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Contents

Microgenesis, <i>method</i> and <i>object</i> : a study of collaborative activity in a Spanish as a foreign language classroom <i>Gabriela Adela Gánem Gutiérrez</i>	1
Sociocultural Theory and its application to CALL: A study of the computer and its relevance as a mediational tool in the processes of collaborative activity <i>Gabriela Adela Gánem Gutiérrez</i>	39

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Sonja Eisenbeiss
Department of Language & Linguistics
University of Essex
Wivenhoe Park
Colchester C04, 3SQ
UK

Email: *seisen@essex.ac.uk*

URL: <http://www.essex.ac.uk/linguistics/wkpaps>

Microgenesis, *method* and *object*: a study of collaborative activity in a Spanish as a foreign language classroom

Gabriela Adela Gánem Gutiérrez, University of Essex

Abstract

This paper draws on the Vygotskian methodological construct of microgenesis to study collaborative activity in an intermediate Spanish as a foreign language classroom. In this study, the construct of *microgenesis* is drawn upon to refer to both, the methodological *tool* to investigate language learning instances as observed in short periods of time (i.e., minutes), and also to refer to those observed language learning instances as the *object* of study. The Sociocultural approach to Second Language Learning (SLL) (Donato, 2000; Lantolf and Appel, 1994; Lantolf, 2000; Lantolf and Thorne, 2006) underpinning this investigation sees interaction as the enabling process that becomes essential for the individual to achieve learning and development. I refer to learning as the process through which participants are able to change, transform (i.e., develop) their use and/or understanding (see Wells, 1999: 111) of the target language. Pairs/trios of students were audio-recorded while collaborating to complete three language tasks in the classroom during an academic semester in a UK university. Microgenetic analysis of the data (transcribed protocols) allowed us to gain further understanding of collaborative activity and of the importance of language as a mediational tool to co-construct meaning and learning opportunities. The results show that although each instance of microgenesis is unique, there are certain characteristics and patterns shared by the various instances identified in the data set. The investigation also highlights the importance of studying discourse markers to help us identify the learners' level of regulation. Finally, we focus on a specific aspect of microgenesis that appears to be crucial

for driving interlanguage forward, and which following van Lier (2000: 252), I refer to as microgenesis affordance.

Introduction

'the search for method becomes one of the most important problems of the entire enterprise of understanding the uniquely human forms of psychological activity. In this case, the method is simultaneously prerequisite and product, the tool and the result of the study' (Vygotsky, 1978: 65, italics in the original).

This study aims to contribute to the growing body of research (Donato, 1988, 1994; Ohta, 1995, 2001; Antón and DiCamilla, 1998; Swain and Lapkin, 1998) looking into collaborative activity from a Sociocultural approach to second language learning (SLL). The paper reports on an investigation of *microgenesis* (i.e., the moment-to-moment co-construction of language and language learning) in a Spanish language classroom (Intermediate level) as learners worked in dyads/triads across three different problem-solving tasks. The foundations for the study lie in what is considered one of Vygotsky's most important contributions to the study of mind (Lantolf and Thorne, 2006: 225), his developmental or *genetic* analysis as a means to understand certain aspects of mental functioning, 'analysis that returns to the source and reconstructs all the points in the development of a given structure' (Vygotsky 1978: 65). Vygotsky conceived of the mind as a system consisting of both natural/biological functions and, importantly, cultural - higher - mental functions, such as voluntary attention, problem-solving capacity, planning, learning, and intentional memory. His primary interest laid in the study of these higher mental capacities and he proposed four *genetic* domains to do so. The *phylogenetic* domain, relates to how the human mind evolved differently from other life forms, by means of culturally mediated tools. The *sociocultural* domain concerns mediation and the different kinds of mediational tools adopted and valued by society. The *ontogenetic* domain studies the appropriation of these mediational tools and how they are integrated into cognitive activity during the processes of an individual's development. Finally, the

microgenetic domain focuses on the overt, in flight, instance of learning as it happens during interpsychological activity (Robbins 2001) “over a relatively short span of time (for example... learning a word, sound, or grammatical feature of a language” (Lantolf 2000: 3).

Microgenesis, or the study of the origin and history of a particular event, is described by Wertsch as “a very short-term longitudinal study” (Wertsch 1985: 55). Microgenesis, refers simultaneously to both the *method* and the *object* of study. *Microgenetic* or historical analysis allows us to investigate and understand a particular event (learning as an *object* of study), or as Mitchell and Myles (2004:198) describe it “a local, contextualized learning process... [that]can sometimes be traced visibly in the course of talk between expert and novice.” It is precisely this conceptual duality that makes of microgenetic analysis a fruitful method to investigate learning (microgenesis) as it unfolds during interaction.

Researchers like Donato, 1994; Swain, 1997; Swain and Lapkin, 2001; and Roschelle and Teasley, 1995 have identified *collaborative dialogue* that emerges from learners’ interactions when engaged in problem-solving activity as the kind of interaction that can potentially lead to language development. In Swain’s words, *collaborative dialogue* ‘is where language use and language learning can co-occur. It is language use mediating language learning. It is cognitive activity and social activity’ (Swain 2000: 97). In this paper I propose that *microgenesis* (method and object of study) as applied specifically to the field of SLL embodies both the identification of *collaborative dialogue* and its microgenetic investigation as a learning process that can be observed while learners engage in goal-directed communication. I refer to development as mediated problem-solving activity where participants are able to overcome a specific language difficulty while carrying out a classroom-based language task, and therefore, cannot claim that the learners will be able to use the language in question in the long term without requiring ‘conscious attention [and/or] external assistance’ (Lantolf and Thorne, 2006: 221). For ontogenetic studies where longer

term development has been documented see Belz and Kinginger, 2003; Belz and Vyatkina, 2005; Kinginger and Belz, 2005; and Ohta, 2001, for example.

Analytically, the exploration of how learners make use of language as a mediational tool during collaborative activity is of paramount importance (Frawley 1992; DiCamilla and Anton 1997; Roebuck 2000; Swain and Lapkin 2000). Furthermore, I propose that although each instance of microgenesis (see method below) is unique since it is co-created by individuals with their own histories and goals, there are certain characteristics and patterns that appear to be similar throughout the various instances of microgenesis identified in the data. Although each developmental instance is unique and ‘contingent upon individual learner experiences’ (Belz and Vyatkina, 2005: 42), this study unravels similar patterns emerging from various microgenesis instances, which show the workings, and interrelation between what the individual brings to the interaction and what gets constructed in collaboration¹. An important issue in our discussion is the analysis of discourse markers, which together with Aljaafreh and Lantolf’s (1994) regulatory scale, help us gain further insights into the participants’ level of regulation.

The following section provides a brief overview of Sociocultural theory and some key concepts that underpinned this investigation. Subsequently, I describe the method and context in which the study was carried out. Finally, the analysis and results sections provide an in-depth examination of microgenesis as a developmental process, before focusing on a specific aspect that appears to be crucial for driving interlanguage forward, and which I refer to as microgenesis affordance.

Sociocultural Theory

Sociocultural Theory is a theory of mental development rooted in the work of the Russian psychologist Lev S Vygotsky (1896-1934). Three interwoven major ideas form the basis of Vygotsky's work: 1) an emphasis on developmental or *genetic* analysis as a means to understand certain aspects of mental functioning; 2) the claim that individual mental functioning has social origins; and 3) an emphasis on the mediated nature of human action (Wertsch 1991: 25). The implications of these ideas as applied to our understanding of **knowledge**² and **learning** (i.e., knowledge building) are profound. Knowledge, hereby understood not as an object to be 'possessed' or a commodity to be accumulated by the individual (see Sfard, 1998: 5), but as an understanding which is "recreated, modified, and extended in and through collaborative knowledge building³ and individual understanding" (Wells, 1999: 89). For Vygotsky, knowledge is not created in the individual mind, it is essentially created in the social realm, through interaction. The importance of knowledge and how it is socially co-constructed is stressed by Wells (1992) by means of three principles. First of all, knowledge is interpsychologically created by knowledgeable individuals, therefore it is not conceived as a pre-existent product waiting to be exchanged; secondly, this knowledge co-construction is both social and cultural; and finally, its construction is always **mediated** by cultural processes and tools, either physical or psychological (Wells 1992: 286-287; see also Mercer and Scrimshaw 1993). The process through which activity, that is originally mediated/regulated by tools and other people, is transferred from the social to the individual plane is referred to as **internalisation**. This process is achieved by appropriating the means of regulation and manipulating them voluntarily (Lantolf, 2000).

Learning, or "the development of increasingly effective ways of dealing with the world and its meanings" (van Lier, 2000: 246) is seen in Sociocultural theory as a mediated

process that originates in societal activity where the issues of instruction, agency, and situatedness need to be considered. The role of instruction is fundamental to this approach. Instruction is essentially a collaborative act where **zones of proximal development (ZPD)** - in Vygotsky's words, 'the discrepancy between a child's actual mental age and the level he reaches in solving problems with assistance' (Vygotsky 1986: 187) - are created by the participants, agents with their own social perspectives and histories, goals, attitudes, etc. Ohta (1995, 2001) has adapted the construct for the L2 learner as "the distance between the actual developmental level as determined by individual linguistic production, and the level of potential development as determined through language produced collaboratively with a teacher or peer" (Ohta, 2001: 9). The situated quality of learning means that circumstance is a pervasive aspect that has to be carefully considered since 'learning unfolds in different ways under different circumstances' (Donato 2000: 47).

Finally, **Activity Theory** (Leontiev, 1978) provides an analytic framework - rooted in Sociocultural theory - for the systematic investigation of collaborative activity in the classroom. According to Wertsch (1985), Activity Theory raises the fundamental question of what the individual or group is doing in a particular setting. In order to find this out, it is necessary to investigate what the motivation behind the activity is. For analytical purposes activity can be categorised into three different levels: activity (why something takes place, motive oriented), action (what is being done, goal oriented), and operation (the actual doing, means oriented) (Lantolf and Thorne, 2006: 217).

Method and Context of the study

The study was conducted in a Spanish as a foreign language classroom for undergraduate students throughout an academic semester where the author was also the class teacher. The

participants were 11 females and 7 males in their late teens/early twenties. Their level of Spanish was Intermediate, which corresponds to a grade C in 'A' level Spanish, the national qualification within the British Education context taken at the end of secondary schooling. This classroom-based study focused upon the following grammatical structures which were the content of the course programme established by the language department at the university: personal pronouns to include subject, direct and indirect object, prepositional and reflexive pronouns; infinitive verbs; radical changing verbs; and 'ser' *versus* 'estar' (the two Spanish verbs for 'to be'). None of these structures were expected to be completely new for the students although, as a pre-test showed, they had indeed problems with their use.

In line with a microgenetic method of data analysis and in order to facilitate the study of activity as it unfolds throughout task completion, the main instrument for data collection was the task⁴. Learners were audio-recorded while performing language tasks in pairs/groups. The recorded data (5 hrs 20 min of learners' interaction) were transcribed, based on procedures from Psathas (1995) and Ohta (2001), to produce *protocols* for data analysis. The three tasks, described below, were implemented in two modes: computer-based and paper-based. The purpose for comparing the two modes of implementation was to facilitate the study of the computer pervasiveness in activity. This issue, however, is beyond the scope of the present article, for the full study and specific results in relation to the computer the reader is referred to Author 2003; 2004.

Half of the dyads accomplished a Computer-Assisted Language Learning (CALL) task and half a Paper task. In the interest of preserving the normal conditions of this classroom-based study, students chose their partners as this was the normal practice throughout the semester. However, they were asked to work alternately between the two modes throughout the three tasks. In other words, participants that worked on CALL mode in task 1 were then asked to work on Paper mode in task 2 and so on. The study corpus therefore

comprised 12 protocols, which were managed and analysed with the assistance of two software packages: *N5*⁵ and *Excel*. Students also took a grammar test at the beginning and at the end of the study (pre-post-tests respectively) in order to evaluate changes in their use of the grammatical structures mentioned above (for a report of these results refer to Author 2004).

The tasks

Three problem-solving tasks were specifically designed as the main data collection instrument to record the processes of collaboration undergone by participants while accomplishing them either at the computer (CALL tasks)⁶ or in a paper version (Paper tasks). The two main methodological purposes of the tasks as instruments for data collection were 1) to provide the participants with an opportunity to engage in interpsychological activity by collaborating to complete them; 2) to promote the production of output⁷ since this might lead to language development - e.g. through focusing on form; by ‘pushing’ learners to get involved in more mental efforts and so, process language at a deeper level; by moving from semantic to strategic levels in order to achieve accurate production (Swain, 1995).

The completion of each of the three problem-solving tasks (see brief descriptions below) represented an overall goal. However, to achieve that goal, students also needed to engage in discrete, grammar oriented exercises or micro-tasks implemented as gap-filling, translation, jumbled sentences, and/or caption writing. These embedded micro-tasks were designed to prioritise work on specific language issues, i.e., personal pronouns (tasks 1 and 2), infinitive and radical changing verbs (task 2), and ‘*ser*’ *versus* ‘*estar*’ (task 3). Inter-mental activity was expected to take place in relation to communication for meaning (throughout each task as a whole), metalinguistic talk (when tackling the grammar specific exercises embedded in each task), and metacognitive activity (when planning and organising

how to tackle the tasks). The latter is considered to be particularly important to stimulate individuals, provide them with an infrastructure to negotiate development, take and manage control of their activity and learning, and guide them through the tasks (Hoven 1999; Swain 2000; Ohta 2001).

Feedback and help from the computer were provided in various degrees and three different ways: clues, hints, and a correction button. Learners working on the paper tasks received feedback and help from the teacher-researcher who was always available to everyone.

Task 1: Professionals Today: This task consisted of three parts: 1) a discussion about the world of work, implemented through a hierarchical exercise where participants had to organise concepts such as ‘power’ and ‘money’ according to what they considered more or less important in the world of work; 2) an interview reconstruction of a Spanish professional talking about his views of the world of work (a range of personal pronouns were needed to successfully complete 1 and 2); and 3) creation of a document to express participants’ own views about the topic, but in the context of the UK.

Task 2: Gifted Daughters: Task two was a problem-solving task where participants were given clues that would help them solve a problem posited: to find out which language and which musical instrument belonged to which of five sisters. To solve the problem the dyads had to collect five clues (e.g. “*la hermana que toca el piano no habla alemán*” *the sister that plays the piano doesn’t speak German*), which were provided to them, one at a time, on the computer screen - or on a piece of paper handed in by the teacher - after completing micro-tasks based on grammar (e.g., focusing on personal pronouns, and infinitive and radical changing verbs).

Task 3: Mexico City: Finally, the third task was an adaptation of ‘dictogloss’ (Kowal and Swain 1997: 295 and Swain and Lapkin 2001: 101) which is described as ‘...a procedure

that encourages students to reflect on their own output. In this procedure, a short, dense text is read to the learners at normal speed; while it is being read, students jot down familiar words and phrases; the learners work together in small groups to reconstruct the text from their shared resources...’ (Kowal and Swain 1997: 295).

In the CALL version of dictogloss participants read a text provided on the computer screen instead of listening to it, they then worked on its reconstruction also on the computer (several examples of the verbs ‘ser’ and ‘estar’ were used). The Paper version of this task consisted of three pages: one with the instructions, another one with the text, and a third one with the title of the text and blanks for learners to reconstruct it; as in the CALL version, punctuation marks were provided.

To summarise, the three tasks designed for collection of data in this study provided the students with a twofold and explicit general objective. On the one hand, students had the specific aim of completing the problem solving phase of the tasks, and on the other hand, they were able to focus on form by working on the grammatical structures that were part of the exercises embedded in the tasks.

Analysis and Results

Microgenesis Instances (MGIs)

A fundamental premise within Vygotskian theory of cognitive development is that development first appears in the interpsychological plane, i.e., through social interaction, and it is then internalised by the individual in the intrapsychological plane (Ohta, 2000: 54). Furthermore, the origins and processes of development (*microgenesis*) are sometimes visible as they unfold during interaction.

In order to study collaborative activity and to assess its relevance for SLL, all language related episodes (LREs) were identified throughout the data. An LRE is defined as ‘any part of a dialogue where the students talk about the language they are producing, question their language use, or correct themselves or others’ (Swain and Lapkin 1995). Subsequently, the full set of LREs in the data was further analysed and studied in order to identify those LREs where there were overt signs (e.g. correcting an erroneous form) that some interlanguage restructuring had taken place, these are what I am referring to as instances of *microgenesis*. Table 1 shows the number of microgenesis instances (MGIs) identified in each protocol.

Table 1: Language Related Activity: number of language related and microgenesis instances

	Task 1				Task 2				Task 3				Total task 3		
	CT1*	2CT1	PT1	2PT1	Total task 1	CT2	2CT2	PT2	2PT2	Total task 2	CT3	2CT3		PT3	2PT3
Total No. of LREs	28	29	26	38	121	14	12	12	12	50	15	2	19	14	50
Total No. of MGIs	3	0	3	2	8	2	3	2	0	7	0	0	7	0	7

* CT1 = protocol 1 computer-task1; 2CT1 = protocol 2 computer-task1; PT1= protocol 1 paper-task1, etc.

As the table shows, there are few microgenesis instances in relation to the total number of LREs per task, but with a much higher ratio in tasks 2 and 3. Merging the figures of the four protocols per task, task 1 contained the lowest percentage of MGIs of the three, with only 7% whereas tasks 2 and 3 mirror each other with 14%.

Deriving from the construct of language related episode (LRE) devised to study language related activity during interaction (Swain 1998; Swain and Lapkin 1995, 2000), microgenesis instances (MGI) are another analytical construct that helps us investigate language learning activity and some of the processes underlying it while learners engage in collaboration as shown in instance 1 below. In the example, learners are engaged in an

interview reconstruction through gap filling, and specifically focusing on the reflexive pronoun 'se':

(CT1) microgenesis instance 2 (MGI2)⁸

- 98 M 'avanzar'
'go on' ((reading while pressing button on screen))
- 99 E 'ahora a la entrevista'
'now to the interview'
- 100 M uhum
- 101 E 'buenos dias buenos dias en su opinión en qué'
'good morning good morning in your opinion what is'
- 102 M 'hoy en' día (.) 'hoy en' día
'now a'days (.) 'nowadays'
- 103 E en qué lo? basa
what is it ((wrong pronoun)) *based on?*
- 104 M 'en su opinión en qué' (.) para quién (.) en general o
'in your opinion what is' (.) for whom (.) in general or
- 105 E 'en qué en qué' se 'basa'?
'what is what is' se ((correct pronoun)) 'based on'
- 106 M si
yes
- 107 E si?
yes?
- 108 M es posible no estoy seguro segura ((laughter))
it's possible I'm not sure
- 109 E si ((laughter))
yes

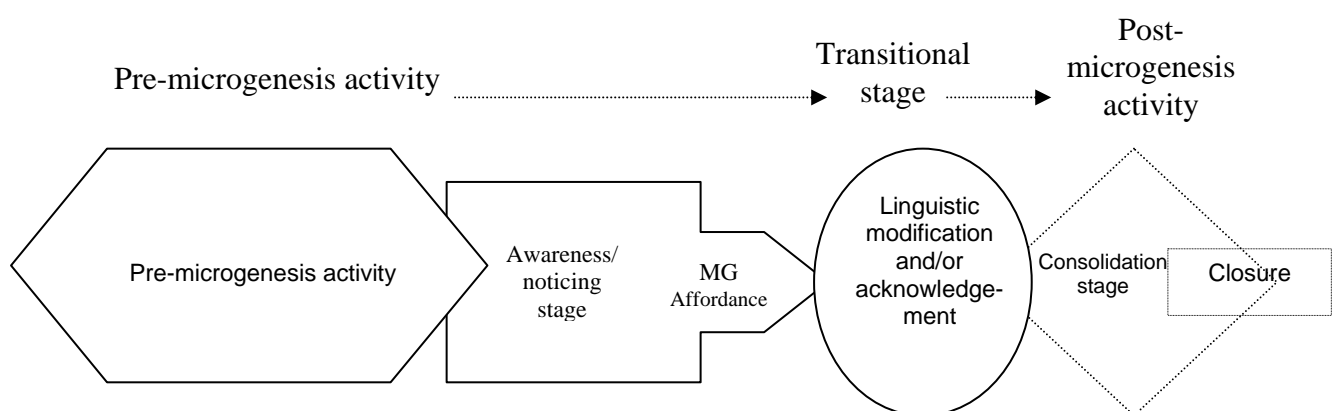
This instance shows how the dyad creates a collective window of opportunity which is then cognitively seized by Ellen (all names are pseudonyms) in turn 105. From turn 98 onwards, they both use reading aloud as a cognitive tool for regulation to try and fill in a gap with a personal pronoun (se). In turn 103 Ellen advances an option - lo - which is not correct, but which nevertheless brings Mina to focus onto personal pronouns (she had just been working on a noun 'día' for a different gap), see turn 104. This turn is at the core of the MGI when Mina engages with this particular problem-solving endeavour and reads aloud part of the sentence as a focus tool and then, after a pause, produces some kind of metalinguistic private speech⁹.

Although we do not have further data, e.g. a retrospective interview with the participants that would throw more light on Mina’s processes and thoughts when uttering speech turn 104 nor an insight into what Ellen might have thought made her correct the pronouns, we do know from the data that Ellen’s interlanguage is modified immediately after Mina’s self-questioning, elliptical utterance in turn 104 which appears to have had certain resonance in Ellen’s inner processing. We could describe this exchange as an intermental continuation of processing or a momentary borrowing of consciousness aided by private speech. The following sections provide an overview of microgenesis as a process followed by an analysis of an essential aspect of microgenesis that I call microgenesis affordance¹⁰.

Outlining microgenesis patterns

This section outlines certain characteristics and patterns identified throughout the microgenesis instances as observed during the overt co-creation of knowledge in the collaborative language classroom. Activity, leading to microgenesis, that emerged throughout the data was characterised by the phases shown in Figure 1, though not all phases were present in all the microgenesis instances.

Figure 1: Microgenesis phases



Pre-microgenesis activity

Pre-microgenesis activity normally entails organisational talk and an awareness/noticing stage, leading to microgenesis affordance (see below). Organisational talk may refer to learners' speech that is directly related to task preparation, for instance when learners are discussing task instructions and/or how to tackle the task (metatalk). However, organisational talk is more often talk that mediates the co-creation of a common focus of attention so that the task can be initiated or continued without metatalk. In these cases, learners make use of reading aloud - either reading the instructions on the screen or their piece of paper, or reading the exercise they are focusing on, e.g. the sentence to be translated or to be completed.

Of crucial importance in this phase of collaborative activity is what I have termed the noticing stage after the first of Swain's (1995) functions of output. Noticing has been associated with the learning processes students need to engage in as part of interlanguage development: 'a second language learner will begin to acquire the targetlike form if and only if it is present in comprehended input and "noticed" in the normal sense of the word, that is, consciously' (Schmidt and Frota 1986: 311). Noticing can be directly related to the task the learners are completing, for instance when they are trying to fill in a gap in a sentence or recreating a text and they become aware of a lack of linguistic knowledge, or when that lack in knowledge is made apparent by their partner's language during collaboration, or their partner's correction. Alternatively, noticing might be indirectly related to the task, in other words, learners might notice a gap in their knowledge through input while reading instructions, or while reading the text surrounding the linguistic focus intended by the task designer.

In this study of 22 instances of microgenesis identified in 12 protocols, 10 are related to target items and 12 are not (see Table 2). Two main - interrelated - issues arise from this fact, first of all, the relationship between task and activity¹¹ and secondly, the importance of

noticing in relation to the students' regulatory stage. Although the main linguistic foci targeted by the design are related to personal pronouns, infinitive verbs, radical changing verbs, and ser/estar, the data show how learners themselves determine what they focus on according to their own linguistic needs.

Table 2: Linguistic focus in microgenesis instances

MG instance	Targeted? Y / N	Details	Location
1	N	Article (del)	CT1
2	Y	Personal pronoun (se)	CT1
3	N	Vocabulary (éxito)	CT1
4	Y	Vocab (desarrollo intelectual)	PT1
5	N	Vocab (aburrimiento)	PT1
6	N	Vocab (esencial)	PT1
7	Y	Infinitive	CT2
8	Y	Radical changing verb	CT2
9	Y	Gerund	CT2
10	Y	Infinitive + pronoun	PT2
11	N	Vocab (cuidado)	PT2
12	Y	Ser vs estar	PT3
13	N	Spelling (belleza)	PT3
14	N	Morphology (trabajadores)	PT3
15	N	Syntax (los)	PT3
16	N	Syntax (tener)	PT3
17	N	Vocab (historia natural)	PT3
18	N	Morphology (sonrientes)	PT3
19	Y	Personal pronoun (se)	2PT1
20	N	Form of address	2PT1
21	Y	Morphology (to know)	2CT2
22	Y	Gerund	2CT2

This is an important issue in collaborative activity. If ‘... noticing can trigger cognitive processes that have been implicated in second language learning; cognitive processes that generate linguistic knowledge that is new for learners or that consolidate their existing knowledge’ (Swain 1995: 130), how is it that collaborative activity provides the cognitive platform for learners to capitalize on the noticing stage and work further towards the modification of their interlanguage system and achieve internalization? What are the microgenesis affordances upon which learners co-construct further knowledge to gain self-regulation? How is it that noticing might lead to language learning? What the data show is

that not only can collaborative activity provide a suitable platform for noticing, but it further supports cognitive engagement leading to modification of the learners' language and/or learning 'routines' (see the post-microgenesis stage below). Once learners' cognitive window gets activated, for example by the noticing stage, learners working within their ZPD and with suitable interpsychological support can further benefit from the collaborative enterprise.

Although the noticing stage and the microgenesis affordance are very closely linked within the process of microgenesis, they are not the same thing. Noticing precedes the microgenesis affordance; noticing precedes linguistic change. The affordance tools visible in the data include private speech; explicit mediation by the expert either in the L1 or the target language (TL); co-constructed speech; the novice's spoken language, e.g. a desire to express him/herself in the TL; and the novice's written language, e.g. having to spell a word or write a sentence.

Transitional stage

The transitional stage visible in microgenesis normally involves an overt acknowledgement of linguistic change, e.g. reflected through a discourse marker, and/or linguistic modification of the learner's interlanguage. Analysis of the transitional stage in the instances of microgenesis helps us understand the regulatory state of the novice in relation to the developing item or structure. The data show three different patterns related to the vocal saliency of the transitional stage; 1) the transitional stage is overtly marked through a discourse marker such as 'oh'; 2) the transitional stage is acknowledged by means of an acknowledgment discourse marker such as 'umm' or 'yeah'; and 3) the stage is unmarked, the learner just incorporates the linguistic change.

Discourse markers are 'sequentially dependent elements which bracket units of talk' (Schiffrin 1987: 31). In the context of microgenesis, they bracket stages of cognitive

development; they mark specific moments where interlanguage change is occurring or adjusting. As McLaughlin remarks, the presence of a discourse marker such as ‘oh’ is an overt indication of the ‘sudden moments of insight’ or ‘clicks of comprehension’ learners experience (McLaughlin 1987: 138). Therefore, discourse markers help us understand stages of regulation and relationship dynamics within the dyad. Moreover, they help us understand the processes of microgenesis in collaborative activity because they ‘simultaneously’ mark information backward and forward, they have both an ‘anaphoric and cataphoric’ quality and ‘they are devices that work at discourse level’ (Schiffrin 1987: 37). The latter is particularly relevant to differentiate between markers such as ‘ah’ and ‘yeah’ as being discourse markers that reflect new, and *unexpected* information, or ‘ah’ and ‘yeah’ functioning as acknowledgement markers that reflect new, but *expected* information, for instance. This kind of knowledge aids our analytic understanding of regulation and its relationship to microgenesis processes. The assessment of regulatory levels in the microgenesis instances studied was based on Aljaafreh and Lantolf’s ‘five general levels of transition from intermental to intramental functioning’ (1994: 470):

Level 1	The learner is not able to notice, or correct the error, even with intervention.
Level 2	The learner is able to notice the error, but cannot correct it, even with intervention.
Level 3	The learner is able to notice and correct an error, but only under other-regulation. The learner understands assistance, and is able to react to the feedback offered.
Level 4	The learner notices and corrects an error with minimal, or no obvious feedback from the tutor and begins to assume full responsibility for error correction. However, development has not yet become fully intramental, since the learner often produces the target form incorrectly and may even reject feedback when it is unsolicited.
Level 5	The learner becomes more consistent in using the target structure correctly in all contexts. The individual is fully self-regulated.

Note: Levels 3 and 4, my bold

Table 3 below summarises the relationship between discourse markers and the level of regulation apparent in the subjects of microgenesis instances as found in the data.

Table 3: Discourse markers and regulatory levels

MG	Discourse Marker	Acknowledgment Marker	Unmarked	Regulatory Stage
CT1-MG3	oh	um (expected information)		3
CT1-MG1	oh			3
PT1-MG4	ay yeah			3
PT3-MG15	ah			4
2PT1-MG19	ah			4
2CT2-MG21	entonces			3
2CT2-MG22	ah ... pero			4
PT3-MG13		ah (expected information)		3
PT1-MG5		ah ok		3
PT3-MG17		yeah		3
PT3-MG18		um		3
PT2-MG10		yeah um		4
PT2-MG11		umm		3
CT1-MG2				4
CT2-MG7				4
CT2-MG8				4
CT2-MG9				4
PT3-MG14				3
PT1-MG6				4
PT3-MG16				4
PT3-MG12				3
2PT1-MG20				4

As Table 3 shows, there is no definitive link between the presence of a discourse marker and the level of internalization. In seven microgenesis instances the transitional stage is marked by a discourse marker which makes salient either a sense of unexpectedness brought about by the new information provided by the acting expert or the expression of self-realisation resulting from the interaction.

There are six instances marked by acknowledgement markers (as opposed to discourse markers) which are characterised by a higher degree of expectancy (assessed through the discourse surrounding the markers) when receiving the new information that affords linguistic change. The fact that in these cases learners appear to be expecting new information from their partner might be because a) there was some pre-microgenesis activity

preparing the learners for the new information; b) the learner was immediately able to map the new information to a known structure which somehow diminished the level of unexpectedness; and c) in one case the learner was more regulated (level 4). Although the regulatory stage of these novices (level 3) still requires assistance from the expert, the level of revelation manifested when receiving the supportive/new information from their expert-partners is lower than in the MGIs where the discourse marker is the prevalent form.

Finally, the unmarked transitional stage shows a relationship with a higher degree of regulation (level 4) where ‘the learner notices and corrects an error with minimal, or no obvious feedback’ (see internalization levels above). Crucial to the absence of a marker in the transitional stage of these instances is pre-microgenesis activity and its characteristics. Expertise is co-created through collective scaffolding supporting the novice to take advantage of the environment affordance to obtain the needed knowledge, hence a higher level of regulation. There are, however, two examples of unmarked transitional stage and regulation level 3 in which the novice is scaffolded through drill pronunciation practice, or by means of co-constructed help.

Post-microgenesis activity

Post-microgenesis activity reflects the subtle consummation of applied knowledge. This is the linguistic space where the mastering of the tool becomes dually exercised; used for doing, as in task completion, and used for cognition, to consolidate language learning.

In most of the microgenesis instances, post-microgenesis activity simply bridges task completion, through the consummation of the communicative act. In other words, having controlled the language in question, learners are able to complete the exercise they are working on and move on towards the following activity phase. In some MGIs what could be

described as discourse of schooling is exercised in a parallel plane in order to consolidate language internalisation. For instance, learners repeat the word or structure, normally while writing or typing the correct versions. However, some dyads go beyond repetition and engage in either personal or public learning routines: for example the novice makes use of L1, private speech, and cognitive statements such as 'I don't know', to contextualise the words they have been working on; learners engage in a dyadic effort where both novice and expert engage in a complementary drill practice and metalinguistic routine; or the novice applies his/her newly gained knowledge to exercise task completion and control through humour, for instance.

The analysis of microgenesis processes contributes to our understanding of the potential of dyadic collaborative activity in the language classroom. As we stressed above, studying microgenesis as a series of levels or stages facilitates our insight into learners' activity, but it does not mean that when learners are engaged in the co-construction of knowledge they necessarily follow those levels as separate procedures to achieve regulation.

Microgenesis Affordance

The following section is an analysis of a specific aspect of microgenesis that appears to be crucial for driving the learner's interlanguage forward, microgenesis affordance. Microgenesis affordance immediately precedes what we have identified as the transitional stage in microgenesis and it entails the processes and/or characteristics of the assistance provided by the more knowledgeable peer, e.g. the acting expert in that particular instance, or the characteristics of the linguistic environment that allow for a learner to capitalize on the affordance to modify and enhance his/her interlanguage. The term affordance refers to 'a particular property of the environment that is relevant - for good or for ill - to an active, perceiving organism in that environment. An affordance affords further action (but does not cause or trigger it)' (van Lier 2000: 252). From the point of view of an ecological approach to

language learning as the one advanced by van Lier, affordances are learning opportunities that can be used by an ‘active and engaged’ learner to take action over his/her language.

Microgenesis affordance is an essential characteristic of the MGIs observed in the data and it embodies the co-creation of common ground upon which opportunity for language learning is offered (e.g. corrective feedback) and/or simply taken by the learners actively engaged in collaborative activity. Microgenesis affordances can be created by the two minds, so attuned to each other that they appear to be acting as an extension of one another, as we can see from the examples such as the ones involving private speech (see below), or they can be overtly created by means of assistance either requested or unrequested. 11 out of 22 microgenesis instances identified in the data are characterised by the former type of co-constructed affordances (from now on referred to as affordances), and the other 11 are the result of overt assistance (from now on referred to as assistance) 6 requested instances versus 5 unrequested.

Assistance as microgenesis affordance

In this section we will analyse the types of assistance encountered in the microgenesis instances and the mediational mechanisms that support the creation of assistance. We will do so by analysing representative instances of the type of assistance being studied.

Requested assistance

Three types of requested assistance were identified in the data, a straightforward reply, paraphrase followed by a reply, and co-constructed assistance. Replies were basically translations either from the target language (Spanish) into L1 (English) or *viceversa*; the

paraphrase was followed by a reply in the L1; and the co-construction followed an implicit request in the L1. What determines the kind of assistance the expert provides, however, depends on factors that ultimately impact on the learning experience the dyad/group as a whole is undergoing. The most important of those factors is the sensitivity shown by the expert towards a) the partner requirements as manifested while struggling with a particular word, for example; b) the task goals; and 3) the acting expert's personal objectives (for instance providing the requested assistance efficiently no to become distracted from the task goal). The result is a dialogic opportunity for both learners that arises from an asymmetric situation. We will illustrate the above assertions through a contrastive analysis of microgenesis instances and the choice of help provided by the learners taking part in those exchanges.

L1 Reply

Use of L1 can prove to be a very effective mediational mechanism if investigated within its situated context (see Antón and DiCamilla, 1998; de Guerrero and Villamil, 2000; Swain and Lapkin, 1982, 2000). Two of the instances that involve use of L1 in the provision of help exemplify how the experts' choices are affected by what is going on in the collaborative act. The first instance (MG3) illustrates Mina's ability to provide the requested assistance by Ellen in an effective, economical way that did not disrupt the overall focus of task implementation, e.g., the completion of an interview reconstruction.

(CT1) MGI3

- 148 E 'en los' (.) 'en cuanto a' ((reading quietly)) que ah (.) talking of technology
'in the' (.) 'in relation to' that ah (.) talking of technology
- 149 M umm ah
- 150 E 'qué tan importante' es 'el'
'how important' is 'the'
- 151 M si (.) es el (.) es el
yes is the is the
- 152 E es el (.) es el éxito? o (.) no?
is the is success? or (.) no?
- 153 M no en tec tecnología?
no in tec technology?
- 154 E no se no se qué sign significa su 'éxito en el poder el dinero' (.) éxito es
I don't know what success means in 'power money' success is
- 155 M success
- 156 E oh
- 157 M 'poder' (.) um 'qué tan importante' (.) how important 'es el es el el '
'power' (.) um 'how important' (.) how important ' is the is the the'
- 158 E how important's success in 'your' work? I don't know
- 159 M el poder
power
- 160 E um?
- 161 M el poder
power
- 162 E [typing] poder
power
- 163 M no es tecno tecnología no es (.) computador?
no it's techno technology no is it (.) computer?

The fact that Mina simply replies in the L1 (t 155) facilitates the provision of help without losing focus on the task goal, e.g. filling in a particular gap. Mina's behaviour reflects a recognition of both, her partner's specific need - Ellen has been actively trying to learn the meaning of 'éxito' - but also her own. She has been using repetition as a regulatory tool to gain control over the task and would not want to lose that focus by engaging in a more lengthy and, potentially distracting from the immediate goal, process. Therefore, paraphrasing or exemplification, for instance was not Mina's choice. In this situation, use of the L1 was an effective tool for the collaborative enterprise as a whole. We can compare this instance with a second MGI where L1 is also used as a mediational tool for the provision of requested assistance, but whose characteristics are different.

Paraphrase and L1 reply

(PT1) MG14

- 12 L um qué es desarrollo intelectual?
um what's intellectual development?
- 13 H es umm es como (.) ah (.) que es umm que tu aprende ah durante ah su carrera=
it's umm it's like (.) ah (.) that it's umm that you learn ah during your career=
- 14 L =ok
- 15 H intellectual development
- 16 L ay yeah ((laughter))
- 17 H ah
- 18 L no ((laughter)) no ()

Although in this instance the expert also uses L1 to provide assistance to the novice, the L1 is not the immediate option chosen by Hena. After being asked, in the target language, what the meaning of intellectual development is (t12), Hena resorts to paraphrasing. It has to be noted that, unlike 'éxito' in MG3, 'desarrollo intelectual' is a working item for the completion of the task, as the learners are trying to hierarchically organise a series of concepts, including intellectual development, according to their own priorities. Understanding the terms in this part of the task would therefore have been perceived as important by both learners. Hena's efforts to explain the meaning of the item in Spanish suggests that she is actively taking this classroom exercise as a learning activity. She is behaving as a language student who is constantly reminded of the importance of using the TL as much as possible, but as importantly, she seems to be taking advantage of this affordance, initiated by her partner, to stretch her interlanguage (notice the fillers, repetition, and pauses in turn 13). In turn 15, however, she provides the translation of the term into English after the acknowledgement marker 'ok' quietly uttered by Liam in turn 14. Although 'ok' would normally mean understanding of the interlocutor's message, we - as analysts - learn through turns 16-18 what Hena - as a committed collaborator and acting expert - immediately perceived in turn 14: that Liam had not really grasped the meaning of 'desarrollo intelectual' from Hena's paraphrase. The fact that Hena uses L1 as a further tool to convey the meaning

of the words and provide the required assistance to her classmate suggests that even though she was cognitively engaged in her Spanish performance, she was also sensitively open to and aware of her classmate's needs.

This MGI is a clear example of how learners acting as experts in a particular situation are able to provide scaffolded help and how an active learner takes advantage of the collaborative situation to engage in a process of learning (stretching her own interlanguage) and teaching (providing the required help) simultaneously. Finally, we also witness the internalization process undergone by Liam who progresses from object-regulated behaviour (verbally pointing at the unknown term), through other-regulated (Hena's assistance), to self-regulation (a linguistic understanding that allowed him to even use humour in turn 18 in relation to the term). Of course, he had access to the term in the L1 and we do not pretend to claim he would be in a position to use the Spanish expression in other contexts and situations in the long term, but what is evident is that the collaborative situation in which the expert provided graded help was an effective context that allowed for both learners to actively engage in a learning process (Aljaafreh and Lantolf, 1994; Donato, 1994).

Co-construction

The third type of requested assistance observed during microgenesis is co-construction. According to Ohta, co-construction is an explicit form of assistance 'as the peer chimes in with a syllable, inflection, word, or phrase, or completes an utterance started by the peer. Co-construction sometimes results in vertical construction, in which peers collaborate to produce an utterance, alternately providing words or phrases to the growing utterance' (Ohta 2001: 88-89). The example of requested assistance in our microgenesis data set results indeed in a vertical construction.

(PT3) MGI17

- 296 A [the history museum (.)
297 J eh ah la galeria tate (.)
eh ah gallery tate
298 P eh um el museo du eh natural de historia,
eh um the museum of eh natural history
299 J de histo de (. de
300 P historia
301 J his to ria
302 A [natural
303 P [historia
304 A yeah de historia natural
305 J that's it (. y eh

This instance is part of an ongoing process of co-construction where the learners (a triad) are creating a text about London which follows the reconstruction of a text about Mexico City. Students are listing places of attraction in London one of them being ‘the history museum’ (t 296) proposed by Alex in English. The expression of the place in English is rightly interpreted by Jack and Paul as a request for assistance and the three of them subsequently engage in the co-construction of the expression in Spanish. This is another example of the use of English as an economical resource that far from compromising the collaborative activity becomes a facilitator for it. The three learners engage in collective scaffolding and achieve together what was beyond individual achievement (see Donato 1994). This group performance, moreover, transcends the dyadic interaction and what was originally a collective effort to help Alex, becomes a beneficial experience for the three learners at different levels. While they are all working to co-construct ‘museo de historia natural’, Jack and Paul are also dealing with another issue in turns 299-301 where Jack is having problems with the word ‘historia’ and Paul produces the whole word for him (t 300).

The three examples of requested help analysed in this section provide an insight into the ways learners respond to each other’s needs during collaboration as well as how a request for help turns into an affordance for the group. These are clear benefits of the dialogic

experience where linguistic actions exceed the individual by having an impact on both participants of an exchange.

Unrequested assistance: corrective feedback

There were five instances of unrequested assistance out of 22 instances of microgenesis. The five cases each involved a recast, which has been defined by Ohta as ‘an utterance that reformulates a learner’s erroneous utterance. Recasts may contrast with learner utterances phonologically, morphologically, syntactically, or semantically, but are based on the learner’s erroneous utterance and maintain semantic contiguity with it. Recasts are immediately subsequent to the utterance’ (Ohta 2001:141). Two of the instances were phonological corrections that were followed by pronunciation practice whereas three were recasts of a morphological nature, for example:

(PT3) MGI15

- 131 j =las las mexicanos
 = **the *the mexicans* ((*wrong gender for the needed article*))
- 132 a los mexicanos [son morenos
 the mexicans are dark-skinned
- 133 j [ah los mexicanos
 ah the mexicans

Other types of microgenesis affordances

I will now refer to microgenesis instances where participants co-create learning affordances which are not based on corrective feedback. I identified eleven such instances in the data. These instances entail characteristics of the linguistic environment that allow for a learner to capitalize on the affordance and thus enable him/her to modify and enhance their interlanguage. I will illustrate this point by means of two examples.

This first example of microgenesis affordance both helps us understand some of the ways in which learners tackle linguistic problem-solving by making language more manageable, but also how learners benefit from each other's mental activity.

(CT2): MGI8

- 114 Henry (Hn) 'Elisa no es la chica que habla alemán' (.) que pasó? (.) ok 'avanzar' 'she had to practise but carried on reading' umm,
'Elisa isn't the girl that speaks German' (.) what happened? (.) ok 'go on' 'she had to practise but carried on reading' umm,
- 115 Hena (H) umm creo que es
umm *I think it's*
- 116 Hn es el antepasado si
it's the anterior preterite yes
- 117 H tu
- 118 Hn [tuvo
- 119 H [tuvo
- 120 Hn tuvo que practicar,
had to practise
- 121 H si ((typing)) prac
- 122 Hn pract eh p r a c tiicar
pract eh p r a c tiise
- 123 H pero
but
- 124 Hn carried se seguir? seg she carried on reading pero (.) no se carried on continuar?
carried *ca carry? car* she carried on reading *but* (.) *I don't know* carried on *to continue?*
- 125 H si cont
yes cont
- 126 Hn continuó? no se como se dice el pasado continue? ((mumbles and she writes))
carried on? I don't know how to say the past carried on? ((incorrect tacit subject))
- 127 H con ((typing, they smile)) [pero
con ((typing)) [but
- 128 Hn [pero es es el material ((they smile))
[but *it's the material*
- 129 H pero continuo (.) es el=
but carried on (.) *it's the=*
- 130 Hn =no s no estoy seguro (.) continuo=
=I'm no I'm not sure (.) *carried on*
- 131 H =[gerundio
=[*gerund*
- 132 Hn [a leer?
[*to read?*
- 133 H después de [continuar
after to [continue

- 134 Hn [continuar leyendo leer leyendo (.) leyendo?=
[to continue reading to read reading (.) reading?
- 135 H =si es leyendo porque es el gerun gerundio average(.) después de seguir y continuar
yes it's reading because it's the gerund average gerund (.) after to carry on and to continue
- 136 Hn ((he types)) l e y e n d o punto
r e a d i n g full stop

As we can see from the beginning of the instance learners are collaboratively tackling the translation into Spanish of the sentence 'she had to practise but carried on reading'. In turn 124 Henry isolates the problematic verb 'to carry on' which can be translated both as 'seguir' or 'continuar'. It is relevant to note the various processing strategies that help the learners achieve regulation as they are revealed in that turn and which are common in collaborative activity. First of all, Henry isolates the problematic item 'carried', then we witness a memory retrieval process in two stages, first for a syllable, then the whole word: 'se seguir?' followed by just 'seg' having realised the discrepancy between 'carried' (past tense) and 'seguir' (correct verb, but in the infinitive form). He uses repetition and code-switching to continue his efforts when he repeats 'she carried on reading' as a tool to try and gain control but switches into Spanish for the conjunction 'pero' which they already control. After a brief pause followed by his cognitive statement 'no se', he tries to regulate again through repetition of 'carried on' and produces 'continuar?', a synonym of 'seguir' still in infinitive.

In turn 125 Hena intervenes to accept 'continuar' although she stops short at 'cont' presumably because she is also having problems with the past tense. Nevertheless, her intervention makes them both choose 'continuar' which enables them to focus on this and resume their efforts. Turn 126 is a hypothesis testing turn for Henry who tries both forms of the past tense 'continuó' and 'continué', some metalanguage and probably some private speech (which is indecipherable because he is mumbling). After some comments related perhaps to typing problems, Hena rebuilds on Henry's suggestions and types - while repeating - 'pero continuó', which is correct, in turn 129.

Finally, she starts her construction of a grammar rule that eventually helps them achieve regulation. Turns 129 to 135 are the product of interwoven consciousness between these two learners which culminates with Henry's internalization processes - rooted in Hena's metalanguage - and his own production of the correct form 'leyendo' (followed by a little learning routine in turn 134). So through turns 129, 131, 133, and 135 Hena retrieves the grammar rule, 'it is the gerund, after to continue because it is the average gerund after to carry on and to continue', and by doing so she enables Henry to move from the incorrect form *'a leer' to the correct 'leyendo' through the even turns 130, 132, and 134. In this particular instance the fact that both learners approach the task differently is to their advantage. While Hena focuses on retrieving a grammar rule, Henry focuses instead on trying out the verb forms.

Mapping knowledge

Another way in which learners take advantage of the collaborative act to engage in L2 processing is by questioning their partner's utterance and mapping it against their own knowledge. The following instance involves the co-translation of the sentence 'her boyfriend doesn't know how to play the piano.'

(CT2) MGI7

24	H	'avanzar' 'go on'
25	Hn	su novio ((typing)) <i>her boyfriend</i>
26	H	novio <i>boyfriend</i>
27	Hn	novio <i>boyfriend</i>
28	H	no <i>doesn't</i>
29	Hn	no sabe no <i>doesn't know</i>

- 30 H si no sabe
yes he doesn't know
- 31 Hn no sabe
he doesn't know
- 32 H tocar
how to play ((in Spanish how is not necessary))
- 33 Hn tocar si tocar el piano (.) el piano o el
to play yes how to play the piano (.) the piano or the
- 34 H umm
- 35 Hn how cómo tocar? es (.) es sabe tocar (.) no sabe cómo tocar? o tocar? tocar
how how to play? Is it (.) is it he knows how to play (.) or knows to play? or to play?
to play
- 36 H umm
- 37 Hn si tocar [el] piano,
yes to play ((without how)) [the] piano,
- 38 H [el] (.) el piano ((smile))
[the] (.) the piano

From turn 24 to 32 Hena and Henry proceed with the task of translating the sentence by means of co-construction, they co-build language by repeating what their partner said and building on it to develop the structure in hand. However, in turn 33 there is a change in Henry's performance. At first, he accepts Hena's suggestion 'tocar' as a translation for 'how to play' which is the correct form in Spanish, since the 'how' becomes redundant, but then he becomes engaged in dialogic thought about the structure, e.g. a pause followed by the repetition of 'el piano' and the introduction of the disjunctive conjunction 'o' (or) which suggests he is thinking about a different option. The second part of this turn indicates what becomes apparent later on, that Henry is questioning the need for 'como' (how) before the verb 'tocar' (to play). Hena's backchannel cue 'umm' in turn 34 encourages him to bring forward his language questioning by making his thought explicit in turn 35 where he reveals he is contrasting the target language structure against his L1.

This process of 'matching up' or 'mapping' one structure over another can be compared to the processes described by Doughty (2001) when referring to intake in language learning,

...it is that component [intake] where psycholinguistic processing takes place. That is, where information is matched up against prior knowledge and where, in general, processing takes

place against the backdrop of the existing inter-segmentation of grammaticization on the basis of perceptual salience or semantic transparency, together with other cognitive principles of storage, mapping and analysis, learners gradually internalize the target structure of the input into the developing language system (Doughty 2001: 215).

However, what we can see in this microgenesis instance is that some of the processes described by Doughty as part of the internalisation process are occurring *through* and, importantly, *because of* the regulatory mechanisms brought about by the intermental activity in which these two learners are engaged. Henry starts turn 35 being very much object-regulated, having to linguistically ‘point at’ the trouble source and contrast it in both languages, ‘how cómo tocar? is it he knows to play or knows how to play?’ and then goes on, at the end of the turn, being aided by the verbalization sound of ‘or to play? to play’ to finally achieve regulation in turn 37 while uttering the whole correct verb phrase ‘sí tocar el piano’ (*yes to play the piano*). Although in these last stages of the instance Hena just intervenes twice with backchannel cues (turns 34 and 36), her assistance in the internalisation process, incidental as it might be, is important. First of all, she produces the correct structure which affords Henry’s engagement with, and questioning of, the form. Secondly, Henry’s efforts to *communicate* to Hena his questioning of whether they should include ‘como’ (how) as part of the translation are, at the same time, *facilitating* his language internalisation.

Conclusion

Sociocultural theory postulates that knowledge is created interpsychologically, not conceived as a pre-existing product to be exchanged, and that the co-construction of knowledge is always mediated by either physical or psychological tools. Learning is a situated activity ‘therefore it unfolds in different ways under different circumstances’ (Donato 2000). Throughout this paper we witnessed the mediated co-construction of knowledge by the participants. The learners made use of semiotic mechanisms to different degrees and for different purposes, thus reflecting their tasks perceptions and their particular goals and needs.

In this paper, we highlighted the importance of microgenesis as both, tool and focus of study. The object of this investigation was to identify and study those instances where language learning was taking place during interaction, while– simultaneously – gaining a deeper understanding of how the process was taking place. Ohta remarks, when referring to obtaining and providing assistance, that “the interactional mechanisms involved ... during language learning tasks have been little examined” (Ohta, 2000: 52). This study aimed to contribute to the body of research into how the learners deploy some specific semiotic resources such as use of L1, repetition, and reading aloud to gain control over the task in hand, and to facilitate knowledge co-construction and interlanguage development (DiCamilla and Anton, 1997; Frawley, 1992; Roebuck, 2000; and Swain and Lapkin, 2000).

In addition, the potential interface between speech and cognitive activity was illustrated by means of our insights into the discourse marker. Discourse markers were found to bracket stages of cognitive development; more specifically, they appear to mark moments where interlanguage change is occurring or adjusting. Therefore, their microgenetic study can help us understand stages of regulation and relationship dynamics within the dyad. In other words, examining the collaborative enterprise through the microgenetic lens provided the analytic tool for the simultaneous study of individual semiotic tools and the process of language development without creating a vacuum between dialogue and activity.

A crucial issue that has been eluding Sociocultural SLA researchers remains inconclusive: is it possible to claim that the interlanguage restructuring observable during interaction does become internalised? (For exceptions, see developmental studies over long periods, e.g., Ohta, 2001; Belz and Kinginger, 2003; Belz and Vyatkina, 2005). It was not within the scope of this study to provide such evidence, but I believe it is important for future research from this theoretical stance to accurately establish the long-term effect that microgenesis (i.e., “a local, contextualized learning process”, Mitchell and Myles, 2004:198)

has on the learners' interlanguage. However, it is encouraging, from a Sociocultural approach, to be able to witness a process that might have contributed to the students' progression from other to self-regulation.

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¹ Although the kind of analysis pursued in this investigation shares characteristics with other types of linguistic analysis, for example with Conversation Analysis, it differs from them in that "cognition and the social and cultural context of talk are considered legitimate concerns... Dialogue is treated as a form of intellectual activity – as a mode of thinking [and the analysis] is concerned not only with the processes of joint cognitive engagement, but also with their developmental and learning outcomes" (Mercer, 2004: 141).

² For an in-depth discussion of conceptualisations of this term, see Wells, 1999: 51-97.

³ The activity in which "the individual is engaged in meaning making with others in an attempt to extend and transform their collective understanding with respect to some aspect of a jointly undertaken activity" (Wells, 1999: 84).

⁴ There were other, supplementary, instruments for data collection in the study (pre/post language tests, and two different types of questionnaires). For information about the full study see Author, 2004.

⁵ Package for qualitative data analysis from QSR.

⁶ The CALL tasks were created with two pieces of software, a Web page generator, GoLive by Adobe, and the authoring programme, HotPotatoes by Half-Baked.

⁷ The term ‘output’ is used in this paper in reference to Swain’s ‘output hypothesis’ (1995, 2000). For discussions on the use of terminology that invokes an ‘information-processing ‘input-output’ view of L2 learning see Swain, 2000; van Lier, 2000; de Guerrero, 2005.

⁸ Transcription conventions:

<i>italics</i>	=	translation into English
‘ ‘	=	reading aloud
(.)	=	pause
()	=	indecipherable
(())	=	comments
#	=	turn number
=	=	latching
[=	overlapping
?	=	rising intonation
→	=	turn to be discussed in the text
S	=	speaker (pseudonym initial)
CT1	=	protocol 1 computer-based task 1
2PT1	=	protocol 2 paper-based task 1, etc.

⁹ Private speech is self-directed language that can be observed when learners are experiencing cognitive challenges and it is employed to gain self-regulation and control task performance (McCafferty, 1994; Donato, 1994, 2000). The identification and subsequent analysis of private speech utterances presents, however, difficulties and even controversies (*cf.* Wells, 1998:349-350), not least because of the practicalities of “capturing” it during data collection. Private speech is often uttered in a low voice, and includes elliptical language, as was the case for the utterance in question.

¹⁰ ‘The word Affordance was coined by the psychologist James Gibson to refer to a reciprocal relationship between an organism and a particular feature of its environment (1979)’ (van Lier, 2000: 252).

¹¹ I refer to *task* as a focused piece of work that serves as a blueprint for learners to engage in meaningful activity in pursuit of a goal. The *activity* generated by the learners’ interaction with the task is a unique event since it is defined by the processes that develop as a result of that interaction in combination with the learners’ own goals and perceptions of the task (*cf.* Coughlan and Duff, 1994: 175).

¹² ‘Consciousness implies language or symbol use, process, and activity in social space’ (Roebuck: 2000: 81).

Sociocultural Theory and its application to CALL: A study of the computer and its relevance as a mediational tool in the processes of collaborative activity.

Gabriela Adela Gánem Gutiérrez, University of Essex

Abstract

This study in the field of Second Language Acquisition (SLA) was conducted in a Spanish as a foreign language classroom. The study investigates dyadic face-to-face collaborative dialogue *at* the computer from a Sociocultural perspective. Protocols for analysis were obtained by the transcription of audio recordings of (12) dyads/triads completing three tasks in two mediums of implementation, computer and non-computer-based. By comparing learners' activity in the two mediums through microgenetic analysis (i.e., developmental analysis), we were able to study some specific ways in which the computer influenced the course of interaction. Specifically, the aim of the study was to investigate the value of the *tasks* as pedagogical instruments to support collaborative activity in the foreign language classroom; the value of *collaborative activity* as a source for possible restructuring of interlanguage (i.e., *microgenesis*); and the impact of the *computer* as a mediational tool in the processes of collaborative activity. Results confirm 1) the three tasks support high degrees of collaborative activity – albeit qualitatively different; 2) language can - sometimes simultaneously - be deployed by learners both as a

means of communication and as a cognitive tool to achieve linguistic development; 3) the presence of the computer seems to change the nature of collaborative activity.

1 Introduction

A fundamental premise from a Sociocultural approach to language learning is the notion of knowledge being social and *created* in interaction. According to Vygotsky (1978), cognitive development appears first in the inter-psychological plane and it is then appropriated by the individual. The processes undergone in inter-psychological activity are mediated by tools, either physical and/or symbolic, language being the most pervasive of these. Social interaction is a means to achieve development that enables appropriation/internalisation “through a dynamic transformative process called *microgenesis*” (Wertsch, 1985 in Ohta, 2000:54). The learning process I am referring to as microgenesis can sometimes be observed while learners engage in dialogic communication, and can thus be studied within the situated activity in which it occurs.

Framed within this approach to language learning, the main objective of the investigation reported in this article was to study collaborative activity across three tasks in two modes of implementation (computer *versus* paper) in order to address the following questions:

1. To what degree do the three different tasks in the two mediums of implementation – computer and non-computer based – support collaborative activity in the classroom?
2. To what degree do participants engage in High Quality Collaboration (HQC)?¹
3. What is the effect of the computer as a mediational tool in the processes of collaborative activity?

After establishing the theoretical underpinnings of the study in the section entitled “Sociocultural Theory”, I provide an overview of the context and research methods deployed (see “the study” below). The comparative nature of the methodology employed aims to identify specific patterns and characteristics of interaction influenced by the medium. In other words, the comparison between computer and paper modes moves away from general questions about the supremacy of one mode over another. The aim is to explore specific tasks implemented in a particular context to identify possible strengths and weaknesses brought about by the mediational tool. A second aspect to bear in mind is the need in the field to find, test, and refine the methodological constructs required to adequately investigate collaborative activity in the classroom. In an effort to contribute to the fulfilment of this need, I introduce the concept of High Quality Collaboration (HQC) (see “analytical procedures” below), a methodological construct grounded in the data that facilitates both qualitative and quantitative data analyses. This paper forms part of a wider study of the processes of collaborative activity in computer-mediated tasks (cf. author, 2004).

¹ For the purposes of the present study I have defined *High Quality Collaboration* as collaboration where learners, working within a zone of proximal development (ZPD), are able to co-construct language related knowledge. For further explanation see “Analytical procedures” section below.

2 Sociocultural Theory

Sociocultural Theory is rooted in the “Vygotskian argument that knowledge is social and is created in interaction” (Daniels, 1993). The Sociocultural approach to learning differs from other cognitive approaches in that it does not accept that knowledge originates and develops exclusively inside the individual mind by means of biological mechanisms and internal processes. Vygotsky accorded learning a fundamentally social nature. Thus learning is a mediated process that *originates* in societal activity. The learning process “...can sometimes be traced visibly in the course of talk between expert and novice. This local, contextualized learning process is labelled *microgenesis*” (Mitchell and Myles, 2004:198). From a Sociocultural perspective there are three important issues to be considered in relation to learning, specifically in the classroom: instruction, agency, and situatedness. The role of instruction is at the core of this approach. Instruction is essentially a collaborative act where zones of proximal development² are created by the participants, that is agents with their own social perspectives and histories, goals, attitudes, etc. The situated quality of learning highlights that circumstance is a pervasive aspect that has to be carefully considered since “learning unfolds in different ways under different circumstances” (Donato, 2000: 47).

Due to the complexity of agency during activity and the pervasive influence of circumstance upon it, it is possible that activities change and evolve even in the span of a

² In Vygotsky’s words, the ZPD is “the discrepancy between a child’s actual mental age and the level he reaches in solving problems with assistance indicates the zone of proximal development” (Vygotsky, 1986:187). Lantolf (2000) has interpreted the zone of proximal development (ZPD) as a metaphor for the “site where social forms of mediation develop...for observing and understanding how mediational means are appropriated and internalized” (2000:16-17).

few moments. Furthermore, although a group of participants might be involved in performing a particular task, this does not mean that they are all engaged in the same activities which, in turn, has major implications in the language classroom since it is students that shape both the goals and outcomes of tasks (see Lantolf and Appel, 1994; Donato, 2000; and Roebuck, 2000). These theoretical insights have been corroborated by investigations into SLA tasks carried out by researchers such as Coughlan and Duff who suggest that tasks are no more than “behavioural blueprints” (1994: 175) for learners to engage in their own particular activity. Not only do their protocols show how five different learners conceptualise the same task differently, but also how the same learner re-interprets the same task in a different way when asked to perform it again over a period of time. Their work leads them to conclude that on the one hand “a linguistic event never duplicates a past one, and can never be truly replicated in the future” and on the other hand, although “the task or blueprint may be the same, the activity it generates will be unique” (Coughlan and Duff, 1994:190).

2.1 Collaborative dialogue

From a Sociocultural perspective, the cognitive processes involved in the production of output that might lead to language development - e.g. through focusing on form; by “pushing” learners to get involved in more mental efforts and so, process language at a deeper level; by moving from semantic to strategic levels in order to achieve accurate production, etc. (cf. Swain, 1995) - are first realised in the inter-mental plane and then internalised. It is through and by means of dialogue that noticing, hypothesis testing, and

reflective metalinguistic talk can occur (Swain, 1997). However, not all dialogue is equally conducive to cognitive and linguistic development. Researchers like Donato (1994), Swain (1997), Swain and Lapkin (2001), and Roschelle and Teasley (1995) have identified *collaborative dialogue* that emerges from learners' interactions when engaged in problem-solving activity as the kind of interaction that can potentially lead to the co-construction of linguistic development through the process of internalisation³. In Swain's words, *collaborative dialogue* "is where language use and language learning can co-occur. It is language use mediating language learning. It is cognitive activity and social activity" (Swain, 2000: 97). Crucially, engagement in collaborative dialogue does not necessarily take place because learners misunderstand each other and have to "negotiate for meaning" (*cf.* Long, 1983; Pica, 1994), but because they notice a linguistic problem and try to find out solutions to solve it. Central to this perspective is the issue of agency, to be able to understand collaborative activity we also need to understand "how the learner relates himself to the learning task and how this relationship is based on the learner's self-constructed goals" (Donato, 1988: 5).

³ The process of transition from inter-mental activity to intra-mental activity is called appropriation -or internalisation (*cf.* Frawley, 1997).

3 The study

3.1 *Context, learners, and research design*

The study was conducted in a Spanish as a foreign language classroom for undergraduate students throughout an academic semester; the class was conducted largely in the target language, although English was sporadically used. The participants were 11 females and 7 males in their late teens/early twenties. Their level of Spanish was Intermediate, which corresponds to a grade C in 'A' level Spanish, the national qualification within the British Education context taken at the end of secondary schooling. The study focused upon the following grammatical structures as part of the course programme being taught by the author: personal pronouns to include subject, direct and indirect object, prepositional and reflexive pronouns; infinitive verbs; radical changing verbs; and 'ser' *versus* 'estar' (the two Spanish verbs for 'to be'). None of these structures were expected to be new for the students although, as the pre-test showed, they had indeed problems with their use.

The main instrument for data collection was the task. Learners agreed to be audio-recorded while performing language tasks in pairs/trios for the purposes of research. Data were collected by the teacher-researcher during weeks 5, 8, and 11 out of a 12-week programme. Due to the fact that data collection was implemented as part of the students' Spanish class, participants were free to decide whom they wanted to work with since this is what normally happens in all the Spanish sessions at the University and it was not in conflict with the study design. The recorded data (5 hrs 20 min of learners' interaction) were transcribed to produce protocols for data analysis. The three tasks, described below,

were implemented in two modes: computer-based and paper-based. The main purpose for comparing the two modes of implementation was to facilitate the study of the computer pervasiveness in activity (cf. Author 2003; 2004). For each of the tasks, participants were divided into two groups. Half of the dyads/trios accomplished a Computer-Assisted Language Learning (CALL) task and half a Paper task. Students were given the opportunity to work alternately between the two modes throughout the three tasks. In other words, participants that worked on CALL mode in task 1 were then asked to work on Paper mode in task 2 and so on. The study corpus comprised of 12 protocols (2 paper-based and 2 computer-based for each of the three research tasks), and were managed and analysed with the assistance of two software packages: N5 and Excel. Students also took a grammar test at the beginning and at the end of the study (pre-post-tests respectively) in order to evaluate progress in relation to the grammatical structures mentioned above (for a full report refer to Author 2004).

3.2 The tasks

Three problem-solving tasks were specifically designed as the main data collection instrument to elicit and record the processes of collaboration undergone by participants while accomplishing them either at the computer (CALL tasks) or in a paper version (Paper tasks). The main methodological purpose of the tasks as instruments for data collection was to provide the participants with an opportunity to engage in inter-psychological activity by collaborating to complete them. Using the capabilities of HotPotatoes, feedback and help from the computer were provided in various degrees and three different ways: *clues*, *hints*, and a *correction* button. *Clues* were selectively

provided by means of a question mark button next to a blank; when clicking this button students would obtain clues in the top frame of the screen. *Hints* were available in selected frames; this button was always positioned at the bottom of the screen and students would get letters for the words required just by putting the cursor in the desired blank and clicking the hints button. The *correction* button, always located at the bottom of the page and provided in every frame, would integrate correct answers to the text, but marking them by means of bold type; incorrect gaps would be cleared out for students to continue working on them. The teacher-researcher was always available to everyone whether they were working at the computer or on the paper versions of the tasks. In general, there was more help available as the task progressed to encourage the participants to collaborate and get help from each other before resorting to the machine. Learners working on the paper tasks received feedback and help from the teacher-researcher when requested.

Task 1: Professionals Today

The first task (see appendix 1) consisted of three parts: 1) a discussion about the world of work, implemented through a hierarchical exercise where participants had to organise concepts such as ‘power’ and ‘money’ according to what they considered more or less important in the world of work; 2) an interview reconstruction of a Spanish professional talking about his views of the world of work; and 3) creation of a document to express participants’ own views about the topic, but in the context of the UK. The goals of this task were on the one hand, to provide a space for discussion and collaboration to reach

common agreement and express their own thoughts and, on the other hand, to practise personal pronouns in a contextualised way.

Task 2: Gifted Daughters

Task two (see appendix 2) was a traditional problem-solving task (trail quiz) where participants are given clues that will help them solve the problem posited. This task consisted of a macro-task: finding out which language and which musical instrument belonged to which of five sisters; and five embedded micro-tasks that focused on grammar (personal pronouns and infinitive verbs). The micro-tasks were implemented as gap-filling, translation, jumbled sentences, and caption writing. In other words, the dyads had to solve a problem by collecting the necessary five pieces of information, the object for this being the encouragement of metacognitive talk which is believed to stimulate individuals, provide them with an infrastructure to negotiate development, take and manage control of their activity and learning, and guide them through the tasks (see Hoven 1999; Swain 2000; Ohta 2001). Each piece of information was provided to them by the computer - or teacher - after completing a micro-task based on grammar. This task was also intended to bring about metalinguistic talk in relation to personal pronouns and use of infinitive verbs in Spanish.

Task 3: Mexico City

Finally, the third task (see appendix 3) was an adaptation of 'dictogloss' (Kowal and Swain 1997: 295 and Swain and Lapkin 2001: 101) which is described as '...a procedure that encourages students to reflect on their own output. In this procedure, a short, dense

text is read to the learners at normal speed; while it is being read, students jot down familiar words and phrases; the learners work together in small groups to reconstruct the text from their shared resources...’ (Kowal and Swain 1997: 295). The purpose of implementing this type of task in the study was twofold: a) to promote the production of metalinguistic talk while providing learners with practice on ‘ser’ and ‘estar’ since these verbs were necessary for the successful reconstruction of the text; b) to compare the effects of the computer (as opposed to the Paper version) in terms of creativity and accuracy.

In the CALL version of this task participants read the text provided on the right hand side of the computer screen instead of listening to it (as done in ‘dictogloss’), they were not allowed to typewrite while the text was on the screen. The Paper version of this task consisted of three pages: one with the instructions, another one with the text, and a third one with the title of the text and blanks for learners to reconstruct it; as in the CALL version, punctuation marks were provided. The text was designed for learners to focus on the verbs ‘ser’ and ‘estar’. Intermental activity was expected to produce metacognitive and metalinguistic talk.

To summarise, the three tasks designed for collection of data in this study provided the students with a twofold general objective. On the one hand, students had the specific aim of completing the problem solving phase of the tasks, and on the other hand, they were able to focus on form by working on the grammatical structures that were part of the exercises embedded in the tasks.

Figure 1: Summary of the tasks as a tool for data collection

TASK	PROCEDURE	MAIN GOALS	EXPECTED INTER- MENTAL ACTIVITY	PROGRAMME TYPE FOR CALL VERSION
1. Professionals Today.	1. Discussion -aided by computer- about the world of work and relationships. 2. Cloze exercise to complete interview with a Spanish professional about perceptions of work and relationships. 3. Creation of a document to express students' own views towards either professional life in Spain, taking into account the views in the interview, or work life in the UK.	To practise personal pronouns. To discuss and express their views on the task topics. To create a document in order to synthesise their discussion.	Communication for meaning. Metalinguistic talk. Metacognitive activity (e.g. planning)	Drag-drop programme implemented with HotPotatoes Partial- deletion programme. Webpage generator GoLive.
2. Gifted Daughters: Problem-solving task: variation on a trail quiz.	Students have to solve a problem by collecting the necessary information (5 pieces). Each piece of information is provided to them by the computer when they successfully complete a grammar task.	To solve a problem. To practise personal pronouns, and the infinitive.	Metacognitive talk leading to the solution of the problem (e.g. planning, and negotiation) Metalinguistic talk.	HotPotatoes to produce cloze, translation, matching and jumbled sentence exercises. GoLive.
3. Mexico City: Text reconstruction, a variation on Dictogloss	1. Students read a short text on the screen that will disappear after 60 seconds. (They have two opportunities to read the text.) 2. Students collaborate on reconstruction of the text, following a cloze format . 3. Students write together a similar text, but this time about London, using a word processor.	To work on “Ser” y “Estar” by reconstructing a text in which these verbs are essential. To create a document that will reflect their personal perceptions about London. To negotiate the kind of information to be included in their text.	Metacognitive talk: planning how to tackle the task. Metalinguistic talk. Communication for meaning.	HotPotatoes. GoLive.

3.3 Analytical Procedures: Interaction foci and Collaborative

Episodes

Analysis focused on the study of patterns emerging from the data on the one hand, but also on the study of behaviour that might be unique to certain dyads/trios on the other. The aim was to better understand the degree to which certain tasks and task features might be considered as blueprints in terms of being pedagogical tools, and what the specificity of the computer might be throughout the processes of collaborative activity.

3.3.1 First level of analysis: *Foci of interaction*

The degree of collaboration in the study refers to a dual dimension during interaction, a) the social relationships developed among the participants, i.e., did they collaborate, compete, argue, etc. and b) what the focus of those social relationships was, e.g. the task, the target language, social conversation. In order to assess and compare the degree of collaboration and *foci* of interaction among tasks and between mediums, the data were coded for *language related talk* (following Swain and Lapkin, 1995, any talk about the language students are producing, any language-related questioning, or when they other - or self-correct their language production); *task related talk* (talk specifically related to task implementation, i.e. about content, problem-solving activity, or simply carrying out the task without focusing on the target language); and *off-task talk*. Subsequently, percentages of the foci of talk across the data were calculated in order to gain a quantitative perspective of the relationships between type of task and medium of

implementation, and the foci of talk supported. These percentages were calculated taking the *text unit*⁴ as the unit for analysis. The *text unit* was adopted for this kind of quantification rather than the speech turn, because that is the unit utilised by N5, the software package through which data were managed.

3.3.2 Second level of analysis: High Quality Collaboration (HQC)

Once all the *language related talk* was identified throughout the data, it was further segmented and coded into *episodes* following Swain (1998: 70) who defines a language related episode (LRE) as “any part of a dialogue in which students talk about the language they are producing, question their language use, or other -or self-correct”, and which focuses on one “language item only” (Fortune and Thorp, 2001: 146).

A further construct for data analysis was *High Quality Collaboration* (HQC). For the purposes of the present study I have defined *High Quality Collaboration* as collaboration where learners, working within a zone of proximal development (ZPD), are able to co-construct language related knowledge. This can be achieved through what Donato (1994) has called “collective scaffolding”, which is collaboration where several “novices” are able to empower each other by achieving as a dyad/group what they could not achieve individually; or by an individual “expert” providing the necessary assistance required by a “novice” to achieve any kind of language related development. In my view, and as the definition of HQC implies, microgenesis episodes (MGEs), i.e. episodes where the learning process towards internalisation *can be perceptible* to the researcher’s eye, are

⁴ In N5 a line is a text unit “of at most 74 characters in length (including spaces)” QSR International Pty Ltd© 1980-2000. A text unit, therefore, does NOT necessarily correspond to a speech turn.

not the exclusive manifestation of learners working within their ZPDs. This metaphoric socio-cognitive space is also “inhabited” by other LREs where learners achieve, through collaboration, language constructions which appeared to be beyond their individual capabilities as evident at the beginning of the LRE in question, but where the process of change as such is not overt. Figure 2 provides examples of the two kinds of LREs I have categorised as HQC.

Figure 2: High Quality Collaboration

<i>microgenetic LRE (excerpt from computer-based task 2)</i>	<i>non-microgenetic LRE (excerpt from computer-based task 1)</i>
129 H: pero continuo (.) es el= (=I'm no I'm not sure (.) carried on)	65 E: ehhe "qué piensan ustedes acerca de lo que es importante" ((fading voice while reading instructions)) ehhe "what do you think is important" ((fading voice while reading instructions))
130 h: =no s no estoy seguro (.) continuo= (=I'm no I'm not sure (.) carried on)	66 M: um (.) ah (.) LE parece? ((pause)) o la A um (.) ah (.) to her ((in Spanish indirect personal pronoun "le")) it seems? ((pause)) or the a
131 H: =[gerundio (=[gerund)	67 E: a a mi (.) compañera ((pause)) LE si to to my (.) classmate ((pause)) le yes
132 h: [a leer? ([to read?)	68 M: le parece? [si le parece to her it seems? [yes to her it seems ((using correct personal pronoun "le"))
133 H: después de [continuar (after to [continue)	69 E: [le parece porque es (.) indirecto ((pause)) que la inteligencia gencia es [más? [to her it seems because it's (.) indirect ((pause)) that intelligence is [more?
134 h: [continuar leyendo leer leyendo (.) leyendo?= ([to continue reading to read reading (.) reading?)	
135 H: =si es leyendo porque es el gerundio average(.) después de seguir y continuar ((she recalls? a grammar point studied in class)) =(yes it's reading because it's the gerund average gerund (.) after to carry on and to continue)	

In the microgenetic episode we are able to witness how Henry (h) progresses from being unable to produce the correct form in turns 130 and 132 to gaining control of the form and producing it correctly in turn 134 as a result of Hena's intervention (H) and the collective experience, which enables them to engage in a pedagogic routine. In the non-

microgenetic example, on the other hand, the correct form is produced by Mina in turn 66, but she shows uncertainty (turns 66 and 68). Ellen takes Mina's suggestion and hesitation (t66) as a point of departure for reflective consideration (t67) that culminates in metalinguistic consolidation for both participants (t69). Although change is not "visible" in the episode, knowledge construction and consolidation are, as learners empower each other within a ZPD.

Methodologically therefore, the process of categorisation of HQC is simultaneously intertwined with qualitative analysis. The method was rooted in the work and notions conceptualised in fields such as psychology, education, and SLA, but was developed as analysis became more grounded in the data. For validity and reliability purposes, the process for developing the coding scheme entailed various stages where categories were defined, checked, and refined until we (supervisor and researcher) were confident the system worked and could be applied to the data reliably, e.g. two protocols were independently coded and results compared. The relevance of the computer was assessed throughout all the stages of analysis as an integral aspect of the phenomena being investigated. However, the computer's impact was specifically studied through comparisons across the data in relation to its effect on talk foci, i.e. language related talk, task related talk, and off-task conversation, as well as to the use of semiotic mechanisms (such as repetition, use of L1, reading aloud) mediating CALL activity (for the latter see Author, 2004). These analyses were carried out to inform us on possible advantages or drawbacks of using the computer to implement specific types of tasks.

4 Results and Discussion

All the participants in the study showed willingness to work as part of a pair/trio, no disputational talk or un-collaborative behaviour was identified in any of the transcribed protocols. Across the three tasks, there were no striking differences between the percentage amounts of talk for language related matters, task related activity, and off-task activity. Learners working on paper engaged in 4% more language related talk than people working at the computer, with virtually no difference (1% more on paper) in terms of task related talk. Students at the computer engaged in 7% off-task conversation whereas paper-based learners in only 2%. The medium influenced off-task conversation in that some of the computer off-task talk was caused by distractions directly related to the computer (for example one dyad had technical problems with a text that was not meant to be visible on the screen), and paper-based learners normally engaged in off-task conversation while having to wait for the teacher to check their work. As Table 1 and Table 2 show there are more important medium related differences across individual tasks both in relation to talk foci and HQC collaboration.

Table 1: Percentages of talk foci between mediums

% of text units	CT1	PT1	CT2	PT2	CT3	PT3
Language Related Talk	59.5	67	66.5	55.5	17.5	34
Task Related Talk	31	33	29.5	41.5	75	64.5
Off – Task Talk	9.5	0	4	3	7.5	1.5

Table 2: HQC comparison

	CT1	PT1	CT2	PT2	CT3	PT3
Total No. LREs	57	64	26	24	17	33
HQC Episodes	16	21	11	5	1	11
MG Episodes	3	5	5	2	0	7

These tables and figures are discussed in the following sections.

Task 1: Professionals Today

In task 1, an interview reconstruction primarily based on gap filling, learners working on paper engaged in a higher percentage (67%) of language related talk than learners working at the computer (59.5%) whereas for task 2 the results were the opposite, there was a higher percentage of language related talk at the computer (66.5%) than on paper (55.5%). There is a sharp difference in task 3 where learners working on paper showed a much higher degree of language related talk (34%) than learners at the computer (17.5%). In task 1 the difference observed in relation to language related talk is more related to the amount of off-task conversation learners engaged in than to the medium itself. One of the computer dyads spent some of the task time socialising because they had never worked together before, and they obviously needed to establish a socio-affective rapport before they embarked on the task. The other computer-based dyad who also spent some time off-task also needed to do so, as they got slightly diverted from the task to talk about how to type in orthographic accents on the computer, and although this was not

particularly important for one of the participants, the other one made recurrent efforts to find out throughout the session.

Consistently with the amount of language related talk, more LREs were identified in the dialogue of paper-based learners (64) than in computer-based ones (57, see Table 1 and Table 2 above). Of particular importance, however, is the amount of HQC and microgenetic episodes (MGEs) identified in task 1. Learners working on paper co-constructed 21 HQC episodes (HQCEs) of which 5 were considered microgenesis, and these figures were 16 and 3 respectively for learners working at the computer. The computer played a limited role in the learners' collaborative achievement of HQC. In the case of HQC constructed around targeted items, i.e. pronouns, infinitive verbs, radical changing verbs, and *ser* versus *estar*, learners had access to immediate feedback from the machine, which could be potentially valuable to reinforce the recently constructed knowledge. Furthermore, in a minority of targeted HQC items, negative feedback from the computer made the learners continue working on those items. However, the teacher actually scaffolded 4 out of the 16 HQC episodes at the computer and 7 out of 21 in the paper-based version. There were no considerable differences in relation to task-related talk in this task between the two mediums.

Task 2: Gifted Daughters

Learners' talk in Task 2, the macro problem-solving task based on micro problem-solving linguistic exercises such as translation, gap filling, caption writing, and jumbled

sentences, shows interesting differences between the mediums. The percentage of language related talk (see Table 1 above) was higher at the computer (66.5%) than on paper (55.5%). In spite of this, the amount of LREs is very similar in the two mediums (see Table 2: HQC comparison), 26 at the computer versus 24 on paper). There is, however, a clear difference in relation to HQC with computer-based learners able to co-construct 11 HQC episodes out of which 5 were identified as MGEs. In the case of learners working on paper, they only constructed 5 HQC which included 2 MGEs. The machine played an important role in this kind of task; first of all, the availability of immediate feedback on demand meant that learners did not have to wait for the teacher to check their work and provide subsequent clues and exercises which was the case for paper-based learners. Secondly, the specific kind of computer feedback provided, combined with the nature of the sub-tasks, encouraged learners to stretch their interlanguage and continue working on erroneous items, which in time led to a considerable amount of reflective talk and also contributed to 3 out of 5 MGEs. Precisely because of the importance of computer feedback hereby highlighted, special care needs to be accorded to the kind of feedback programmed in the task since there were also occasions where feedback created some confusion, e.g. the non-acceptance of a sentence because it was lacking a full stop. Finally, this particular task design gave computer-based learners more control and freedom as to how and when they wanted to tackle the macro problem-solving task. Paper-based learners did not have this choice, pace and range of “working tools”, e.g. further exercises provided by the teacher, were dependent on the teacher’s availability.

In terms of task-related talk, the higher percentage identified in the paper-based protocols (41.5% versus 29.5% for computer learners) was related to the following two main reasons: first of all, learners spent more time trying to figure out what they had to do to carry out the task in spite of having exactly the same instructions as their computer counterparts. Secondly, as outlined above, they spent longer working on the macro problem-solving task than learners at the computer. The indexes of off-task talk were very low in both mediums; the only dyad at the computer that engaged in off-task conversation did so at the beginning of the task because they had not worked together before. Off-task talk in the paper version was caused by learners having to wait for the teacher to provide feedback.

Task 3: Mexico City

For this task learners had to read a short text about Mexico City, and then reconstruct it. They also had a subsequent sub-task where they had to write a similar text about London. This task was the least successful of the three research tasks, with only one group out of four benefiting from it linguistically. Furthermore, its implementation on the computer fundamentally influenced the nature of activity away from language learning. The percentage of language related talk for the learners working at the computer was low, only 17.5% versus 34% for learners working on the paper version, and there was only 1 computer-based HQC episode (see Table 1 and Table 2: HQC comparison). The direct effect of the computer on the way learners interpreted and implemented the tasks was caused by the use of boxes to hold each word. The rationale for the design was to

promote the use of key content words, such as the name of city symbols, as the basis for language discussion about grammar words to make sense of the content and recreate the text. However, the appearance of boxes on the monitor encouraged a mnemonic approach throughout the whole session because learners knew they needed to “remember” the text exactly as they had read it for the computer to accept it. Piper reports similar behaviour when referring to the talk of learners working on a COPYWRITE task: “[learners] are seeking to call up the words mainly from their memory” (Piper, 1986: 192). This software is based exactly on the same principle as our task 3, learners read a text on screen and then try to reconstruct it with no help, but with dashes representing words. I believe that the fact that learners read the text instead of listening to it, as it is normally implemented in traditional dictogloss, also appealed to a reproduction of a seen “object” from memory rather than a reconstruction of a heard “text” which would be more difficult to reproduce exactly.

The dyad working on the paper version also followed a memory approach –even when they did not worry much about the spaces provided for words on their sheet- and these learners also kept very close to the original text when they wrote their own text about London. Neither of the two dyads at the computer finished the reconstruction task. The triad working on paper approached the task from a more creative perspective which produced the best results, 45% of language related talk, and 9 HQC episodes that included 7 MGEs, more - as a group - than any of the other dyads/groups across the three tasks. The results from this successful triad bear resemblance to the kind of activity reported by Swain and Lapkin (2001), whose dictogloss students focused on form while

discussing their language problems, “brought to conscious attention gaps in their own knowledge”, engaged in hypothesis testing and built on each other’s resources (2001:110).

The fact that language related work at the computer (17 LREs in total, which included 1 HQC episode) did not provide learners with opportunities to stretch their interlanguage and co-create zones of proximal development also reflects the nature of learners’ activity. They were working from the memory of a recently read text, and the language they focused on was either within their memory grasp where they were making spelling corrections, for instance, or simply involved self-corrections. Even the limited amount of LREs (3) where learners engaged in some reflective activity and could have potentially led to some creative use of vocabulary, for instance, was cut short by the sudden recollection of a word in the text, ending thus the creative exploration they had initially embarked on. The delivery of this task via the computer meant a task transformation from “open” - as the paper version was - into “closed” where the gaps of the computer required discrete, precise information (cf. Loschky and Bley-Vroman, 1993).

Task-related talk, which represented a large percentage in both modes of implementation, 75% for computer-based and 64.5% for paper-based interaction, was - as language related talk - qualitatively different. Learners at the computer engaged in more meta-task commentary, as well as planning how to tackle the exercise, whereas learners on the paper version engaged in more task-implementation talk. Text reconstruction was supported by cumulative repetition, for instance, without necessarily focusing on form

while doing so. Off-task conversation, 7.5% at the computer, was related to keyboard combinations to type orthographic accents, and some socialisation. The minimal off-task percentage among learners working on paper (1.5%) was an interesting mini-discussion brought up by the general topic of cities that was the basis for their activity.

5 Conclusions

Sociocultural theory has provided theoretical and methodological foundations in this study to investigate pair/group interaction at the computer and the impact of the machine upon collaborative activity. A core premise underlying the investigation is that dialogic activity has the potential to support cognitive and linguistic development (*cf.* Swain 1997; Swain and Lapkin, 2001). However, not all dialogue is *collaborative dialogue* (i.e., “where language use and language learning can co-occur”, Swain, 2000: 97) and we need to gather more information to understand the inter-psychological basis for the adequate promotion of the latter. The type of task learners engage in and the influence of the medium, that is computer or paper, on interaction also need addressing if we are going to provide better opportunities for learners in classrooms where computers are increasingly being used. Variability across the dyads/groups in terms of performance highlights the need to evaluate and discuss tasks as blueprints for activity (*cf.* Coughlan and Duff, 1994). The results of this study therefore reflect the activity that took place among specific learners under specific circumstances.

Keeping the above observations in mind, and to summarise the findings in relation to the research questions posed at the beginning of the study, I believe the dictogloss version was the least successful of the three tasks, and when implemented at the computer, it was a very limited source for language related activity. In its paper version, however, the motivation and creative approach of a group of participants made of the task a meaning making experience. Task 1 supported the highest number of HQC episodes and proved to have certain useful features, such as the opportunity for learners to explore their own ideas and stretch their interlanguage in order to express them; the main gap-filling format provided opportunities for form focused discussions even when this type of exercise could have led to its individual resolution. A downside of this task was the requirement for learners to work on gap-filling for too long; this, I believe, undermined learners' efforts to make a better use of the semantic and syntactic context surrounding the gaps. The integration of macro and micro problem-solving endeavours in task 2 showed mixed results. Most learners did not find the macro problem-solving task relevant to their language class and therefore relegated it as an exercise to do after the "proper" work on language. Based on this study and other reports on the use of problem-solving tasks that are not obviously language oriented (see comments about "Lemonade Stand" in Abraham and Liou, 1991) I also believe caution needs to be observed not to cognitively overload learners to a degree where the concern for linguistic activity is overshadowed. In relation to the micro problem-solving tasks based on language, the translation and caption writing exercises were the most successful in task 2, with jumbled sentences being the least linguistically motivating. Even when learners are expected to work at syntactic level in order to create meaningful sentences, there is very little evidence that they do so, and the

drag and drop facility (very popular in commercial CALL programmes) when this task is implemented via the computer invites, in my view, a trial-and-error approach.

Drawing on Sociocultural Theory to study interaction and collaboration in the language classroom is a concept still in its infancy. The kind of developmental analysis promoted by Vygotsky as a means to explore cognitive development needs to be cautiously explored and refined when applied to the study of second language development. In this article, I have advanced an analytical unit, *High Quality Collaboration* (HQC) to investigate the co-construction of language related knowledge among learners working on paper and computer-based tasks. This unit has allowed qualitative analysis of interaction as well as quantification for comparative purposes. More specifically, HQC episodes have enabled the study of knowledge co-construction between learners even when some episodes cannot be strictly classified as microgenetic ones. Undoubtedly, this unit of analysis will have to be further tested to assess its value as a methodological tool in other studies.

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