domain like foreign language enjoyment within the affective domain. The next step is to look backward to identify the dynamic procedure that accounted for these. In language studies, for example, a work of research may start with monitoring and determining significant affective constructs of language learning like foreign language enjoyment in an English as a foreign language course. Next, the researcher might want to examine, using the saturated self-report data, how the specific attractor states seen in the educational context emerged.

It is worth noting that although the name of RQM may make all SLA researchers think the method is necessarily qualitative, in practice, it does not have to be. RQM is rather a mixed approach and involves multiple methods of research, not exclusively qualitative in type. RQM does not necessarily involve a formal modeling. Nevertheless, the underlying rationale for RQM is truly univocal, pointing to the fact that it is essential to look backward (what “retrodictive” actually means) from dynamic and complex emergent patterns to find out about the dynamic, context-dependent procedures that contributed to the emergence of those specific states. RQM also emphasizes that this is possible in each stage of research having its basis in the design of former stages. The RQM standard procedure, as described by Dörnyei (2014) with regard to the application of the method in SLA studies, is a sequential array of practical steps beginning with the identification of qualitatively divergent attractor states (“Q”) which a system has reached followed by an inductive evidence collection while going backward (“R”) to obtain a model for the dynamic procedure (“M”) which led to those attractor states (Dörnyei, 2014). RQM aims to delve into the prominent and typical outcomes of an SLA cognitive, affective or behavioral construct, and then to investigate the underlying processes that have multiple causes (which is termed as “signature dynamics” too) and make each of these outcomes and their dynamic trajectories idiosyncratic.

## Complex dynamic system in SLA

By CDST, language learning is seen as a complex system of cooperating elements or factors. In this system, language progress

arises in a communicative setting as a consequence of a process of self-organization (Verspoor et al., 2021). This theory calls for a revitalized awareness of intra-individual diversity and non-linear patterns of progress, as well as a holistic-system perspective (Lowie and Verspoor, 2019). Thus, in such a system, analysis of individual trajectories is necessary.

The idea that different aspects of SLA issues should be specifically addressed from a complex dynamic approach was initially put out by Larsen-Freeman (1997). Since that time, CDST has attracted the attention of numerous SLA researchers who have studied various areas of the field, including language acquisition and development (Larsen-Freeman, 2016), language ecology (van Lier, 2008), language variations (Cooper, 1999), and psychology of language learning and teaching (Dörnyei, 2014).

Researchers now have a fresh viewpoint that questions the fundamental assumptions underlying scientific investigation using CDST. In particular, traditional beliefs that a language’s features are conveyed from a proficient speaker to a beginner student or from an intrinsic universal system to a manifest language usage have been challenged in SLA (Larsen-Freeman, 2020). According to the CDST theory, language develops as a result of a learner using it in a situation involving interaction with other language users. CDST takes an ecological perspective. In other words, learners are not cut off from their learning environment or their learning process. This is because complex systems are frequently seen as cross-disciplinary since they are linked, self-organizing, and co-adaptive.

## Advantages of RQM in SLA studies

In the SLA domain, RQM has been more to the interest of investigating psycholinguistic and sociolinguistic matters (Chan et al., 2015; Hiver, 2017). Beyond SLA research, several researchers interested in investigating complexity in different social sciences suggested using the retrodictive model as the best method which adopts a mathematical modeling framework from the higher-order complexity line of research (e.g., Larsen-Freeman and Cameron, 2008; Byrne, 2009, 2011). The best introductory source to RQM in the field of SLA, as suggested by Hiver and Al-Hoorie (2019) is Dörnyei’s (2014). If the core rationale for using the RQM in SLA studies and its constituent elements (procedural steps) are justified, a basic knowledge of how to elicit and analyze longitudinal data can most possibly suffice to make the suggested procedure useful for all researchers.

Retrodiction differs from the prediction in that the latter entails inferring future events or behaviors from the data available now. However, the former is the interpretation of the current data based on past observations. Emergence, in a dynamic system, often prevents thinking about clear-cut future events regardless of the former states of the system as general rules are inconceivable regardless of a particular background (Byrne, 2013). What makes things still more indefinite is the possibility of agency in social sciences (Al-Hoorie, 2015; Larsen-Freeman, 2019). When things are to a great extent indefinite, how can we generate any knowledge that can be applied to the complex underlying causes of outcomes and procedures that can be seen in the surrounding world? How could the logical forward-looking claims be made by saying “if a certain thing is done, what happens next”? These issues should,

certainly, be considered in a well-integrated SLA research program (Dörnyei, 2014, as cited in Hiver and Al-Hoorie, 2019).

In an attempt to solve these issues in the application of the method in SLA studies, RQM tries not to only focus on the causes of variation in complex systems. Rather, it delves into the dynamic outcomes and the inherent quality of the emergent effects. After establishing a sound knowledge of outcomes and effects, the next step is, as suggested by Byrne (2011), to look backward at how the systems developed over time or reflect the systems' gaining or losing stability while changing through time. Thus, the kind of research questions addressed in RQM focus more on a historical, past-looking provision of evidence for present time events. When this evidence is provided, the study can be further developed to the inquiry of the potential prospective evidence (i.e., probabilistic anticipations) in a retrospective manner (Byrne and Callaghan, 2014). Instances of research questions for exploring affective variables in SLA research are provided below as suggested by Hiver and Al-Hoorie (2019).

- What emergent outcomes are conceivable for a human L2 learner's system of developing a certain affective variable (e.g., anxiety, boredom, enjoyment)? Why these at the cost of others?
- What is the current state of this system, and why is it as it is?
- How has the system of a particular affective factor become what it is at the present time?
- Which combination of similar constructs or cases lead to divergent outcomes in terms of a certain affective factor?
- Which combination of similar constructs or cases lead to identical outcomes in terms of a certain affective factor?
- What changes and adaptations has a system had before it reached the present state of a given affective factor?
- How can older trajectories of an affective variable get organized?
- What conditions are involved in the changes made to the L2 learner's affective variable? Which factors together can lead to the experience of certain affective variables?
- What causal explanation can be provided to the understanding of how the system reached its current state?
- What type of future projection would the observers count on?

## Procedures of a retrodictive approach

Retrodiction helps SLA researchers to find out how a current state became what it is now. Thus, it involves making inferences about certain conditions by moving backward and excavating the underlying causes (Sayer, 1992). Such a retrodictive procedure has its roots in social sciences and has always looked for revealing the complex and context-dependent causal mechanisms (Downward and Mearman, 2007). Many, if not all complexivists, admit that the search for a cogent and detailed causal explanation for system outcomes is essential for research with the aim of both elucidating observable states and being useful (Byrne and Callaghan, 2014). With the emergence of CDST in the field of SLA, the difficulty pertaining to case studies lies in the generation of knowledge from certain analytical units with the potential of being expanded to more than a particular case (Lowie and Verspoor, 2019). If

retrodiction is used as a basic research design, SLA researchers can investigate what dynamic systems are and what they actually do, and probably more importantly, how they turn into their current state. Thus, RQM manages to reflect better the global outcomes and procedures of variation by unraveling how that variation is made.

The first stage of RQM involves discovering the attractor states or the system outcomes which are to be investigated (for instance, an outcome of language learners' anxiety or boredom), and then sampling the individual learners purposefully. Thus, typical language learners who show a high level of the variable of interest should be selected. Of note is that the number of patterned outcomes is limited corresponding to the dominant attractor states characterizing the system through time in the space of the state (Hiver, 2015a).

The second step involves purposively sampling the typical cases that are adequately representative of the recurrent outcome (e.g., the affective variable of interest such as foreign language enjoyment) and are prototypical representative of a certain pattern. Next, the data elicitation techniques are employed to investigate the target outcome. This would involve a comprehensive account of exemplary behavior, and elaborations of the features of the most prototypical instances. It usually entails the collection of an array of information sources from traditional focal groups or through interviews, self-administered questionnaire surveys and also observations. As, in its most general sense, the RQM is problem-centered, retrodiction needs a set of qualitative and quantitative approaches to research to go beyond the employment of discipline-oriented techniques (Mearman, 2006). It should be noted that the outcomes on their own just reflect part of a whole, which do not necessarily be the most fruitful and revealing part. Therefore, discovering and elaborating on the latent constituent elements of the system is just half of the whole research procedure (Hiver and Al-Hoorie, 2016).

The next step of RQM involves tracing the trajectories of dynamic growth using the time-scaled data so as to reveal the idiosyncratic signature dynamics (i.e., the strongest causal mechanisms underlying a system) and contribute to the conceptualization of how the system led to that outcome (e.g., to analyze the process through which a language learner develops boredom). In the end, when such growing complexities are better scrutinized, the practical or realistic reflection of the given outcome (i.e., what it appears to be and the way it affects other systems) is investigated in an analytical way.

## Review of RQM studies in SLA

The number of studies conducted in the SLA domain using the RQM is limited. Here, the few studies conducted so far with this approach will be reviewed. The procedures and findings can be insightful for a future body of research.

First of all, Dörnyei (2014) drew attention to the rise of CDST in SLA research, yet admitted that it was hard to operationalize this dynamic approach in actual research. Then, he introduced RQM as an effective research method that reversed the typical direction of research by beginning from the end, which means beginning from the outcomes of a system, and then going back to find why specific elements of the system led to the emergence of a particular outcome

at the cost of the other conceivable outcomes. More specifically, he illustrated two class-based research projects in which the language class was considered as a dynamic system, and the system outcome alternatives were the different learner archetypes (e.g., motivated, demotivated, and passive) which were found in the L2 class.

As one of the first studies using RQM in the field of SLA, Chan et al. (2014) employed RQM to explore L2 learner motivation in Hong Kong. The researchers started their study by first requesting an instructors' focused group to identify prominent learner archetypes in the classrooms. Then, based on the instructors' descriptive reports, the researchers conducted in-depth interviews with the prototype learner in each group. As a result, they were able to learn more about the "signature dynamics" of the motivational system as it relates to the various prototypes. They demonstrated how RQM might be applied practically to identify the underlying causes of a specific conclusion involving language learners, and their retrodictive technique was efficient.

One of the best exemplary studies on the use of RQM was conducted by Hiver (2017). He investigated EFL teachers' performance, motivation, and well-being. He looked into the performance, motivation, and well-being of Language instructors. Using the RQM, he explored how EFL instructors maintained their professional equilibrium and efficiency in the face of their demanding and anxiety-provoking workplaces. The first piece of study (Hiver, 2015b) provided proof that instructors, in response to conflicts unique to the classroom, developed a higher-order psychological entity known as the "teacher immunity." According to this exploratory research, Hiver contended that teacher immunity grows into a double-nature protective form. Sometimes, the emergent outcome might act as a useful protection to help teachers to continue to be committed and to succeed. Yet, in other forms it can adversely affect the individual's performance and turn into an occupational threat. Thus, Hiver decided to explore the dynamic behaviors of the adaptive instructor immunity outcome and the maladaptive instructor immunity outcome.

Particularly, with regard to the procedures of RQM, Hiver (2017) used the RQM to first discover and analyze the notably common outcomes of L2 teacher immunity. Afterward, he used a powerful two-step identification procedure through triangulating exploratory focal group data (from different teachers as well as teacher trainers) with quantitative questionnaire surveys of a bigger sample of EFL professionals to substantiate the validity of the outcome features and categories both theoretically and emergently. Using the triangulated data collection, the researcher discovered accurate teacher immunity prototypes and categorized them in four emergent groups:

- (1) adaptively immunized (i.e., those enjoying a strong, advantageous kind of teacher immunity),
- (2) maladaptively immunized (i.e., those having a constant, unproductive kind of teacher immunity),
- (3) immunocompromised (i.e., those not having any integrated kind of teacher immunity);
- (4) moderately immunized (i.e., those with half-way characteristics of teacher immunity).

The researcher discovered these primary archetypes and after that took a further step to scrutinize the network of constituent elements and the primary underlying dynamic patterns of growth—or the system's signature dynamics—that led to the observed outcomes. These conventional data sources allowed

the researcher to trace back the global dynamic procedure on which all four categories were based in a self-disciplined array of four steps—triggering, linking, rearrangement and stabilization. The researcher's further fine-tuned analysis revealed the complex causal underpinnings that led these systems to generate case-wise trajectories or directions of development for specific outcomes and prototypes. Eventually, the researcher analyzed how the emergent outcomes represented in professionals' affective variables and attitude, teaching in practice, and undertaking and endurance in their working environments. The researcher indicated that teacher immunity was represented in the incentives, mentalities and performance of different prototypes. Teacher immunity indirectly affected teachers' range of action and reactions to the situational requirements of their instructions. Moreover, teachers' self-concept, their perseverance in achieving their goals as well as their self-efficacy were related to the particular outcomes of teacher immunity. Thus, this research concluded that teacher immunity allows teachers to endure challenges, use their motivation resources and remain productive in their routine work conditions.

In a more recent work of research, Elahi Shirvan and Talebzadeh (2020) drew attention to the recent shift in SLA research from negative to positive psychology, and the arising dominance of the dynamic phase in this field of study. These researchers acknowledged that the recent works of research attempted to micro-map the anxiety that foreign language learners experienced as well as the foreign language enjoyment they felt from a dynamic approach. Elahi Shirvan and Talebzadeh (2020) acknowledged that the distinctive dynamics of language learners' anxiety, which develops as a negative emotion, and enjoyment, which emerges as a positive emotion, had not previously been investigated. Influenced by Dörnyei's (2014) study, they used RQM as a cutting-edge method to explore at the distinctive dynamics of these two learner-related constructs. Via focal-group interviews with a group of educators about their learners' anxiety and enjoyment in their classes, they were able to pinpoint the enjoyment and anxiety archetypes. They also conducted in-depth interviews with a prototype L2 student from each archetype in order to discover more about the patterns and trajectories that lead to a specific outcome or attractor state, by following and examining the dynamic events in the language class. These findings offered useful insights about the dynamic trends that result in distinctive archetypes of enjoyment and anxiety and also the use of RQM for investigations of the enjoyment and anxiety dynamics.

The most recent work of research enlightened by the RQM seems to be Wang's (2021) study which explored the second language learning motivation of 5 Chinese undergraduates who learned Bulgarian as their academic field of study in Bulgaria in a 1-year instructional course. This study focused on a scarcely investigated second language learning context, in which the L2 was related to a host population of limited ethno-linguistic vitality. According to the theoretical basis of the second language learning motivational self-system and the ideal multilingual self, and guided by the rules and regulations of RQM, this research discovered 3 different patterns of motivation that emerged within the 1-year experience of studies in a foreign country (i.e., Bulgaria): lowered motivation with a poor ideal Bulgarian self; unstable and changing motivation with a lowered ideal Bulgarian self; and changing motivation with an enhanced ideal Bulgarian self. A comparison of the emergent patterns showed that: (a) L2 learners' agentic

understanding of their layover in the host country had a significant effect on their cultural concerns, thus affecting the their ideal Bulgarian self; (b) the decrease/increase of the ideal Bulgarian self was a main reason for the intensification or impoverishment of the students' motivation for learning the Bulgarian language; (c) an ideal multilingual self can compensate for the weakened ideal Bulgarian self, through motivating directly the language learners' learning while the ideal Bulgarian self was lowered.

## Conclusive remarks

As already raised by several researchers especially [Chan et al. \(2015\)](#), there are major methodological issues with doing L2 empirical research inspired by the CDST. Overall, the main concern is that the outcomes of exploring dynamic systems, especially those with human systems (e.g., L2 learners) are hard to predict as it is practically not possible to know beforehand how the different factors work hand in hand with each other ([Haggis, 2008](#)). This issue was openly expressed by [Larsen-Freeman and Cameron \(2008\)](#) too. They emphasized that how a complex system behaves is not entirely random, yet it is not fully predictable either. What poses serious problems for researchers is the low predictability and the failure to enlist possibly relevant factors before doing the research. RQM was introduced basically to solve this issue, as it allowed researchers to rely on the self-organizing capacity of a system (i.e., its tendency to raise the regular quality of the initially fleeting, flowing, and complex behavior of the system).

Therefore, RQM uses the adjusting power of self-organization to add predictability to system behavior and make it researchable. As the main word *retrodiction* shows, the conventional way of doing research is reversed in RQM. At first, the end states or archetypes are identified in the L2 learning system's behavior and then a backward trace is taken to unravel the dynamic trajectories leading to the conditioned states. This is how the reasons why the system could have ended up with a specific outcome is tracked back. The existing literature on RQM applied in SLA research has provided supporting evidence for the effectiveness of the method since the language learning process as well as the language learners' or teachers' development of cognitive, affective constructs and behavior are marked by complexity and dynamicity that lend themselves to productive inquiries of causal mechanisms. As the existing literature is still limited in size, many L2 learning constructs remain to be explored further in RQM in the prospective line of research.

## Suggestions for further research

Several L2 teacher- or learner-related constructs have been explored so far using the RQM. Examples are immunity, motivation, well-being, equilibrium, and professional or academic achievements. One line of future investigations can build on the findings of these studies (already done) and explore programs of context-specific interventions for maladaptive teacher or learner outcomes that exerts effects on the self-organized mechanism and assesses ideas, which have partly been suggested somewhere else ([Hiver and Dörnyei, 2017](#)), for re-initiating the process at main steps in its self-organized direction and directing it to a

more constructive outcome, for example by suggesting a set of revolutionary coping strategies and building resolution narratives. With self-organization, there is a hope of introducing change to every individual in every context ([Hiver, 2017](#)). Language learners or teachers faced will low motivation, immunity, equilibrium and the like can be made motivated and self-efficacious again.

Another line of research can set aside the previous literature, and begin to explore unexplored L2 teachers' or learners' cognitive, affective or behavioral constructs through the RQM. There are several still under-researched affective variables, for instance, that await being explored in the light of the CDST with an appropriate research methodology. RQM has the capability of exploring the causal mechanisms underlying affective variables such as L2 learning-related boredom, enjoyment, anxiety, and stress among other factors. RQM-led works of research can pave the way for later interventional studies to control or reduce the effect of the causal mechanisms that account for negative emotions or attitudes among language learners.

Finally, as mentioned previously, the use of the method provides both SLA researchers and L2 teachers with deeper awareness about the real-time experiences of L2 learners in the ecology of a second or foreign language classroom see [Larsen-Freeman \(2016\)](#). Thus, it can be applied in future research to explore the signature dynamics of the teacher-student interactions in the L2 classroom as well as both learners' and teachers' mindsets about these interactions.

## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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# Enhancing EFL students' engagement in online synchronous classes: The role of the Mentimeter platform

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The present research aimed to evaluate teachers' attitudes toward the use of the Mentimeter platform in synchronous education. This study also sought to delve into teachers' perspectives on the role of the Mentimeter platform in improving students' engagement in online synchronous classes. To that end, the study was carried out in Palestine in response to the ongoing shift to synchronous online teaching to raise teachers' consciousness about the importance of using online tools to boost students' engagement and make them feel connected in synchronous classes. A quantitative approach was used to collect data, and 44 Palestinian teachers from various educational institutions completed closed-ended questionnaires. The study's outcomes demonstrated that teachers had positive attitudes toward employing the Mentimeter platform in synchronous education. The results also indicated that almost all educators perceived that the Mentimeter platform serves a vital role in increasing student engagement in online synchronous sessions. Teachers asserted that Mentimeter presentation styles decrease the probability of boredom among students, which in turn encourages them to actively participate in online synchronous classes. Enhancing students' engagement in online synchronous classes was still a main challenge for educators. Therefore, to increase students' involvement in synchronous learning environments, it is necessary to regularly train the teaching staff of schools, learning institutions, and colleges in the use of Mentimeter. Future studies in Palestine and other countries are also recommended to simultaneously concentrate on teachers' and students' viewpoints.

## KEYWORDS

Mentimeter platform, student engagement, synchronous education, online synchronous classes, teachers' perspectives

## Introduction

The success of synchronous education highly depends on the degree of student engagement in classroom contexts. According to [Martin and Bolliger \(2018\)](#), engagement serves a crucial role in fostering online learning. Likewise, [Britt \(2015\)](#) highlighted the significance of student engagement in online synchronous classes by referring to its enormous impact on students' intellectual growth. Student engagement is essential to addressing the problems of student loneliness, failure, retention, and boredom in online learning environments ([Pawlak et al., 2021](#); [Derakhshan et al., 2022](#)). Student engagement has been generally defined as the level of focus, interest, and enthusiasm that students exhibit to initiate and continue the learning process ([Bundick et al., 2014](#)). According to [Bower et al. \(2015\)](#), synchronous education involves

students and teachers interacting in a particular virtual environment via an online platform. Weitze (2015) characterized synchronous education as a new educational mode that has a significant impact on pedagogical design.

To increase student engagement with the online educational curriculum, online instructors must devote sufficient time to the search for interactive learning resources (Abrami et al., 2011; Banna et al., 2015; Firman and Rahayu, 2020; Derakhshan et al., 2021). For this purpose, they also need to employ an efficient online platform (Revere and Kovach, 2011). It is up to teachers to design a cooperative learning environment that motivates students to put more effort into learning tasks (Carolan and Kyppö, 2015). There are numerous problems and difficulties with synchronous online education, notably when it comes to student engagement (Rusakova et al., 2022). Most synchronous educational settings still lack personal contact and interaction between teachers and students (Ramsey et al., 2016). Synchronous instruction raised the demand for teachers to be technologically competent (Herawati et al., 2022). From the instructors' perspectives, synchronous settings necessitate fundamental modifications to the instructors and their instructional techniques (Cain, 2015; Ramsey et al., 2016). Additionally, given the fact that the quality of online instruction is somewhat dependent on teachers' technological literacy (Bower et al., 2015), teachers need to actively learn how to work with the technology (Grant and Cheon, 2007; Weitze et al., 2013).

One way to facilitate active learning in synchronous educational settings is the implementation of "Audience Response Systems" (ARS). These systems are easily applicable in synchronous educational environments since they enable teachers to offer a variety of questions to students during lectures (Compton and Allen, 2018). The use of such electronic response systems has been shown to be useful in improving student engagement (Morrison, 2015). These days, different digital platforms such as Mentimeter, Kahoot, Plickers, GoSoapBox, and Poll Everywhere make it possible for teachers to boost their students' engagement in synchronous learning environments (Pikhart et al., 2022a,b). In the current study, researchers aim to delve into the role of the Mentimeter platform as one of these digital platforms. According to Little (2019), Mentimeter is a form of "Student Response System" (SRS) that invites students to participate in conversations and debates using their mobile, laptop, or tablet devices. Similarly, Puspa and Imamyartha (2019) maintained that Mentimeter is accessible software that improves dialogue among students. Quang (2018) also argued that Mentimeter promotes collaborative learning by enabling students to share their opinions with teachers and other students. It also provides users with interactive learning opportunities with its attractive presentation of the results (John, 2018).

Given the value of the Mentimeter platform in online educational environments, the current research intends to assess teachers' attitudes toward the use of the Mentimeter platform in synchronous online education. This research also attempts to evaluate teachers' viewpoints regarding the role of the Mentimeter platform in enhancing students' engagement in online synchronous courses. Consequently, the results of this paper will assist Palestinian educators in overcoming difficulties in enhancing students' engagement in EFL synchronous learning contexts and increasing their perceptions toward using such an online tool in their synchronous classes. Considering the main goals of the study, three research questions were posed as follows:

- What is the role of the Mentimeter platform in enhancing Palestinian students' engagement in online synchronous classes?
- To what extent can teachers' academic degrees, working environments, and the most commonly used Mentimeter's tool influence their attitudes toward the use of the Mentimeter platform in online synchronous classes?
- Is there any significant relationship between teachers' attitudes toward the use of this platform in online synchronous classes and their perspectives toward the role of the Mentimeter platform in enhancing students' engagement?

## Literature review

Several previous studies on using the Mentimeter platform for online instruction have been conducted. Technology-integrated learning and online cutting-edge tools play an important role in enhancing students' different learning styles and stimulating their interest and motivation toward online learning. In this regard, Madiseh et al. (2022) carried out a scoping review to look into how well mental models are incorporated into teaching and learning. According to the study's conclusions, Mentimeter's integration into educational settings improved student motivation by encouraging active participation from students, enhancing student-centered pedagogy, and giving prompt feedback for anonymous student responses.

Attempting to maintain students' engagement, active participation, and critical thinking skills remains one of the most challenging problems that educators face in online synchronous classes. Several researchers have found solutions to this problem by introducing the Mentimeter into online synchronous classes. For example, Anggriani et al. (2022) used a quasi-experimental method to investigate how the problem-based learning model with the integration of a Mentimeter affects improving elementary students' critical thinking and collaboration skills. In the same context, a recent review about the use of Mentimeter's quizzes and online surveys as interactive applications to increase students' engagement during online lectures conducted by Utomo and Utama (2022) recommended the utilization of interactive applications be carefully prepared to ensure good student engagement but not overly used to prevent any possible distractions. In addition, they came to the conclusion that survey and interactive presentation applications are available to improve classroom and online lecture engagement.

Online instructional teaching tools have a significant impact on students' awareness and behavior concerning autonomous learning. Consequently, a group of university lecturers conducted an evaluation study to assess the educational applications of Mentimeter to encourage students' engagement and active learning. The inclusive potential of the Mentimeter application was highlighted by qualitative and quantitative data from both students and educators. This is because the application allows participation from a diverse audience with different backgrounds and capacities, ensuring inclusive and equitable education for all and enhancing interaction, collaboration, attention, and engagement (Pichardo et al., 2021). Moreover, a descriptive study of students' cognitive abilities and responses to problem-based learning using web-based apps such as the Mentimeter application revealed that students had a positive attitude toward learning statistics, were more enthusiastic about their

studies, and their understanding and skills in basic statistical concepts were enhanced as a result of using the Mentimeter application (Ahmad and Subekti, 2021).

In fact, synchronous learning is difficult for students of various learning levels. However, the use of online ICT tools facilitates synchronous learning and makes it more appealing to students and their needs. In this sense, students at Oman College responded positively to the incorporation of Mentimeter in the computer science lecture across nine areas, based on a study: First, the application's simplicity of use. Second, how much the class participates in class. Third, the freedom to express oneself without worrying about looking foolish. The fourth is drive. Fifth, remembering earlier subjects. The sixth is preparing for the upcoming sessions. The seventh is remembering the key points of the conversation. Eighth grade, participation in class, and overcoming boredom by providing instantaneous feedback on learning is the ninth (Quiroz Canlas et al., 2020). Likewise, Iqbal et al. (2021) investigated students' perspectives by administering a survey to students in higher education to assess the potential of the Audience Response System (ARS) to improve learning, participation and involvement, sociability, and motivation. According to the findings, the use of ARS has a high potential to improve students' learning, socialization, and motivation, resulting in a more positive attitude, a sense of well-being, and a sense of accomplishment. The potential of Mentimeter was also emphasized by Moorhouse and Kohnke (2020), who found that SRS like Mentimeter offers students a versatile and varied approach to answering using their mobile devices. They thought Mentimeter had the potential for application in EAP/ESP and English-language classes due to its adaptability and limitless student capacity, as it increases students' active responses, promotes test results, and increases motivation to learn.

Blended learning has been introduced into the educational system and has significantly changed how students acquire, share, engage, access, and consolidate their knowledge. In this respect, a descriptive qualitative study was conducted at the State University of Medan with the goal of describing the requirements of learning media based on blended learning utilizing a Mentimeter application to enhance students' creative mathematical thinking abilities. The findings revealed that blended learning-based learning materials are required to improve students' creative thinking capacity through the use of Mentimeter applications (Andriani et al., 2019). Similar to this, Valley and Gibson (2018) discussed the use of Mentimeter in both lectures and seminars and suggested instructing more students to employ this technology in their group presentations. Encouraging other higher education peers to use Mentimeter or further incorporate it into lectures and seminars in order to boost student engagement and enhance the overall teaching and learning process.

Besides that, Mentimeter's feature allows teachers to find out about the students' opinions. Lapshova et al. (2021) investigated the use of the Mentimeter to conduct surveys remotely. It was discovered that using Mentimeter allowed for efficient surveying, automatic results, and feedback on a specific topic, allowing for beneficial activities in the learning environment and fostering students' professional competence. The significant impact of Mentimeter assessment features in evaluating students' progress in online synchronous classes was also reported by Mohin et al. (2022) who conducted a case study on students' perceptions of using Mentimeter and developed a case study on the Mentimeter formative assessment methodology. According to the results, the use of Mentimeter

has a favorable effect on students' attitudes and performance, the learning environment, and technical factors. Additionally, they came to the conclusion that by encouraging active learning, student participation, and enjoyment, the Mentimeter could play a significant role in altering the dynamics of the huge lecture. Mentimeter makes formative assessment more engaging and enjoyable. On the other side, teachers can benefit from using Mentimeter to evaluate students' comprehension and enhance their own teaching methods.

In the digital age, online tools are critical for language learning. For example, Wong and Yunus (2020) carried out action research to investigate the efficiency of utilizing the Mentimeter platform in developing students' writing vocabulary. The findings revealed a considerable discrepancy between the pre- and post-test outcomes. Also, a descriptive qualitative study about the impact of Mentimeter on enhancing students' engagement in the EFL classroom conducted by Sari (2021) revealed that students had a positive perception toward the implementation of Mentimeter in the EFL classroom. However, the majority of students perceive that no reason makes them dislike Mentimeter's use in the EFL classroom. The findings also demonstrated a strong influence of Mentimeter on the students' participation in discussion activities and opinion-sharing while learning English. Additionally, Demirci et al. (2021), who employed the Audience Response System in English teaching, carried out another study on the opinions of 10th-grade students regarding the use of Mentimeter in English class. The outcomes showed that using Mentimeter to teach the course had a good impact on how engaged the students were. It has been determined that it improves student engagement, makes them like the class, motivates them, and aids in their ability to concentrate. Furthermore, Mentimeter fosters competition, enabling students to have fun while learning from their mistakes through constructive criticism.

Students' agreement on using the Mentimeter in their online English classes was examined by a cross-sectional study done by Puspa and Imamyartha (2019), who found that social science students were in agreement with the use of the online application in their classroom, the use of the Mentimeter in their English environment, and the effects of the Mentimeter application on their speaking and writing abilities. They came to the conclusion that Mentimeter is one of the best technologies utilized by English students and that this study offers major teaching methods in its use as a variation in education for social science students.

By concentrating on the students' growth in various English skills, a mixed-methods approach to determining the students' perceptions of the process of learning English using the Mentimeter platform was determined. The findings of the observational analysis describe how students participated in expressing their opinions, seeking the lecturer's and friends' advice, practicing idiomatic vocabulary, having a chat face-to-face and taking turns, working in discussion groups, and taking quizzes on the lecturer-prepared Mentimeter platform feature page. Students who responded to the questionnaire and interview questions all agreed that using the Mentimeter platform application helped them learn the English language better. The Mentimeter application's user viewpoints on English learning have a significant impact on improving English, especially in speaking and vocabulary, and can encourage them to take part in learning so that learning integrated with technology becomes very much needed to be carried out on a sustainable basis (Samad and Munir, 2022).

## Methods

### Participants

Using random sampling, to do so, researchers posted an online survey, an invitation letter outlining the study's goals and who was eligible to participate, and a consent form on the websites of Palestinian colleges, universities, schools, and educational institutions, as well as on social media sites. A total of 44 Palestinian teachers with different academic degrees were selected from various educational institutions. The final sample comprised 27 males and 17 females. The demographic information of the participants is exhibited in **Supplementary Figures 1-3**.

The majority of participants (68.2%) were recruited from schools ( $N = 15$ ) and universities ( $N = 15$ ). The rest (31.8%) were selected from colleges ( $N = 7$ ) and educational centers ( $N = 7$ ).

While, the majority of respondents (80%) held MA ( $N = 20$ ) or Ph.D ( $N = 15$ ) degrees. Other respondents (20%) ( $N = 9$ ) had a BA degree.

On the other hand, **Supplementary Figure 3** illustrates that the highest frequency of the study sample was 22, with a 50% percentage in favor of all the above, followed by the word clouds tool with a frequency of 8 and an 18.2% percentage, presentations with a frequency of 7 and a 15.9% percentage, open-ended questions with a frequency of 4 and a 9.1% percentage, and the lowest tool, quizzes, with a frequency of 3 and a 6.8% percentage.

### Instrument

To collect the needed data, a researcher-made survey was distributed among respondents. The survey was designed and developed based on the research questions and previous related studies. The developed survey was sent to two experts at Al Quds Open University to validate the accuracy of the items.

### The variables of the study

The variables in this paper were both independent and dependent. The academic degree, type of educational institution, and the most commonly used Mentimeter's tool were all independent variables. The dependent variables were teachers' attitudes and perspectives on the role of the Mentimeter platform in enhancing online engagement in synchronous online teaching and teachers' perspectives on the role of the Mentimeter platform in enhancing online engagement in online synchronous classes.

The researchers designed and developed the questionnaire in English based on the study questions and related studies. The survey comprised three parts; the first part is background information about teachers. The second part examines teachers' attitudes toward the role of the Mentimeter platform in enhancing online engagement in synchronous online teaching through various statements, such as the ability of this online tool to foster active discussion, be appropriate for different learning styles, be attractive and simple to use in synchronous classes, and the ability and level of students to engage with learning materials and their teachers in different ways. The third part is about teachers' perspectives on the role of the Mentimeter Platform in enhancing online engagement in synchronous online

classes. For example, statements like "students easily engage in open-ended discussion," "Mentimeter enables more active participation from students in online lectures," "spontaneous participation is facilitated by Mentimeter's quiz feature," and "students' achievement of the unit learning outcomes was enhanced by the use of Mentimeter presentations" are also measured in this study.

### Procedure

A consent form that guarantees participants' understanding of the ethical issues regarding voluntary participation, data security, and the anonymity of any data or information used in any publication arising from this study was first distributed to 87 Palestinian teachers. The final number of teachers who indicated their agreement by signing the consent form to participate and have experience using Mentimeter in synchronous classes was ( $N = 44$ ). Having collected the required data, the researchers analyzed the teachers' viewpoints using the Statistical Package for the Social Sciences (SPSS). The Pearson correlation test was employed to evaluate the relationship between teachers' attitudes toward the role of the Mentimeter platform in student engagement and their perspectives toward the use of this platform in online synchronous classes. Moreover, using independent t-tests, one-way ANOVAs, and Sheffee tests, the impact of situational variables, including academic degree and working environment, on teachers' use of the Mentimeter platform in online synchronous classes was examined.

To answer the first research question, the researchers measured mean differences and SD differences between repeated measures with the same instrument for each dimension and the total degree to determine the role of the Mentimeter platform in enhancing students' online engagement in synchronous education. The researchers carried out a one-way ANOVA test to calculate differences in the total degree of the tool based on the academic degrees of participants for the second research question. To test the role of the working environment (an educational institution), the researchers used Mean and one-way ANOVA to measure the differences in the total degree of the tool. In addition, the

TABLE 1 Equivalence of labels.

Label	Score
Strongly disagree	1
Moderately disagree	2
Slightly disagree	3
Slightly agree	4
Moderately agree	5
Strongly agree	6

TABLE 2 Correction codes.

Impact degree	Percentage
Very high	80% and more
High	70–79.9%
Medium	60–69.9%
Low	50–59.9%
Very low	50% and less



researchers used mean, one-way ANOVA, and Scheffé's *post hoc* test to indicate the differences in the total degree of the tool in order to test the most commonly used Mentimeter's tool variable. Also, to answer the third research question, the researchers used the Pearson Correlation Test to find out the correlation between teachers' attitudes toward using the Mentimeter platform in synchronous online teaching and their perspectives toward the platform's role in enhancing students' online engagement in synchronous teaching settings.

## Data analysis

The researchers reviewed the output of the questionnaire before entering it into the computer for data analysis. As all instructors' responses were between "strongly disagree" and "strongly agree," the researchers then converted these results into numbers (i.e., a score). **Table 1** shows the equivalence.

Also, responses based on estimation averages were scored on a 6-point Likert scale. The correction codes are shown in **Table 2**.

## Results

### Research validity and reliability

The developed questionnaire was sent to two experts at Al Quds Open University to check its accuracy and validity. The reliability of the questionnaire was also calculated using the Cronbach alpha coefficient. The results of the Cronbach alpha coefficient are presented in **Tables 3–5**.

**Tables 3–5** show that the reliability of each domain and the whole questionnaire was 0.857, 0.888, and 0.935, respectively, which is an acceptable reliability index. Obviously, reliability values range between 0.8 and 0.9, indicating that the tools are reliable and that researchers can draw meaningful conclusions from the data and analysis.

To answer the first research question, the researchers measured mean differences and SD differences between repeated measures with the same instrument for each dimension and the total degree to

determine the role of the Mentimeter platform in enhancing students' online engagement in synchronous education (see **Tables 6, 7**).

**Table 6** shows that the average response is very high for all items in the first dimension and the total degree. The average response in the sample is located between 81 and 90.2%. These findings show that teachers have extremely positive attitudes toward using the Mentimeter platform in synchronous online instruction. Teachers, for example, agree on the attractiveness and simplicity of Mentimeter presentation to both teachers and students. Also, they agree on the ability of mentimeter to encourage students' active learning so they can express their answers, review content through quizzes, videos, and documents, using various forms of questions and slide types. Furthermore, they agree that students with different learning styles can easily engage in a Mentimeter presentation due to the platform's multiple teaching methodologies.

**Table 7** shows that the average response is very high for all items in the second dimension and the total degree. The average response in the sample is located between 80.2–87.8%. This result demonstrates that teachers express very positive perspectives toward the role of the Mentimeter Platform in enhancing students' online engagement in synchronous online teaching. Teachers, for example, agree on the spontaneous participation that is facilitated by Mentimeter's quiz feature and the instant feedback they can get about students' progress. They also agree on students' active engagement through the use of Mentimeter presentations, open-ended discussion, and competition. Furthermore, they agree that students' motivation toward learning online courses was enhanced due to using Mentimeter's tool to present online materials that were appropriate for students' different learning styles.

To answer the second research question, the researchers used One Way ANOVA to calculate the differences in the total degree of the tool based on the academic degree of participants. The results are shown in the following tables (**Tables 8, 9**).

**Table 8** shows the results of the means and SD differences according to academic degree for all domains. According to the results, the value of the mean in the first domain that discussed teachers' attitudes toward using the Mentimeter platform in synchronous online teaching achieved the highest mean value of 5.2045 and a standard deviation value of 0.78382. On the other hand, the lowest mean value was 5.0432 in favor of the second dimension, which presented teachers' perspectives toward the role of the Mentimeter Platform in enhancing students' online engagement in synchronous online teaching. According to the results of the same domain levels, the highest mean average for the first domain was 5.2963 in favor of the Ph.D education level, and the lowest mean average value was 4.9630 in favor of the other education level. This indicates that teachers who hold a Ph.D. degree have the highest attitudes toward using the Mentimeter platform in synchronous online teaching in comparison with teachers with other education levels. According to the results of the second domain, the highest mean value was 5.1667 in favor of the Ph.D. education level, and the lowest mean value was 4.8222 in favor of the BA education level. Also, the holders of Ph.D. degrees expressed higher perspectives toward the role of the Mentimeter Platform in enhancing students' online engagement in synchronous online teaching in comparison with BA degree holders. Whereas, the total degree's highest mean was 5.2315 in favor of the Ph.D. education level and the lowest value was 4.9981 in favor of other education levels. Overall, most of the Ph.D. degree holders show the highest level of agreement on the role of the Mentimeter platform in enhancing online engagement in

TABLE 3 Result of the Cronbach alpha coefficient for the first dimension.

	Participants (N)	Questionnaire items (N)	Alpha value
Total degree	44	9	0.857

TABLE 4 Result of the Cronbach alpha coefficient for the second dimension.

	Participants (N)	Questionnaire items (N)	Alpha value
Total degree	44	10	0.888

TABLE 5 Results of the Cronbach alpha coefficient for the two dimensions.

	Participants (N)	Questionnaire items (N)	Alpha value
Total degree	44	19	0.935



TABLE 6 Mean and standard deviation of the respondents' answers (dimension one).

No.	Items	Mean	Std. deviation	Response rate	Impact degree
1	Mentimeter platform is attractive and simple to use.	4.8636	1.40747	81	Very high*
2	Mentimeter's feature helps me to know the opinion of my students.	4.8864	1.38456	81.3	Very high*
3	Mentimeter presentation software is user-friendly and visually appealing.	5.4091	0.92304	90.2	Very high*
4	On mentimeter platform, various forms of questions foster active discussion.	5.3636	1.01365	89.3	Very high*
5	Word cloud question form helps students express their answers without being afraid of getting embarrassed.	5.1364	1.09100	85.5	Very high*
6	Mentimeter App helps students review content through quizzes, videos, and documents.	5.3864	1.01651	89.6	Very high*
7	Mentimeter enables me to use various slide types to show the presentation's material.	5.2500	1.16389	87.5	Very high*
8	Mentimeter presentation provides an integrative way of teaching and learning in synchronous environment.	5.2500	1.16389	87.5	Very high*
9	Multiple teaching methodologies that are appropriate for various learning styles are offered by Mentimeter interactive presentation.	5.2955	1.06922	88.2	Very high*
	Total degree	5.2045	0.78382	86.7	Very high*

\*Maximum response score is 6.

TABLE 7 Mean and standard deviation of the respondents' answers (dimension two).

No.	Items	Mean	Std. deviation	Response rate	Impact degree
10	Spontaneous participation is facilitated by mentimeter's quiz feature.	5.0455	1.16048	84	Very high*
11	I can get instant feedback about students' progress.	5.2045	1.21195	86.7	Very high*
12	Mentimeter platform facilitates students' engagement on equal terms.	5.1136	1.14559	85.2	Very high*
13	My students easily engage in open-ended discussion.	4.8409	1.25648	80.2	Very high*
14	Mentimeter presentation forms eliminate awkward silences.	4.8864	1.43407	81.3	Very high*
15	Mentimeter enhanced learning by facilitating two-way dialogue.	5.0000	1.21999	83.3	Very high*
16	Mentimeter enables more active participation from students in online lectures.	5.2727	1.10735	87.8	Very high*
17	Student's achievement of the unit learning outcomes was enhanced by the use of mentimeter presentations.	4.8182	1.26257	80.3	Very high*
18	Employing mentimeter competition enables students to stay longer in the online lecture without getting bored.	5.0000	1.25754	83.3	Very high*
19	Mentimeter increases students' motivation to learn online more.	5.2500	1.03710	87.5	Very high*
	Total degree	5.0432	0.85682	84	Very high*

\*Maximum response score is 6.

synchronous online teaching. While the majority of respondents to the other education level variable expressed the least agreement with the Mentimeter platform's role in enhancing online engagement in synchronous online teaching.

According to Table 9, there were no statistically significant differences between the participants' academic degree on all dimensions and the overall degree in the contribution of the Mentimeter platform in enhancing students' online engagement in synchronous online teaching. To test the role of working environment (educational institution), the researchers used Mean and One Way ANOVA test to measure the differences in the total degree of the tool. The outcomes are shown in Tables 10, 11.

Table 10 shows the results of means and SD differences according to the working place variable for all domains. Results show that the value of the mean average of the first domain that discussed teachers' attitudes toward using the Mentimeter platform in synchronous

online teaching has the highest mean average value of 5.2045 and a standard deviation value of 0.78382. On the other hand, the lowest mean value was 5.0432 in favor of the second dimension that presented teachers' perspectives toward the role of the Mentimeter Platform in enhancing students' online engagement in synchronous online teaching. According to the results of each domain level, the highest mean average for the first domain was 5.2815 in favor of schools, and the lowest mean average value was 5.1270 in favor of educational centers. This result indicates that teachers who work at schools had the highest attitudes toward using the Mentimeter platform in synchronous online teaching in comparison with other teachers who work at educational centers. According to the results of the second domain, the highest mean value was 5.1867 in favor of universities and the lowest mean value was 4.8429 in favor of colleges. This illustrates that teachers who work at universities expressed higher perspectives toward the role of the Mentimeter Platform

TABLE 8 Mean and standard deviation (based on academic degree).

Dimensions	Academic degree	N	Mean	Std. deviation
Dimension 1	BA	9	5.2469	0.30316
	MA	20	5.1667	1.02503
	Ph.D.	15	5.2963	0.49766
	Total	44	5.2045	0.78382
Dimension 2	BA	9	4.8222	0.56740
	MA	20	5.0700	1.09597
	Ph.D.	15	5.1667	0.50871
	Total	44	5.0432	0.85682
Total	BA	9	5.0346	0.40871
	MA	20	5.1183	1.04480
	Ph.D.	15	5.2315	0.48009
	Total	44	5.1239	0.79942

TABLE 9 Results of one-way ANOVA (based on academic degree).

Dimensions		Sum of squares	DF	Mean square	F	Sig.
Dimension 1	Between groups	0.321	3	0.107	0.164	0.920*
	Within groups	26.097	40	0.652		
	Total	26.418	43			
Dimension 2	Between groups	0.637	3	0.212	0.275	0.843*
	Within groups	30.931	40	0.773		
	Total	31.568	43			
Total	Between groups	0.259	3	0.086	0.127	0.944*
	Within groups	27.221	40	0.681		
	Total	27.480	43			

\*Statistically significant at  $\alpha \leq 0.05$ .

in enhancing students' online engagement in synchronous online teaching in comparison with teachers who work at colleges. Whereas the total degree's highest mean was 5.1896 in favor of universities and the lowest value was 4.9929 in favor of colleges, overall, most university teachers show the highest degree of agreement on the role of the Mentimeter platform in enhancing online engagement in synchronous online teaching. While the majority of college teachers were divided on the role of the Mentimeter platform in increasing online engagement in synchronous online teaching.

Table 11 shows that there were no statistically significant differences at the significant level of  $\alpha \leq 0.05$  in the role of the Mentimeter platform in enhancing students' online engagement in synchronous online teaching as attributed to the working place variable on all dimensions and the total degree. To test the most commonly used Mentimeter's tool variable, the researchers used Mean and One Way ANOVA, and Scheffe's *Post Hoc* test to indicate the differences in the total degree of the tool. As shown in Tables 12–14.

Table 12 shows the results of mean and SD differences according to the most commonly used Mentimeter's tool variable for all

TABLE 10 Mean and standard deviation (based on educational institution).

Dimensions	Educational institution	N	Mean	Std. deviation
Dimension 1	University	15	5.1926	1.13192
	School	15	5.2815	0.35849
	Educational center	7	5.1270	0.71845
	College	7	5.1429	0.75554
	Total	44	5.2045	0.78382
Dimension 2	University	15	5.1867	1.09340
	School	15	5.0467	0.45335
	Educational center	7	4.9286	0.71581
	College	7	4.8429	1.16884
	Total	44	5.0432	0.85682
Total	University	15	5.1896	1.10443
	School	15	5.1641	0.37199
	Educational center	7	5.0278	0.69750
	College	7	4.9929	0.93746
	Total	44	5.1239	0.79942

TABLE 11 Results of one-way ANOVA (based on educational institutions).

Dimensions		Sum of squares	DF	Mean square	F	Sig.
Dimension 1	Between groups	0.160	3	0.053	0.081	0.970*
	Within groups	26.259	40	0.656		
	Total	26.418	43			
Dimension 2	Between groups	0.682	3	0.227	0.294	0.829*
	Within groups	30.886	40	0.772		
	Total	31.568	43			
Total	Between groups	0.274	3	0.091	0.134	0.939*
	Within groups	27.206	40	0.680		
	Total	27.480	43			

\*Statistically significant at  $\alpha \leq 0.05$ .

domains. Results show that the value of the mean average of the first domain that discussed teachers' attitudes toward using the Mentimeter platform in synchronous online teaching has the highest mean average value of 5.2045 and a standard deviation value of 0.78382. On the other hand, the lowest mean value was 5.0432 in favor of the second dimension that presented teachers' perspectives toward the role of the Mentimeter Platform in enhancing students' online engagement in synchronous online teaching. According to the results of each domain level, the highest mean average for the first domain was 5.5714 in favor of presentations, and the lowest mean average value was 4.0370 in favor of quizzes. This result indicates that teachers who used presentations as an interactive tool in synchronous online teaching have the highest attitudes toward using the Mentimeter platform in synchronous online teaching in

**TABLE 12** Mean and standard deviation (most commonly used Mentimeter's tool).

Dimensions	The most commonly used Mentimeter's tool	N	Mean	Std. deviation
Dimension 1	Word clouds	8	5.2361	0.57716
	Open- ended questions	4	4.5000	2.04979
	Quizzes	3	4.0370	0.73981
	Presentation	7	5.5714	0.28276
	All the above	22	5.3636	0.33277
	Total	44	5.2045	0.78382
Dimension 2	Word clouds	8	5.0625	0.65670
	Open- ended questions	4	4.4750	1.99228
	Quizzes	3	3.6333	1.10151
	Presentation	7	5.5143	0.37607
	All the above	22	5.1818	0.44362
	Total	44	5.0432	0.85682
Total	Word clouds	8	5.1493	0.59771
	Open- ended questions	4	4.4875	2.01134
	Quizzes	3	3.8352	0.89307
	Presentation	7	5.5429	0.26287
	All the above	22	5.2727	0.34569
	Total	44	5.1239	0.79942

comparison with teachers who used quizzes. According to the results of the second domain, the highest mean value was 5.5143 in favor of presentation tools and the lowest mean value was 3.6333 in favor of quizzes. This illustrates that teachers who used presentations in synchronous teaching settings expressed higher perspectives toward the role of the Mentimeter Platform in enhancing students' online engagement in synchronous online teaching in comparison with teachers who used quizzes. Whereas, the total degree's highest mean was 5.5429 in favor of presentations, and the lowest value was 3.8352 in favor of quizzes. Overall, most teachers who used presentation tools in synchronous online teaching agreed the most on the role of the Mentimeter platform in increasing online engagement. While the majority of teachers who used quizzes in synchronous teaching had the lowest level of agreement with the Mentimeter platform's role in increasing students' online engagement.

**Table 13** shows that there were statistically significant differences on the first and second dimensions and the total degree, and so there are statistically significant differences at the level of significance  $\alpha \leq 0.05$  in the role of the Mentimeter platform in enhancing students' online engagement in synchronous teaching as attributed to the most commonly used Mentimeter tool variable. To find differences between levels, the researcher used Scheffe's test for dimensional comparisons between levels to find out between which levels were the differences on the third dimension (**Table 10**).

**Table 14** shows that the differences were on the first and second dimensions, and the total degree between presentations and quizzes was in favor of presentations in the sense that teachers who used presentations have indicated higher attitudes and perspectives toward the role of the Mentimeter platform in enhancing students' online engagement in synchronous teaching settings than teachers who used

**TABLE 13** Results of one-way ANOVA (based on most commonly used Mentimeter's tool).

Dimensions		Sum of squares	DF	Mean square	F	Sig.
Dimension 1	Between groups	7.582	4	1.895	3.924	0.009*
	Within groups	18.837	39	0.483		
	Total	26.418	43			
Dimension 2	Between groups	9.234	4	2.308	4.031	0.008*
	Within groups	22.334	39	0.573		
	Total	31.568	43			
Total	Between groups	8.324	4	2.081	4.236	0.006*
	Within groups	19.157	39	0.491		
	Total	27.480	43			

\*Statistically significant at  $\alpha \leq 0.05$ .

**TABLE 14** Results of Scheffe's *post hoc* test (based on most commonly used Mentimeter's tool).

Dependent variable	(I) Use Mentimeter	(J) Use Mentimeter	Mean difference (I-J)
Dimension 1	Presentation	Quizzes	1.53439*
Dimension 2	Presentation	Quizzes	1.88095*
Total	Presentation	Quizzes	1.70767*

\*Statistically significant at  $\alpha \leq 0.05$ .

**TABLE 15** Results of Pearson correlation test.

Dimensions	Mean	Std. deviation	Pearson correlation value	Significance value
Teachers' attitudes	5.2045	0.78382	0.899	0.000*
Teachers' perspectives	5.0432	0.85682		

\*Statistically significant at level  $\alpha \leq 0.05$ .

quizzes. While the other comparisons are not statistically significant. To answer the third research question, the researchers used the Pearson Correlation Test to find out the correlation between teachers' attitudes toward using the Mentimeter platform in synchronous online teaching and their perspectives toward the platform's role in enhancing students' online engagement in synchronous teaching settings, as shown in **Table 15**.

**Table 15** shows that there is a strong positive correlation between teachers' attitudes toward using the Mentimeter platform in synchronous online teaching and their perspectives toward the platform's role in enhancing students' online engagement in synchronous teaching settings. where the value of the coefficient of the Pearson Correlation Test ( $r$ ) was 0.899 since it was greater than 0.5 and the significance value was 0.000, and so there is a positive relationship at the level of significance  $\alpha \leq 0.05$  between teachers' attitudes toward using the Mentimeter platform in synchronous online teaching and their perspectives toward the Mentimeter platform's role in enhancing students' online engagement in synchronous teaching settings in favor of teachers' attitudes.

There is a strong positive linear relationship between two continuous dependent variables, as shown in [Supplementary Figure 4](#), and there are differences in their relationship in favor of teachers' attitudes toward using the Mentimeter platform in synchronous online teaching because its mean average is higher than teachers' perspectives toward the Mentimeter platform's role in enhancing students' online engagement variable. This result also implies that teachers' positive attitudes toward using such online tools in synchronous online classes assist them in carrying out synchronous course teaching with acceptable quality and facilitate their job in maintaining students' online engagement.

## Discussion

The present research set out to evaluate the Palestinian teachers' attitudes toward the Mentimeter Platform and its impact on students' engagement in online synchronous classes. The results of data analysis demonstrated that the majority of educators perceived that the Mentimeter platform is useful for increasing students' engagement in online synchronous courses. This result seems to be consistent with those of some previous studies (e.g., [Valley and Gibson, 2018](#); [Moorhouse and Kohnke, 2020](#); [Demirci et al., 2021](#); [Sari, 2021](#); [Mohin et al., 2022](#); [Utomo and Utama, 2022](#)). The results of our study also indicated that the attitudes of the participants were favorable toward the usage of the Mentimeter platform in synchronous online instruction. However, we note that these positive perspectives would enable educators to utilize most of the Mentimeter in synchronous learning environments. The findings from this study are consistent with those from [Valley and Gibson \(2018\)](#), [Andriani et al. \(2019\)](#), [Puspa and Imamyartha \(2019\)](#), [Anggriani et al. \(2022\)](#). In this regard, the study by [Quiroz Canlas et al. \(2020\)](#) focuses on a number of advantages of integrating the Mentimeter into the computer science lecture, including the application's ease of use, increased participation in class, freedom to express oneself without worrying about coming off as stupid, remembering earlier topics, remembering the key points of the conversation, overcoming boredom, and providing instantaneous feedback on learning. All of these have also been noted by the teachers who participated in our study. The educators have overwhelmingly positive opinions about the Mentimeter Platform's contribution to increasing students' online engagement in synchronous online teaching in terms of avoiding boredom. Teachers, for instance, agree that using Mentimeter competitions encourages students to stay in the online lecture for longer periods of time without getting bored and that Mentimeter presentation styles prevent awkward silences.

In addition, we must stress that the average response for all inquiries about teachers' views of the Mentimeter Platform's contribution to improving students' online engagement in synchronous education was very high and ranged between 80.2 and 87.8%. Furthermore, when compared to college instructors, the majority of university instructors have the highest level of agreement on the Mentimeter platform's role in strengthening online engagement in synchronous online teaching, as well as the highest level of agreement among instructors who use presentation tools in such instruction. In this case, to increase students' involvement in synchronous learning environments, it is necessary to regularly train the teaching staff of schools, learning institutions, and colleges in the use of Mentimeter. As we have previously stated, our goal

is to further explore the insights and perspectives surrounding the Mentimeter Platform's contribution to improving online student engagement in synchronous instruction. The constructive viewpoints of the participants should be highlighted. As a result, it is evident that there is a significant positive association between teachers' attitudes toward using the Mentimeter platform for synchronous online teaching and their perceptions of the platform's contribution to increasing students' online engagement in such circumstances. This indicates that as teachers' attitudes improved, so did their opinions on how the Mentimeter platform might improve students' online involvement in real-time learning environments. These outcomes are consistent with earlier research (e.g., [Ahmad and Subekti, 2021](#); [Mohin et al., 2022](#)).

On the other hand, students' point of view about the efficiency of the Mentimeter platform in synchronous online learning was carried out by [Puspa and Imamyartha \(2019\)](#), [Demirci et al. \(2021\)](#), [Sari \(2021\)](#), [Mohin et al. \(2022\)](#), and [Samad and Munir \(2022\)](#), who revealed that students had positive perceptions toward the implementation of Mentimeter in the EFL classroom and there is a significant impact of this online tool in students' engagement, makes them like the class, motivates them, aids in their ability to concentrate and encourage them to take part in learning. Therefore, synchronous learning integrated with online tools becomes very much needed to be carried out on a sustainable basis.

Finally, it is worth noting that the results of this research are subject to at least three important limitations. First and foremost, this study was completely conducted in Palestine, which is an Asian country. Second, this study was solely focused on the role of the Mentimeter platform in improving students' engagement. It would be interesting to examine the impact of other online platforms such as Kahoot, Plickers, GoSoapBox, and Poll Everywhere on students' engagement. Third, in this research, students' perceptions toward the use of the Mentimeter platform in online synchronous courses were neglected. To attain more comprehensive outcomes, future studies are recommended to simultaneously concentrate on teachers' and students' viewpoints.

## Conclusion

The present inquiry sought to delve into Palestinian teachers' viewpoints regarding the use of the Mentimeter platform in synchronous education. Moreover, it aimed to assess teachers' perceptions of the role of this platform in enhancing students' engagement. The results evinced that the majority of participants had positive perceptions toward Mentimeter platform. Moreover, the participants perceived the Mentimeter platform to be highly influential in increasing students' engagement in online synchronous courses. The results of the current study may have important implications for all teachers who are struggling with student disengagement in online educational environments. Given that the Mentimeter platform serves an important role in improving students' engagement, teachers are strongly recommended to employ this platform with a view to enhance their students' engagement. The study's findings could be useful for teacher educators as well. Considering the positive impact of the Mentimeter platform on students' engagement, teacher educators need to teach their teacher students how to work with such technologies in educational settings.

## Data availability statement

The original contributions presented in this study are included in the article/**Supplementary material**, further inquiries can be directed to the corresponding author.

## Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

## Author contributions

AT: conceptualization, methodology, validation, formal analysis, investigation, resources, and writing—original draft preparation. JM: writing—review and editing and supervision. Both authors have read and agreed to the published version of the manuscript, listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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## Conflict of interest

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## Supplementary material

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# Investigating the modulation of stimulus types on language switching costs: Do semantic and repetition priming effect matter?

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**Introduction:** In the present study, I investigated the influence of stimulus types on bilingual control in the language switching process. The commonly employed stimuli in language switching studies – Arabic digits and objects – were compared to further investigate the way in which inhibitory control could be modulated by semantic and repetition priming effects. The digit stimuli have two unique characteristics in the language switching paradigm, for example, they are present repeatedly and are semantically related to each other, compared with pictorial stimuli. Thus, these unique characteristics might influence the operation of inhibitory control in bilingual language production, modulating the size and asymmetry of switching costs.

**Methods:** Two picture control sets were set up to match those characteristics: (1) a semantic control set, in which picture stimuli belong to the same category group, such as, animals, occupations or transportation and specific semantic categories were presented in a blocked condition; and (2) a repeated control set, in which nine different picture stimuli were repeatedly presented like the Arabic digits from 1 to 9.

**Results:** When comparing the digit condition and the standard picture condition, analyses of naming latencies and accuracy rates revealed that switching costs were reliably smaller for digit naming than for picture naming and the L1 elicited more switching costs for picture naming than for digit naming. On the other hand, when comparing the digit condition and the two picture control sets, it was found that the magnitude of switching costs became identical and the asymmetry in switching costs became much smaller between the two languages.

## KEYWORDS

language switching costs, bilingual language production mechanism, L2 inhibitory control, asymmetrical switching costs, priming effect, lexical access, language style

## 1. Introduction

One of the most amazing abilities of fluent bilinguals is to seamlessly switch between two languages without breaking a sweat. According to previous literature of bilingual language production and comprehension, semantic representations simultaneously activate two lexicons of bilinguals even when speaking in one of the languages (Poulishie and Bongaerts, 1994; Green, 1998; Costa et al., 1999; Dijkstra and van Heuven, 2002). This raises a question here as to why lexicon co-activation does not lead to substantial non-target language intrusion when speaking in the target language, for example, previous

evidence suggests that bilinguals make few language errors. This finding led Green (1998) to suggest that there must be a language control mechanism to regulate concurrent language coactivation in a way that it suppresses non-target language activation to guarantee the speech production in the target language.

One important issue here is as to why the language co-activation does not result in massive intrusions from the non-target language when speaking in the target language, for instance, previous evidence has shown that bilinguals rarely make language errors (Poulish and Bongaerts, 1994). These findings have led Green (1998) to argue that a language control mechanism must be in place to mediate the concurrent language co-activation, which inhibits the activation of the non-target language in order to produce speech in the target language. So far, Green's Inhibitory Control model (the IC model, hereafter) has received compelling evidence from the language switching paradigm in which participants are asked to name objects or Arabic numbers in either their first or second language (e.g., Meuter and Allport, 1999). This naming condition forms two types of trials: (1) the stay trial in which the naming language in the current trial is the same as the preceding trials; and (2) the switch trial in which the current response language differs from the one used in the previous trial. The typical finding is that switch trials resulted in slower naming latencies and more naming errors than stay trials did. The naming latency difference between switch and stay trials has been referred to as so-called "language switching costs." However, previous language switching studies have not reached consistent results regarding the size and (a) symmetry of switch costs due to various methodological differences such as different stimulus types (pictures and digits) and a variety of preparation time. Focusing on stimulus types, the present study aimed to examine whether and how this methodological difference modulate the size of and (a)symmetry in switching costs, using a cued language switching paradigm.

It is both empirically and theoretically important to investigate the impact of stimulus types on language switching. First, it could shed light on whether or not language switching studies using various stimulus materials are comparable. This is of great importance considering that the size and (a)symmetry of switching costs differ greatly among studies using different types of stimuli, that is, numerical digits and pictures (or objects; e.g., Costa and Santesteban, 2004; Costa et al., 2006; Philipp et al., 2007; Verhoeft et al., 2010; Guo et al., 2011; Mosca and Clahsen, 2015; Chang et al., 2016). Furthermore, some studies even challenged the presence of an inhibitory control mechanism and its proposed persisting inhibition effect in bilingual language production as they did not observe asymmetrical switching costs as empirical evidence for inhibition. However, the present study intended to seek evidence of the modulation of stimulus types on language switching costs, and therefore the absence of asymmetrical switching costs does not necessarily deny the mechanism of inhibitory control. Second, it has been well established that many methodological differences that go beyond stimulus differences, such as speakers' language proficiency and the length of preparation time, account for a lack of asymmetrical switching costs, leaving stimulus differences untouched. Therefore, a thorough understanding of how stimulus differences affect language switching process allows for unambiguity and precision in the future research design, as well as a clear indication of whether and how the language production processing stage could play a role in bilingual language control.

## 2. Literature review

### 2.1. General findings on language-switching paradigm

In the trial-by-trial language-switching task, participants are required to name items (e.g., standardized black-and-white line drawings or Arabic digits from 1 to 9) in either their first or second language. The language in which stimuli are expected to be named depends on a colour cue (usually the colour of the background screen), varying from trial to trial. This gives rise to different types of trials. For example, in the non-switch (or stay) trial, participants name the stimulus in the same language as the one used in the preceding trial. In contrast, in the switch trial, participants name the stimulus in a different language from the one used in the preceding trial. The general finding in this context is that participants' naming performance is impaired in the switch trial than in the stay trial. Specifically, switch trials result in slower naming latencies and more naming errors. The calculation of subtracting naming latencies of switch trials from non-switch trials is called "language switching cost." These switch costs have also been found in the switching paradigm that does not involve linguistic processes such as the task-switching paradigm (e.g., Meiran, 1996; Rogers and Monsell, 1996; Monsell, 2003; Kiesel et al., 2010).

The first influential study to examine the consequences of the cross-language competition and the possibility of bilingual language control was by Meuter and Allport (1999). In their study, proficient (but not balanced) bilinguals performed in the numeral switching task, with much theoretical underpinning borrowed from task-switching theories. As said, they were required to name the Arabic numerals in either their first or second language according to colour cues. The authors hypothesized that based on the task set inertia hypothesis (Allport et al., 1994), one could predict that the dominant task should result in larger switch costs than the nondominant task. This is because the dominant task needs to be more suppressed in order to perform the nondominant task. As a result, when subsequently switching into the dominant task, more time and effort are needed to re-activate the dominant task. In contrast, switch costs should be smaller when switching to the less dominant task, due to the less suppression exerted on the weaker task in the preceding trial. This was exactly what the authors observed.

The results showed that naming latencies of switch trials were slower than those of stay trials and L2 switch trials resulted in faster naming latencies than L1 switch trials did, pointing to the asymmetry in switching costs. This suggests that switching from the weaker language (e.g., L2) to the more dominant language (e.g., L1) was more costly than the other way around, resulting in an asymmetrical switching cost. The finding of an asymmetrical switching cost is perfectly interpreted as evidence of the IC model. As mentioned above, the IC model assumes that the amount of inhibitory control exerted on a language is proportional to its strength; in other words, the more dominant or stronger the language, the greater the inhibition is exerted. Following this line of logic, the stronger L1 should be more suppressed when it serves as the non-target language in the L2 switch trial. As a consequence, it should take more time to overcome this inhibition when switching into the L1, that is, language re-activation becomes more difficult because of the stronger inhibition, resulting in the observed asymmetrical switch costs.

Meuter and Allport (1999) also proposed that relative proficiency levels of bilinguals' two languages should affect the degree of switching cost asymmetry. To test this assumption, the researchers divided their participants into two groups according to their L2 proficiency levels; one group showed more L1 dominance while the other was relatively balanced bilinguals. It was found that the unbalanced participants continued to show the asymmetrical switch costs, while the balanced group did not, which suggests that the language proficiency could modulate the asymmetry in switching costs and further confirms the assumption that inhibition applied to an unintended language is proportional to its relative strength (Costa and Santesteban, 2004; Gollan and Ferreira, 2009; Calabria et al., 2012).

Nevertheless, there has been inconsistency in the research findings on the pattern of switching costs (including both size and (a) symmetry), thus leading authors to challenge the involvement of inhibitory control mechanisms in bilingual language production. However, it appears premature to assume that the absence of asymmetry reflects a lack of inhibitory control, as both participant- and task-related variables might influence the results. For instance, to explore how a participant-related factor (i.e., language proficiency level) affects the IC mechanism, Costa et al. (2006) observed the language switching performance of trilingual when switching between their L1 and L2 and L2 and L3 (note that these participants were highly proficient at their L2 but less proficient at their L3). Surprisingly, symmetrical switching costs were reported in their two experiments regardless of the dominance of the two languages involved in switching, replicating their previous study (Costa and Santesteban, 2004), which led them to argue that differences in proficiency levels do not necessarily result in asymmetry in switching costs for highly proficient or balanced bilinguals. This is because, as they suggested, when performing language switching tasks, highly proficient bilinguals do not rely on inhibition of the unintended language because they develop a so-called "language-specific selection" mechanism where bilingual language control is not required (Costa et al., 1999).

These observations may lead one to ask, "is inhibition only called upon when unbalanced bilinguals switch between two languages?" or "can we therefore conclude that the presence of inhibition depends on the proficiency level of bilingualism?" (Bobb et al., 2013, p. 494). The answer to these questions might be no, as the proficiency difference is not the only consideration affecting switching costs, in other words, task-related variables, i.e., preparation effect, stimulus differences, language similarity, and so on, could also be an alternative explanation of the presence of symmetrical switching costs in Costa et al. studies. The rationale for such a claim is that the experiment settings in Costa et al.'s (2006) study differed greatly from Meuter and Allport's (1999), allowing for a longer preparation effect between the colour cue and the presence of pictorial stimulus (the cue-to-stimulus interval, CSI). This preparation effect, as measured by various CSIs, has received scholarly attention in both language and task switching research and is thought to modulate the size and (a)symmetry of switching costs (e.g., Meiran, 1996; Costa and Santesteban, 2004; Philipp et al., 2007; Verhoef et al., 2010; Declerck et al., 2012).

Despite the fact that no convergent evidence has been shown about how CSIs exactly affect the size and (a)symmetry of switching costs, largely due to methodological differences and a great variation in research design, investigating the interaction between preparation

effect and switching costs is fruitful as it deepens our understanding of how inhibition control functions in different stages of the language switching process and what kinds of factors could affect it. However, little is known about how other task-related variables, such as stimulus types, modulate inhibition during language control. Some studies used digits (e.g., Meuter and Allport, 1999; Jackson et al., 2001), whereas others used pictures (e.g., Mosca and Clahsen, 2015) or a limited number of pictures (e.g., Costa and Santesteban, 2004; Costa et al., 2006). According to Levelt et al.'s (1999) word production model, repeated access to semantic representations at the conceptual preparation stage can facilitate the activation of their lemmas. One might ask, in digit naming, whether and how enhanced activation at the concept and lemma selection stages could modulate the functionality of the IC model.

It is worth noting that in both Costa and Santesteban (2004) and Costa et al. (2006), only ten pictures were used for hundreds of trials, and this practice effect may have resulted in a decrease and the symmetry of switching costs, as what they observed. It can therefore be argued that proficiency or language dominance alone cannot interpret inconsistencies in switching costs. Therefore, a more detailed investigation of other factors should be conducted. Furthermore, a systematic investigation of stimulus type could reveal a complex picture of the inhibitory control process in terms of its processing stages and mechanism, as well as account for observed non-convergent patterns of asymmetries and strengths in switching costs.

## 2.2. The effect of stimulus types on switching cost: Digit vs. picture

Previous language switching studies mainly used two types of stimuli: Arabic digits from 1 to 9 (e.g., Meuter and Allport, 1999; Jackson et al., 2001; Philipp et al., 2007; Guo et al., 2011) and random objects (pictures) (e.g., Costa and Santesteban, 2004; Costa et al., 2006; Verhoef et al., 2010; Mosca and Clahsen, 2015; Chang et al., 2016). Therefore, it might be problematic to compare directly language switching studies because of the methodological differences. It should be noted that picture and digit stimuli differ on various levels. First, according to Herrera and Macizo (2010), the digits represent a specific semantic group, which is not the case for the picture stimulus. It has been well documented that in the blocked semantic naming paradigm, longer naming latencies have been observed when pictures were semantically related to each other than when they were unrelated (e.g., Oppenheim et al., 2010). This impaired performance in the semantic blocking context has been referred to as the "semantic interference effect" or "semantic blocking effect" (e.g., Cipolotti et al., 1995; Herrera and Macizo, 2010).

One could argue that if picture stimuli belong to the same semantic categories, then the naming latencies in the stay and switch trials should be slower since the coactivation of semantically-related items in two languages competes for selection. However, this may not be the case in the language switching paradigm because language membership changes in switching trials might lead to the disappearance of the semantic interference effect (e.g., Green, 1998; Lee and Williams, 2001; Runnqvist et al., 2012), which will be further discussed in the General Discussion section. However, in stay trials, according to Howard et al. (2006), when a sequence of pictures forms a single semantic group, two effects play a role in parallel. First,



participants might be able to anticipate the semantic category of the picture stimulus in advance; second, a short-term facilitatory semantic priming effect (at the conceptual level) from the previous trial should facilitate the selection of the target word. This short-term semantic facilitation effect has been observed in previous studies, for instance, [Wheeldon and Monsell \(1994\)](#) found that producing a word ‘dog’ transiently speeded up the subsequent naming of a picture of a ‘cat’. This argument is also in line with findings that bilingual language control occurs at different lexical processing stages such as, phonological, conceptual and orthographical selection stages (e.g., [Declerck et al., 2015; Zhang et al., 2020](#)).

Another evidence for this short-lasting semantic facilitation effect comes from [Damian and Als \(2005\)](#). In their study, participants were required to name pictures within homogeneous and heterogeneous contexts four times (presentation cycle 1–4). The results showed that the semantic interference effect was absent on the first presentation of each item, which emerged thereafter, remaining stable for the remainder of the presentations, and there is a semantic facilitative effect characterized by faster object naming latencies in the first presentation cycle of the homogeneous block. [Navarrete et al. \(2014\)](#) took this issue even further and they explored the effect of within-category semantic distance (within-category semantically close vs. far) on the pattern of facilitation and interference effects. The same pattern of result was replicated: semantic distance did not modulate the facilitation effect in the first presentation cycle.

In their subsequent study ([Navarrete et al., 2014](#), p. 259), they redesigned the traditional blocked picture naming paradigm in which the semantically related pictures were present repeatedly per block and a consequential design was introduced: (1) “each picture was presented once per block” and (2) “blocks were repeated multiple times.” Strikingly, their results showed that (1) the semantically related condition facilitated picture naming and (2) the semantic interference effect was only observed when pictures were presented multiple times per block. They argued that this facilitation effect might result from a trade-off between lexical interference and semantic facilitation. That is, the magnitude of the conceptual facilitation might override that of the lexical interference. For instance, participants might notice the shared semantic features of the items in homogeneous contexts and use this knowledge to predict the category of other items in this cohort. [Belke et al.’s \(2017\)](#) study further confirmed that this kind of facilitation effect was strategic in nature, and the blocked-cyclic paradigm allowed participants to bias the levels of activation of the semantic representations, resulting in a processing advantage for the members of a specific semantic category. This bias, according to [Belke et al. \(2017\)](#), operates at the conceptual level but not the lexical level.

Furthermore, another theoretical model that can possibly provide empirical evidence for the argument that semantic priming effect would affect switching costs comes from [Kroll and Stewart’s \(1994\)](#) Word-Concept Association model in bilingual language production. This model suggests that the strength of link between semantic concepts and lexical representations (or lemmas) differs from L1 to L2, that is, concepts have a stronger link to their corresponding lexical representations in L1 than L2. Following this logic, it could very well be that in switch trials, recovery from the inhibition of L1 is less time-consuming and effortless due to its enhanced concept activation that allows L1 lexical representations receive more activation from the concepts than L2 lexical representations. Then, it can be predicted that the (a)symmetry of switching costs can be affected when stimuli are

semantically related. In sum, the results observed from these traditional semantic blocking studies might be taken as evidence that the semantic priming effect or semantic blocking effect formed in the digit naming in the language switching paradigm is likely to modulate the switching costs.

There is another difference between the digit and picture naming in the language switching paradigm. Specifically, language switching studies using digits as stimuli typically employ nine numerals repeatedly throughout the experiment, while studies using pictures employ unique objects in each trial or a certain number of pictures that are repeatedly presented fewer times. In this case, if the same stimulus such as a word or an object is presented several times within finite intervals, then it will be processed more efficiently at the subsequent occurrence (e.g., [Hernandez and Reyes, 2002](#)). Such facilitation has been referred to as the repetition priming effect. Following this logic, it is clear that the limited number of digit numerals (from one to nine) can cause a robust repetition priming effect relative to the picture stimulus that varies from trial to trial, thus modulating switching costs.

The third difference between picture and digit naming is that digits might be cognate (referring to a phonological overlap between languages) in two languages from the same language family such as, romance language. Studies have provided support for the claim that the cognate can facilitate bilingual picture naming (e.g., [Costa et al., 2000; Hoshino and Kroll, 2008](#)). This facilitation effect has been taken as evidence of phonological co-activation of two languages. In this case, in a bilingual group whose two languages belong to the same language family (e.g., English-German or English-Spanish bilingual speakers), numeric digits could have large phonological overlap between languages, which provides the possibility that cognate status may also make a difference to the switch costs. This is the case in both [Verhoeef et al. \(2009\)](#) and [Declerck et al. \(2012\)](#), who reported that cognates in digital stimuli led to symmetrical switching costs in German-English and Dutch-English bilinguals’ performances. For instance, [Verhoeef et al. \(2009\)](#) reported smaller switching costs with cognates, which is also the case in [Declerck et al. \(2012\)](#), who even reported symmetrical switching costs with cognates. It is also interesting to explore whether the digital effect could extend to language pairs without cognate status, as in the present study (Chinese-English).

As shown in the review of the current body of research, there is not a consistent picture of switching costs in the language switching paradigm due to methodological differences especially in the stimulus variation across studies. In addition, so far, no systematic investigation has been conducted to examine the way in which these methodological differences modulate the size and (a)symmetry of switching costs. To such an end, the current experiment was designed to investigate this issue.

### 3. Research methodologies

This experiment explores whether and how stimulus types affect the language switching performance of proficient (unbalanced) Chinese-English bilinguals. To do so, participants’ naming latencies and accuracy rates in digit naming were compared to those in random picture naming, semantically related picture naming and repeatedly presented picture naming. This manipulation allows to explore the



factors that may contribute to observation of digit effects in the language switching paradigm.

*Hypothesis 1:* Switching costs can be modulated by different types of stimuli, that is, switching costs might be different between the digit naming and picture naming.

*Hypothesis 2:* The semantic relationship between the stimulus can lead to a reduction and symmetry in switching costs.

*Hypothesis 3:* The repetition of the stimulus can reduce switching costs and lead to a symmetry in switching costs.

As argued in the literature review section, there are methodological differences between picture naming and digit naming in language switching studies. Specifically, studies employing pictures use unique stimuli for each trial, while studies employing digits use repeated numerals (from 1 to 9) during the experiment. Given different patterns of switching costs (i.e., symmetry and asymmetry in switching costs, presence or absence of switching costs) reported in these studies, the current experiment aimed to examine whether stimulus type differences are responsible for switching cost variance.

According to Declerck et al. (2012) and Liu and Chaouch-Orozco (2022), digit naming is different from (random) picture naming in the language switching paradigm in three aspects: (1) digits could formulate cognates when two languages share an alphabet system (i.e., English, Dutch, and German), which is not the case for pictorial stimuli although some pictures might also have cognates between two languages (2) numerical digits are repeatedly presented and named for hundreds of times, and (3) digits are semantically related, formulating a digital concept group that makes co-activation of semantically-related concepts possible. Previous literature has shown that inhibitory control occurs at different processing stages, such as at the concept level (Bobb et al., 2013), at the lemma level (e.g., Green, 1998), at the phonology or orthography level (e.g., Declerck et al., 2012). Therefore, it is interesting to assume that these specific digital features modulate language control, thereby causing the inconsistency in the size and (a)symmetry of switching costs that reported in different studies using digits and pictures as their stimuli. Since the language combination in this study is Chinese and English which do not have any phonological overlap and cognates, only the last two features were examined.

By comparing standard picture naming to semantically related picture naming, one can test whether the semantic activation impact inhibitory control and language switching. Following the same logic, by comparing standard picture naming to repeated picture naming, one can test whether repetition priming impact inhibitory control and language switching. Once we got the results and confirmed hypotheses that these two effects indeed modulated language switching, it is rationale to argue that the stimulus type is a factor affecting language switching and one can call for an attention to future researchers that Arabic digits might not be ideal stimuli considering their mixed effects.

The comparison between the digit numbers (from 1 to 9) and the standard pictures in which picture stimuli are not unrelated and unrepeated allowed me to address the question of whether switching costs could be affected by stimulus types. Furthermore, as argued before, digits have two unique characteristics that (1) they are

semantically related to each other and (2) they are repeatedly named during the experiment. To match these characteristics, two other picture sets were added: (1) the semantic control set in which picture stimuli are semantically related to each other, and (2) the repeated control set in which nine semantically unrelated pictures were repeatedly presented in this blocked condition like the numerals from 1 to 9. These two control sets aimed to investigate which digit characteristics could result in switching cost differences observed in the first comparison.

### 3.1. Participants

Twenty participants who were postgraduate students at the University of Cambridge participated in this experiment (13 males and seven females, mean age = 25.3). Participants were all right-handed and had normal or corrected to normal vision. They reported Chinese as their stronger first language (L1) and English as their weaker second language (L2). Despite that they started learning English at different ages (ranging from 3 to 12 years old; mean age = 8.1), all 20 participants received formal English training from their junior high school. In addition, all participants had taken the International English Language Test Systems (IELTS) for admission to the University of Cambridge and achieved over 7.5 overall scores. More importantly, most participants had been studying abroad (United Kingdom, United States, and Australia) for their undergraduate degree for more than 3 years, which means that they had much more opportunities to switch between English and Chinese. Finally, participants were paid (4 pounds) as compensation. Power analysis should be conducted in future work on language switching.

### 3.2. Materials and designs

As aforementioned, the aim of this experiment is to investigate the effects of digit characteristics on language switching costs and this exploration could shed light on the difference in switch costs observed in previous studies using different stimulus types (digits and pictures). The four stimulus sets were presented in different blocks, which consisted of (1) a pure digit block (Arabic digits from 1 to 9); (2) a standard picture block in which the object were unrelated and not presented repeatedly; (3) a control block with semantically-related pictures (e.g., animal: dogs/cats; career: firemen and soldiers); and (4) a control block with nine repeated pictures that were semantically unrelated.<sup>1</sup> All the numeric stimuli were presented pseudo-randomly so that the same digit was not presented consecutively. All pictures were black-and-white line drawings.

The whole digit condition consisted of 61 Arabic digit stimuli. The first trial was a null switch trial, and therefore there were 60 trials in total. Half trials were to be named in Chinese and the other half in English. Crucially, there were two types of trials: (1) switch trials, in which the current stimulus was to be named in a different language

<sup>1</sup> All picture stimuli used in the current study obtained from: <https://crl.ucsd.edu/experiments/ipnp/> (Accessed on November 11, 2021).

from the preceding one (e.g., Chinese, English or English, Chinese); and (2) non-switch or stay trials, in which the current stimulus was to be named in the same languages as the previous one (e.g., Chinese, Chinese or English, English). The number of these two types of trials was balanced.

The standard picture block was composed by unrelated common objects that were selected from the International Picture Naming Project database. The semantically-related picture block comprised items related to animals, careers and transportations, respectively. Similar to the digit block, there were 61 pictures and 60 trials with equal number of language switches and repetitions in these two pictorial blocks. Finally, other nine pictures formed the repeated picture set and were presented repeatedly within 60 trials. Each picture (2 cm high\*1 cm wide) was presented at the center of the laptop screen. The block order was counterbalanced across participants, but the trial sequence in each block was kept fixed. The response language in each trial was indicated by a colour cue, with red indicating Chinese and blue indicating English.

### 3.3. Procedure

Participants were tested individually in a quiet room, and they were seated approximately 40 cm from the laptop screen. Prior to the experiment, participants were required to sign the Participant Consent Form of University of Cambridge. Verbal instructions were then given to them before the experiment that they were supposed to name the digits and the pictures as quickly and accurately as possible in either their L1 or L2 according to the colour cues. Depending on the condition, participants were informed which type of stimuli would be presented on the laptop screen.

Before the formal experiment, participants were required to name each picture stimulus both in Chinese and English without time pressure and given the correct name in the case of an error. In addition, to familiarize the participants with the experiment and the voice-key, they proceeded with a practice block containing 16 trials (8 picture trials and 8 digit trials).

During the experiment, written instructions were presented on the screen in the participants' native language, Chinese. Then, each trial started with a fixation across ("+") presented for 400 ms. Then a red or blue square appeared on the screen for 600 ms as a language cue, immediately after which an Arabic numeral or a picture was presented. The stimuli remained on the screen for 1,300 ms during which participants' reaction times (RTs) were recorded by the SuperLab 6.0. Then, the next fixation across was presented for 400 ms before the subsequent trial began. Participant were given a four-minute break between blocks. The whole experiment took approximately 45 min to complete.

### 3.4. Apparatus

The whole experiment was conducted using a laptop running Microsoft Windows 10 operating system. Stimulus presentation and data collection were set out using SuperLab 6.0 software (Cedrus Corp.). Naming responses were collected using an Input Microsoft Sound Mapper. Participants' naming latencies were recorded by the Realtek HD Microphone, which measured from the display of the

target stimulus to the speech onset of the vocal responses. The writer sat next to participants to record naming accuracies.

## 3.5. Data coding and analysis

The first trial in each condition was coded as a null switch trial and thus excluded from subsequent analyses. In addition, naming responses beyond the response interval (1,300 ms) or less than 600 ms during which the microphone was mis-triggered (e.g., by stuttering or cough) were excluded from the data analyzes (3.9% of the data). Naming errors here refer to those incorrect names and the inappropriate response language.

The dependent variables were participants' accuracy rates and naming latencies (RTs). The within-subject independent variables in the basic contrast were the 'stimulus type' (digits, the standard pictures), the 'response language' (Chinese vs. English), and the 'language transition type' (switch vs. stay trials). The mean correct response latencies (RT) and percentage error data were analyzed separately using analysis of variance (ANOVA) run in IBM SPSS Statistics (SPSS Inc. Released 2007. SPSS for Windows, Version 16.0. Chicago, SPSS Inc). In further contrast, participants' performance in the standard picture set was compared to that in two picture stimulus control conditions: (1) semantic control condition, and (2) repeated number control condition.

It should be noted that switching costs are mainly calculated by the reaction time difference but not the accuracy (or error) rate between stay and switch trials in previous language and task switching studies. This is because accuracy rates were either very high (e.g., Guo et al., 2011) or insensitive to switching costs (e.g., Meuter and Allport, 1999; Costa and Santesteban, 2004). Therefore, this study will follow this trend: the analysis of the accuracy rate data were reported but switching costs were only measured by the naming latency difference between stay and switch trials.

## 4. Data analysis

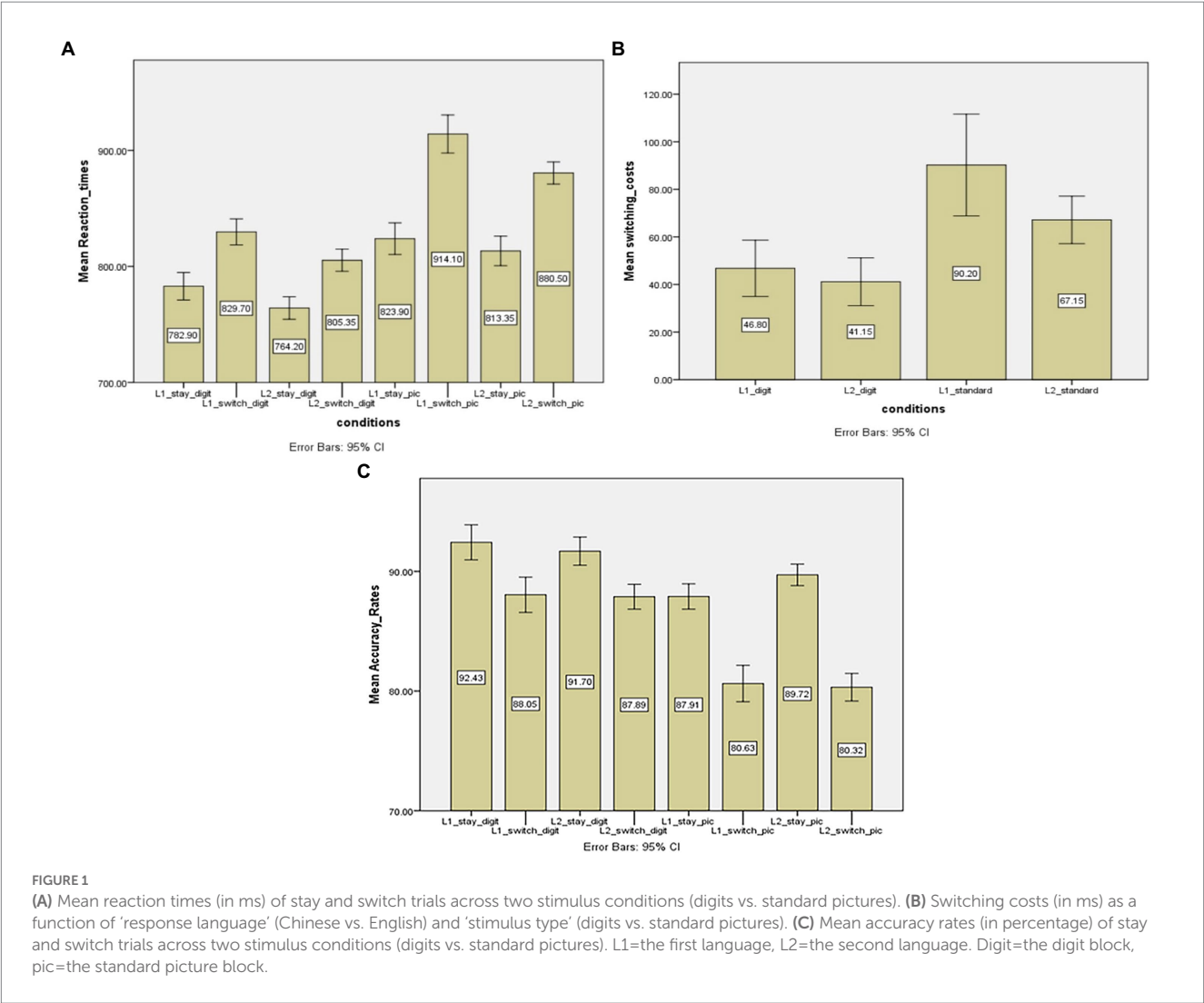
### 4.1. Digit vs. standard picture stimuli

In this comparison, performance between digits naming and standard picture naming was compared (see Table 1 for a summary of this comparison). Figure 1A shows mean reaction times in different trials. It is important that the two-way interaction effect was found between 'transition type' and 'stimulus type',  $F(1,19) = 49.506$ ,  $p < 0.001$ ;  $MSE = 333$ ;  $\eta_p^2 = 0.177$ , revealing that the naming latency differences between switch trials and stay trials varied from Arabic digits to objects. Specifically, the switching costs in digit naming were smaller than those in picture naming (90 vs. 44 ms in picture naming and digit naming, respectively). In contrast, the two-way interaction effects of "response language\*" 'stimulus type',  $F(1,19) = 0.042$ ,  $p > 0.05$ , and 'response language\*' 'transition type',  $F(1,19) = 4.083$ ,  $p > 0.05$ , and the three-way interaction effect of 'response language\*' 'stimulus type\*' 'transition type',  $F(1,19) = 2.646$ ,  $p > 0.05$ , were not significant.

In addition, further paired sample *t*-tests were performed to examine the switching costs were asymmetrical between two languages in different stimulus type conditions (see Figure 1B for the

TABLE 1 Reaction times in ms and accuracy rates in percentage (standard deviations in brackets) in the digit naming and standard picture naming.

	L1 (Chinese)		L2 (English)	
	Stay trial	Switch trial	Stay trial	Switch trial
Digits	782.90 ms (25) 92.43% (3.0)	829.70 ms (24) 88.05% (3.0)	764.20 ms (21) 91.70% (2.1)	805.35 ms (20) 87.89% (2.0)
Standard pictures	823.90 ms (29) 87.91% (2.0)	914.10 ms (25) 80.63% (3.0)	813.35 ms (27) 89.72% (2.0)	880.50 ms (20) 80.32% (2.0)



overall switching costs in different conditions). For the digit naming, there was no significant difference between switching costs of L1 and L2 (46 ms vs. 41 ms in L1 and L2, respectively),  $t(19) = 0.746$ ,  $p > 0.05$ . For the picture naming, however, L1 resulted in larger switching costs than L2 did (90 vs. 67 ms in L1 and L2, respectively),  $t(19) = 2.247$ ,  $p < 0.05$ .

In terms of the main effect, there was a significant effect of ‘stimulus type’,  $F(1,19) = 187.471$ ;  $p < 0.05$ ;  $MSE = 1,752$ ;  $\eta_p^2 = 0.908$ , suggesting that picture naming was much slower than digits naming (i.e., 764 vs. 854 ms in digit naming and picture naming, respectively). Second, there was a significant effect of ‘response language’,  $F(1,19) = 47.63$ ;  $p < 0.05$ ;  $MSE = 704$ ;  $\eta_p^2 = 0.715$ , showing that L1 resulted in slower naming latencies than the L2 did (823 vs. 794 ms, respectively). Third, ‘transition type’ also showed a significant effect,  $F(1,19) = 198.642$ ,  $p < 0.05$ ;  $MSE = 899$ ;  $\eta_p^2 = 0.913$ , suggesting that naming in switch trials was slower than in stay trials (i.e., 776 vs. 843 ms in stay and switch trials, respectively). This also indicates that robust switching costs were observed in the picture and digit naming tasks when the cue-to-stimulus intervals were at 600 ms.

Figure 1C shows mean accuracy rates in different trials. A two-way interaction effect was observed between ‘stimulus type’ and ‘transition type’,  $F(1,19) = 179.776$ ,  $p < 0.05$ ,  $MSE = 5.495$ ;  $\eta_p^2 = 0.633$ , suggesting that accuracy rate differences between two types of trials varied across digits and pictures. This result is consistent with the observation of RT analysis that switching costs were different between

the picture naming and digit naming. However, main effects of other two-way interaction of ‘response language’\*‘transition type’,  $F(1,19)=0.602$ ,  $p>0.05$ , and ‘response language’\*‘stimulus type’,  $F(1,19)=1.904$ ,  $p>0.05$ , and three-way interaction,  $F(1,19)=3.046$ ,  $p>0.05$  were not significant. Additionally, there were significant effects of ‘stimulus type’,  $F(1,19)=168.057$ ,  $p<0.05$ ,  $MSE=1154.550$ ;  $\eta_p^2=0.898$ , and ‘transition type’,  $F(1,19)=204.755$ ,  $p<0.05$ ,  $MSE=1545.049$ ;  $\eta_p^2=0.915$ . This shows that switch trials resulted in more errors than stay trials did, which is in line with the RT analysis that switch trials caused slower naming responses. On the other hand, the variable ‘response language’ did not show the significant effect,  $F(1,19)=0.9$ ,  $p>0.05$ , suggesting that both L1 and L2 caused comparable naming errors.

## 4.2. Discussion

The purpose of this comparison (digits vs. standard pictures) is to examine whether the stimulus type could have a potential influence on switching costs. Replicating previous studies on language switching (e.g., Meuter and Allport, 1999; Costa and Santesteban, 2004; Costa et al., 2006; Philipp et al., 2007), switch trials resulted in slower naming latencies and lower accuracy rates in digit and picture naming, that is, the switching costs were clearly observed. This result is consistent with the IC model (Green, 1998) that the presence of switching costs is due to the effort to overcome the inhibition of the previously non-target language. In addition, crucial to the comparison between two different types of stimuli is that the amounts of switching costs are modulated by the stimulus type as shown in the interaction effect between the ‘transition type’ and ‘stimulus type’. In other words, it was found that the switching costs were smaller in the digit naming than in the picture naming, which is in line with the Hypothesis 1 that the picture naming will lead to larger switch costs compared to the digit naming. Surprisingly, the stimulus types also had an effect on the asymmetry of switch cost; symmetrical switching costs were observed in digit naming not in standard picture naming.

The observed digit effect is a novel finding showing that the stimulus type can have a potential effect on the size and (a)symmetry of switching costs, given that the previous literature on language switching has largely focused on examining participant-related factors, such as language proficiency or the age of the L2 acquisition, that might affect the switching costs (e.g., Costa and Santesteban, 2004; De Groot and Christoffels, 2006; Festman and Mosca, 2016). This observed “digit facilitation effect” could explain the disparities in switch costs observed in previous studies using these two types of stimuli.

As aforementioned, the Arabic digits have two unique characteristics (the phonological overlap is not applicable in

Chinese-English language combination): (1) they belong to the same semantic category group; (2) they are repeatedly presented, compared to the standard objects, which might be attributed to the smaller size and symmetry of switching cost differences. This argument appears to be rational considering Costa and Santesteban (2004) and Costa et al. (2006), where symmetrical switching costs were also reported with only ten pictures being repeatedly named through the whole experiment. Therefore, in order to examine whether the reduction in switching costs is due to these characteristics, participants’ performances in the semantic picture set and repeated picture set were analyzed in the following.

## 4.3. The standard picture set vs. the semantic control set

In this comparison, participants’ performance in the standard picture set was compared to that in the semantic control stimuli set. Similar to the previous comparison, a three-way 2 (response language: Chinese vs. English)\*2 (language transition type: stay vs. switch trials)\*2 (stimulus type: the standard vs. semantically related pictures) repeated ANOVA was performed for RT and accuracy rates analyses. Table 2 highlights participants naming performance in different conditions.

A two-way interaction effect between ‘language transition type’ and ‘stimulus type’ was observed,  $F(1,19)=36.147$ ;  $p<0.05$ ;  $MSE=683.347$ ;  $\eta_p^2=0.655$ , suggesting that naming latency differences between switch trials and stay trials were different between two stimulus types. Specifically, the switching costs were larger in the standard picture set than in the semantic control set (79 vs. 30 ms, respectively). Therefore, it can be argued that semantic information of the stimulus can account for the decrease in the switching costs. Additionally, the interaction effect of ‘response language’ and ‘transition type’ ( $F(1,19)=5.904$ ,  $p<0.05$ ,  $MSE=845.309$ ,  $\eta_p^2=0.211$ ) indicates that switching costs were different between the L1 and the L2. In contrast, the two-way interaction effects of ‘response language’\*‘stimulus type’,  $F(1,19)=0.009$ ,  $p>0.05$ , and the three-way interaction effect,  $F(1,19)=0.056$ ,  $p>0.05$  were not significant (see Table 2 for a summary of this comparison).

In order to further examine the effect of stimulus type on the asymmetry in switching costs, paired sample t-tests were performed (see Figure 2B for the overall switching costs in different conditions). For the standard picture naming, the switching costs for the L1 were significantly larger than those for the L2 (90 vs. 67 ms in L1 and L2 naming, respectively),  $t(19)=2.247$ ,  $p<0.05$ . However, in the semantic control set, the switching costs were comparable for L1 and L2 (38 vs. 20 ms),  $t(19)=1.160$ ,  $p>0.05$ . Therefore, this pattern of results assumes that the semantic blocking effect can modulate the asymmetry in switching costs.

TABLE 2 Reaction times in ms and accuracy rates in percentage (standard deviations in brackets) in the semantically related picture naming and standard picture naming.

	L1 (Chinese)		L2 (English)	
	Stay trial	Switch trial	Stay trial	Switch trial
Semantically-related pictures	846.55 ms (32) 85.34% (2.0)	884.75 ms (35) 85.08% (2.0)	832.85 ms (29) 84.06% (3.0)	852.60 ms (34) 83.98% (2.0)
Standard pictures	823.90 ms (29) 87.91% (2.0)	914.10 ms (25) 80.63% (3.0)	813.35 ms (27) 89.72% (2.0)	880.50 ms (20) 80.32% (2.0)



According to Figure 2A, naming responses in switch trials were significantly slower than those in stay trials (829 vs. 882 ms;  $F(1, 19) = 112.050$ ;  $p < 0.05$ ;  $MSE = 1034.255$ ;  $\eta_p^2 = 0.855$ ), pointing to the switching costs. Additionally, there was also a main effect of ‘response language’,  $F(1, 19) = 67.601$ ;  $p < 0.05$ ;  $MSE = 299.553$ ;  $\eta_p^2 = 0.781$ , suggesting that the L1 resulted in slower naming latencies than the L2 did (867 vs. 844 ms in L1 and L2 naming, respectively).

Figure 2C shows mean accuracy rates in different trials. There was a two-way interaction effect of the ‘transition type’\*‘stimulus type’,  $F(1, 19) = 76.609$ ,  $p < 0.05$ ,  $MSE = 666.672$ ;  $\eta_p^2 = 0.801$ , suggesting that the accuracy rate differences between stay and switch trials were larger in the standard picture naming than in the semantically related picture naming. This is in line with the observation of the naming latencies, confirming that the switching costs would become smaller in the semantic blocking condition. Other two-way interaction effects of ‘response language’ \* ‘stimulus type’ ( $F(1, 19) = 3.933$ ,  $p > 0.05$ ) and ‘response language’ \* ‘transition type’ ( $F(1, 19) = 1.567$ ,  $p > 0.05$ ) were not significant. Lastly, there was no three-way interaction effect,  $F(1, 19) = 2.681$ ,  $p > 0.05$ . The analysis of accuracy rates also showed that the main effect of the ‘transition type’,  $F(1, 19) = 115.309$ ,  $p < 0.05$ ,

$MSE = 723.350$ ;  $\eta_p^2 = 0.859$ , was significant, suggesting that switch trials caused more errors than stay trials did. In contrast, main effects of the ‘response language’,  $F(1, 19) = 0.297$ ,  $p > 0.05$ , and the ‘stimulus type’,  $F(1, 19) = 0.052$ ,  $p > 0.05$ , were not significant.

## 4.4. Discussion

The results clearly reflect the influence of stimulus type on language switching costs, that is, the switching costs can be modulated when stimuli belong to the same semantic category, which provides evidence for the Hypothesis 2. Specifically, the switching costs became smaller in the semantic control set in which the semantic blocking condition was formed than in the standard picture set. In addition, the asymmetry in switching costs was also affected, that is, L1 caused the same amount of switching costs as the L2 did in the semantic control picture set.

Crucial to the present context is the observation that the speed with which a given picture can be named is affected by whether or not objects from the same category have been named in the preceding trials (e.g., Damian et al., 2001; Rahman and Melinger, 2009). Previous

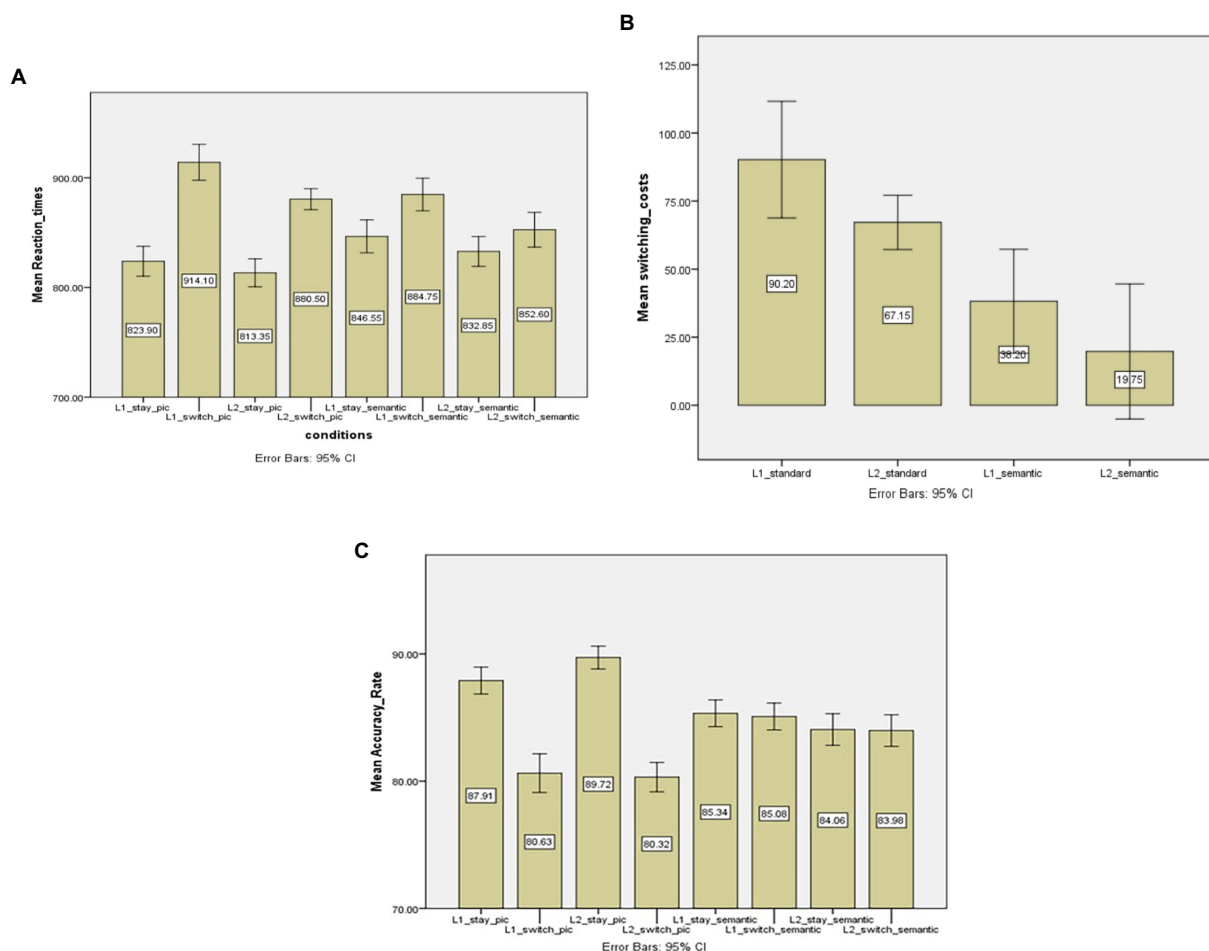


FIGURE 2

(A) Mean reaction times (in ms) of stay and switch trials across two stimulus conditions (standard vs. semantically related pictures). (B) switching costs (in ms) as a function of ‘response language’ (Chinese vs. English) and ‘stimulus type’ (standard vs. semantically related pictures). (C) Mean accuracy rates (in percentage) of stay and switch trials across two stimulus conditions (standard vs. semantically related pictures). L1=the first language, L2=the second language. Standard=the standard picture condition, semantic=the semantically related picture condition.



studies on blocked naming task manipulate the context in which pictures appear in successive trials depicting objects that are from the related semantic categories—the homogeneous context, or that are not related to each other—the heterogeneous context. The general finding is that objects are named more slowly in the homogenous context than in the heterogeneous context, when pictures are named several times (e.g., Damian et al., 2001; Damian and Rahman, 2003) or once (e.g., Kroll and Stewart, 1994). This finding may predict that stay trials in the semantic control set would result in slower naming responses than those in the standard picture set due to the semantic blocking effect. To such an end, a 2 (response language: Chinese vs. English)  $\times$  2 (stimulus type: the standard picture vs. semantically related picture) ANOVA was performed in stay trials. There was a main effect of ‘stimulus type’,  $F(1,19)=8.936, p<0.05$ , which confirms the prediction that stay trials in the semantic condition caused slower naming latencies than those in the standard picture condition did (839 vs. 818 ms).

The situation seems to be more complicated if a semantic competitor that has been named previously is in another language. As aforementioned, the IC model (Green, 1998) implements language control in bilingual context through a mechanism that inhibits activation from the language that is not relevant for speech production. In the language staying context, when a language task schema is maintained (e.g., speaking in L1), this inhibitory mechanism suppresses co-activated lemmas from the non-response language (L2). Consequently, this “staying relationship” between two consecutive trials can allow for the within-language semantic interference effect as suggested before, thus causing slower naming latencies in stay trials when objects are semantically related. However, if there is a change of language (e.g., switching from language A to language B in the switch trials) this inhibition mechanism suppresses those lemmas with non-response language A tags that are previously activated for production. Therefore, it can be argued that the inhibition is thought to have a global effect on the non-response language, which means that it will inhibit active words with incorrect language tag (e.g., Green, 1998).

In sum, the semantic blocking effect could cause the interference effect on the stay trial but cannot affect the switch trial, therefore a reduction in switching trials could be reasonably observed when the stimulus belongs to the same semantic category. Furthermore, another interpretation of such a reduction in switching costs and the change in asymmetry might come from the ‘concept-switching facilitation’ theory proposed by recent researcher on language switching studies (e.g., Declerck et al., 2013, 2015; Zhang et al., 2020).

#### 4.5. The standard picture set vs. the repeated control set

In the last comparison, participants’ naming responses in the standard picture naming were compared to those in the repeated picture naming. This comparison aims to explore whether the repetition priming effect can lead to the smaller switching costs as predicted in the Hypothesis 3. A 2 (response language: Chinese vs. English)  $\times$  2 (language transition type: stay vs. switch trials)  $\times$  2 (stimulus type: standard vs. repeated pictures) within-subject ANOVA was performed for RT and accuracy rate analyses. Table 3 highlights participants naming performance in this comparison.

Figure 3A shows mean reaction times in different trials. A two-way interaction effect was found between ‘transition type’ and

‘stimulus type’,  $F(1,19)=16.782, p<0.05$ ;  $MSE=801.504$ ;  $\eta_p^2=0.469$ , revealing that the naming latency differences between switch trials and stay trials varied from the standard picture set to the repeated control set. Specifically, the switching costs in the repeated picture naming were smaller than those in the standard picture naming (42 vs. 79 ms). In contrast, the two-way interaction effect of “response language”  $\times$  ‘stimulus type’ ( $F(1,19)=0.250, p>0.05$ ) was not significant. Lastly, there was a three-way interaction effect of ‘response language’, ‘stimulus type’ and ‘transition type’,  $F(1,19)=5.933, p<0.05$ ,  $MSE=379.250$ ;  $\eta_p^2=0.238$ , suggesting that switching cost differences between two stimulus types varied from L1 to L2.

In order to further examine whether the stimulus type affects the asymmetry in switching costs, paired sample t-tests were performed (see Figure 3B for the overall switching costs in different conditions). The result showed that the switching costs were asymmetrical between two languages in the repeated picture naming,  $t(19)=2.779, p<0.05$ , and the L1 resulted in slower naming responses than the L2 did (57 vs. 27 ms). The same pattern of result was also observed in the standard picture naming, and the switching costs for the L1 were significantly larger than those for the L2 (90 vs. 67 ms),  $t(19)=2.247, p<0.05$ . Consequently, it can be argued that the asymmetry in switching costs cannot be modulated by repetition priming effect.

In terms of the main effect, there was a significant effect of ‘stimulus type’,  $F(1,19)=104.771, p<0.05$ ;  $MSE=1337.459$ ;  $\eta_p^2=0.846$ , suggesting that the standard picture naming was much slower than the repeated picture naming (857 vs. 798 ms). Second, there was a significant effect of ‘response language’,  $F(1,19)=16.171, p<0.05$ ;  $MSE=1498.454$ ;  $\eta_p^2=0.460$ , showing that L1 resulted in slower naming latencies than the L2 did (840 vs. 816 ms, respectively). Third, ‘transition type’ also showed a significant effect,  $F(1,19)=309.007, p<0.05$ ;  $MSE=471.267$ ;  $\eta_p^2=0.942$ , suggesting that naming in switch trials was slower than in stay trials (i.e., 798 vs. 858 ms in stay and switch trials, respectively).

Figure 3C shows overall accuracy rates of this comparison. a two-way interaction effect of ‘transition type’ and ‘stimulus type’ was observed here,  $F(1,19)=107.674, p<0.05$ ,  $MSE=584.078$ ;  $\eta_p^2=0.850$ , suggesting that accuracy rate differences are significant between two types of stimuli. This is in line with what was observed in the analysis of RT data that switching costs became smaller in the repeated picture naming condition. On the other hand, other two-way interaction effects, such as ‘response language’  $\times$  ‘stimulus type’ ( $F(1,19)=1.320, p>0.05$ ) and ‘response language’  $\times$  ‘transition type’ ( $F(1,19)=1.391, p>0.05$ ) and three-way interaction effect were not significant ( $F(1,19)=3.207, p>0.05$ ). The results of the accuracy rate analysis also showed that there were main effects of ‘transition type’ ( $F(1,19)=178.069, p<0.05$ ,  $MSE=812.252$ ;  $\eta_p^2=0.904$ ) and ‘stimulus type’ ( $F(1,19)=529.405, p<0.05$ ,  $MSE=1704.983$ ;  $\eta_p^2=0.965$ ), but not of ‘response language’ ( $F(1,19)=4.193, p>0.05$ ). These revealed that stay trials and repeated picture stimuli resulted in higher accuracy rates.

#### 4.6. Discussion

In line with the observations of the semantically related vs. standard pictures, the results of RT and accuracy rate analyses here reflect the influence of the repetition priming on language switching

costs, that is, the switching costs can be modulated when stimuli are presented repeatedly, which provides evidence for the Hypothesis 3. Specifically, the switching costs became smaller in the repeated control set than in the standard picture set. However, the asymmetry in switching costs appeared not to be affected by the repetition priming effect, since the L1 caused larger switching costs than the L2 did with both types of stimuli. This pattern of results provides clear evidence that the main difference between bilingual picture naming and digit naming in switch paradigm lies to the repetition of digits. The reason why repetition priming effect can modulate language switching costs will be analyzed in the General Discussion section.

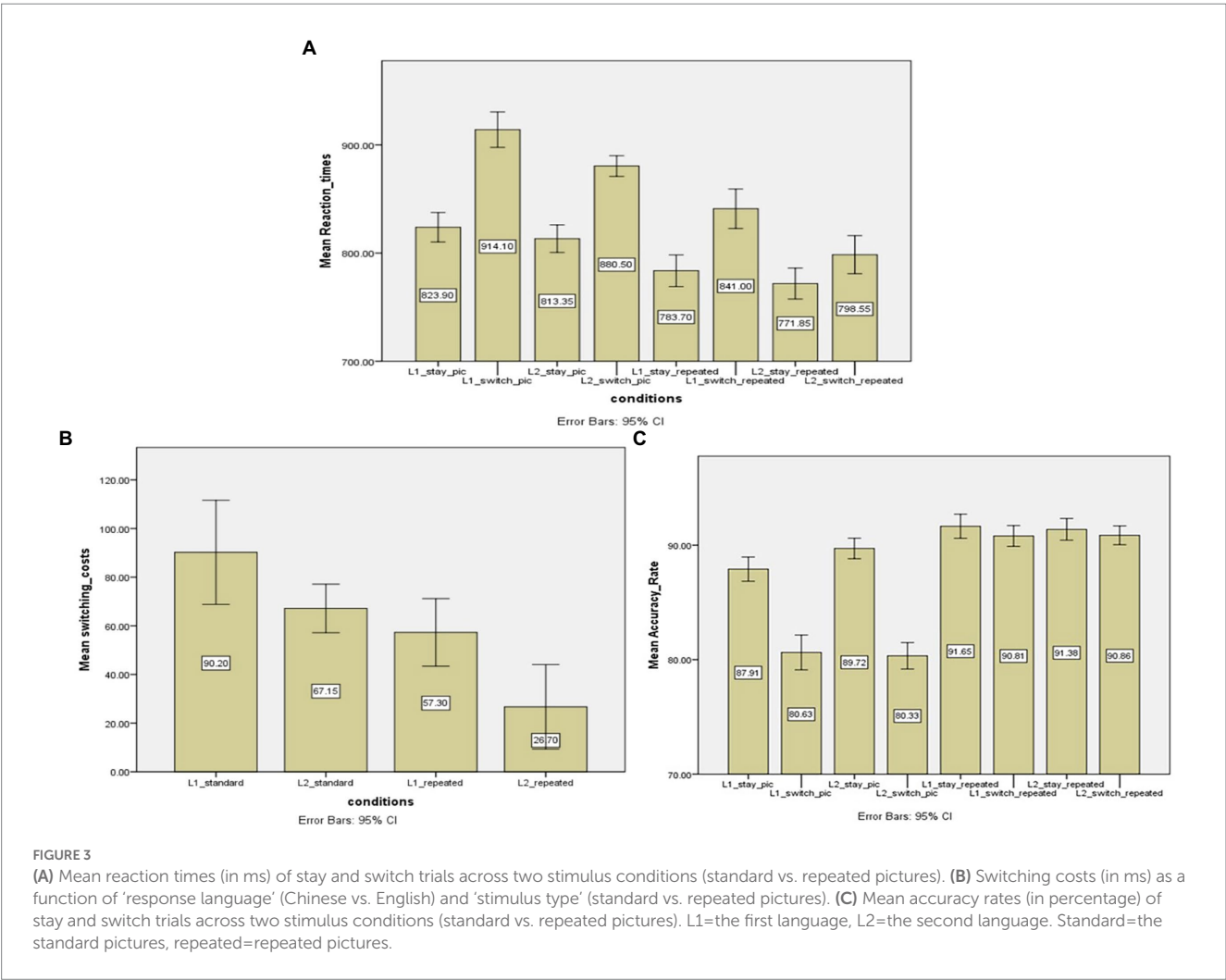
## 5. General discussion

### 5.1. Arabic digits vs. pictures: The cognate effect?

It should be noted two languages examined in the present study are Chinese and English that belong to two different language families. Specifically, Chinese belongs to the Sino-Tibetan language family that does not have an alphabet system but uses a logographic system for the written language, and thus Chinese words are not created out of letters as is the case with alphabetic systems (e.g., English and German). This phonological difference will not give rise to the cognate

TABLE 3 Reaction times in ms and accuracy rates in percentage (standard deviations in brackets) in the repeated picture naming and standard picture naming.

	L1 (Chinese)		L2 (English)	
	Stay trial	Switch trial	Stay trial	Switch trial
Repeated pictures	783.70 ms (31) 91.65% (2.0)	841.00 ms (39) 90.81% (1.9)	771.85 ms (30) 91.38% (2.0)	798.55 ms (38) 90.86% (2.0)
Standard pictures	823.90 ms (29) 87.91% (2.0)	914.10 ms (35) 80.63% (3.0)	813.35 ms (27) 89.72% (2.0)	880.50 ms (20) 80.33% (2.0)



words. Cognates are words in two languages that have a common origin and thus are similar or identical and have the same meaning.

Interestingly, this cognate effect was observed in [Declerck et al. \(2012\)](#) with German-English bilinguals. They hypothesized that many digits (in German and English) are cognate such as “six,” “nine,” “five” in English and “sechs,” “neun” “fünf” in German, which can possibly be taken to interpret the difference in switch costs observed in previous studies using different target stimuli. To test their hypothesis, a cognate picture set that constituted of items depicting cognates was added and participant’s naming responses performance in digit naming, standard picture naming and cognate picture naming were recorded. The results showed that switch costs were smaller for digit naming when comparing the digit stimuli set and standard picture stimuli set, while no switch cost difference was observed between the cognate picture set and digit set. Taken together, this data pattern reveals that phonological overlap between two languages can account for the smaller switch costs in digit naming. Furthermore, as suggested by the inhibitory control model, lexical selection mechanism suppresses the activation of the unintended language and the re-activation of previously inhibited lexical items requires time, which accounts for the reason why slower response latencies are observed when switching between two languages. Following this line of logic, if the switch costs become smaller and overcoming the inhibition requires less time, it can be assumed that bilingual digit naming exerts less language control than picture naming. This is arguably because repetition priming effect observed in the present study and phonological overlap reported in [Declerck et al.’s \(2012\)](#) study strengthen the activation levels of target lexical items to reach the threshold for language production, thus partially eliminating the lexical repetition between two languages.

However, the finding that cognate status could reduce the switch costs has been challenged by [Verhoef et al. \(2009\)](#), who examined Dutch-English bilinguals’ performance in the language-switching task and did not observe differences in switch costs between pictures that have cognate words in the other language and those that do not have. Interestingly, [Christoffels et al. \(2007\)](#) even found that pictures depicting cognates exert larger switch costs than those depicting non-cognates. Taken together, whether the cognate can be taken as an indicator of smaller switch costs needs further examination. These contradicted results might reveal that the observation in [Declerck et al.’s \(2012\)](#) study that cognate pictures could reduce the switching costs was mainly due to the repetition of these cognate pictures rather than the phonological overlaps.

## 5.2. Semantic and repetition priming effects and their implications for bilingual language control

As suggested in this experiment, the stimulus type differences could have potential influences on the switching costs, that is, digit naming leads to less magnitude of and symmetry in switching costs than object naming, suggesting that bilingual digit naming requires less inhibitory control than picture naming. Given that this digit-leading facilitation effect is a novel finding (to the best of my knowledge, only one study by [Declerck et al. \(2012\)](#) reached a similar conclusion), there is no such existing theoretical model or framework

in the bilingual language production literature that can be taken as an interpretation for it. However, fortunately, the observations through comparing Arabic digits to semantic control picture sets and repeated control picture sets provide a clear hint as to the role of repetition and semantic priming effects in the modulation of the bilingual language control process. Note that this study did not compare digit naming directly with manipulated picture naming is because digits have two different features that makes it difficult to independently test each of them. The second concern is that these two features might cause an additive effect. There are three interpretations for the modulation of semantic priming effect on switching costs.

The first possible reason for a reduction in the switching costs would be a slower naming latency in stay trials if the naming latencies of the switch trials keep constant. This might be the case in the semantic control picture set. Crucial to the semantic contextual effects is the observation that naming latencies with which a stimulus was named was influenced by previous one from the same semantic category. Previous studies on the lexical retrieval process in speech production have had a converging result showing that “retrieving a word has a negative effect on the subsequent retrieval of other words from the same semantic category” (e.g., [Oppenheim et al., 2010](#), p. 227). These negative consequences have been termed cumulative semantic interference. For example, naming ‘dog’ could result in a slower naming latency when it is followed by a semantically related word such as ‘cat’ or ‘pig’ than by an unrelated word such as ‘pen’. Consequently, stay trials in semantic control block may form the cumulative semantic interference effect, leading to slower naming latencies.

However, in switch trials, where the language membership changes, it is argued that the semantic contextual effect should disappear because of the language alternation (e.g., [Green, 1998](#); [Runnqvist et al., 2012](#)). As suggested by [Green \(1998\)](#), the bilingual control mechanism achieves inhibition by regulating the so-called “language task-schema” that is responsible for controlling output goals (i.e., speak in the L1 or speak in the L2). These language task schemas control the activation levels of the lexical system by connecting them with language tags that reflect the language membership of the lexicon. In this way, the language task-schema could exert the suppression signal on the lexical system, inhibiting all lexical nodes containing language tags of the non-target language. This inhibitory control process has a globally negative effect on the non-target language tags, suppressing any lexical representation containing incorrect language tags, regardless of any linguistic relationship among non-target lexical items.

Therefore, these two assumptions have led scholars to argue that lexical items that have been previously retrieved in one language will not have sufficient activation to interfere language production when naming semantically-related words in the other language in the following trials ([Runnqvist et al., 2012](#)). For example, naming ‘cat’ will not cause interference with the naming of ‘gou’[dog] in Chinese. As [Green \(1998, p. 75\)](#) explained, “if there is any changes of language, then any lemmas in the previously active language will become inhibited.” In certain circumstances, this should lead to the abolition of both across-language and within-language competition priming.” This argument was confirmed in [Lee and Williams’s \(2001\)](#) study, where they found that the semantic interference effect disappeared when there was a change of language membership in advance of the production of the target stimulus. Taken together, this line of evidence

suggests that the semantic status of the picture stimuli does not have any effect on the language alternation or switch process.

In sum, the reduction in switching costs could be attributed to the different functionality of semantic contextual interference in stay and switch trials. On the other hand, the RT data seem to be at odds with a strong version of the IC model that predicts that the semantic contextual interference effect could be completely abolished since there were still slower naming latencies in switch trials in the semantic control block compared to those in the standard picture block. Nevertheless, the weaker version of the IC model still allows for some components of the semantic interference effects when switching between languages might fit with the present study.

The second possible explanation of the finding that semantic priming effects allow for reducing the need for inhibitory control comes from the argument that bilingual language control might occur at different lexical processing stages (e.g., Green, 1998; Declerck et al., 2015; Zhang et al., 2020). As explained in the literature review section, the second tenet of the IC model argues that inhibitory control is reactive, suggesting that the stronger the activation of competitors in the non-target language, the stronger the inhibition that needs to be applied. Following this logic, an observed reduction in the inhibition process could imply that the activation of lexical representations in the unintended language is affected by some other factors, such as the semantic and phonological relationships between words.

According to the language production model (e.g., Levelt et al., 1999), language production starts with the activation of semantic representations that then spreads to lexical nodes at the lemma level, followed by activation at the phonological level. For example, when bilinguals switch from “dog” in English to the “cat” in Chinese, it requires switching between semantic representations (or concepts, i.e., from “DOG” to “CAT”) and lexical representations (or lemmas, i.e., from “dog” to “猫” cat in Chinese). One could argue that manipulations at the concept level should affect language switching (e.g., Declerck et al., 2013, 2015; Chang et al., 2016). This appears to be the case in the semantic control picture set. Note that semantically related pictures were presented in a blocked condition (i.e., animal, occupations, and transportation blocks), allowing participants to be aware of the semantic categories at the start of each block. Consequently, those semantic representations or concepts (at least some of them) belonging to a specific semantic category group can be prepared or activated in the bilingual’s lexicon, compared to the standard picture condition, where there is no such prepared activation. Consequently, once the semantic representations in the same category can be projected in advance, the switching costs at the concept level are reduced. This argument is congruent with Zhang et al.’s (2020) study, where they found that related and repeated concepts facilitate language switching as compared to unrelated concepts.

This prepared activation caused by the conceptual facilitation effect reduces the amount of inhibition needed to suppress the non-target semantic representations, thus speeding up the concept selection process. This argument appears to be reconciled with the IC model in a way that inhibitory control is still required globally to suppress the activation of non-target representations and lemmas. Furthermore, it might also be that participants may notice the shared semantic feature of the items in the blocked condition as in this experiment and use this knowledge to predict other items in this semantic cohort (Belke et al., 2017). That is, the semantic priming effect constrains the activation of lexical items to a certain semantic category, which may lead to a local inhibition of non-target lexical items belonging to this semantic group. Compared to

the global inhibition executed on the entire language, this local inhibition might be much weaker so that switching costs become smaller when pictures are semantically related. Taken together, these could suggest that different conditions might invoke different types of inhibitory control, i.e., local versus global control.

According to Declerck et al. (2015) and Kroll and Stewart’s (1994) Concept-Word Association Model, once the semantic concepts are activated, L1 lexical nodes receive a higher level of activation than those of L2 because the concepts have a stronger connection to their L1 lemma than their L2 translation equivalents. Therefore, in the semantic control block, where the conceptual representations can be predicted and prepared, L1 lexical representations will receive more activation than L2 lexical items. Furthermore, as Declerck et al. (2015) argued, this effect only operates on switch trials, where cross-language competition is fierce. Therefore, when switching from L2 to L1, this extra-activation of L1 lexical representations in the semantic control block makes the recovery from inhibition of L1 lemmas much easier and less time-consuming than the standard picture block. In contrast, when switching from L1 to L2, the L2 lemmas are activated less than the L1 lemmas, prior to the language control process, and thus should be more difficult to recover. These activation differences therefore reduce the asymmetry in switching costs in the semantic control set compared to the standard picture set. Furthermore, this idea seems to illustrate that language control mechanisms may involve both inhibition and facilitation (Declerck et al., 2013).

Regarding the repetition priming effect, Kleinman and Gollan (2018) observed that naming pictures in one language slowed the subsequent naming of their translation equivalents, such that naming ‘dog’ inhibits ‘perro’ and vice versa to the same extent. Moreover, they also found that this inhibitory effect is considered long-term, and “not only does this inhibition effect over trials, which also accumulates without plateauing for at least as long as measured here in; i.e., 96 trials’ (Kleinman and Gollan, 2018, p. 122). These patterns of results thus led them to further assume that the cross-language repetition priming effect in fact results in an increase in switching costs but does not affect the asymmetry of switching costs.

At first glance, this argument in a sense is in direct conflict with repetition priming and the results observed from the repeated picture control group. In addition, the idea that this long-term inhibitory effect resulted from a cross-language repetition effect also contradicts what was found in Francis and Saenz, 2007 study. It was found that Spanish–English participants named picture stimuli more quickly in both L1 and L2 when they had previously named the same pictures than when they have never named them. Here, it is very difficult to deny Kleinman and Gollan’s (2018) argument for lateral inhibition of the translation equivalent, thus I adopt a compromise to interpret it. Specifically, the co-existence of between-language inhibition and repetition facilitation raises the possibility that the repetition facilitation effect from previously naming the stimuli can dwarf the inhibition of naming it in the other language.

In sum, in the present study it is clear that the inhibitory control mechanisms can be modulated by other aspects of language processing such as repetition and semantic priming effects. However, there is no model of inhibitory control specified in previous studies that can interpret these patterns of findings, and thus future research needs to work on this field to examine how bilingual language control is adapted to different language processing conditions. Furthermore, note that this study adopted a cued (forced) language switching paradigm where the response



language is determined by the colour cue, which is significantly different from voluntary language switching (e.g., natural naming). Some studies using a voluntary language switching task (e.g., Gollan and Ferreira, 2009; Blanco-Elorrieta and Pyllkanen, 2017; de Bruin et al., 2018) reported that language switching costs became smaller or even disappeared in the voluntary language switching task compared to forced (cued) language switching. This, in combination with their neuroimaging evidence, leads Blanco-Elorrieta and Pyllkanen (2017) to suggest that inhibition may not be required when bilinguals spontaneously switch between two languages and that a language-specific selection mechanism allowing bilinguals to directly select target lexical items regardless of robust lexical competition is developed. Nevertheless, considering the current findings that inhibitory control may operate at different levels [e.g., semantic representation level (conceptual level), lemma (lexical selection) level, phonological level, and so on], it might be that voluntary language switching allows for the workaround of some components of inhibition (but not all of them) associated with language switching at certain levels. This argument appears to be consistent with findings that switching costs became smaller but did not disappear as observed by Gollan and Ferreira (2009). Furthermore, it is still unclear how and where voluntary language switching reduces switching costs and modulates inhibitory control processes, which deserves further investigation.

## 6. Conclusion

Previous language switching studies mainly used two types of stimuli: Arabic digits and pictures, however, the results appear to be inconsistent: the size of and (a)symmetry in switching costs differ across studies. The current experiment was designed to examine whether and how these methodological differences (task-level factors) modulate the size of and (a)symmetry in switching costs. The results revealed that the digit naming resulted in smaller switching costs than the picture naming, suggesting that bilingual language control is less required in digit naming. However, language switching costs became smaller, when picture stimuli belonged to the same semantic categories or were repeated presented throughout the experiment, compared to when they were unrelated and unrepeatable. These results further suggested that semantic and repetition priming effects helped to reduce switching costs and explain inconsistent results of switch costs in previous studies using different types of stimuli. It is further argued that semantic priming effects can result in less global inhibition required to suppress the activation of non-target language and a local inhibitory control executed only on a specific semantic category.

In general, these results are in line with Green's (1998) inhibitory control model that bilingual language production requires the inhibition of the non-target language, and the extent of this inhibition depends on the proficiency (or dominance) of the non-target language, that is, the dominant L1 is inhibited to a larger extent than the weaker L2.

### 6.1. Limitation

Considering a random selection of participants in this study and previous language switching literature, a power analysis should be conducted in future work as a more scientific and rigorous way to determine the sample size. The second deficiency is that participants' L2 proficiency was mainly indicated by interviews and their IELTS

scores, and these qualitative measurements are insufficient. Hence, standardized measurements such as the LEAP-questionnaire (Kaushanskaya et al., 2020) and the Multilingual Naming Test (Gollan et al., 2012) can be used in future research to examine participants' L2 proficiency and socio-cultural status quantitatively.

## Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

## Ethics statement

The studies involving human participants were reviewed and approved by the Department of Theoretical and Applied Linguistics Ethics Committee (DTAL) at the University of Cambridge. The participants provided their written informed consent to participate in this study.

## Author contributions

QS designed and conducted the study, completed the statistical analysis, and wrote the manuscript. YC managed the figure information, co-wrote the manuscript, and contributed to manuscript revision. Both authors contributed to the article and approved the submitted version.

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## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that can be construed as a potential conflict of interest.

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## Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1090744/full#supplementary-material>



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# The need for ecological momentary assessment in researching emotional factors in language education

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Language learning is an emotional and dynamic process, which is marked by fluctuations in language learners' positive and negative emotional variables (e.g., boredom, enjoyment, anxiety). Presumably, evidence can be found for an ecological view of the patterns and variations involved in language learners' emotions under the influence of the interactive individual and contextual elements of classroom learning. The present study contends that an ecological momentary assessment (EMA), which is compatible with the complex dynamic system theory (CDST) can help to explore the dynamics of language learners' emotional variables as they develop out of the process of classroom language learning. EMA is capable of tracing the moment-by-moment changes in a certain emotional trait in language learners as they are learning a foreign or second language. This innovative approach to research compensates for the shortcomings of retrospective studies (the delay of recalls) and also single-shot research designs (for data collection). It is fit for the assessment of the emergent patterns of L2 emotional variables. The distinctive features and pedagogical implications will be further discussed here.

## KEYWORDS

emotional variables, ecological momentary assessment, emotions, second language acquisition, classroom learning, dynamic process

## Introduction

Ecological momentary assessment (EMA) was an attempt originating from clinical psychology to substitute or complement static retrospective works of research, which failed to capture how behavior could change through the passage of time and from one context to another (Hektner et al., 2007). EMA is not considered an individual method of research; rather, it includes an array of methods and methodological approaches. It encompasses a repeated sampling of the research participants' behaviors and experiences at the current time in real life or education and in the participants' natural contexts. EMA seeks to increase ecological validity, lower recall bias, and facilitate the investigation of micro-processes affecting behavior in real-world settings. Studies using EMA evaluate specific phenomena or experiences in the research participants' lives or trace the participants at regular points of time, typically through random time sampling, via technologies including telephones and written diaries to physiological sensors and electronic diaries (Shiffman et al., 2008). The potential of EMA has recently drawn the attention of researchers in the SLA field, and specifically in the area of L2 emotional research (see Elahi Shirvan et al., 2020; Derakhshan, 2022). Thus, a review of these potentials can contribute to deeper insights into how this method can be applied in future research in L2

emotional domain. The distinctive features of EMA and its benefits for researchers will be reviewed here, and then more specifically for the second language acquisition (SLA) domain. Afterwards, we can see how EMA studies can be fit for exploring the L2 emotional variables involved in the classroom language learning process. An exemplary work of research will be presented along with a summary of its findings and the main contributions similar studies could make to the SLA theory and practice.

## Distinctive features of EMA

The data collected through EMA can be used to answer research questions about specific events or contexts, individual differences, and the temporal variation of processes through time, and the interactions between the underlying constructs (Moskowitz and Young, 2006). Thus, they can represent both the complexity and the richness of the data obtained from EMA. The different forms of EMA methods share several distinctive features, which are summarized by Stone and Shiffman (1994) and Stone et al. (2007a) and presented below. EMA deals with data collected from real-world contexts, as the research participants live their natural lives. The ecological dimension of EMA exactly implies this because EMA helps to make a generalization about the participants' real life, and accounts for the ecological validity (Shiffman, 2007). Another distinctive feature is that the measurements are made on the participants' present condition (Shiffman et al., 2008). For instance, the self-reports in EMA enquire about the feelings an individual has at the current time, instead of looking for recalls or an abstraction of what already happened or how the individual felt at long intervals. The momentary dimension of EMA exactly means that it hopes to compensate for the bias and error that can occur in the retrospection method. In EMA, the units of assessment are selected strategically to be moments, whether according to random sampling (to represent the participants' experiences through representative sampling) or the specific variables of interest (e.g., occasions when the individuals get distracted, get bored or enjoy themselves), or by any other type of sampling. The participants are supposed to take part in several measurements at several points of time, illustrating how their behavior and experiences change through time and in different circumstances.

As previously mentioned, EMA can include different methods (e.g., time-based design, event-based monitoring). What these all share is doing measurements of individuals' recent or current conditions, repeatedly sampled through time, in their ecological and natural surroundings (Delespaul, 1995).

## Fundamental literature on EMA

The beginning of EMA is traced back to 1994 (Stone and Shiffman, 1994), and has continued to be an active research area for years. There has been a plentiful volume of research works relying on EMA methodologies. The popularity of EMA as a helpful method of research is evident by the existing reviews and books published on this topic, such as the books about EMA-related methods and the reports published by Stone et al. (2007b), Hektner et al. (2007), and Fahrenberg and Myrtek (2001) employment of EMA uses for psychology by DeVries (1992), and data analysis discussions by Walls and Schafer (2006). There were some review studies by Wheeler and

Reis (1991) about the sampling designs of EMA techniques, Scollon et al. (2003) about the advantages and disadvantages of EMA methods, Bolger et al. (2003) about the different applications of the diary technique, and Piasecki et al. (2007) about the uses of EMA techniques for clinical psychology.

Various studies have used EMA approaches for topics related to clinical psychology, personality, and health care domain, and a number of review articles elaborated on their use in some other areas (Tennen et al., 2005). The use of EMA methods in clinical psychology was discussed by Thiele et al. (2002). The applications of EMA in psychopharmacology were discussed by Moskowitz and Young (2006). In industrial psychology, the applications were discussed by Beal and Weiss (2003) to industrial psychology. The popularity of EMA methods lies in the fact that it can explore a wide array of experiences, conditions and behaviors.

Thiele et al. (2002) reviewed the published studies on diary keeping, and reported many academic works of research on mood, pain, anxiety disorders, eating, sleep, alcohol consumption and physical problems. Yet, the list of EMA studies is longer than that, as it is extended to investigating social support, depression, work activity, relationship initiation, psychotherapy, satisfaction, adverse effects of medications, psychological stress, and self-esteem.

The psychological issues investigated *via* EMA include anxiety disorders, bipolar disorder, addictive disorders, schizophrenia, depression, and ADHD and actually many cases of psychopathology (Colombo et al., 2020). Besides the clinical symptoms and syndromes, EMA has been also extensively employed to investigate the fundamental adaptation mechanisms related to adjustment, including social support, self-esteem and coping along with behaviors at the core of behavioral medicine and health psychology. To cut it short, EMA approaches have been employed to explore many psychological variables outside the second language acquisition (SLA) domain. Thus, they are worth being used in exploring the psychological traits involved in language learning too, as justified below.

## EMA major categories

There are two major categories of EMA depending on the arrangement, scheduling, and time coverage of analysis. In global measurements including personality surveys, the researcher presumes that the analysis covers the individual participant's whole experience in single-shot data collection designs, losing sight of the dynamic and the developmental nature of the variable of interest. In EMA, moments or periods of time are assessed, which raises the problem of how to make sure that the periods or moments that are analyzed adequately represent the participant's experience (see Shiffman et al., 2008). Occasionally, the analyses can be viewed as representative of the participant's behavior or experience (Kop et al., 2001). Therefore, conducting an EMA study can fundamentally lead to a sampling design to capture moments in a subject's life. The major effect on the design should be the purpose of the research.

In assessment and sampling designs, EMA may be typically categorized into the time-based sampling and event-based sampling designs (Wheeler and Reis, 1991; Shiffman, 2007). Time-based sampling often seeks to describe an experience more inclusively and broadly, for instance by observing the temporal changes in an emotion through a course with no pre-determined emphasis on individual



events. Event-based designs do not aim to describe an individual's whole experience but instead to emphasize specific separate episodes or events in individuals' life excitement, trauma, shock, and plan the collection of data in relation to these episodes. These will be discussed in more detail below.

In some problematic conditions, the interest of research lies in specific episodes or events such as the instances of mental distraction, aggression, and panic attacks. Such instances can appropriately be investigated through event-based monitoring, which entails the triggering of assessments by the incidence of a predetermined event of interest to the research. For instance, the participants can be requested to do some rating whenever they experience a panic attack (Taylor et al., 1990), get involved in a social interaction that lasts for more than 10 min (Reis and Wheeler, 1991), or feel a special extreme emotion. Usually, the participants themselves decide when the event has happened and begin the assessment (despite the fact that some events may be detected automatically by certain instruments; see Kop et al., 2001). These designs need unambiguous descriptions of the event.

Time-based designs are fit for certain clinical phenomena, including pain and mood whose variation is continuous and is not simply captured in an episodic model of conceptualization. Sometimes, the event or the variable of interest can be continuously traced. In some others, this may not be probable, and EMA designs prefer time-based sampling. There are different types of time-based sampling designs depending on the time-plan, frequency, and schedule (see Delespaul, 1995). The resolution of the study will have been determined by the frequency of time-based evaluations. The required resolution is a function of the purpose of study, the existing knowledge about the target behavior, and the theoretical model of the research. Different time-based assessment plans are included in EMA. Some, like time series analysis and simple autocorrelation analysis, involve assessments set at fixed intervals, which lets the time block act as the analytic unit and provides evidence for analyses which need evenly timed evaluations. A special case is the use of daily diaries as already mentioned. Some works of research have applied somehow irregular time spaces, usually characterized by social variables. Also, sometimes, combined designs are used to test different research hypotheses (Shiffman et al., 2008).

## Ecological and dynamic approach to L2 emotional factors

The present study contends that the progress of L2 students' emotional factors need to be investigated from a dynamic and ecological point of view. The emotions involved in language learning develop out of a network of relations between the L2 learner with the teacher and peers, who are all involved in the immediate environment for learning marked by emergent values, inherent dynamicity, activity, multiplicity and variability (Van Lier, 2004).

In this dynamic and ecological view, the association between the student and all the linguistic and non-linguistic factors (e.g., cognitive, emotional) that reside in the ecology of classroom become important (Elahi Shirvan et al., 2021; Mercer, 2021; Liu et al., 2022). Therefore, the dynamic and ecological investigation of language learners' emotional variables reflects the connections between L2 learners and whatever is present around them and can, thus, offer new insights into how the

affordances or agents contribute to the development or intensification of a particular emotional factor (e.g., enjoyment, boredom, grit, etc.). It also has the advantage of considering the learners' surrounding environment significantly influential in the growth of different emotional states (Drew and Heritage, 1992). As pinpointed by Larsen-Freeman (2016), it is not possible to effectively explain the teaching or learning without reference to the contexts with which they are affiliated (Larsen-Freeman, 2016; Larsen Freeman, 2019).

Within an L2 classroom, Larsen-Freeman (2016) maintains that the constituent elements are not just the agents (i.e., instructors and learners and all their thoughts, feelings, performance, and actions) but the physical and temporal qualities of the learning context environment are also important. The time of class, the physical properties and everything about the space and time can significantly influence teaching and learning. Therefore, to explore the development of the emotions emerging out of the language learning experience, we should examine it as embedded within all these realities of the learning environment. That is why an ecological approach is relevant here. It considers the major contextual elements either human or not human that can all somehow affect the development and change in language learners' patterns of emotional variables (Russell and Gajos, 2020).

We recurrently mentioned the notion of the emergent nature of emotions or emotional variables. According to Van Lier (2004), the seemingly over-emphasis on emergence is because language acquisition takes place when simple components are integrated to comprise a larger system. As approached by Larsen-Freeman (2016), emergence means something new appears when not anticipated out of a whole interconnected relationships among the constituent elements (of a whole). Thus, investigating EFL learners' emotional variables and emotions from a dynamic and ecological point of view better reveals how the different interactive elements at different situated levels can lead to the emergence of a certain emotion. As for variability and diversity involved in the ecology of language learning, the implication is that teachers need to treat students differently and acknowledge their differences (Bourdieu, 1991; McLaren, 1998).

In sum, as individual L2 learners' evident variability needs to be considered in the learning experience (Rose et al., 2013), a dynamic and ecological approach is deemed essential to explore language learners' emotional variables. It offers a deeper understanding of how the patterns of a specific emotional variable (e.g., boredom, enjoyment, anxiety, etc.) may emerge differently across different learners. Following the procedure of an ecological approach and the presumed dynamic quality of language learners' emotional variables (MacIntyre and Gregersen, 2012), the justification for using an EMA together with the complex dynamic system theory (CDST) is the emphasis of the two on the nuanced ecological elements (Van Lier, 2004) and operational mechanisms, emphasis on context and also the constituent elements of the L2 learning systems (Hiver and Al-Hoorie, 2016).

## Bridging the gap of the application of EMA for exploring L2 emotional variables

EMA has helped users to indicate that the emergent development of positive and negative affects results from modifying the proximal stimuli (Zohar et al., 2003; Fisher and Noble, 2004), personality-related variables (Grandey et al., 2002), and perceived job characteristics

(Fisher, 2002). It is evident that the experiential quality of EMA allows users to adequately trace and confirm the dynamic mechanisms of actual affective conditions from an ecological point of view, and it makes contributions to theoretical underpinnings (Scollon et al., 2003). There is a significant dearth of studies using EMA in the SLA domain to investigate the dynamics of L2 emotions in the literature. There is an exemplary published work of research by Elahi Shirvan et al. (2020), which will be reviewed here. We will go on to emphasize that a frequent measurement of language learners' emotions through time can add to our conceptualizing of the subjective quality of the L2 learners' momentary feelings during multiple ecological timescales.

Inspired by the new change from negative psychology to positive psychology in SLA research (MacIntyre and Gregersen, 2012; MacIntyre and Mercer, 2014; Dewaele and Li, 2020), Elahi Shirvan et al. (2020) employed EMA for assessing L2 learners' emotional variables. These researchers investigated the emergent patterns of language learners' foreign language enjoyment in the SLA domain. They employed an ecological momentary assessment to add to the existing knowledge of the dynamics of this ecosystem in the network of individual students and their learning context. Elahi Shirvan et al. (2020), used a time-based sampling scheme of ecological momentary assessment and investigated the dynamic aspects of enjoyment in different points of time including seconds, minutes, etc. in an intermediate EFL program. They used open-ended interviews and also recorded journals for weeks. The findings of this study were useful as they revealed variation in the sequence of time scales, from moment-to-moment variation to the monthly changes. The researchers discussed the emergent patterns of enjoyment from one timescale to another according to the features of the CDST.

This exemplary work of research managed to highlight how an ecological and dynamic perspective managed to increase knowledge of the dynamics of an L2 learning-related emotion and reveal the emergent dynamic patterns of that emotion in several ecological timescales. As Elahi Shirvan et al. (2020) suggested, the use of EMA to assess the dynamics of foreign language enjoyment can be further developed in future investigations through an event-based sampling design. Yet, it is noteworthy that scrutinizing the dynamics of the L2 emotion they explored (i.e., foreign language enjoyment) and its ecological time-dependent changes is still in its infancy. Exploring these dynamics using EMA can reveal the context-bound quality of the emotion system. Overall, building on the findings of this study and other similar works of research can lead to the development of a representative model of L2-related emotions and their dynamic nature.

As for pedagogical implications, the findings of EMA studies of L2 emotions can probably show that even similar L2 students can experience diverse degrees of emotions in diverse time-points of an L2 course. Teachers can be made aware that, in spite of the self-directed factors contributing to L2 learners' emotions, they can have a major role in the students' points of time of positive emotions and probably in moments they may feel some negative emotion. Thus, the significance of teacher's role is highlighted more than ever before, as their role is more determining in the development of a supportive and positive class climate. Furthermore, teachers need to be made aware that the effectiveness of their role in the emotional experiential moments of the language learners is not always the same, and that they need to be particularly careful about and aware of the self-related factors that account for the private emotional zone that the students have (Elahi Shirvan et al., 2020).

There are still many positive and negative L2 emotions that await being assessed *via* EMA in SLA studies. Examples of the former (positive emotions) are playfulness, L2 grit, passion for learning, compassion, and examples of the latter are foreign language learning boredom, L2 anxiety, and stress. These can be explored in EMA studies with the aim of answering this sample research question: How do moments of [L2 emotion of interest] vary under the impact of ecological elements in various moments?

EMA studies of these emotional variables enjoy the benefits of a dynamic and ecological perspective. Researchers who used traditional measurement methods for these emotions faced the problem that language learners either significantly overestimated or underestimated the emotions, cognitions, and behaviors they experienced before in their recalls after a long time (e.g., Thomas and Diener, 1990; Robinson and Clore, 2002). Also, as observed, the traditional notes on recollections were typically distorted by different conditions of reporting during the assessment, consisting of a temporary mood, a prevailing and frequent experience, or the most new one (Brief et al., 1995). Gathering moment-by-moment data several times, close to the time when an emotion rises, makes EMA an appropriate approach to address the distortions and biases related to the retrospective reports of L2 emotions (Smyth and Stone, 2003).

## Conclusion

The existing gap in the SLA research of L2-related emotions using EMA points to the yet-to-mature perceived value of the ecological and dynamic approach to investigating different emotional variables in the SLA domain. Though in the current research on L2 emotional factors, there is the recurrent emphasis on the social embeddedness of student (or instructor) related emotional factors (Bronfenbrenner's, 1979, 1993), the ecological and dynamic momentary assessments of L2 emotions are scarce. The findings of the previous studies on L2 emotional constructs point to the socio-culturally constructed nature of language learners' development of different emotions such as anxiety and enjoyment inside the interactive network of external and internal personal and contextual variables. Mapping out the moment-by-moment emergent patterns of the dynamic quality of language learners' emotional variables in terms of values, quality, diversity, variability, and activity inside the ecology of the class helps to reveal useful outcomes on a multi-systemic scale.

There is research evidence in the SLA domain that several factors are involved in the development of L2 emotions, such as the language learners' motivation, beliefs and, linguistic and cognitive factors in affecting the development of the students' emotional variables (see Dörnyei and Ryan, 2015). Besides, L2 emotions are affected by L2 learners' prior learning experience and attendance in extracurricular tasks. Moreover, such factors as classroom setting, the existing curriculum, course evaluation are effective in the emergence of L2 emotions. The key role of social, cultural and educational factors should not be ignored either. Thus, it is expected that EMA studies be proceeded by more extensive and in-depth follow-up studies to identify the roots of the wider range of underlying factors. The body of research on learner or teacher-related emotional variables showed that L2 emotions emerge dynamically from an interactive network of cognitive, linguistic, and emotional constructs. It can be also concluded that the contextual factors of the language teaching or

learning processes cannot be wholly predictive of the future events. Therefore, the generalizability of the findings to other cases in other contexts should be made with caution (Ricca, 2012).

## Pedagogical implications and suggestions for further research

EMA studies enjoy distinctive benefits over conventional research methods of L2 emotional variables. EMS studies employ both an ecological and a dynamic approach to the exploration of emotional variables, which have a developmental nature. Despite the advantages and promises and extensive use in other fields of study such as clinical psychology, it has been still used significantly less in SLA studies. Considering the illuminating findings of the ecological studies of the SLA domain, it is hoped that the line of research especially the EMA types will continue to shed light on more emotional variables that have not yet been explored ecologically in language studies. Examples of these less explored L2 emotional variables are foreign language learners' boredom, passion for learning, perceived loneliness and compassion.

Using time-based scales of the EMA framework to explore the dynamics of an L2 emotional variable can be followed up by future researchers in the form of event-based sampling scales. Yet, admittedly, understanding the dynamics of L2 emotions and their ecological temporal momentary changes is still rare. Investigating these dynamics using EMA can unravel the situation-specific nature of the L2 emotion system. Generally speaking, the findings obtained from the EMA studies can help to gradually build up an adequately representative model of L2 emotions and their dynamic developmental process. The findings of the EMA line of inquiry into L2 emotions can potentially prove the fact that even a single L2 learner may feel different intensities of a certain emotion in several distinctive scales of time during a language learning course. These can range from classroom interaction at the micro scale to the whole course at the macro scale.

The findings of the limited time-scaled studies revealed interesting details about the nuances of variation in the trajectory of the target variable (e.g., momentarily or monthly). More similar inquiries are needed to be capable of tracing the changes in the variables of interest more closely and realistically. Despite the growing interest in positive psychology, because there is a dearth of ecological research in SLA, it is suggested that both positive and negative emotional variables (involved in language learning) be explored using the EMA of ecological systems.

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Regarding the limitation of EMA for the exploration of the dynamics of both positive and negative emotions in the field of SLA, it is worth noting that the procedures of data collection might seem time consuming and involve personal interventions. However, several techniques for the establishment of the trustworthiness of future studies using EMA in terms of credibility, transferability, dependability, and confirmability should be taken into account. Some of these techniques are prolonged engagement, persistent observation, thick description, and member-checking (see Lincoln and Guba, 1985).

## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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