DESIGNING TASK-BASED CALL TO PROMOTE INTERACTION: EN BUSCA DE ESMERALDAS

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ABSTRACT

Developing effective language teaching materials based on second language acquisition principles is a priority which needs to be addressed in all language teaching areas. The field of computer-assisted language learning (CALL) is no exception. "En Busca de Esmeraldas" is a CALL activity delivered via the Internet and based on principles of language teaching (Doughty & Long, 2002; Long, in press) and on Chapelle's (1998) proposals for developing multimedia, grounded in SLA research.

The first part of this article presents the steps necessary for designing an effective language learning tool to foster communication and negotiation, taking into consideration the importance of supporting integral education, using tasks, providing elaborated input and feedback, and promoting collaborative learning. The second part of the article reports on a study conducted using such a tool to determine whether communication and negotiation occurred, and whether the negotiation was similar to that reported in previous studies that claim such negotiation facilitates the comprehension process.

INTRODUCTION

All areas of education are undergoing changes in the way teaching and learning are perceived. Teacher-centered, class-lecture based, and structural-syllabus instruction are giving way to a more student-centered, hands-on, practical, and flexible approach (Shank & Cleary, 1994). The field of second language teaching is no exception in this paradigm shift. New theories and applications of language teaching are exploring the benefits of new methods and pedagogical approaches, among them task-based language teaching (Crookes & Gass, 1993; Long, in press) and focus on form (Doughty & Williams, 1998; Long, 1991a, 1998; Long & Robinson, 1998).

Parallel to these changes in education is a technological revolution realized in the increasing use of computers for learning, the implementation of the Internet, and the rise of network-based teaching. Until now, many CALL activities were created with the sole rationale that computers are useful and motivating for students, although such activities lacked a solid research base. Recently, however, the field of CALL has begun to undergo self-evaluation, and researchers are now claiming that in order for the field to progress, it is necessary to look to SLA principles that make language teaching effective (Chapelle, 1998; Doughty, 1987; Levy, 1999).

The Rationale for Network-Based Activities

Design, preparation, and programming of a computer-based activity are highly time-consuming, and typically entail more difficulties in development than any paper-and-pencil classroom activity. Therefore, in order to justify the investment in a CALL activity, there must be a rationale for why it is implemented via the computer instead of another, less resource-demanding form. Simulations are one type of computer-based activity that allows students to be immersed and actively involved in an environment that is not otherwise accessible (Crookall & Oxford, 1990; Higgins & Morgenstern, 1990; Scarcella & Crookall, 1990). The computer, thus, becomes a tool that cannot be easily substituted by any other language teaching procedure and, therefore, the work invested in the creation of the materials is justified.

Furthermore, CALL activities may be based in a network, such as the Internet, presenting several advantages: rapid global access at any time from any computer with Internet access; integration of graphics, audio, and text; and ease and low cost of publication (Kern & Warschauer, 2000). In sum, network-based simulations offer access to an otherwise unattainable environment that translates into language input and tasks for second language (L2) students.

L2 Interaction

Several theories postulate a relationship between language acquisition and output during the interaction process (Pica, Holliday, Lewis, & Morgenthaler, 1989; Swain & Lapkin, 1995), between language acquisition and input (Long, 1996), and between language acquisition and negotiation of meaning (Ellis, 1999; Ellis & He, 1999; Gass, 1997; Gass & Varonis, 1989, 1994; Loschky, 1994; Lyster, 1998a, 1998b; Lyster & Ranta, 1997; Pica, 1994; Pica, Lincoln-Porter, Paninos, & Linnell, 1996). Some interaction studies also indicate that negotiation with a teacher in the classroom is valuable for language acquisition (Ellis, Tanaka, & Yamazaki, 1994; Pica, 1991). Hegelheimer and Chapelle (2000), following Long (1996), posit that interaction may not be effective by itself, and that noticing input may be necessary for language acquisition (Schmidt, 1990). They also state that learners are most likely to notice linguistic form during interaction, and that the most useful interactions are "those which help learners comprehend the semantics and syntax of input and which help learners to improve the comprehensibility of their own linguistic output" (Hegelheimer & Chapelle, p. 42).

In addition, studies that focused on student dyads have suggested that interaction facilitates comprehension better than conditions without the interaction component (Gass & Varonis, 1994; Loschky, 1994; Pica, Doughty, & Young, 1986; Polio & Gass, 1998). Other studies have also pointed out a positive effect of negotiation for meaning on the quality of the students' immediate production (Holliday, 1995; Linnell, 1995, reviewed in Gass, Mackey, & Pica, 1998). Additional findings suggest that the interaction process frequently results in improvement in the speech of lower level speakers. Moreover, those speakers who have already acquired a form did not change it as a result of their peers' errors, but they could help to model and correct this form (Gass & Varonis, 1989). In addition, it has been suggested that during language interaction, both native (NS) and non-native (NNS) speakers provided their interlocutors with input modified towards comprehensibility (Pica et al., 1996). According to research, not only is language input important for SLA, but output may increase the control that learners have over already acquired structures, permanently restructuring the learners' interlanguage (Donato, 1994; LaPierre, 1994; Noboyushi & Ellis, 1993).

Several CALL studies have also examined the interaction of students engaged in computer-mediated communication (CMC). These studies present data collected while students are "chatting" (in a written form) using a computer as the communication instrument (Beauvois & Eledge, 1996; Blake, 2000; Kern, 1995; Kitade 2000; Warschauer, 1996). The interaction analyzed in this article is not CMC. Rather, it is more similar to traditional face-to-face interaction, with an added component, the computer, which serves not as a communication vehicle but as a presenter of materials to engage students in conversation.

THE DESIGN PRINCIPLES

The general organization of "En Busca de Esmeraldas" (In Search of Emeralds)[1] places students in a plot in which they are hired to help find a document at the University of Hawai‘i. Students have the choice of either reading a letter or listening to a message on their answering machine from a woman in Spain who would like to hire them to search for a document at the University. Students have the option of accepting or rejecting the job by writing and submitting an electronic letter. If they accept the job, they then have three choices: listening, reading, or working with a partner to follow directions while engaged in a three-dimensional environment. The first option allows the student to listen to directions while navigating the three-dimensional simulation through a building. The second option allows the student to read the

directions while navigating through the building. And the third option encourages students to work in pairs, using the L2 to communicate. During the simulation (for all three options), one of the students has the directions for finding the document, while the other student navigates the simulation. The directions require that the students move through a building to find a key that opens the door to an office where they can find a hidden map. The last task consists of writing back to the employer to inform her that the document has been found and to ask her for further instructions. The complete activity can be found at http://marta.lll.hawaii.edu/enbusca.[2]

In order to create this activity, two sets of principles, based on SLA research, were taken into account: Long's principles of language teaching (Doughty & Long, 2002; Long, in press) and Chapelle's principles for developing multimedia CALL (Chapelle, 1998).

Language Teaching Methodological Principles

In order to select design features that had a strong base in SLA research, the Language Teaching Methodological Principles (TMP) proposed by Long (in press) and adapted by Doughty (2000a) were used as guidelines. Doughty's adaptation divides these principles into four categories: activities, input, learning processes, and learners.

Table 1. Language Teaching Methodological Principles (adapted from Doughty, 2000a)

ACTIVITIES
1. Support integral education
2. Use tasks, not texts, as the units of analysis
INPUT
3. Elaborate input
4. Provide rich input
LEARNING PROCESSES
5. Encourage inductive/"chunk" learning
6. Focus on form
7. Provide negative feedback
8. Respect learner "syllabuses"/developmental processes
LEARNERS
9. Promote cooperative/collaborative learning
10. Individualize instruction

TMP 1: Support Integral Education

This principle refers to the concept of "learning by doing." For "En Busca de Esmeraldas," students take on the main role in a developing story. The overall activity is designed so that, upon its completion, students have not only immersed themselves in the simulated target language environment, but have also become practiced in some computer skills, such as writing and sending e-mail, and navigating through a 3-D environment, all done in L2.

TMP 2: Use Tasks as the Unit of Analysis

Task-Based Language Teaching (TBLT) is the pedagogy that best fits the principle of "learning by doing." According to Long (1985, p. 91, 2000), there are four main steps necessary to develop TBLT:

1. Conduct task-based needs analysis to identify target tasks.
2. Classify the target tasks into task types.
3. Develop pedagogic tasks from the task types.
4. Select and sequence the pedagogic tasks to form a task-based syllabus.

Although the activity presented here is not part of a task-based syllabus, the steps for a TBLT program were considered in the design of the activity. A small needs analysis eliciting some instructional and pedagogic needs was conducted among students and faculty in the Spanish department at the University of Hawai'i. The responses indicated that there was an evident need for a medium that would allow instruction and practice in giving and receiving directions in an efficient and realistic manner. The 3-D simulation was designed to meet this apparent need. From the needs analysis three target tasks were identified: listen and understand directions, read and understand directions, and follow directions. They were then classified into more general task types: receive directions and follow directions. Next, several pedagogical tasks were created: listen to an answering machine message and identify what needs to be accomplished (view it), follow the directions given orally on a tape (view it), follow directions given in a letter (view it), and work with a partner in exchanging information (view it). Finally, the tasks were sequenced in a chronological manner, following the steps for the document search.

In addition to Long's TBLT model, the complexity of the tasks was also considered for the task design. Since the early 1980s there has been important research on measuring task complexity (Brindley, 1987; Brown, Anderson, Shillcock, & Yule, 1984; Candlin, 1984; Nunan, 1989; for a review, see Robinson, in press). Robinson distinguishes between task complexity (the cognitive demands of the task), task difficulty (depending on learner factors), and task conditions (the interactive demands of tasks). He states that task complexity should be the only consideration when selecting a task, since the other two cannot be anticipated.[3] Robinson proposes planning time, number of tasks, prior knowledge, and number of elements as possible dimensions of complexity. All these concepts were taken into consideration when developing the present materials. In addition, "En Busca de Esmeraldas" was evaluated by 42 participants who were enrolled in their fourth language semester at the University of Hawai'i, to assess the design features as well as the difficulty of the task. The evaluation consisted of a questionnaire (see Appendix) with 23 statements rated on a scale from *5=strongly agree* to *1=strongly disagree*. The mean was calculated for every statement. The results of the students' evaluations were uniform, and the level of difficulty of the activity seemed to be appropriate for the group (see Table 2).

Table 2. Students' Answers to Questionnaire

	Mean	*SD*
text is easy to understand	4.19	0.74
messages are easy to understand	3.90	0.83
movie is easy to follow	4.16	0.73
appropriate for level	4.38	0.58
interesting activity	4.71	0.59
helps me understand directions	4.21	0.79

Based on the results of the students' evaluations, some changes were made to the activity. Directions were rewritten where they seemed unclear, and the sound files were compressed for faster uploading.

TMP 3: Elaborate Input
TMP 4: Provide Rich Input

Rich, elaborated output has been shown to be more effective for language acquisition than simplified input, which provides unnatural use of language and deprives the students of items necessary for language development. Elaborated input has also been shown to be more effective than natural, unmodified input,

which may be linguistically too dense and may lack items that could aid comprehension (Long, 1997; Parker & Chaudron, 1987).

In order to provide clear, understandable, but not simplified language, the input for the different tasks was created as follows: Two native speakers of Spanish, other than the researcher, examined the texts to make sure the language used was natural and appropriate to convey the message. Ten first-year students then read the texts to identify potentially unfamiliar words. These words were kept in the text, but modified input was provided to help students comprehend those words by glossing them through synonyms, antonyms, paraphrases, definitions, or links to an on-line dictionary. When the student placed the cursor over an underlined word, a small window opened in the top left corner of the screen. It disappeared when the cursor was moved away.

TMP 5: Encourage Inductive/"Chunk" Learning

Several theories propose that superior language acquisition by children as compared to adults may be the result of children learning items as formulaic sentences (Wray, 2000, cited in Doughty & Long, 2002). Doughty and Long also suggest that the incorporation of whole "chunks" of the input may be beneficial for adult language learners when performing a task. Following this idea, "En Busca de Esmeraldas" incorporates those "chunks," or common phrases, necessary for giving and following directions such as "dobla a la derecha/izquierda" (turn right/left), "sigue adelante" (go straight). These "chunks" were also enhanced with color for saliency (view it).

TMP 6: Focus on Form

For "En Busca de Esmeraldas" to be effective, it was very important to pay attention to the learning processes involved, so that the activity would not only promote interaction, but the language produced by the students would also be as accurate as possible for their level. Research has shown that some type of teacher intervention is desirable to achieve linguistic accuracy (Doughty & Williams, 1998; Pavesi, 1986; Schmidt, 1983, 1993). Focus on Form (FonF) allows L2 teachers to implement this principle in an effective manner. According to Long (2000), "FonF refers to how attentional resources are allocated and involved briefly drawing students' attention to linguistic elements (words, collocations, grammatical structures, pragmatic patterns, etc.) *in context*, as they arise incidentally in lessons whose overriding focus is on meaning, or communication" (emphasis in original; p. 185; see also Doughty, 2001; Doughty & Williams, 1998; Long, 1991a, 1998; Long & Robinson, 1998).

While students were working with "En Busca de Esmeraldas," teachers provided help with common and individual linguistic problems. For details about the issues and limitations of implementing FonF in a classroom setting, see Doughty (2001).

TMP 7: Provide Negative Feedback

Intervention in the form of feedback has also proved to be effective for language acquisition, both in L1 and L2 settings (for an overview see Long, Inagaki, & Ortega, 1998). "En Busca de Esmeraldas" included two possibilities: a) feedback provided by another student during the negotiation of meaning; and b) feedback provided by the teacher as a response to students' written output, submitted by e-mail. The first type of feedback is difficult to control from the designers' point of view, since it depends on the participants. Nevertheless, if the instructor is going to participate in the activity, recasting is recommended since it is unobtrusive and more effective than modeling (Long, 1999). The pedagogic technique chosen to implement the second type is at the discretion of the teacher supplying the e-mail feedback.

TMP 8: Respect Learner "Syllabuses"/Developmental Processes

This principle advocates that content should be determined by students' needs and psycholinguistic readiness for the content. Following this principle, "En Busca de Esmeraldas" originated from a needs

analysis that identified practice giving and following directions in a realistic environment as important. As for the students' psycholinguistic readiness, examination of students' writing showed that they had been exposed to and started to use directions, but that they still did not do so in a native-like manner.

TMP 9: Promote Collaborative Learning

Cooperative learning occurs during the interaction among small groups of students. According to educational researchers and psychologists, peer-interaction is the most successful form since it promotes support, acceptance, and social development (Slavin, 1990; Wells, Ling, & Maher, 1990). One of the key concepts of cooperative learning is the importance of a high success rate that results from working collaboratively on tasks. There is considerable research from an educational perspective on the value of task completion as a preferred method of instruction (Sharan, 1990) that supports the choice of a task-based approach for a network-based activity. Furthermore, cooperative language learning embodies the idea that language has a predominant social function and endorses the "social interactionist theory" in which language finds its use in functions relevant to the learner's immediate communicative needs (Doughty, 2000b).

TMP 10: Individualize Instruction

The individualization of instruction based on parameters such as language learning aptitude, motivation, cognitive style, interests, and learning strategies has proved to be effective for language learners (Doughty & Long, 2002). "En Busca de Esmeraldas" includes several tasks that can be accomplished through different media (audio and visual) in an effort to accommodate different learning strategies, interests, and cognitive styles. Although for Doughty and Long, the idea of "individualization" is not synonymous with "autonomous learning," an added advantage of using computers for teaching is the possibility of providing distance instruction. This is especially the case with network-based activities, since they can be accessed from any location where the Internet is available. This feature allows for independent, autonomous, and class learning. Students can access the task as many times as desired, whenever it is most convenient for them.

Principles for Developing Multimedia CALL

In addition to following Long's (in press) general methodological principles for language teaching, Chapelle's (1998) "seven hypotheses relevant for developing multimedia CALL" (p. 23) were taken into account:

1. The linguistic characteristics of target language input need to be made salient for "input enhancement."
2. Learners should receive help in comprehending semantic and syntactic aspects of linguistic input.
3. Learners need to have opportunities to produce target language output.
4. Learners need to notice errors in their own output, and they need to correct these errors.
5. Learners need to correct their linguistic output.
6. Learners need to engage in target language interaction whose structure can be modified for negotiation of meaning.
7. Learners should engage in L2 tasks designed to maximize opportunities for good interaction.

The relevant aspects of SLA, according to Chapelle (1998), are the noticing of input, the intake or comprehended language that may help develop the language system, and the negotiation of meaning that facilitates second language development. Chapelle's proposals coincide with several aspects of Long's (in press) general methodological principles for language teaching. Both emphasize the importance of enabling the production of target language output by engaging the learners in L2 interaction (hypothesis

3), in which they negotiate meaning to accomplish a task (hypotheses 6 and 7). "En Busca de Esmeraldas" incorporates Chapelle's suggestion that students need help understanding syntactic and semantic aspects of the language by providing modified input to aid comprehension (hypothesis 2). In addition, the input was also enhanced with color and a larger font to make the directions more salient (hypothesis 1; Sharwood-Smith, 1993; view it).

Summary

In order to be effective for language learning, the design of "En Busca de Esmeraldas" integrates methodological principles of language teaching that are well grounded in SLA principles. Based on these principles, the activity includes a series of tasks that engage students in the learning process by promoting interaction. The input presented was modified to be salient and elaborated, not simplified. In addition, the design also included features that promote learner autonomy.

A STUDY OF L2 INTERACTION DURING THE 3-D SIMULATION

Given that oral interaction and negotiation of meaning are potentially important for the acquisition of language, and that well planned task-based activities incorporating SLA principles could foster communication and negotiation, the 3-D simulation portion of the network-based activity was analyzed to determine if such communication and negotiation occurred, and if it did, whether it was similar to that reported in previous studies (Gass & Varonis, 1994; Loschky, 1994; Pica, Doughty, & Young, 1986; Polio & Gass, 1998).

Negotiation Model

The negotiation model proposed by Doughty (2000b) was adopted for this study (Figure 1). According to Doughty, the essential feature of the negotiation sequence "is the opportunity that is provided to the learner to process utterances in the L2 which become more comprehensible" (p. 50). Her model incorporates a *trigger,* a *signal,* a *response,* and a *reaction.* A *trigger* is "an utterance or part of an utterance that is not understood" (p. 48). A *signal* is used by the interlocutor to express a lack of comprehension. A *response* then comes from the first speaker trying to repair the problem. A *reaction* is an extension or a response to the repair. This model is similar to the one employed by Gass and Varonis (1985), although they use the term "indicator" instead of "signal." Gass and Varonis also included two types of responses: direct (often *wh*- questions) and indirect (repetition, use of intonation). In this paper, direct and indirect responses are considered without further differentiation since both are part of the negotiation process.

Trigger →	**Signal →**	**Response →**	**Reaction**
lexical item	confirmation check	repetition	exclamation
phonetic error	clarification request	expansion	non-verbal
language complexity	comprehension check	reformulation	correction
task complexity		Use of L1	

Figure 1. Negotiation process (sequence adapted from Doughty, 2000b, p. 49)

To operationalize signals, Long's (1991a) confirmation checks, clarification requests, and comprehension checks were used. These types of input modifications are used to negotiate meaning. Also following Long, the responses in the data were identified as either repetition, expansion, or reformulation.

Subjects

Twelve English-speaking intermediate level students of Spanish as a foreign language at the University of Hawai‘i participated in the study. All but one had taken three semesters of Spanish in the same program.

Although all 12 students participated, the recordings of two dyads (4 students) were not included because the quality of the tape made transcription impossible. All had been exposed to and had started to use directions such as *dobla a la derecha/izquierda* (turn right/left), *sigue adelante* (go straight), and *entra/sale* (enter/exit), as shown by previous examination of their writing, but they still did not do so in a native-like way.

Materials and Procedures

The task consisted of a 3-D simulation, structured as an information gap activity. During this task, one of the participants was given the necessary written directions to convey to his/her partner to navigate through the simulation. Tape-recorders were placed behind each computer station, and, in order to be as unobtrusive as possible, they were preset to record. The students formed pairs, without teacher intervention, and assigned themselves the roles of instruction-giver or navigator. The teacher gave general instructions on how to navigate, and encouraged students to ask and answer questions. Instruction-givers were told not to show the written information to the navigators. In addition to the class instructor, four other instructors assisted students with technical problems and observed several dyads.

Data Coding and Analysis

Four dialogues lasting between 35 and 55 minutes were transcribed and coded to examine the interactional modifications that took place. The transcription system used was fairly standard, but was not adopted from any particular source. Several periods were used to indicate a longer pause. Colors were used for faster identification of breakdowns in communication and for revealing how the errors were followed up and repaired. The language used during the negotiation was then analyzed following the negotiation model discussed earlier (Figure 1). Triggers, signals, responses, and reactions were identified, classified, and color-coded (red for triggers, green for signals, blue for responses, and pink for reactions). English translation is provided between brackets.

The data showed a variety of triggers: lexical items that prompted the negotiation for meaning, phonetic errors that mislead the listener, language complexity of the written instructions, and level of task complexity. Although the complexity of the task was reduced by allowing students to learn to navigate the 3-D environment and become familiar with the computer settings before the task was initiated, the data included some instances where students seem to be have been having some technical problems due to the task rather than the language needed to complete it.

As for types of responses, expansion, repetition, and reformulation were manifest although not abundant. Reactions were not as evident in the data since in many instances they were non-verbal and occurred in the 3-D environment. Nevertheless, there were several instances of reactions that varied from simple exclamations of understanding to corrections of the trigger. These examples from the coded data help illustrate the variety and complexity of the negotiation process.

Table 3. Example 1

	Students' language	Translation	Type of Response
S7*	al salir del ascensor	when you leave the elevator	Trigger -- lexical item
S8	oh, aquí pero no podemos ir a otro! solamente dos cuartos	here but we can not go other! only two rooms	Signal -- clarification request
S7	donde está el ascensor?	where is the elevator?	
S8	que es el ascensor? no comprendo! significa ascensor?	what is the "ascensor"? I don't understand, meaning "ascensor"?	Signal -- clarification request
S7	en ingles es elevator	in English is the elevator	Response -- English use
S8	oh, quieres ir a otro piso?	oh! you want to go to another floor?	Reaction -- exclamation

*S7 = student 7

Table 4. Example 2

	Students' language	Translation	Type of Response
S8	tenemos que decir como hacer con /lleva/	we have to say how to do with "key" (mispronounced)	Trigger -- phonetic error
S7	**/lleva/?** (puzzled)		Signal -- clarification request
S8	so		Response -- repetition/reformulation
S7	**llave**	key	
S8	encotramos la **llave** si si pero	we found the key yes, yes but	Reaction -- correction

Table 5. Example 3

	Students' language	Translation	Type of Response
S5	a la izquierda ... deja ... no arrow?	to the left ... stop ... no arrow?	Trigger -- lexical item
S6	la flecha	the arrow	
S5	doble otra ... entre ... no?	turn another ... enter ... no?	
S6	no puedo	I can't	Signal -- clarification request
S5	a la iz derecha	to the left right	Response -- reformulation
S6	(sound of moving like a plane/bee)		Reaction -- non-verbal
S7	entre ... aaah	enter ... aaah	Reaction -- exclamation

. = pause;
… = longer pause

Although most of the time the process followed a more linear path, in some instances there were several processes embedded in each other, and a reaction was not always apparent. Example 4 (Table 6) illustrates this type of complex negotiation.

Table 6. Example 4

	Students' language	Translation	Type of Response
S1	sube hasta el cuatro piso y al salir del ascensor dobla a la izquierda ... Inmediatamente despues ... dobla a la derecha	go up to the fourth floor and when you come out of the elevator turn left ... immediately after ... turn right	Trigger -- lexical item
S2	[giggles]		
S1	y sigue todo . JESUS!!	and follow . JESUS!!	Signal -- clarification request
S2	uno a tiempo	one at a time	Response -- repetition + trigger
S1	ok wait … Salir del ascensor	ok wait ... Go out of the elevator	Signal -- clarification request
S2	ascensor ascensor (mumbles)	elevator elevator	
S1	a la izquierda ... y [xxx] ... a la	to the left ... and ... to the	Response -- repetition + trigger
S2	**izquierda?** (asks for confirmation)	left?	Signal -- confirmation request
S1	oh . a la izquierda	oh . to the left	Response -- repetition
S2	izquierda es	left is	Signal-- confirmation request
S1	oh!	oh!	Reaction -- exclamation

. = pause
… = longer pause

The coding of the data also included the number of turns, number of utterances, t-units, and c-units (communication units), and noted how many of these were read from the written directions. The definitions for these units were adopted from Long (1991a). *Turns* are "one or more utterances bounded by silence or the speech of another"; an *utterance* is " a stream of speech under a single intonation contour bounded by silence or the speech of another"; a *t-unit* is defined as "one main clause plus a subordinate clause attached to or embedded in it"; and a *c-unit* is "a t-unit or isolated phrase not accompanied by a verb, but which has communicative value" (Long, 1991b, p. 1). This study used communication units (c-units) as the primary units of analysis, since they most appropriately account for those utterances that were not complete, lacked a verb, or were simply exclamations, but were used as elements for communication. The count of the c-units included both Spanish and English elements, since both were used to convey information; and when two words were used contiguously conveying the same meaning, one in English and one in Spanish, they counted as one c-unit (e.g., *wait, ya, si* = 3 utterances, 2 c-units; wait, ok, yes).

Results

Once the data were coded for negotiation and interaction features, a number of analyses were undertaken to reveal the nature of the L2 simulation discourse. By comparing the proportion of turns taken by participants in a dyad (Table 7) it can be verified that the task was constructed well enough to elicit language from both participants. This result confirms that of Gass and Varonis (1985) who found that this type of task elicited as much language interaction as that where both participants held half of the required information.

Table 7. Account of Units for All Participants

	Turns	English	Utterances	t-units	c-units	reading*
S1	54	16	77	38	83	21
S2	48	18	63	13	67	0
S3	50	0	63	30	67	7
S4	49	5	64	13	71	2
S5	40	7	56	24	64	13
S6	39	2	65	29	75	4
S7	56	1	92	44	104	13
S8	55	10	115	49	125	10

*reading = not their own utterances; reading from written directions
S1, S3, S5, S7 = direction givers
S2, S4, S6, S8 = navigators

In addition, the interaction took place mainly in the target language despite the fact that one of the participants in each dyad had written instructions, and that both participants spoke the same L1.

Table 8. Percentages of Target Language Use

S1	S2	S3	S4	S5	S6	S7	S8
55%	73%	90%	90%	69%	92%	87%	84%

S1 exhibited the lowest amount of L2 use (55%). Due to his limited command of the target language, 97% of his t-units were read or in English. Further analysis of this participant's language during an informal oral interview revealed that his command of the language was considerably lower than that of the other seven participants.

Since the percentage of turns by participant is not a primary indicator of negotiation, further analysis examined the triggers that indicated a break in communication, and the signals and responses that constituted the interaction. The analysis of signals and responses (Table 9) showed that signals were used

mainly by participants in the navigator role, and the preferred signal was a clarification request, followed by a confirmation request. On the other hand, responses were produced both by direction giver mainly in the form of repetition, and by the navigator by using English. Although at first glance this result was surprising, a more detailed analysis of when the use of English had taken place by participants in the navigator role showed that most of the instances had occurred between S1 and S2, where S1, the direction giver, had a much lower command of the language and often inquired about the translation of words he/she only could read in the written directions.

Table 9. Signals and Responses

		Direction giver	Navigator	Total
Signals	Confirmation requests	2 7.4%	25 92.6%	27 100%
	Clarification requests	8 17.4%	38 82.6%	46 100%
	Comprehension checks	2 50%	2 50%	4 100%
Responses	Repetitions	16 72.7%	6 27.3%	22 100%
	Expansions	8 100%	0 0%	8 100%
	Reformulations	4 100%	0 0%	4 100%
	Use of English	9 37.5%	15 62.5%	24 100%

The data contained only eight instances of expansion and four instances of reformulation. This is probably because (a) explanation and reformulation may require a higher than intermediate-level command of the target language to appear frequently; (b) explanation and reformulation are usually produced by the NS, if there is one, in a dyad; and (c) the language abilities of the two participants were similar although in each dyad one participant took the leading role.

The data were also analyzed to determine the most common type of trigger (Table10) and reaction. Lexical items that were unknown to one or both of the participants accounted for most of the triggers that initiated negotiation (approximately 53%), followed by language complexity (30%). Phonological errors triggered a few of the negotiations (approximately 7%), a result consistent with the intention of the task to elicit negotiation of meaning for task completion. Lexical items carry meaning necessary for the completion of the task, but phonological errors usually do not impede comprehension.

Table 10. Triggers

Types	Total number	Total as %
Lexical	16	53.33%
Phonological	2	06.66%
Language complexity	9	30.00%
Task complexity	3	10.00%

The discourse was also examined for sequences that might reveal L2 acquisition. In two out of the four interactions there are examples of a student correcting an error during a later interaction (i.e., after his/her partner had produced the correct form). In example 5 (Table 11), S8 produced an erroneous form (/lleva/) repeatedly. This was not understood by his interlocutor, S7, who first questioned and then repaired the error. Several turns later, S8 produced the correct form. Of course, a follow up is needed before claiming

that S8 has corrected this item in his/her interlanguage, but noticing the form and the overt correction constitute an initial step towards the acquisition of the form.

Table 11. Example 5

	Students' language	Translation
S8	Ok (reading) escribe una carta diciendo que lo has encontrado y preguntado cuando lo necesitas y que debes hacer con el trabajo (end of reading) Tenemos que escribir carta y tenemos que decir como hacer con lleva	Ok (reading) write a letter telling what you have found and asking when she needs it and what do you need to do about the job (end of reading) We have to write letter and we have to say how to do with lleva
S7	lleva?	
S8	Preguntando cuando:	asking when
S7	(reading) Lo necesita	(reading) She needs it
S8	When you need .. found .. when it is needed and what you should do with it and that was the /lleva/ si?	
S7	Si	yes
S8	So	
S7	si llave	yes key
S8	Necesitamos escribir una carta ahora	we need to write a letter now
S7	Si. Pero.	yes but
	(they turn around and start talking in Spanish with one of the invited instructors for a long time about his private life)	
T	terminaron de escribir la carta?	did you finish writing the letter?
S8	encotramos la llave .si si pero que necesitamos escribir una carta?	we found the key yes yes But what do we need to write a letter?

(red = trigger, green = signal, blue = response, pink = incorporation of negotiation)

This example also confirms that one learner not only does not pick up the other learner's errors, but can be a model that would induce a correction (Bruton & Samuda, 1980; Gass & Varonis, 1989; Pica et al., 1996).

Finally, this study revealed a variety of indicators of comprehension involved in the negotiation process: 41% non-verbal reactions (navigator placing cursor on the right place in the simulation), 34% exclamations followed by the navigator correcting the cursor position in the simulation, and 25% corrections of the trigger made by its originator (see Table 12).

Table 12. Reactions.

Type	Total number	Total as %
Non-verbal	41%	18
Exclamation	34%	15
Self-correction	25%	11

DISCUSSION

These results show that the language produced by the participants during the simulation was typical of negotiation for meaning, where the main emphasis is on the completion of the task, and where language is used with its main communicative purpose in an economical way, without paying attention to the production of long, accurate constructions. The students produced utterances very similar in type to those produced by non-native speakers in the study by Pica et al. (1996). Pica et al. concluded that L2 students can be a source of modified input, although limited, and that interaction between L2 students, although not as rich as the interaction between native speaker and non-native speaker, does offer "data of considerable quality, particularly in the area of feedback" (p. 80). As an improvement to the present study, it would be interesting to form dyads of students that do not share the same L1 since this would eliminate the possibilities of responding with their L1, and would force students to negotiate more through repetition, expansion and reformulation (more similar to native-nonnative dyads).

Measuring comprehension is difficult, and this study was not specifically designed to measure comprehension or learning, but rather to present an example of a CALL task designed to elicit L2 interaction between dyads of students and to examine the type of interaction that actually occurred. Certainly, more research is necessary to assess the relationship between interaction and comprehension, to find out what type of interaction leads to comprehension, and to discover how language comprehension can be identified and measured.

If research indicates that negotiation leads to comprehension and ultimately to language acquisition, the claim would have some important pedagogic implications for language teaching. Most learners, especially those studying less commonly taught languages, may not have many occasions to interact with NSs, especially in classroom settings. Therefore, pair work and student-centered activities could be an efficient and beneficial substitute for native speakers. However, as Pica et al. (1996) state, NNSs' negotiation may not provide the necessary input modification that would result in restructuring of the learner's interlanguage. For this reason, interaction should not be limited to this type of negotiation. Negotiation for meaning, as presented here, may have a beneficial role when used in combination with other pedagogic principles that promote language acquisition.

CONCLUSION

The design of the network-based activity described and evaluated in this program was motivated by the need to develop language teaching materials, especially CALL materials, that are well grounded in SLA principles. "En Busca de Esmeraldas" was developed based on sound language teaching principles. "En Busca de Esmeraldas" incorporates a sequence of tasks building towards a meaningful goal, designed to support learning by doing. The input provided during the tasks is elaborated, to provide students with rich input, shown by SLA research to be beneficial for language acquisition. Giving feedback was also considered, and recasting suggested as the preferred feedback form. Finally the ordering of tasks was designed to promote cooperative learning, in order to involve students in L2 interaction and negotiation, while working towards a meaningful goal.

A case study of the L2 interaction generated by the 3-D simulation was also undertaken to asses whether this task was effective in generating L2 interaction, the type of interaction, and whether this CALL interaction was similar to that of previous research. Keeping in mind the relatively small number of subjects, the results of the analysis nevertheless suggest that students engaged in L2 interaction negotiated in ways similar to previous reports suggesting that this type of negotiation facilitates comprehension and could lead to language acquisition. More research is needed in the areas of L2 interaction between nonnative speakers and in the creation of effective CALL materials. It is important to keep in mind that

well-designed, effective materials need to be grounded in language acquisition research and solid language teaching principles.

NOTES

1. "En Busca de Esmeraldas" is a two-part network-based activity: Part one is the search for a map, and part two is the search for the emeralds. This paper describes part one.

2. The simulation component of "En Busca de Esmeraldas" consisted of 23 Web pages designed with Claris Homepage 3.0, which incorporated 23 image files, two audio files (created with Microsoft Sound Recorder for Windows 98 and compressed and modified with Awave software), and two QTVR movie files created with Quick Time VR software. These two movies constituted the simulation, and each one was built from 60 digital pictures converted into six panoramic scenes, where the students could navigate inside a three-dimensional (3-D) environment. The environment places students at the basement of a building and allows them to navigate up and down the building, entering different corridors and doors.

In the 3-D environment, the students followed spoken or written directions, alone or as part of a communicative activity. Although one could claim that this activity could be more effectively implemented by using the "real-world" environment, 80 students trying to follow the same path inside a building would create serious difficulties. The simulation eases the constraints that time and space impose in actual language instruction.

3.This is a complex subject, and other aspects of cognitive demands may need to be considered such as those associated with abstract/general and concrete/specific learning skills.

APPENDIX
Students' Questionnaire

Please circle the most adequate answer.
5 = Strongly agree **4** = agree **3** = I don't know **2** = disagree **1** = strongly disagree

About the Program	
Navigation through the project was clear	5 4 3 2 1
You knew where you were going at all times	5 4 3 2 1
The design was uniform	5 4 3 2 1
The design was visually appealing	5 4 3 2 1
The font was easy to read	5 4 3 2 1
The links were easy to recognize	5 4 3 2 1
The text was not overwhelming	5 4 3 2 1
The pictures uploaded in a reasonable time	5 4 3 2 1
The movies uploaded in a reasonable time	5 4 3 2 1
The movie quality was good	5 4 3 2 1
The sound uploaded in a reasonable time	5 4 3 2 1
The sound quality was good	5 4 3 2 1
Allowed different navigation routs	5 4 3 2 1
It was interesting to follow	5 4 3 2 1
Other comments:	
What did you find was the best part of the project:	
About the Activity	
The instructions were easy to understand	5 4 3 2 1
The texts were easy to understand	5 4 3 2 1
The listening messages were easy to understand	5 4 3 2 1
The movie was easy to follow	5 4 3 2 1
The movie was interesting to follow	5 4 3 2 1
The level of the project was appropriate	5 4 3 2 1
The project was interesting	5 4 3 2 1
It helped me understand directions	5 4 3 2 1
Would you try this simulation again in the future yes / no	
Why:	
Any other comments that would help evaluating the activity:	
Gracias	

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