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How mind-body-world ecologies work: The use of gestures for idea generation in a Grade 4 composition class

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Abstract

Guided by the sociocognitive theory, this study investigated how teachers used gestures in cooperation with other multimodal resources to improve the learning outcomes of students. Two teachers and their students in Grade 4 writing classes at a local elementary school in Singapore participated in the study. Data were collected over a seven-month period using classroom observations. Multimodal interaction analysis and conversation analysis conventions were employed to analyze the lessons. The results show that teachers and students adapted multimodal resources in the writing classrooms, such as teacher's gestures, body movements, eye gazes, and drawings, to negotiate meaning. The study has yielded insights into practical application of the participation framework in elementary-school writing lessons. The study also confirms that teachers' symbiotic gestures do serve the pedagogical function of drawing students into a desirable participation framework, thereby enhancing their understanding of target learning points. The interplay between mind (speech) – body (gesture) – world (ecosocial elements such as classroom environment) ecologies and the participation framework is important in that it fosters positive teaching and learning experiences in elementary-school classrooms. A pedagogical implication is that teachers should carefully design their lessons to incorporate gesture and an array of multimodal teaching resources for effective instruction including inducing active participation by the students.

Keywords: Multimodal resources; writing classrooms; sociocognitive approach

1. Introduction

The last decade has witnessed a growing body of research on gestured instruction in the Science, Technology, Engineering, and Mathematics (STEM) disciplines (Goldin-Meadow,

2014; Stieff et al., 2016). Recent research has primarily centered on how gesture produced by students supports communication, reasoning, problem solving, and spatial thinking in mathematics, chemistry, and mechanical engineering (Alibali et al., 2011; Goldin-Meadow, 2014; Novack et al., 2014; Stieff et al., 2016). While teachers play a pivotal role in facilitating the learning process, the potential impact of their gestures on student learning and cognition has been relatively unexplored. There is a need to investigate the value of gestured instruction to maximize its potential for improving students' thinking and engagement in class activities.

Symbiotic gesture can be conceptualized from sociocognitive theory (Atkinson, 2010; Churchill et al., 2010), which holds three fundamental principles. The first principle is inseparability, which means that the mind, body (such as gesture), and ecosocial world (such as classroom environment) are inevitably interconnected. The second property is adaptivity, which means that we use language to adapt to ecologies through interaction with humans and non-human environments so as to do things in the world (i.e., social action). The third property is alignment, which refers to "the moment-by-moment processes by which ecosocial elements (including gesture) are produced and coordinated" (Nishino & Atkinson, 2015, p. 38). The sociocognitive approach emphasizes the centrality of "cognition in writing and its development" (Nishino & Atkinson, 2015, p. 37), and highlights the multimodal and naturalistic nature of research (Nishino & Atkinson, 2015). As an important element of the sociocognitive approach, gesture impacts learning.

Defined as "complex motor movements that occur in three-dimensional space" (Stieff et al., 2016, p. 81), gestures tend to be part of people's talk (Goldin-Meadow, 2014). In the context of learning, gestures can help students better understand complex ideas or abstract concepts. Goldin-Meadow and Beilock (2010) suggest that learners' observation of gesture can impact their learning or even change their thoughts. Goldin-Meadow (2014) emphasizes that "gestures teachers produce have an impact on what learners take from their lessons and may therefore have an effect on learning" (p. 5). Gestures can likewise help explain what is going on in the human mind because they reflect the speaker's thoughts and may also affect the thoughts of the listeners.

Informed by the sociocognitive approach and the potential benefits of gestures on learning, the present study explores how the mind, body, and world interact dynamically with each other in the ecology of the English writing classroom, particularly in the idea generation phase of the writing process. Toward this end, our study uses an authentic classroom context from the sociocognitive perspective (Atkinson, 2010) to provide insights into second-language acquisition in terms of pedagogy and practice.

We adopt a sociocognitive approach (Atkinson, 2010) in analyzing two Grade 4 English language writing lessons for several reasons. First, human cognition and action have been used as resources to explain people's interaction with language, in both physical and cultural environments (Goodwin, 2003). Accounting for mere utterances (language performance) or cognition without associated gesture and surrounding environment can make it difficult to understand the multimodality of the extended cognition. Second, we need to include environment in our study because it may explain the difference between intra-space and inter-space in meaning-making due to a language's function as social action (Johnson,

2004). Third, neuroscientists suggest that the brain's mirror neuron system is developed when a person understands and imitates others' actions (Möhring et al., 2015). That is, a mirror neuron system opposes decontextualized cognition that does not relate to the body and ecosocial worlds (Atkinson, 2011).

2. Literature review

Among limited empirical studies that adopted the sociocognitive approach in second-language acquisition, some have related students' gestures to improvements in their learning. For example, Nishino and Atkinson (2015) demonstrated the alignment principle in dyadic collaborative writing between two doctoral students using Goodwin's (2000) multimodal interaction analysis, which meant analyzing interpersonal communication that includes verbal and non-verbal communication modalities. The results show that interdependent cognition, gesture, body movement, and the ecosocial world are integrated and aligned in an adaptive way to negotiate meaning or solve problems that the student-writers face in co-authoring a journal paper. Another study (Churchill et al., 2010) adopted symbiotic gesture (Goodwin, 2003) to understand the interconnection between gesture, cognition, body, and world, and how an appropriate use of teachers' gesture can enhance L2 learning. When the teachers associate their gestures, body movements, and spoken words with the material environment (e.g., worksheet), the students learn better, and they can produce more accurate answers (Goldin-Meadow, 2014).

In order to understand embedded cognition in classroom settings, other studies have explored the application of multimodal resources, beyond gestures, to enhance the students' learning outcome. Shanahan and Roof (2013) investigated how teachers taught reading strategies using a diversity of resources, which include iconic, metaphoric, and deictic gestures produced by the teachers besides pictures, charts, and spoken words. Their study suggests that examining teachers' embedded cognition within the ecosocial world, which includes the classroom environment, is crucial for a comprehensive understanding of language learning, beyond focusing solely on verbal interaction. Meanwhile, Wolfe (2005) examined symbiotic gesture to extend "the traditional notions of the composing process to include activities and spaces that exist beyond and prior to verbal and written texts" through collaborative group planning (p. 325). The results of the study indicated that in a computer-assisted classroom, interacting with pen, paper, notes, and gestures, along with the computer may help the group members negotiate and translate "abstract ideas into an embodied representation" (p. 325).

In an L2 classroom context in the United States, Ikeda's (2011) findings indicated that teachers might be using non-verbal resources to establish intersubjectivity (Heritage & Atkinson, 1984) between Japanese-as-a-Foreign-Language (JFL) learners and their teachers. The teachers used body movements to signal to learners to participate in activities when the conversation channel needs to shift from "one-to-one" to "one-to-many" (pp. 219-220). To maximize the value of environmental gesture, a common participation framework needs to exist between the interlocutors (Goodwin, 2003). The participation framework refers to

discourse, interaction, and participation processes of teacher-to-the-whole-class. Exploring this further, Smotrova and Lantolf (2013) investigated how a gesture-speech interface mediated lexical-item learning in EFL classrooms. Students' imitation of gestures that their teachers produced was considered to be L2 learning and was analyzed as 'catchment' (McNeill, 2005) or 'alignment' (Atkinson et al., 2007). The above studies have shed light on the use of teachers' gestures in a participation framework, to extend from one-teacher-to-one-student to subsequently teacher-to-the-whole-class.

While the abovementioned studies give insights into gestured instruction from the socio-cognitive approach, there remains a need for further research in actual classroom contexts. To better understand teachers' gestures for facilitating teaching and learning activities, further exploration of the pedagogical functions of gestures must be carried out (Harrison et al., 2018; Nakatsukasa, 2019, 2021). There is also a need to better understand how teachers use gesture in cooperation with other multimodal resources to improve the learning outcomes of students (Freitas & Serrano, 2023; Lopez-Ozieblo, 2022; Montiegel, 2022). In addition, as most of the previous studies investigated the use of gesture in university classrooms, there is a need for studies in other settings such as elementary schools because differential methods of instruction, and "writing takes place in a rich ecology of mind, body, and sociomaterial world, with each contributing crucially to its outcome" (Nishino & Atkinson, 2015, p. 38). In order to fill these important gaps, the present study investigates the interactions between teachers and students in two Grade 4 writing classrooms, focusing on the stage of idea generation. Our goal is to gather empirical evidence to explore how teachers and students adapt multimodal resources in the writing classrooms, such as teacher's gestures, body movements, eye gazes, drawings, white boards, visualizers, and activity sheets, to negotiate meaning. Such a study can yield useful implications that help teachers maximize the benefits of gestured instruction through a deepened understanding of mind, body, and world ecologies.

3. The study

3.1 Participants

The study took place in Singapore, where English is the official lingua franca and where bilingual policy is practiced. At home, students speak different mother tongues, such as Mandarin, Hokkien, Cantonese, Malay, Hindi, and Singlish. In neighborhood elementary schools, English is the medium of instruction. The writing classes are usually divided into regular writing classes and remedial classes. Typical writing classes, comprising about 40 students in each class, include activities of planning, writing, and revising based on the national implementation program of STELLAR (Strategies for English Language Learning and Reading). The participating school followed 12 writing units based on STELLAR. In each unit, the students learned English language writing through class, group, and individual activities. The remedial classes are specifically designed for students who received a marginal

pass in the English composition examination in the previous year. For Grade 4, there were approximately 10-12 students in each remedial class (classes B, C, D, E, and F). They were asked by their English language teachers to attend four remedial lessons after school over a semester. The remedial classes, designed by the first author of this study, focus on the social-cognitive approach to writing to enhance the students' English writing competence.

Two teachers (Tim and Anne, pseudonyms) and their students in Grade 4 writing classes at a local elementary school participated in the study. Both teachers have taught English for more than five years. Among the 11 teachers who participated in a broader study, which investigated the impact of sociocognitive writing intervention on student writing, we selected Tim and Anne for the present in-depth inquiry, due to their outstanding teaching that encompasses different ecosocial elements in the classroom. In addition, we selected six focal students who demonstrated dynamic interactions with the teachers. The demographic information of Tim, Anne, and the focal students is shown in Table 1.

Table 1
Demographic Information of the Participants

Participant		Age	Mother tongue	Gender	Class	Nature
Teacher	Tim	35-40	Malay	Male	D	Regular writing class
	Anne	30-35	Tamil	Female	E	Remedial class
Students	C1	10	Chinese	Female	D	Regular writing class
	C2	10	Chinese	Male	D	Regular writing class
	C3	10	Malay	Female	D	Regular writing class
	C4	10	Chinese	Female	D	Regular writing class
	E1	10	Chinese	Male	E	Remedial class
	E2	10	Chinese	Male	E	Remedial class

3.2 Data collection and analysis

Over a period of seven months (i.e., two semesters), 12 regular writing lessons and six remedial lessons (of 1,135 minutes in total) were observed, video-recorded, and verbatim transcribed. We watched both the teachers' and students' conversations while focusing on their symbiotic gestures (Goodwin, 2003) and the elements that were related to sociocognitive theory (Atkinson, 2011). Three excerpts, focusing on the generation of ideas for a narrative story in composition lessons, were extracted from classes D and E for further analysis due to the following reasons. First, symbiotic gestures were well represented in these two excerpts. Second, the teachers in both classes D and E applied multimodal resources to assist their teaching, in particular to enhance students' understanding of the content, and facilitate the delivery of the instructional materials.

Moreover, it was apparent that multimodal interaction analysis (Atkinson, 2011) and conversation analysis conventions (Sidnell, 2010) were employed in analyzing the lessons (e.g., Atkinson, 2011; Churchill et al., 2010; Goodwin, 2003; Nishino & Atkinson, 2015). Conversation analysis considers verbal and non-verbal behaviors in interaction with an aim to understand how different people converse with one another. The analysis takes a micro-analytic perspective by conducting moment-by-moment examination of "coordinated talk, gestures and additional semiotic resources in specific local and sociohistorical contexts" (Nishino & Atkinson, 2015, p. 42). The complementary semiotic resources included language, nonlinguistic vocal behavior, gaze, facial expression, gesture, head and body movement, tools, settings, and roles and relations (Atkinson, 2011, p. 152). The transcription conventions adopted in the current study are illustrated in Appendix A. The multimodal interaction analysis (semiotic resources in the classroom), conversation analysis (verbal and non-verbal behaviors), and participation framework (participation processes of teacher-to-the-whole-class) complement one another to answer the research question.

3.3 Research Question

The research question that guided this study is: How do teachers and students adapt multimodal resources in the writing classrooms to negotiate meaning?

4. Findings

In this section, we report two cases (Tim and Anne) from two Grade 4 ESL writing lessons conducted by English language teachers. Only two cases are reported because from the available data, these instances best represent how mind-body-world ecologies work in teaching writing. The reporting was kept succinct in respect of space limitations for publication. The figures illustrate what actually happened during class.

4.1 Teacher Tim: Ecosocial adaptivity

The context for Excerpt 1 is a writing class focused on the task of analyzing an original story titled 'Frog Prince.' Teacher Tim focused on the teaching of different stages of a narrative, namely its setting, events, problem, solution, and ending. As shown in Excerpt 1, the students were divided into groups and were asked by the teacher to change the storyline. Students needed to maintain the main idea / moral of the original story. The groups had the original text as their reference and some stationery on their desks. Tim approached the focal group to check whether the students got the main idea of the story that they were going to re-write.

In the beginning of the group conference, the students in the focal group asked Tim two questions. C1 asked whether it was acceptable to change the main character from the Frog Prince to a Frog Princess (line 2). Tim responded that it was possible as long as all the group members agreed to the idea (line 3). The importance of concurrence of events

(i.e., teacher-student interactions) was emphasized in the theory of multimodality. First, Tim raised his voice when he articulated the word 'AGREES.' Second, Tim circled his right hand twice to indicate 'the whole group' as he said 'as long as the group AGREES.' Lastly, he paused for almost one second after saying 'AGREES.' The pause within the utterance served to invite attention from the listeners (Clark, 1996).

Another student (C4) asked a question before Tim finished his utterance in line 3. C4 asked Tim about the possibility of adding more characters (line 4) to the story. Tim repeated the question (line 6) to clarify that he did not misunderstand it (Borich, 2015). C4 nodded as a sign of confirmation that Tim accurately understood her question (line 7). Tim allowed the group to add more characters (line 8) by responding 'why not.'

Excerpt 1 Part one
(RH: right hand; LH: left hand; BH: both hand; IF: index finger; PU: palm upside; P: pointing)

1	T	((Teacher approaches the group))
2	C1	can we change it to the frog princess::?
3	T	(0.65) can:::. (0.46) as long as the group AGREES, (0.98) [to this idea:: (0.24) can]. ((RHPU)) ((RHIF circling two times))
4	C4	[to <↑this> ((RH rising))
5		add more] characters? ((RHP pointing right side))
6	T	(0.53) to add more characters? (0.41)
7	C4	((nodding))
8	T	ya, why not?= ((Head moving L->R))

Next, Tim was going to explain the main idea of the ball dropping into the hole, but he changed his mind in his utterance. Instead, he asked the students what the main idea was (line 9). In doing so, he changed his instructional strategy from direct explanation to divergent question (Borich, 2015). While asking the question, he gave a hint using a hand gesture, dropping the fist of his left hand several times (lines 10-11, 13 and Figures 1-2). Tim used the hand gesture to convey additional information, but his hand gesture did not synchronize with his utterance (McNeill, 2005). It would have been impossible to understand what Tim was trying to say from his talk alone, 'something actually?' (line 10) and 'something?' (line 13). An additional iconic hand gesture showing 'drop/fall' was needed to complete the idea, i.e., that 'something actually falls/drops.'

Excerpt 1 Part two

9 =>but< the main idea-what is the main idea here is? (0.49)

10 something actually?
((LH fist appears)) ((LH fist closes tightly))

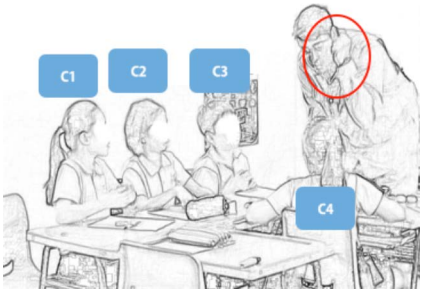

Figure 1

11 ((LH fist moving top->bottom->top))

Figure 2

12 C2 ( )

13 T Something?
((LH fist moving top->bottom->top)) ((LHIF moving top->bottom))

However, three of the students could not get the idea of 'drop/fall' even with Tim's gesture in addition to his utterance and showed puzzled faces (lines 15-16). Eye movements of C3 and C4, as well as a prolonged sound 'ah:::::' with head movement by C2, suggested that the students were searching for a suitable word to match with Tim's gesture (i.e., dropping the left-hand fist several times). The thought process of human beings in solving problems may be exhibited by accompanying eye or head movements (Kinsbourne, 1972). Withdrawing gaze from the object of discussion could be, for example, an attempt to reduce cognitive overload by eliminating distracting visual information (Goodwin & Goodwin, 1986).

Excerpt 1 Part three

14	C2	[ah::::: ((Head moving to LH side))

Figure 3

15	C3	[((puzzled face))
16	C4	[((puzzled face))

When Tim realized that the students could not identify the target word, he used symbiotic gesture to complement his teaching. First, he looked at the objects on the students' desks (Figure 3). Then he grasped an eraser and dropped it on the desk. At the same time, he said 'something…' (Figure 4, line 17). The environmentally coupled gesture (Goodwin, 2003) helped guide the learners to the target word. After Tim had given the symbiotic gesture (line 17), two of the students immediately responded. C3 answered 'make mistake' (line 18) and C2 said 'some' (line 19). Although their responses were not what Tim expected, the students were able to make attempts only after they saw his gesture with the eraser.

C3 expressed difficulty with providing the target word even with the teacher's hand gesture (Figure 5). Showing the palms of both hands and hunching the shoulders upwards indicated that C3 did not understand what the teacher was trying to say. The body language is classified as an emblem gesture, which is a conventionalized sign (McNeill, 2005). Tim considered C3's emblem gesture as a sign of being uncertain, so he showed the symbiotic gesture one more time (line 21). At this point, all the three students (C1, C2, and C3) responded (lines 22-24). C2 and C3 found the target word successfully this time, but C1 uttered a different word in doubt. Their confidence level was indicated in their intonations. C2 and C3 firmly answered 'fell' with a falling intonation, whereas C1 answered with a rising intonation. To sum up, Excerpt 1 demonstrates the importance of symbiotic gesture to both the teacher and students. Given that there are many resources in the classroom environment in general, the teacher's ecological adaptivity through an appropriate use of symbiotic gesture and the multimodal resources may positively influence teaching and learning.

Excerpt 1 Part four

17 T Something…
((grab the eraser from the table and drop it))=

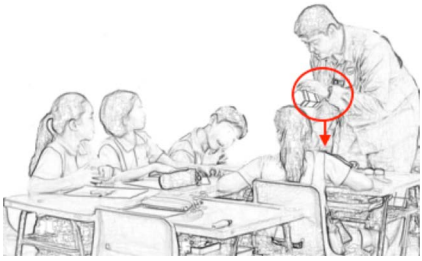

Figure 4

18 C3 [=make mistake]

19 C2 [=some¿]

20 C3
((talk in a very soft voice)) ((BHPU))

Figure 5

21 T something what?
((RH: dropping the eraser one more time))

22 C2 [fell.]

23 C3 [fell.]

24 C1 [( )?]

25 T something fell right? (0.34)
((Head nodding)) ((RHPU P C4, eye contact with C4))

4.2 Teacher Anne: Multimodal interaction

Focusing this time on Excerpt 2, the context is Teacher Anne modelling how to write the coda of a story by showing a text titled 'Prince Zak and the Wise Frog.' In the story, Prince Zak was trying to take out a ball that had gone into a hole. The wise frog came to the prince and offered help to retrieve the ball. In Excerpt 2, after Anne had read the text aloud, she asked the students whether the author of the story had included all viable procedures of getting the ball back. The seven students sat down facing Anne. On their desks, there were basic stationery and activity sheets. In her teaching, Anne used an activity sheet, a white board, a visualizer, and a marker.

Instead of asking the students direct questions regarding writing the coda of the story (lines 26-30), Anne explained by using iconic and metaphoric gestures. In line 27, in pointing out that '°the prince°::: (0.3) oh::: (0.32) fixed the Hose to the Tap,' Anne raised her left hand, then used her right hand to touch her left hand (Figure 6). The left hand meant 'the tap' and the right hand referred to 'the hose.' Anne twisted her right hand as an illustration of turning the tap (Figure 7). She then used her left hand to represent 'water.' Her left hand moved quickly from right to left to mimic 'water coming out' (Figure 8). Her gesture helped the students visualize the main idea. Sime (2008) has pointed out that some learners take advantage of a teacher's gesture in "enhancing comprehension of the message either by illustrating words or ideas, emphasizing important words or making contrasts and comparisons" (p. 265). In this example, Anne's gesture, synchronous with her speech, enabled the students to grasp her message.

Figure 6

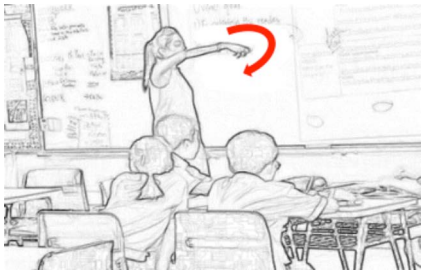

Figure 7

Figure 8

Excerpt 2 Part one

26	T	so, did I(.) did I go and write step by step, (0.45) (standing up) (Moving to the screen) (RHIF P P)
27		˚the prince˚::: (0.3) oh::: (0.32) fixed the Hose to the Tap, (0.22) (LH appeared) (RHPU moving behind to RH)
28		ah..- switch on the Tap::, (.) (RH appeared) (twist the RH)
29		the water flew out::, (LH appeared) (LH Moving R-> L)
30		(.) and then:: he started to:: (0.38) fill up the hole:: with the water.= (LH P the board) (LH P moving L->R)
31		=did I write like that? (0.5) (LH circling just beside the L ear)
32	E1,E2	((Shaking head))

Anne also used symbiotic gesture in explaining the phrasal verb 'bobbing up.' First, she emphasized the clause 'bobbing up towards the light' by saying it loud and slowing down in the beginning of her explanation (line 34). In addition, she underlined (line 34) and drew an arrow at the phrase 'bobbing up' (line 35) on the white board (she used a visualizer to show the model text at the same time). In general, Anne used a number of resources skillfully in the classroom to draw the students' attention to the target phrase. She drew a simple picture on the board and continued to explain the target phrase. In line 36, when she said 'because if there is WAter,' she drew two waved lines on the board (Figure 9). The two waved lines represented 'water' in the hole. In line 37, Anne talked and drew the picture simultaneously. When Anne uttered 'when your ball comes ↑up,' she drew a circle to indicate a ball and an upward arrow to indicate 'coming up.' Interestingly, in line 38, she changed from simultaneous use of speech and drawing to speech and gesture. When she said "it is like glu glu glu glu" with the help of two opened hands, her shoulders moved up and down several times to express sudden appearance of the ball from the water. Lastly, Anne wrapped up her explanation using symbiotic gesture as well. She checked the students' understanding by asking '[right?]' (line 39). E3 nodded his head as he agreed. As soon as she saw E3's nod, she reiterated her explanation by (1) circling the phrase while saying '[so it's bobbing up.]' (line 43), (2) pointing at the ball as well as the upward arrow sign that she had drawn on the board earlier, (3) affirming '[it goes up. OK?]' (line 45), and (4) repeating the target clause with a deictic gesture (line 46).

The initiation and organization of co-cognition (Nishino & Atkinson, 2015) were provided by the text. Anne and the students interacted through the mediation of the text. Apart from Anne and the students themselves, the other non-human objects such as white board, model text that appeared on the white board, the visualizer, and the drawings all contributed to the students' understanding of the lesson. In addition, illustrating part of the text on the board in a bigger font allowed the teacher to guide the students' attention to what is important.

Clearly, environmentally coupled gesture and drawing that are synchronized with speech cannot be understood without one another (Goodwin, 2003). In this example, the main verbal explanation of 'bobbing up' is shown in lines 36-38. The students might not understand it without the accompanying gesture and drawing. Questions might arise in their minds as to where the water comes from, the amount of water, and the relationship between the water and how and where the ball emerged. Through the teacher's drawings (Figures 9 and 10), the students understood that it was moving "wave-like" water that caused the ball to float up to the water's surface. In addition, the teacher repeated a 'shrugging' gesture when she uttered the 'glu glu' sound, to reinforce the manner in which the ball surfaced. In classroom teaching, appropriate use of both symbiotic gesture and talk is important in helping students understand the subject matter (Goodwin, 2003). This excerpt shows that the teacher's gesture, classroom ecology, and language all complement one another in facilitating the teaching and learning processes.

Figure 9

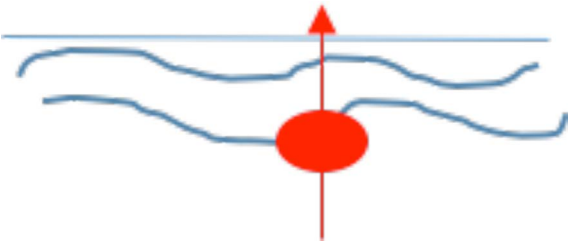

Figure 10

Excerpt 2 Part two

33	T	NO. (.) immediately I go,(0.27) soon↑ he could see ((Shaking head)) ((RH drawing bracket)) ((RHIF P P P board))
34		the ball, (0.43) <u>bobbing up</u> towards the light.> (0.32) ((RHIF p p board)) ((RH underlining on the board))
35		>why did I write this< BOBbing out? (1.4) ((RH drawing arrow towards "bobbing up" on the board))
36		because if there is WAter:::, (0.6) ((Drawing water on the board))
37		when your ball comes ↑up, (0.9) ((Drawing the floating ball on the water))
38		it is like glu glu glu glu ((BHPU+ shrugging several times)
39		[right?] (0.28) ((eye contact with students))
40	E3	[((Head nodding))]

From the teacher-student interactions, it is evident that student learning was taking place. First, the students either shook their head or nodded when Anne asked convergent questions. Second, E1's and E2's participation in the class was indicated by the eye contacts and smiles between them (lines 41 and 42, Figure 11). They seemed interested by the 'glu glu' sounds produced by Anne, so they gazed at each other with smiles on their faces right after her explanation of 'bobbing up.' Third, E2 imitated Anne's shrugging gesture (Figure 12) several times himself (lines 44 and 48, Figure 12). According to McNeill (2005) catchment is indicated in the imitated gesture. In the study of Smotrova and Lantolf (2013), they found that aligned imitation of specific gestures between the teacher and students enhanced the learning of lexical items. In Excerpt 2, E2 likewise imitated Anne's shrugging gesture twice, which suggests that there was catchment developed by the student.

Excerpt 2 Part three

41 E1
[((Maintaining eye contact with E2 and smiling))]

42 E2
[((Smiling toward E1))]

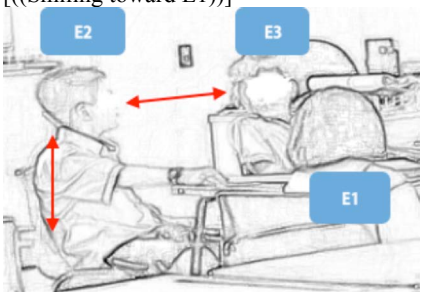

Figure 11

43 T [so it's bobbing up.] (0.31)
((RH circling on the board for emphasis))

44 E2
[((Shrugging the whole body several times))]

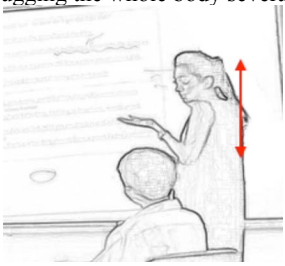

Figure 12

45 T [it goes up. (0.22) >OK?<]
((RHIF P the ball on the board)) ((RHIF P moving up))

46 T [bobbing up <towards> the::↑(0.29) light.=
((RHIF P board))

47 =why light?] (0.2)
((RHIF P board two times))

48 E2
[((shrugging the whole body))]

5. Discussion

The findings demonstrate a complex interconnectivity of mind-body-world activities in English writing classrooms. Adopting a multimodal interaction analysis of the elementary English writing lessons, this study discovered that teachers adjusted their instructional strategies based on a non-human environment (i.e., classroom artefacts) and a non-linguistic semiotic system (i.e., gestures) to convey meaning to students. We now discuss our understanding of mind-body-world ecologies and its impact on student learning.

5.1 Ecosocial adaptability

In Excerpt 1, Tim gave a hint with his hand gesture in the beginning of the group conference, when he noticed that some students could not excogitate the target word. In modifying his instructional strategy, he considered the sociomaterial environment from which he grabbed a student's eraser and dropped it from his hand. This environmentally embedded gesture helped the students to successfully come up with the target word 'fall.'.This is a pedagogical example of how human beings modify their strategies in a given situation to solve a problem (Nishino & Atkinson, 2015). The students did not say openly 'Teacher, we do not know what you mean.' Instead, they showed puzzled faces (by C3 and C4), and uttered a prolonged sound of 'ah:::' (by C2). These indirect expressions by students may signal "a call for help and determine the exact moment of teacher intervention" (Faraco & Kida, 2008, p. 294). In dropping the eraser as an intervention strategy to clarify their doubts, Tim interacted with both human (the students' facial expressions) and non-human elements (an eraser on the desk). As we have indicated in the review of literature, ecosocial adaptability is one of the key principles of the sociocognitive approach (Atkinson, 2010). Tim's example illustrates the alignment of this principle, particularly "the moment-by-moment processes by which ecosocial elements in the classroom are produced and coordinated" (Nishino & Atkinson, 2015, p. 38).

Notice that Tim refined his instruction based on his experience. In Excerpt 3, he did a conference with a new group of students, after finishing the conference with the focal group in Excerpt 1. Again, he tried to convey to the new group the idea of the ball dropping into the hole. To do so, he picked up a correction tape from a student's desk and dropped it (line 51). The purpose was the same as his previous demonstration with the eraser. This time, however, the change in his verbal explanation was more deliberate and important. In Excerpt 1, Tim said 'Something (what)?' referring to the dropping object, which turned out to be rather ambiguous to the students. Based on the reaction of the earlier focal students, Tim now refined what he said to the students as shown in Excerpt 3. He made it clearer that he was referring to the object in his hand, by calling it 'an item' rather than 'something.' In addition, he uttered 'it what' with a symbiotic dropping gesture (lines 58 and 59). This time, the students were better able to identify the target word (lines 56-57, 60-62). This example shows that by adapting to the human element (i.e., students' reaction) as well as flexibly using what was available in the ecosocial world (i.e., the correction tape in Excerpt 3 or the

eraser in Excerpt 1), Tim was able to interact efficiently with the students. It exemplifies his ecological adaptation using symbiotic gestures and an ecosocial element in the classroom.

Excerpt 3

49	T	the idea is about (0.78) ((RH: picking up the correction tape from the table))
50		<so::me↑one> (.) >either the prince or< the: princess (0.54) ((holding the correction tape)) (looking at D5)

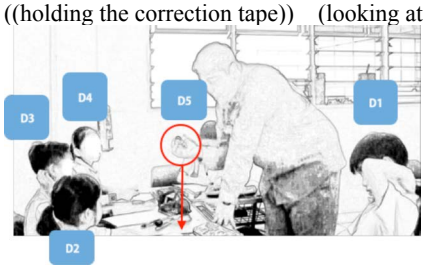

Figure 13

51		what is it? ((RH: dropping the correction tape into the pencil case))=
52	D5	=((moving closer to the desk))=
53	D1	=((suddenly pay attention to the teacher))

Figure 14

54	T	what happened? ((picking up a highlighter)) ((RH: putting down the highlighter and holding it again))=
55		=an item, >what is this item?< it↑ ((RH: shaking the highlighter)) ((RH: dropping the highlighter on the desk))
56	D4	[FELL.]

Excerpt 3 continued...

57	D3	[dropped.]
58	T	it what? ((RH: picking up the highlighter)) ((RH: dropping the item on the LH))
59	T	[fell or dropped.. into somewhere.] YAp¿ fell. ((BHPU)) ((BHPU+eye contact with D5))
60	D5	[FAll.] FEll.
61	D3	[dropped.]
62	D4	[dropped.]

It is noteworthy that the symbiotic gesture is most meaningful within the participation framework (Goodwin, 2003). For example, the focal students in Excerpt 1 were engaged in the participation framework throughout the conference. However, in Excerpt 3, not all the students were in the participation framework at the beginning of the conference. D1 and D5 did not concentrate on Tim's talk before he dropped the correction type (Figure 14). D1 already started planning the story, whereas D5 looked bored as he scratched his neck. However, Tim's sudden symbiotic gesture of dropping the correction type and his simultaneous question 'what is it?' (line 51) drew D1 and D5 into the participation framework (Figure 13). D5 leaned towards Tim, and D1 stopped writing to look at Tim. Both their body position and eye gaze built 'a public field of mutual orientation' (Goodwin, 2000, p. 1496). Within the participation framework, the interaction between the teacher and the students can be sustained. Tim repeated the symbiotic gesture two more times (lines 54-55) after gaining the attention of all the group members. The correct answer was given by D3 and D4, who were in the participation framework from the beginning (lines 56-57). D5, who joined the framework later, provided an answer towards the end of the conference (line 60). The findings are consistent with the research results reported by Ikeda (2011) on Japanese-as-a-foreign-language teachers' use of non-verbal resources, such as gestures, in getting the attention of students in the classroom, as well as the results reported by Sime (2008) on teachers' gestures in drawing students' attention to the teaching points and facilitating productive teacher-student interactions in class.

5.2 Multimodal interaction

For her part, Anne demonstrated knowledge of the multimodality of semiotic resources in her classroom. In explaining the phrasal verb 'bobbing up,' Anne used an array of semiotic resources such as gestures, body movements, eye gazes, varied intonations, pauses, drawings such as arrows and lines, as well as ecosocial elements such as marker, visualizer, white board, and activity sheet. She was an active organizer of the semiotic resources which

produced a significant impact on the student learning. Further, it appears that when gestures are appropriately used for instructional purposes, teachers may appear more approachable to the students (Quinlisk, 2008). Students could feel intimidated and thus reluctant to participate in class when their teachers, perceived to be authoritative, do not harness nonverbal expressions, such as gestures, in the ecosocial world of the classroom (Quinlisk, 2008). On the other hand, when teachers teach with appropriate informal nonverbal cues, they may encourage students to participate more actively. In Excerpt 2, Anne explained 'bobbing up' using an array of multimodal resources, which motivated the students' participation, as indicated by how they imitated their teacher's gestures.

Our finding aligns with Atkinson's (2010) inseparability principle in the sociocognitive approach to studying second language acquisition, which holds that "mind, body, and world function integratively and inseparably in producing social (or sociocognitive) action, including writing" (p. 28). Speech and gesture cannot be separated in effective teaching (McNeill, 2005), because they reinforce each other as indicated in Excerpt 2. Gestures may replace certain words so as to complete the utterance (Platt & Brooks, 2008). In the current study, we have provided understanding of the inseparability nature of speech (mind), gesture (body), and ecosocial elements (sociomaterial world) in the elementary-school pre-writing lessons. Indeed, the students made sense of what Anne conveyed not merely based on her verbal exposition, but also through her symbiotic gestures and strategic use of the classroom's ecosocial elements. The teacher's utterances (lines 36 to 38) were better understood through her adaptivity of resources in the ecosocial world including the drawings (see Figures 9-10) and body movements (Figure 12). The pictures drawn on the white board actually played a role of mediation. The created "temporarily shared world" (Rommetviet, 1974, p. 29) successfully transferred to the students a context for the teacher's gestures (Goodwin, 2003), arrow signs, and eye gazes (Faraco & Kida, 2008). Our findings are consistent with the research results reported by Nishino and Atkinson (2015) on the interconnected and interdependent nature of mind, body, and world. The two elementary school teachers in our study exemplify the three principles – inseparability, adaptivity, and alignment – underlying the socio-cognitive approach to language acquisition (Atkinson, 2010).

6. Conclusion

This study contributes new knowledge to the field of L2 learning by explicating the roles of teachers' gestures and classrooms' multimodal resources in the sociocognitive approach to teaching writing. This underscores the significance of teachers' symbiotic gestures in second language (L2) learning. Notably, it extends their relevance beyond the advanced classes previously studied, now encompassing elementary-school pre-writing lessons. Regarding the impact of gestures in learning, our findings in the writing context also extends prior results to other subjects such as reading (Shanahan & Roof, 2013), mathematics (Goldin-Meadow, 2014), and chemistry (Stieff et al., 2016). Particularly, our results highlight the inseparability of mind-body-world in effective pedagogy, based on how their wholesome application may benefit student learning at the stage of generating ideas in the composition lessons.

The study has also yielded insights into the practical application of the participation framework (Goodwin, 2000, 2003) in elementary-school writing lessons. It is worth noting that in employing body movements (Ikeda, 2011), pauses (Clark, 1996), and gestures (Goodwin, 2003), an important part of the teacher's goal is to attract students' attention in order to allow effective instruction. Our study confirms that teachers' symbiotic gestures do serve the pedagogical function of drawing students into a desirable participation framework, thereby enhancing their understanding of target learning points. The interplay between mind-body-world ecologies and the participation framework is interesting and important in that it fosters positive teaching and learning experiences in elementary-school classrooms.

While the aim of the study is not to produce generalizable findings as limited by the data size, the findings have clear and actionable implications for the application of mind-body-world ecologies and the participation framework in the teaching and learning of L2 writing, particularly during the idea generation stage in composition lessons. A direct pedagogical implication is that teachers should carefully design their classes to incorporate gesture and an array of multimodal teaching resources for effective instruction including inducing active participation by the students. They are cautioned against over-reliance on activity sheets and traditional chalk-and-talk. Teachers should notice that different students with different levels of motivation may approach an assigned task differently (e.g., in Figure 13, D1 already started planning the story, whereas D5 looked bored as he scratched his neck). They may ask students to write a reflection at the end of a writing class to record their experiences in the class, while noting whether and how non-verbal communications and different learning resources impacted their engagement and understanding. These observations obtained from the stage of generating ideas may also be applicable to other stages of writing, such as organizing ideas, drafting, and revising. Another strategy for teacher self-feedback is video recording the lessons they deliver in class and critically analyzing the extent to which they have applied the inseparability, adaptivity, and alignment principles of the sociocognitive approach in their pedagogy.

Future research could adopt a mixed-methods approach to address a larger sample size of data than that used in this study. Also, to yield more insight for teaching and learning, another way to extend this study is by adopting a longitudinal design to investigate young L2 students' learning of writing in general, or generation of ideas for writing in particular, across a number of dimensions such as different genres (e.g., recount, information report, and argumentation), subject disciplines (e.g., science and social science), and proficiency levels of the students.

References

Alibali, M. W., Spencer, R. C., Knox, L., & Kita, S. (2011). Spontaneous gestures influence strategy choices in problem-solving. *Psychological Science, 22*(9), 1138-1144. https://doi.org/10.1177/0956797611417722

Atkinson, D. (2010). Sociocognition: what it can mean for second language acquisition. In R. Batstone (Ed.), *Sociocognitive perspectives on language use and language learning* (pp. 24-39). Oxford University Press.

Atkinson, D. (2011). A sociocognitive approach to second language acquisition: How mind, body, and world work together in learning additional languages. In D. Atkinson (Ed.), *Alternative approaches to second language acquisition* (pp. 143-166). Routledge.

Atkinson, D., Churchill, E., Nishino, T., & Okada, H. (2007). Alignment and interaction in a sociocognitive approach to second language acquisition. *Modern Language Journal, 91*, 169-188. https://doi.org/10.1111/j.1540-4781.2007.00539.x

Borich, G. D. (2015). *Observation skills for effective teaching: Research-based practice* (7th ed.). Paradigm Publishers.

Churchill, E., Nishino, T., Okada, H., & Atkinson, D. (2010). Symbiotic gesture and the sociocognitive visibility of grammar in second language acquisition. *Modern Language Journal, 94* (2), 234-253. https://doi.org/10.1111/j.1540-4781.2010.01019.x

Clark, H. (1996). *Using language.* Cambridge University Press.

Faraco, M., & Kida, T. (2008). Gesture and the negotiation of meaning in a second language classroom. In S. G. McCafferty & G. Stam (Eds.), *Gesture. Second Language Acquisition and classroom research* (pp. 280-297). Routledge.

Freitas, S. D. A., & Serrano, A. D. A. N. (2023). Gestures in the teaching and learning process: A systematic literature review. *Educacao em Revista*, *39*. https://doi.org/10.1590/0102-469839705t

Goldin-Meadow, S. (2014). How gesture works to change our minds. *Trends in Neuroscience & Education, 3*(1), 4-6. https://doi.org/10.1016/j.tine.2014.01.002

Goldin-Meadow, S., & Beilock, S. (2010). Action's influence on thought: The case of gesture. *Perspectives on Psychology Science, 5*(6), 664-674. https://doi.org/10.1177/1745691610388764

Goodwin, C. (2000). Action and embodiment within situated human interaction. *Journal of Pragmatics, 32*, 1489-1522. https://doi.org/10.1016/S0378-2166(99)00096-X

Goodwin, C. (2003). Pointing as situated practice. In S. Kita (Ed.), *Pointing: Where language, culture and cognition meet* (pp. 217-241). Erlbaum.

Goodwin, M. H., & Goodwin, C. (1986). Gesture and coparticipation in the activity of searching for a word. *Semiotica, 62*, 51-75. https://doi.org/10.1515/semi.1986.62.1-2.51

Harrison, S., Adolphs, S., Dowens, M. G., Du, P., & Littlemore, J. (2018) All hands on deck. Negotiation over gesture forms in collaborative discourse. *Lingua, 207*, 1-22. https://doi.org/10.1016/j.lingua.2018.02.002

Heritage, J., & Atkinson, J. M. (1984). Introduction. In J. M. Atkinson & J. Heritage (Eds.), *Studies in conversation analysis* (pp. 1-15). Cambridge University Press.

Ikeda, K. (2011). Enriching interactional space nonverbally: Microanalysis of teachers' performance in JFL classrooms. *Japanese Language and Literature, 45*(1), 195-226.

Johnson, M. (2004). *A philosophy of Second Language Acquisition.* Yale University Press.

Kinsbourne, M. (1972). Eye and head turning indicates cerebral lateralization. *Science, 176*, 539-541. https://doi.org/10.1126/science.176.4034.539

Lopez-Ozieblo, R. (2022). Observations on the progression of gestures with L2 Proficiency: A call for further research. *Journal of Psycholinguistic Research, 52*(2), 381-404. https://doi.org/10.1007/s10936-022-09862-y

McNeill, D. (2005). *Gesture and thought.* University of Chicago Press.

Möhring, N., Shen, C., Hahn, E., Tam, T. M., Dettling, M., & Neuhaus, A. H. (2015). Mirror neuron deficit in schizophrenia: Evidence from repetition suppression. *Schizophrenia Research, 168*, 174-179. https://doi.org/10.1016/j.schres.2015.07.035

Montiegel, K. (2022). Teachers' gestures for building listening and spoken language skills. *Discourse Processes, 59*(10), 771-790. https://doi.org/10.1080/0163853X.2022.2140556

Nakatsukasa, K. (2019). Gesture-enhanced recasts have limited effects: A case of the regular past tense. *Language Learning Research, 25*(4), 587-612. https://doi.org/10.1177/1362168819870283

Nakatsukasa, K. (2021). *Gestures, corrective feedback, and second language development.* The Cambridge Handbook of Corrective Feedback in Second Language Learning and Teaching, 251-272. https://doi.org/10.1017/9781108589789.013

Nishino, T., & Atkinson, D. (2015). Second language writing as sociocognitive alignment. *Journal of Second Language Writing, 27*, 37-54. https://doi.org/10.1016/j.jslw.2014.11.002

Novack, M., Congdon, E., Hermani, N., Goldin-Meadow, S. (2014). From action to abstraction: using the hands to learn Math. *Psychological Science, 25*(4), 903-910. https://doi.org/10.1177/0956797613518351

Platt, E., & Brooks, F. B. (2008). Embodiment as self-regulation in L2 task performance. In S. G. McCafferty & G. Stam (Eds.), *Gesture. Second Language Acquisition and classroom research* (pp. 66-87). Routledge.

Quinlisk, C. C. (2008). Nonverbal communication, gesture, and second language classrooms: A review. In S. G. McCafferty & G. Stam (Eds.), *Gesture. Second Language Acquisition and classroom research* (pp. 25-44). Routledge.

Rommetviet, R. (1974). *On message structure: A framework for the study of language and communication.* Wiley.

Shanahan, L. E., & Roof, L. M. (2013). Developing strategic readers: a multimodal analysis of a primary school teacher's use of speech, gesture and artefacts. *Literacy, 47*(3), 157-164. https://doi.org/10.1111/lit.12002

Sidnell, J. (2010). *Conversation analysis: An introduction*. Wiley-Blackwell.

Sime, D. (2008). "Because of her gesture, it's very easy to understand" - Learners' perceptions of teachers' gestures in the foreign language class. In S. G. McCafferty & G. Stam (Eds.), *Gesture. Second Language Acquisition and classroom research* (pp. 259-279). Routledge.

Smotrova, T., & Lantolf, J. P. (2013). The function of gesture in lexically focused L2 instructional conversations. *The Modern Language Journal, 97*(2), 397-416.
https://doi.org/10.1111/j.1540-4781.2013.12008.x

Stieff, M., Lira, M. E., & Scopelitis, S. A. (2016). Gesture supports spatial thinking in STEM. *Cognition and Instruction*, *34*(2), 80-99. https://doi.org/10.1080/07370008.2016.1145122

Wolfe, J. (2005). Gesture and collaborative planning: A case study of a student writing group. *Written Communication, 22*, 298-332. https://doi.org/10.1177/0741088305278108

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Appendix A
The transcription conventions adapted from Sidnell (2010)

[	A point of overlap onset
]	A point at overlapping end
=	"Latching"
(0.5)	Pauses in tenths of a second
(.)	A micropause; ordinarily less than 0.2 of a second
.	Falling or final intonation
?	Rising intonation
,	Continuing intonation
¿	A rise stronger than a comma but weaker than a question mark
::	Prolongation or stretching of the sound. The more colons, the longer the stretching
-	A cut-off or self-interruption
word	Some form of stress or emphasis, by either increased loudness or higher pitch
Word	Notably high volume
˚word˚	The talk between two degree signs is markedly softer than the talk around it
↑	A sharper rise in pitch
>word<	The talk is rushed
<word>	The talk is markedly slowed
(( ))	Nonlinguistic event descriptions
( )	Something is being said, but no hearing

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