

**Enhancing Academic Language Proficiency
in a Fifth-Grade Spanish Immersion Classroom**

by

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Abstract

The study aimed to promote the development of more complex academic language and linguistic structures by giving immersion students the opportunity to enhance their inner voice in that language. Since the development of L2 inner voice in elementary immersion students has not been investigated to any extent, this study set out to determine how the enhancement of the students' L2 inner voice in the immersion classroom might influence linguistic knowledge and the ability to comprehend and produce language. It was posited that it might be possible to stimulate increased use of the immersion language by students while also enhancing the academic vocabulary and grammatical structure of the language that they use for specific tasks. More specifically, the pedagogical intervention included: (1) modeling by the teacher and the research assistant (RA) in the use of Spanish academic language to solve problems in science and history, and (2) supporting the students in developing their own L2 inner voice in Spanish through modeling and follow up activities.

The study involved 21 fifth-grade students in a Spanish full immersion classroom in St. Paul, Minnesota, their highly experienced native-speaking teacher, and a native-speaking research assistant. Thirty lessons were planned and taught over a five-month period, according to the school curriculum and using activities taken directly from the core curriculum. The teacher and the RA modeled the use of inner voice in thinking through problems related to science and history in Spanish academic language. During the lessons the teacher and the RA encouraged students to utilize a variety of language learning strategies that helped them to improve their ability with the second language. The students were administered pre-measures of oral and written academic language in science and history, and post-measures of the same in science, and just a written post-measure of history. Data on class sessions were collected from observers and from both audio- and video-recordings over the five-month duration of the study.

With regard to the first research question about the effects of L2 inner voice development among immersion students on their problem solving in science and history, the students' use of their inner voice appeared to assist them in explaining the processes involved in problem-solving. By the end of the intervention, the students were not only able to solve problems in front of the class or in-groups but also to demonstrate the way they were able to solve them. It appeared that this activity did have both a cognitive and affective impact on their ability to use Spanish academic language. With regard to the second research question concerning the effect of teacher modeling on students' use of oral and written academic language, this qualitative analysis provides some evidence that the treatment may have had a positive effect on Spanish academic language performance. Students tended to show some improvement over the course of the intervention in their ability to describe academic problems in Spanish, use the appropriate academic vocabulary for the given science or history task, and define academic terms with greater accuracy. This study may constitute an important departure from previous studies in language immersion in that it not only went beyond a description of the immersion classroom, but also entailed an integrated intervention that combined a series of potentially beneficial ingredients.

Introduction

It has been proposed that learners of a second language (L2) have two kinds of language proficiency: basic interpersonal communication skills (BICS) and cognitive-academic language proficiency (CALP) (Cummins, 1984). These two forms of language were later referred to as “social language” and “academic language” (Cummins, 1991). In order to talk about history, science, or other specific content areas in a language immersion program, L2 learners need to make use of complex academic language than they would use for informal social interactions.

By the end of the 1980s immersion programs had begun witnessing a decline in the use of the target language as well as a deficit in structural development in that language as students move up through the grades (Allen, Swain, Harley, & Cummins, 1990). While pedagogical interventions have been seen to enhance immersion students’ ability to deal with L2 academic language (Genesee, 1987; Lapkin, Swain, & Shapson, 1990; LaPlante, 2000), it would still appear that without special intervention the academic language of immersion students is lacking in sophistication as students move through the upper elementary grades.

Specific signs of such deficit have appeared in content-focused studies. For example, observations of Spanish immersion learners revealed that they had difficulty when processing complex word problems in math (Cohen, 1998: 190-210). The study found that the students usually started processing word problems in the target language by reading them to themselves or out loud and then by performing on-line translation into their first language before solving the problem, or continued in the target language until or unless they encountered a conceptual problem. The problem was that if students lacked the ability to think about the particular math problem in academic terms in the target language, this slowed down their thoughts and even retarded their creativity.

This “thinking about concepts” that immersion students perform in the target language takes place through the use of an *inner voice*. What we are calling *inner voice* has been referred to in the literature as “silent,” “private,” or “inner speech” (see Tomlinson, 2001). For the purposes of this study, we are embracing the term used by Tomlinson and others, namely, “inner voice.” In our work, we consider L2 inner voice to mean that inner speech used by learners in an effort not only to deal with the target language but also to manipulate thoughts in that language. The notion is adapted from the inner speech found in the writings of Vygotsky (1961: 531). The language produced by the inner voice may at times be vague, elliptical, and incomplete but its purpose is to serve as a vehicle for one’s own thoughts. The inner voice allows learners to create mental representations of the world and helps them to initiate ideas, plan and develop their thoughts, be creative, and solve problems (Tomlinson, 2000). In short, the increased use of the target language in the inner voice can enhance the mastery the student has over that language.

In addition to the issues of inner voice, another relevant concern is that of the students’ learning style preferences and their language strategy repertoire. There is a rich literature indicating the value of language strategies in developing L2 skills. A highly developed strategy repertoire can help learners in the acquisition, storage, retrieval, and use of the L2 (Chamot, 1999; Chamot & El-Dinary, 1999). Studies of immersion students have helped to provide descriptions of the learning style or language strategy preferences of the students, but this information has not tended to be shared with the learners in any systematic way.

This study, which was conducted in a fifth-grade Spanish immersion class, set out to examine the impact that a pedagogical intervention might have that included the teacher and the research assistant (RA) modeling their own use of Spanish academic language to solve problems

in science and history, and the instructors' enhancing of their students' inner voice in the L2 (taking into account their learning style preferences and their language strategy choices). The rationale was that by introducing these elements in a combined fashion, it might be possible to enhance the students' oral and written skills in academic language as used in history and science lessons.

Review of Literature

Immersion education has received increasing attention since the 1960's as one of the most effective means to facilitate L2 acquisition in school, because students, especially in "foreign-language" situations, do not have contact with the target language outside the classroom setting. Along with the early push for immersion schooling, there was a belief that the novel approach of putting English speakers in a classroom with a teacher who only spoke the L2 would in and of itself produce comfortable fluency among the students across the grade levels. Nonetheless, there have been findings in immersion programs of late that point to a decline in the use of the target language, as well as a deficit in the structural development of the language.

For example, Allen, Swain, Harley, & Cummins (1990) found that the overwhelming majority (over 80%) of French immersion student utterances from grade 3 and 6 study participants were one clause or shorter in length. Other studies of immersion classrooms have shown that for a host of reasons, students do not partake of extended academic discourse through the target language in immersion classrooms (Broner, 2001; Fortune, 2001; Genesee, 1987; Lapkin, Swain & Shapson, 1990; Swain, 1996). Furthermore, immersion students do not get ready access to academic vocabulary outside school, making its use inside schools doubly difficult. It has been observed that immersion students in upper grades tend to use the everyday or vernacular language to express what they want when referring to specific content areas. Their *cognitive academic language proficiency* (Cummins, 1984) now referred to simply as *academic language* (Cummins, 1991)¹ is in decline because it is not being offered as input or required as output.

With regard to academic language, immersion educators both in Canada and in the U.S. have found that there are linguistic gaps in immersion learners' foreign language proficiency. Immersion students have been seen to rely on basic language forms because they have a reduced list of academic vocabulary and structures at their command. For example, U.S. immersion students in the upper elementary grades at an immersion school in Minneapolis seem to have little or no productive facility in their oral language when it comes to certain complex verb tenses such as those necessary for using conditionals and subjunctives in Spanish (Félix-Brasdefer, 2001). More recently, Potowski (2004) found that 16 eighth-grade Spanish L2 learners in dual immersion likewise had little control over the subjunctive, the conditional, and other areas as well (e.g., *gustar* and the infinitive in subject position), even though they had been in a dual immersion program for nine years, and were continuing to receive 50% of their instruction through Spanish.

Likewise, French immersion research has shown that, in spite of having a number of years of comprehensible input in French, the students' spoken and written French contains numerous morphological, syntactic, and lexical deviations from native-speaker norms (Genesee, 1987; Lapkin, Swain, & Shapson, 1990). In addition, Genesee (1987) has argued that students in bilingual and immersion programs fail to exhibit continuous growth in both their repertoire of

¹ *Cognitive/academic language proficiency* (CALP) was originally coined by Cummins, then simply as *academic language* – namely, the language used in learning the academic curriculum (Cummins, 1991).

communicative skills and their formal linguistic competence because they are able to get by in school using a limited set of functional and structural skills. It was also noticed that in the upper elementary grades, there is already a push to increase English-medium instruction, especially in order to prepare students for the standardized district examinations that they will have to take (in English).

In response to these worrisome trends found in immersion school programs, researchers have explored methodologies that have put a focus on the production of academic grammar and vocabulary in an effort to offset, even just slightly, this trend away from target language mastery. Swain (2000) makes the case, for example, that it is not enough for learners to have comprehensible input; they need to be forced or pushed to produce output. One such output-oriented study was undertaken by Laplante (2000), who conducted a study of sixth-grade students in two French immersion classrooms. The students were specifically trained to talk about chemical reactions. The study included over 25 one-hour sessions in which learners were taught how to observe chemical reactions, how to write experimental procedures, and how to formulate conclusions while experimenting with different chemical reactions.

The results showed that the students were able to improve how they talked about science by appropriating certain elements characteristic of scientific discourse into their own discourse. Laplante noted, however, that while their general ability to talk science improved, the students still made numerous grammatical errors in completing their observations and in formulating their conclusions. He recommended a greater emphasis on contextualizing the academic language structures. The study underscored the importance of preparing students to use the academic language that they need for communicating effectively when talking about academic tasks in the second language.

A previous study that had focused exclusively on structure was that of Day and Shapson (1991), who conducted an experimental study to evaluate the effect on French language proficiency of providing seventh-grade French immersion students with opportunities to use and improve the conditional form. The results of the study showed that despite extensive efforts to support the use of the conditional in oral language, the experimental group did not make gains in spoken use of conditionals, whereas they did perform significantly better in writing both in the post-measure and follow-up testing. Perhaps it is at least somewhat reassuring that although these gains were not found for speaking, an examination of the individual class data revealed greater and more consistent growth in writing for the experimental than for the control classes. Several other studies have also demonstrated the effectiveness of “language-sensitive content instruction” (see Harley, 1989, and Lyster, 1994, for further evidence in French).

An issue with immersion instruction, of course, is how much explicit grammar instruction the students will tolerate before they get turned off to the experience, which is one of the reasons that grammar instruction has been somewhat downplayed in such programs. Another reason for downplaying grammar is because experts felt that grammatical form – even the more complex ones – would simply be acquired over time without the need to teach it formally.

Beyond the issue of grammar, it has been observed that immersion programs tend to be evaluated in terms of the outcomes – namely the foreign language proficiency achieved. Little has been documented regarding the **processes** students go through in order to operate in the second language, which is why de Courcy (2002) investigated the processes involved in the acquisition of French by students in late immersion programs in Australia. In her study, she found that comprehensible input in the target language alone is not sufficient for language

learning to occur. Instead, acquisition occurs because of a balance between input and output, mediated by the use of private speech.

In an earlier process-oriented study, Cohen (1998) had found that some fifth and sixth-grade immersion students in St. Paul were using English for solving word problems in math more than they were using Spanish, and especially when the problems were more complex (e.g., comparisons as opposed to simple addition). The findings demonstrated that the subjects usually started processing a word problem in Spanish by reading it to themselves or out loud and that they then either performed on-line translation to English before solving the problem, or they continued in Spanish until or unless they encountered a conceptual problem.²

Although certain cognitive operations are nonverbal, involving symbols and relationships, many of these processes are verbalized in the form of inner or private speech or in the form of social or public speech. In the first language (L1), inner speech or the *inner voice* (Tomlinson, 2000) develops naturally at the same time as the external voice and it mediates thinking. Tomlinson goes on to assert that an L2 version of the inner voice can play an important role in L2 learning as well. It allows learners to create mental representations of the world and helps them to initiate ideas, plan and develop their thoughts, be creative, and solve problems. Their inner voice can assist them in responding intelligently to discourse. Finally, with regard to their emotions, they use their inner voice to help control their feelings and to maintain their self-esteem. Despite the potential for the development of an L2 inner voice, Tomlinson maintains that in many L2 classrooms the external voice is given such primacy from the very beginning that it is literally imposed on and inhibits the inner voice, thus slowing down thought and retarding creativity.

We note that Tomlinson's use of the term "inner voice," and the one adopted in this paper, is referring to a form of verbal representation which is consciously accessible to learners. So this use marks a shift away from the Vygotskian approach to inner voice which considered it as partially inaccessible to conscious inspection. While the inner voice in the way we use it here is most likely not intended for others to hear, it may well be intelligible to others. It is for this reason that a teacher could model this form of language to learners who may well not have the carrier language in the target language to conduct inner voice activities comfortably in it. So instead, they find themselves thinking through concepts partially or extensively in their L1 and then on-lining their utterances in the immersion language, when called upon to speak or write. It would be our contention that this is to the detriment of their target-language development.

A small corpus of empirical research dealing with L2 inner speech has shown that advanced L2 learners – and especially adults or high school students – are using an L2 inner voice for a number of language functions (Guerrero, 2004). In addition, de Courcy (1993) describes late immersion students spontaneously using their L2 inner voice. From her observations and interviews she found that there are four main reasons students answer silently in French: (1) for positive reinforcement of one's own answer; (2) to avoid losing face by calling out a potential wrong answer; (3) to make sense of the question itself; and (4) to get more practice in using the language. This report revealed that internalized speech plays a crucial role in language acquisition. This internal speech as reported by the students is much more than just rehearsal, or practicing of form.

² While the data collectors in that study were native English speakers, the data were collected over a series of months in different class situations, so the switch to using English in math problems was not simply a function of the language of the data collector.

In another study, de Courcy (2002) asked high school and university immersion students to recall experiences in which they noticed that the target language was in their minds, or that they were talking to themselves in the target language. She offered examples demonstrating that students were, in fact, using the L2 private speech without necessarily being aware of it:

Researcher: “OK, other people have said that like when they’re playing-playing sport or just walking around, they’ll talk to themselves about what they’re doing, in French.”

J (student): “Yeah, I’ve done that. You’re just thinking about it...”

P (student): “Once I played basketball in the back yard and just commentated on the game in French.” (de Courcy, 2002: 96)

From these examples, it can be seen that some students had internalized the target language and were able to use it to process information in this language both in and out of school. Another example here shows that the students used the target language in their heads:

P (student): “Somehow in my brain I now have worked out – because of the course, such things that are **just** Chinese.”

Researcher: “Mmm mm?”

P (student): “and I can say that – and some words, I think **everybody** – even people who can’t speak any English, **should** be able to understand, some of them just seem so **natural** and so, let’s see a much better way of s- it’s really as if the Chinese is a better way of expressing.”

Researcher: “Mmm mm?”

P (student): “that idea.”

Researcher: “Mmm mm.”

P (student): “well, the (chair’s) *hua le*, you know, are you aware of broken?”

Researcher: “Mmm mm.”

P (student): “like the- the chair’s *hua le*, the (push bike’s) *hua*-anything’s *hua le*, I mean, that to me – I expect everybody should be able to understand, you know? Just like *tai gui le* [too expensive] too, yeah.” (de Courcy, 2002: 95)

While there has been research by Tomlinson, Guerrero, and de Courcy, with older learners, to our knowledge researchers have yet to explore the benefits of developing the inner voice in L2 among early immersion students in order to help them to improve the way they talk and perform cognitive operations in the target language. So it remains an open question as to whether development of an L2 inner voice in early language immersion programs may be of benefit.

Another area of concern with regard to immersion schooling is the role of language learning strategy repertoires. Descriptive research on the language strategies used by early immersion students has been undertaken and reported in recent years. For instance, a descriptive study conducted with immersion students in Spanish and French full immersion, and Japanese partial immersion programs in the Washington, D.C. area has demonstrated the benefits of discovering the language strategies the students used when performing academic tasks (Chamot, 1999; Chamot & El-Dinary, 1999). In the study, pairs of students in all of these programs provided verbal report data, whether in their native language, in the immersion language, or in both. The researchers found that across age levels, more effective language learners seemed to be adept at monitoring and adapting to the use of new learning strategies, whereas less effective learners clung to ineffective strategies. The more effective learners seemed to focus on the task as a whole while the less effective ones focused too much on the details. An outcome of this

study was the development of teacher workshops under the experienced guidance of Anna Chamot, to train immersion teachers to use strategies-based instruction using the Cognitive Academic Language Learning Approach (CALLA) (see Chamot, Barnhardt, El-Dinary, & Robbins, 1999).

Although the processes by which students reach a given proficiency level are difficult to identify because they are not directly observable, Chamot and colleagues have demonstrated the value for teachers instructing in elementary Spanish and French full immersion and Japanese partial immersion in the Washington, D.C. area of knowing how immersion students figure out the meaning of words, how they remember expressions, and how they solve problems in academic fields like science and history (see Chamot, Keatley, Barnhardt, El-Dinary, Nagano, & Newman, 1996). It is hypothesized that if the students become more aware of the language learning strategies that they use, they can be freer to choose which they will use with a given task³. Likewise, Oxford (2001) and others have stressed the benefits for learners of all ages to be mindful of their style preferences⁴. If their teachers are also mindful of their style and strategy preferences, they can more readily plan instruction that responds to each student's needs.

Whereas work by Chamot and colleagues marks an initial effort at describing the general and specific approaches that immersion students take to their learning (see, for example, Chamot & El-Dinary, 1999), it would appear that a fair number of K-6 immersion teachers have, until recently, been trained primarily as elementary teachers and not as immersion teachers. This situation creates a challenge for teachers to know how to develop among immersion students the requisite language abilities for successful performance in immersion schools. Indeed, few teachers have been trained to survey their students' styles and strategies and to employ this knowledge to the benefit of their students and to their own benefit as well.

So the literature on gaps in academic vocabulary and grammatical form, on how the development of the inner voice in the target language, and on language learner strategies all provided insights deemed potentially valuable for enhancing immersion education in the U.S.

Aims of the Study

Since the development of L2 inner voice in elementary immersion students has not been investigated to any extent, this study sought to describe qualitatively how the enhancement of the students' L2 inner voice in the immersion classroom might influence linguistic knowledge and the ability to comprehend and produce language. The study aimed to promote the development of more complex academic language and linguistic structures by giving immersion students the opportunity to enhance their inner voice in that language. It was posited that it might be possible to stimulate increased use of the immersion language by students while also enhancing the academic vocabulary and grammatical structure of the language that they use for specific tasks. For the purposes of this study, four aspects of *academic language* were focused on:

- the ability to describe an academic problem,

³ Language learning strategies are "specific actions taken by the learner to make language easier, faster, more enjoyable, more self-directed, more effective, and more transferable to new situations" (Oxford, 1990, p.8).

⁴ That is, their basic predisposition to approach language learning in one manner or another (e.g., in a more visual or auditory manner, more extrovertedly or introvertedly, more globally or more with a focus on particulars, and so forth).

- the ability to use academic rather than lay terminology for science and history concepts,
- the ability to use language structures appropriate for academic discourse, and
- the ability to define academic terms.

These aspects of academic language were arrived at through extensive classroom observation by two research assistants in immersion programs throughout the Twin Cities over a six-month period prior to the commencement of this study.

The pedagogical intervention included:

- Modeling by the teacher and the research assistant (RA) in the use of Spanish academic language to solve problems in science and history.
- Supporting the students in developing and utilizing their own L2 inner voice more strategically in Spanish by modeling how it could be done and by providing follow-up activities to enhance this behavior.

Hence, the study constituted an action research project undertaken collaboratively between an RA and a classroom teacher. Specifically, the study addressed the following two research questions:

1. What effect does support of target-language inner voice use among immersion students have on their problem solving in science and history?
2. What effect does the pedagogical intervention have on immersion students' oral and written academic language performance?

Research Design

Description of the Instructors

There were two instructors working in the study. A native speaker teacher of Spanish worked in every session along with a research assistant. The teacher was from Spain and had been teaching in the immersion school for over a decade. Several years before the study, she had completed a Masters' degree in Curriculum and Instruction with an emphasis on immersion schooling. The research assistant, Tania Gómez (also co-author of this report) was a native speaker of Spanish, from Colombia. She was a graduate student at the University of Minnesota and had had prior experience as a teaching assistant in a fourth-grade Spanish immersion class in another immersion school. She spent a total of six weeks in the classroom (from the beginning of September until the middle of October) involved in regular classroom activities and getting to know the students before the pretest data were collected and the intervention began.

Description of the Students in the Sample

The sample group consisted of 21 5th-grade students, ranging in age from 10 to 11 at the Adams Spanish Immersion Elementary School in St. Paul where there was at the time a student population of 632. All the students but one had been in Spanish full immersion since kindergarten. Among them, two were native speakers of Spanish and spoke Spanish at home,

while another seven students had at least one relative with whom they could practice their Spanish. The remaining twelve students had no place to interact in Spanish except at school.

In order to provide the instructional staff background information on the students in the class, the students completed two surveys with all items in English: the *Learning Style Survey for Young Learners: Evaluating your Own Learning Styles* (Cohen & Oxford, 2001a) and the *Young Learners' Language Strategies Survey* (Cohen & Oxford, 2001b). The main purpose for collecting the style preference data was to allow the teacher some insights into how to group students for class activities. The students kept a copy of the style survey in their own personal file so that they could refer back to their responses in order to remind themselves as to their learning style preferences. Students also kept a folded-over card on their desk during the intervention sessions, and the card had on it icons which matched their reported style preferences. By means of these cards, the RA and the teacher were able to make use of the data by selecting learning materials and teaching activities that catered to the style preferences of the students or that purposely stretched them away from their natural preferences.

In addition, the students were asked to select from among the strategies in the survey that they completed or from among other language learning strategies, three strategies that they were committed to adding to their strategy repertoire in order to help them improve their Spanish. The students had their own commitments listed inside a drawing of a magnifying glass on their desks, and from time to time the teacher and the RA referred to those commitments and asked students if they were actually trying to use those strategies.

Instrumentation

The Treatment

As preparation for the intervention, the RA met with the teacher in several sessions to support her in carrying out the think-aloud and inner voice components of the intervention. The think-aloud component involved having the teacher and the RA serve as models for the students as to how they conducted problem solving in their own minds through the target language in order to solve problems in history and science. In other words, they modeled externalizing their own inner voice in Spanish, their first language (L1). This frequently repeated activity also gave the students an opportunity to hear two adults conversing about the science experiments and about opinions of different history issues that the students were being asked to learn. The instructors usually talked out loud about alternative approaches to solving a problem and gave reasons as to why one approach was perhaps better than another. They also made sure to model the use of the appropriate academic language in doing so in order to provide the learners with rich exposure to the instructors' language of thought in the target language.

During the modeling of how the instructors used their Spanish inner voice, they explicitly called attention to the language strategies that they used in order to remember the concepts or language for later interaction or to monitor the academic language that they used to communicate. The activities for enhancing the students' use of their L2 inner voice included having them talk to themselves in L2 academic language using cardboard cell phones, conduct conversations with themselves in the L2 while looking at themselves in a pocket mirror, talking to themselves in the L2 using puppets, and writing post-cards to themselves in the L2 (which they actually mailed to themselves).

At first the students were unaware that they were engaging their inner voice in English most of the time (e.g., when they were at play, when they were thinking of what they would tell their parents, or whatever). They had simply not been aware that this was the case. They learned that they could use their L2 inner voice as a vehicle for solving academic problems. They could also use it when employing the metacognitive strategies of monitoring their vocabulary and grammar.

Thirty lessons were planned according to the school curriculum and used activities taken directly from the core curriculum. Thus, the lessons constituted core material, rather than additions for the sake of the experiment. Accordingly, the intervention involved two science units, one on “variables in science experiments” and the other on “levers and pulleys,” and one history unit, “The Colonies of America.” The goal was to have these units, which provided the content for the study, blend smoothly with the rest of the curriculum. The RA prepared the materials for these activities, and a lesson plan was submitted in advance to the classroom teacher in order to maximize the relevance of the actual tasks within the students’ overall curriculum.

Each science or history lesson consisted of the presentation of the topic that emphasized the use of academic language and complex structures. Two such complex structures that were selected were the subjunctive and the conditional, since these were two that native children at that age clearly controlled but immersion children did not (Felix-Brasdefer, 2001). Throughout the intervention sessions, the students were exposed to more sophisticated academic language than was normally required of them so that ideally they would be able to discuss the information from the various topics with their peers. Examples of academic language in science included nouns such as *fulcro* ‘fulcrum,’ *palanca* ‘lever’ *esfuerzo* ‘force,’ *carga* ‘load,’ *hélice* ‘propeller,’ *rayo* ‘ray,’ *carga negativa* ‘negative load,’ and *carga positiva* ‘positive load,’ and verbs such as *expulsar* ‘to emit,’ *frotar* ‘to rub,’ *amarrar* ‘to tie,’ *oscilar* ‘to swing,’ *balancear* ‘to balance,’ and *girar* ‘to swing around.’ Nouns for history included *nativos* ‘natives,’ *carabela* ‘cavel,’ *brújula* ‘compass,’ and *expediciones* ‘expeditions.’

Likewise, the lessons also included two or more activities calling for problem solving, as a vehicle for having the adults model the appropriate academic language and for stimulating the students to develop their L2 inner voice while solving problems such as why a fulcrum worked the way it did. Special effort was made to ensure that students were taught the language that they would need in order to solve the problems presented at the end of the class. When problem solving was presented at the beginning of the class, the teacher made sure that there was a follow-up problem-solving activity in order to see whether the students were now able to use the appropriate academic language.

The format for presenting academic language within the framework of the three units was to introduce and explain the new repertoire of academic language at the outset, and then have the students practice it in a series of activities (see Appendix A for a list of the activities and a sample lesson plan). At the end of each lesson, the instructors debriefed each other as to the results of the lesson with regard to the teaching of the academic vocabulary and language structures, and their perception as to learner results. The thirty classroom sessions were designed to be used over a period of five months, from October 2001 to February 2002, with approximately two 30- to 45-minute periods per week. In most cases, the students worked in small groups of no more than four people. When the activity called for reading or writing, the students usually worked individually. A variety of student materials were designed, including posters, readings, transparencies, instructions, and evaluation sheets.

In order to cater to individual learning styles, the teacher and the RA sought ways to address differing learning styles at least some of the time. The intention was both to reach and engage all students through enabling them to strengthen their current preferences and to give them an opportunity to stretch their repertoire of learning styles at their own pace. So, for example, students who were more visual were given tasks that favored their style preference and strength, such as describing and summarizing tables, pictures, and maps whenever possible. Students who were more hands-on were able to work through learn-by-doing exercises which the teacher and RA found particularly useful for stretching the students' problem-solving ability with respect to science experiments. The students who were more hands-on felt comfortable while building the objects that were talked about in class. For example, when the different kinds of pulleys were presented and discussed, the students built them and noticed the differences between one and the other. For students who were more auditory, efforts were made to have them listen to the readings or to the instructions out loud.

In terms of style stretching, efforts were made to get the more introverted students working in groups where they needed to participate actively in order to accomplish the tasks. The needs of both the learners favoring a "particular" learning style preference (i.e., those who learned through focusing more on details and who were good at remembering specific information about a topic) and the more global learners (who enjoyed getting the main idea and guessing meanings) were accommodated by organizing the given topic such that there was both focus on specific concepts in detail and also frequent references to the wider picture.

Students were also encouraged to pay more attention to the strategies used in performing academic language tasks (see Appendix B for sample language learning strategies associated with each activity). Some of these strategies included the following: creating mental linkages, repeating, highlighting, using synonyms, asking for clarification or verification, and collaborating or co-constructing responses with their classmates. More specifically, with respect to listening strategies, the students were encouraged to listen to the teacher and the RA carefully and ask questions. Students were also encouraged to pay attention to important words and especially to new words introduced in the lesson. In addition, the students guessed the meaning of some vocabulary by using the context or by using what they already knew.

With regard to vocabulary strategies, the students were taught how to define vocabulary by using the pattern provided in class, by consulting the dictionary, or by asking their peers. Students were also encouraged to draw pictures of the new words in their notebooks or to create a mental picture of the words in their minds. The new academic vocabulary introduced in a given lesson was recycled in a subsequent lesson. With regard to speaking strategies, the strategies that were modeled included saying the new vocabulary words over to themselves and then practicing the new linguistic forms by repeating them out loud. Students were also encouraged to plan ahead what they wanted to say and to ask their peers to help them in planning. Some of the activities included role-plays, skits, or presentations to the class. The teacher and the RA usually gave them strategies for conducting these activities, such as making sure to use of complete sentences, using gestures, and using visual aids.

With respect to reading strategies, the students were trained in how to read history by making pictures of what they were reading and by looking for and highlighting important information. For example, while reading in history the teacher stopped at certain sentences and asked the students to look at these sentences in order to explain the meaning, using their own words. Then, the teacher asked students to copy the sentences into their notebooks and to underline key vocabulary that they needed to use to explain the meaning. Also, when the teacher or RA worked with transparencies, she asked students to picture what they were reading in their

minds. The students in most cases had a record of the new academic vocabulary and the meaning of it by having copied it into “an academic vocabulary file” that we decided to compile for the study (see Appendix C for a sample of a vocabulary lesson activity).

Regarding writing strategies, the students were shown how to make a record of the materials, the procedures, and the results for each experiment. This activity enabled students to make further use of academic language because they were engaged not only in drawing pictures, but in writing down a description of scientific processes, and an explanation for how the objects drawn in the pictures actually worked (see Appendix D for a sample activity).

The Instruments

1. Pre-Measures of Oral and Written Academic Language

The measures for oral and written academic language were constructed so as to assess gains in language proficiency on the basis of the 30 lessons that constituted the treatment. Pilot work had been conducted by two research assistants for Spring semester of the previous year in immersion classrooms in the Twin Cities, in an effort to arrive at viable approaches to measuring academic language in science and history, as well as to arrive at rating scales that could be used in this effort. This work provided the guidelines for the design of the measures used in this study.

The questions for the oral and written language proficiency pre-measures were identical and were based on the topics that the students were covering in science and history (see Appendix E). The questions were designed to assess the academic language that the students were using when problem solving and defining terms in the target language. For science, three of the questions called for a detailed description of a science task that the students had just finished. Another question called for a definition of an academic term included in the task (e.g. “What do you understand by *variable*?”). Another question asked the students to indicate what they liked and disliked about the experiment, and a final question called for their opinion as to future means for solving the problem presented in the experiment.

Six questions were included for the pre-measure in history: two of the questions called for descriptions (e.g., “Describe the person who discovered America.”), two called for definitions of academic vocabulary used in the context, and the other questions asked students to give ways that they would go about discovering new places and about their feelings when doing it. Along with the measures, rating sheets with five subscales for both spoken and written language were designed (see Appendix F).

2. Post-Measures of Oral and Written Academic Language

The post-measures of oral and written academic language followed the same format as the pre-measure questions but assessed different content consistent with the specific topics being covered at the time of the post-measures (see Appendix G). The science post-measure consisted of seven questions that called for description of a problem they were working on at the time, definition of an academic term, and opinions about the way they would go about working with pulleys. Two of the questions called for the use of the conditional or subjunctive in order to see whether students were using these complex grammatical forms. The post-measure of written academic language for the history section had six questions that called for descriptions of the American colonies, opinions they had about being a *peregrine* ‘pilgrim,’ and a definition of academic terms used through the unit. There was no post-measure of oral academic language for

the history section since the students did not cover enough material and, in addition, they were preparing for a district test.

3. Live Classroom Observation, Audio- and Video-Recording

Classroom observation, plus audio- and video-recording were used to obtain data regarding the quality of language use patterns in whole-class, group, and paired interaction. The observers were to note the effects of the teacher and researcher's modeling of the academic vocabulary, and the behaviors shown by students when negotiating the meaning of academic language and when using different language learning strategies. Additionally, an observation instrument (see Appendix H) was used to record the ways in which the teacher and the RA encouraged the students to use their inner voice during different activities. Three observations by outside observers were carried out during the intervention period, and, in addition, the teacher and the RA discussed insights gained from informal observation after each lesson. The audio- and video-recordings were made regularly over the duration of the study to provide a record of the students' academic language development.

Data Collection Procedures

The RA spent 1_ months in the classroom before data collection began. This allowed her to develop a rapport with the students and the teacher. The fact that the teacher and the RA both spoke the target language natively seemed to stimulate the use of Spanish by students in the classroom. For one thing, the teacher encouraged students to use Spanish in class, and in addition, the students always addressed the RA in the target language. The data for the study were collected over a five-month period from October 2001 to February 2002.

The pre-measures of written and oral academic language for history and science were administered in October 2001, prior to the onset of the intervention. The post-measures of written academic language for science and history and the post-measure of oral academic language for science were administered in February, immediately after the completion of the intervention. The initial surveys along with the pre- and post-measures were collected during regular class periods. Each measure took approximately 15 to 30 minutes to complete.

The measures of oral academic language in science and history were administered individually by the RA and tape-recorded. The students had a warm-up conversation with the RA before answering the questions and were told to talk freely. Each oral interview lasted approximately five minutes. The written measures were administered by both the teacher and the RA. The questions were read aloud to make sure everyone understood them. The students were not allowed to use a dictionary while responding to the measures.

During the intervention, the RA wrote detailed observational notes after each class regarding different aspects of academic language used, teacher input, and perceived development of Spanish academic language among the students. Additionally, numerous sessions were audio-taped and seven sessions were video-taped for later analysis of teacher modeling, students' interactions, and academic language and language structure use. In a few cases the video camera was turned off so that videotaping would not disturb the class activities. The data from the audio- and videotaping were transcribed. Approximately 90% of the data were from the audio-taping sessions and 10% from the video-taping.

Data Analysis Procedures

The pre- and post-measures of both spoken and written language were rated according to a rating sheet. The rating sheets consisted of four subscales – (1) facility in describing the problem in comprehensible Spanish, (2) quantity and quality of academic vocabulary, (3) quantity and quality of complex grammatical forms (e.g., use of the imperative, tenses, and mood), and (4) ability to define academic terms in Spanish. Each subscale had five points with 5 = high ability and 1 = low ability.

For the purpose of analyzing the results in the absence of a control group, the results for each student were analyzed separately. In other words, we looked at signs of improvement for each individual student. It should be noted that there were roughly four proficiency levels within the class: native Spanish speakers (2 students); high-level proficiency (4 students); intermediate proficiency level (7 students); and low-proficiency level (9 students). This classification was based on a joint teacher-RA rating, from observing the level of Spanish used by the various students during class sessions. In keeping with the qualitative nature of this study, qualitative descriptions were used to determine students' improvement in oral and written proficiency in science and history as a result of the intervention.

Results

Research Questions #1: Support for target-language inner voice use among immersion students when problem solving in science and history.

The results of the study would suggest that the modeling by the instructional staff appeared to have achieved its goals. While the teacher noted that at first she felt a bit silly thinking out loud, once she got into it, it became part of her routine. She was even applying this technique to lessons with other subject matter beyond the scope of the study. The interaction of both teacher and RA created a setting for asking and answering questions in such a way that the academic language was presented in a type of dialog or conversation mode that provided the students with considerable comprehensible input.

It was also noted that just as with the teacher, the students laughed out loud when they were first asked to talk to themselves. But then they also got used to the routine and appeared to enjoy the activities aimed at assisting them in developing their inner voice in academic Spanish. By the end of the intervention, it is fair to say that these immersion students understood that by using their L2 inner voice they were able to improve their academic language production in the target language. A good example of this kind of activity was a discussion of a science experiment on how thunderstorms were created. The RA asked the students to think to themselves about possible answers to this question. Then, the students were handed a cardboard cell phone and asked to “call” themselves on this make-believe phone and to answer the question to themselves in Spanish. From the observations that were conducted, it was found that the students were not afraid to make up dialogs since everybody was talking at the same time and nobody was paying close attention to anyone else. Also, it seemed that when students had the opportunity to think and organize their ideas and talk about these ideas in Spanish to themselves, they were able to produce better reports and to use more academic language. It was also observed that students felt motivated and wanted to be part of the group that modeled or explained a given activity.

Here is an example of what “feeling motivated to participate” actually looked like at the half-way point during the intervention:

[Audio-taped data]

Teacher: *Tania* [RA], *entonces ¿qué pasa si hago girar el avión más de diez veces? A ver, lo hago.* [She swings the plane while waits for the research assistant to answer.]

‘Tania, what happens if I swing the plane more than ten times? Let me do it.’

[Interruption by some of the students. They wanted to answer the question. One of them answered out loud.]

Andrea [intermediate-proficiency]: *Yo sé, volar rápidamente.* ‘I know, it flies quickly.’

Teacher: *Bueno. Creo que tú no te llamas “Tania.” A ver, déjame hablar con ella.*

Después tú hablas. Entonces, ¿Tania? ‘Okay, I don’t think your name is “Tania.” Let me talk to her first, and then you can speak. Okay, Tania?’

Upon hearing the teacher and RA modeling aloud how they themselves were solving the problems, a few students then tried to imitate them. Especially students with higher Spanish proficiency felt the urge to interrupt the two adults in order to make their suggestions or just to participate. The very act of contributing in this way made it imperative for these students to utilize the academic vocabulary needed to explain the problem or the activity that was taking place. The modeling then provided an unobtrusive measure of whether students could find the language that they needed to explain ideas coherently and fluently when they were encouraged to do so.

Here is an example of how a low-proficiency-level student explained something by using everyday language and the teacher encouraged him to use academic vocabulary to express the same idea (in one of the last science lessons in the study):

[Audio-taped data]

Teacher: *Así que de todo este experimento, ¿qué podemos concluir? Si Tania toma este péndulo* [she hands her the pendulum] *y lo oscila y yo hago lo mismo con este...*

Observen muy bien. Es lo que vosotros acabáis de hacer. Cuenta, Tania [RA]. ‘So, what can we conclude about this experiment? If Tania takes this pendulum and swings it, and I do the same. Look at this carefully. This is what you just have done. You can count, Tania.’

Researcher: 1, 2, 3, 4, y 5.

Teacher: *Mientras tanto cuento yo. Ayúdame, Luis, a contar.* ‘At the same time, I’ll count too. Luis, help me with the counting.’

Luis [low-proficiency]: 1, 2, 3, 4, 5, 6, 7, 8, 9.

Teacher: *Entonces ¿qué concluimos? A ver, ¿que piensas, Miguel?* ‘So what can we conclude? Let’s see, what do you think, Miguel?’

Miguel [low-proficiency]: *La línea corta tiene – se mueve más rápido.* ‘The short line has – moves faster.’

Teacher: *A ver. Miren el poster con todas las palabras que hemos estudiado. Pensemos otra vez y hablemos con esas palabras. ¿Cómo se llama la línea* [showing the pendulum]? *A ver, chicos. Lo estamos haciendo para ayudarlos. Intenta de nuevo, Miguel.* ‘Let’s see. Look at the poster with all the words we have studied. Think again and talk using those words. What do you call the line? Let’s see, guys. We are doing this [referring to the poster] to help you. Try again, Miguel.’

Miguel: *El péndulo *corta* [instead of the masculine adjective *corto*] *mueve.* ‘The short pendulum moves.’³

³ The use of an asterisk in the spoken or written Spanish of the immersion students indicates either the use of the wrong article, an inappropriate conjugation of a verb, the lack of agreement, or a misspelled word.

Teacher: *¿Mueve? A ver. Otro verbo más específico.* ‘Moves? Let’s see. Another more specific verb.’

Lucía: *Oscilar.*

Teacher: *Muy bien, Miguel. Entonces, dices que el péndulo corto ...* ‘Very good, Miguel. So, you say that the short pendulum...’

Miguel: *Oscila más rápido del largo.* ‘Swings faster than the large one.’

It was interesting to see an increase in the use of academic Spanish in class by perhaps five or six of the nine lower-proficiency students. They made more of a contribution through their thoughts and ideas in solving the different problems at the end of the intervention than they had at the outset, as revealed through the videotaped observations. Here is an example:

[Working in groups as they studied the principles of the pendulum]

[Audio-taped data]

Researcher: *A ver aquí ¿qué está pasando?* ‘Let’s see here. What is happening?’

Roberto [low-proficiency]: *Mira el péndulo line.* ‘Look at the pendulum line.’

Researcher: *Péndulo solamente; no line.* ‘Pendulum only; you don’t say “line.”’

Roberto: *O si. El péndulo es muy largo y entonces cuando mueves [RA points to the poster] o si oscila *poquitos tiempos [por un poquito tiempo].* ‘OK, yeah. The pendulum is very long and when you move it ...OK, yeah, it swings a few times.’

Researcher: *¿Pocas veces? ¿Cuántas?* ‘A few times? How many?’

It was through monitoring the students’ responses in these interactive situations that the teacher and the RA were able to determine the extent to which the students used academic language, as well as to get a sense of the academic language that was the most difficult for students to use. Through this monitoring process, the instructors were able to identify language material that needed to be included again in further lessons or to be covered in another area of study, such as in language arts. In addition, it was observed that the immersion students were active participants in the various classroom tasks and took advantage of opportunities for cooperation, whether in pairs or in small work groups that would report their thoughts or results to the whole class on a regular basis. Furthermore, the tasks used in the intervention were seen to reinforce in the classroom an element that had been less prevalent in previous student performance, namely, student-to-student interaction on an academic topic in Spanish.

Research Question #2: The effect of the pedagogical intervention on immersion students’ oral and written academic language performance.

In responding to the second research question, we will look first at the oral data and then at the written data in all four sub-areas of academic language: (1) **descriptions** of academic problems in Spanish, (2) the quantity and quality of academic **vocabulary**, (3) the quantity and quality of complex **grammatical forms**, and (4) **definitions** of academic terms. In almost all cases we will contrast in a qualitative manner the Spanish academic language used by the students at the outset of the study with that used by them after the intervention was well underway or terminating. We will be taking examples both from science and history, and will be comparing students using our rough benchmark of their language proficiency (low, intermediate, high, or native speaker).

As indicated above, there were two means for determining improvement in oral academic language, one was through the pre- and posttesting, using a measure of academic language, and

the other was through regular classroom observation, using both audio- and video-taping. While the pre-posttesting of oral language was limited to science, there were regular observations of oral language in history. So this section draws both from the pre-post testing data and from the audio- and video-taped data in order to provide statements about the level of Spanish academic language at the outset of the intervention and after various exposures to the intervention for some months. The real names of the students have been replaced by pseudonyms.

Oral Academic Language

a. Oral Description of Problems in Science and History Tasks

An analysis of the pre-measures of the oral academic language use in science and history indicated that the students had some command of vocabulary and language structures at the outset, which made it relatively easy for them to communicate in the second language. However, we noted that there was ample room for improvement. In other words, at the outset of the study there was some lack of academic vocabulary and complex Spanish language structures that may have impeded students from giving more comprehensive and complete descriptions of scientific experiments and of history tasks about the American colonies.

From early recordings and observations, the RA observed that students' descriptions were short in length and offered few details. Also, the interspersing of English and the use of incomplete sentences in Spanish seemed to characterize their classroom language at the time.

At the Outset of the Study

In the early sessions, the majority of students seemed to rely on short answers that in most cases included English words. Also, the language structure in most cases did not include the use of complete sentences. In the following example taken from a low-proficiency student we can see these patterns.

[Talking about variables in a science experiment]

[Audio-taped data]

Researcher: *¿Me puedes decir en qué consiste tu experimento?* 'Can you tell me what your scientific experiment is about?'

Kim [low-proficiency]: **La* [instead of the masculine article *el*] *pan con la* peanut butter. 'The bread with peanut butter.'

Researcher: ¡*Uhm!* [she waited for the student to explain something else, but it never happened]

When looking at data from intermediate students, we noticed similar patterns: a noticeable use of English vocabulary and the use of short phrases in Spanish. It was observed that the burden was on the teacher to draw out of the students a more comprehensive description when they were describing the steps taken to conduct a scientific experiment, a description of the results, or their observations about the experiment. In order to get a more complete or comprehensible response from the majority of students, the teacher had to ask questions about it. Here is an example:

[Audio-taped data]

Teacher: *A ver y en el experimento de Doris, ¿qué ha hecho la variable al pan?* ‘Let’s see, and in Doris’ scientific experiment, how has this factor affected the bread?’

Doris [intermediate-proficiency]: *El pan es como con cosas arriba de.* ‘The bread has like things on top of it.’

This description does not really provide a complete picture neither of what had happened to the bread nor of why it had happened. The student here answered the question by giving a broad description of what was happening with her experiment, but avoiding academic vocabulary that would have been useful in providing more details. It would be fair to say that most students used this strategy in order to finish the tasks quickly. In a few instances that were not tape-recorded, students demonstrated their ability to a detailed explanation fairly easily in English about the changes in the bread.

Likewise, while some students (especially at the low and intermediate-proficiency levels) may have had control over some of the academic language at the outset, they preferred to use everyday language to describe what they were doing. The students tended to be brief and to use English words to describe or to explain what they wanted to say:

[Students working on a task in which they described the observations of their experiments]

[Audio-taped data]

Julián [intermediate-proficiency]: *Aquí escribimos, aquí. La peanut butter ¿cómo se dice en español?* Concha [the teacher], *¿cómo se dice peanut butter?* ‘Here we write it, here. How do you say “peanut butter” in Spanish? Teacher, how do you say “peanut butter”?’

Teacher: *La crema de cacahuate; ¡qué rica que es! ¿Le pusiste crema de cacahuate a tu experimento?* ‘The peanut butter; it is so delicious! Did you put peanut butter in your experiment?’

Adriana [low-proficiency]: *Sí, y nosotros *poner en *el* [instead of the feminine article *la*] *oscuridad para ver mañana.* ‘Yes, we put it in the dark to see it tomorrow.’

[Later in the same conversation]

Adriana: *Concha [the teacher] dice que necesitamos escribir los cambios aquí. ¿Qué son “cambios”?* ‘Concha [the teacher] says that we need to write the *cambios* here. What are *cambios* [changes]?’

Julián: *Como si *un cosa ...el pan...el peanut butter tiene algo diferente de hoy – mañana.* ‘Like if a thing...the bread...the peanut butter has something different from today to tomorrow.’

Adriana: *El pan se hace como hard y así.* ‘The bread gets like hard and like that.’

It was also found that the high-proficiency students gave brief, straightforward answers when problem solving using academic vocabulary. Perhaps these students also felt that they needed to finish fast, and that it was not necessary to say any more than they did. Although these students clearly had the ability to respond faster to questions than the other students, the teacher would ask questions in order to get the students to discuss the details about the experiment:

[Audio-taped data]

Researcher: *¿Podrías explicarme como hicieron el experimento?* ‘Could you explain to me how you did the experiment?’

Omar [high-proficiency]: *Nosotros colocamos el pan en una bolsa y ya.* ‘We put the bread in a bag and that’s it.’

Researcher: *¿Y qué? ¿Qué querían averiguar?, o ¿por qué lo colocaron allí?* ‘And what? What were you trying to find out?, or why did you put the bread there?’

Omar: *Porque queríamos.* ‘Because we wanted to.’

The following examples are taken from lessons about airplanes where students had to use scientific variables and carry out tasks. We start with data gathered from students at three different proficiency levels in an early session, and it can be seen that their descriptions were not very detailed and sometimes incomplete:

[Audio-taped data]

Researcher: *Cuando trabajaste en grupos, ¿qué variables decidieron aplicar al avión?* ‘When you worked in groups, what variables did you decide to apply to the plane?’

Cristina [low-proficiency]: *Inclinación y ah! peso y...* ‘Incline and, ah!, weight and...’

Researcher: *Y ¿por qué aplicaron esas variables?* ‘And why did you apply these variables?’

Cristina: *No sé.* ‘I don’t know.’

Researcher: *¿Qué querían saber con esta variable?* ‘What would you want to know by using this variable?’

Cristina: **Cuantos vueltas necesitábamos para el movimiento de...* ‘How many turns we needed for the movement of...’

Researcher: *¿Recuerdas cuáles fueron los resultados del experimento?* ‘Do you remember what the results of the experiment were?’

Cristina: *Fue 35 para todo y 19 para-* ‘It was 35 for all and 19 for-’⁴

[Audio-taped data]

Researcher: *¿Sabes para qué sirve la hélice?* ‘Do you know what function the propeller has?’

Paul [intermediate-proficiency]: *Si, *para el aire para pasar, ir para cuando hacer rodear girar y el aire pasar y el avión y puedes hacer como un-xx.* ‘Yes, for the air to pass, to go for when making it turn around and the air passes and the plane and you can make like a-xx.’

Researcher: *Cuando trabajaste en grupos ¿qué variable decidieron aplicar?* ‘When you worked in groups, what variable did you decide to apply?’

Paul: *Si, ¿qué pasa si nosotros *pone [instead of ponemos] una cinta en un marcador y pone en *la [instead of the masculine article el] avión y pone cinta como en unos lápices y cosas así.* ‘Yes, what happens if we put some tape in a marker and put it on the plane and put tape like on pencils and things like it?’

[Audio-taped data]

Researcher: *¿Cuál es el trabajo o función de la hélice?* ‘What is the role or function of the propeller?’

Lucía [high-proficiency level]: *Se mueve muy rápido y da la energía para que el avión pueda volar.* ‘It moves very fast and produces the force so that the plane can fly.’

Researcher: *Cuando trabajaste en grupos, ¿qué variable decidieron aplicar?* ‘When you worked in groups, what variable did you decide to apply?’

Lucía: *Miré la [instead of the masculine article el] línea suelto.* ‘I look at the loose line.’

Researcher: *Y ¿por qué decidieron aplicar esta variable?* ‘And why did you apply this variable?’

⁴ The use of “-” is to indicate that the last word was inaudible on the tape and “-xx” is to indicate that the student was cut off before finishing the utterance.

Lucía: *Porque va a ser como diciendo que es una variable más *distinto que...* ‘Because it is going to be like saying that it is a different variable from...’

Researcher: *¿Qué querían saber con esta variable?* ‘What would you want to know by using this variable?’

Lucía: *Si vuela más rápido o más despacio.* ‘Whether it flies faster or slower.’

Two Months Later

As of two months into the intervention, the majority of students seemed more accustomed to the use of detailed descriptions. Yet, as the following examples from an experiment on electricity indicate, three other students (Kim, Julián, and Omar) representing the low-, intermediate-, and high-proficiency levels demonstrated that even though they had now learned how to provide more comprehensible descriptions, they still preferred to give only short descriptions of what they were doing:

[Audio-taped data]

Researcher: Kim, *¿me puedes explicar lo que pasa con tu experimento?* ‘Kim, can you explain to me what’s happening with your experiment?’

Kim [low-proficiency]: **La* [instead of the masculine article *el*] *peine toma el papel.* ‘The comb attracts the paper.’

Researcher: *¿Cuál es la razón para que esto suceda?* ‘What’s the reason this is happening?’

Kim: **El* [instead of the feminine article *la*] *electricidad de mi cabeza. El peine agarra electricidad. ¿Así se dice?* ‘The electricity from my head. The comb takes the electricity. Is that how you say it?’

[Audio-taped data]

Researcher: *Explicame lo que estás haciendo, por favor.* ‘Explain to me what you are doing.’

Julián [intermediate-proficiency]: *Bueno, yo *toma* [instead of the appropriate conjugation of the verb *tomo*] *el globo y peino mi pelo con *lo* [él]. *Entonces, yo muevo el globo lejos de mi cabeza y el pelo es como straight.* ‘Well, I take the balloon and comb my hair with it. Then, I move the balloon far away from my head and my hair stands all the way up.’

Researcher: *¡Interesante! Y ¿por qué crees que esto está pasando así?* ‘Interesting, and why do you think this is happening in this way?’

Julián: *Es porque *la(el)...globo, no la electricidad-. El globo tiene electricidad, no, no sé.* ‘It is because the balloon, not the electricity-. The balloon has electricity, no, I don’t know.’

[Audio-taped data]

Researcher: Omar, *¿me puedes explicar que estás haciendo con eso?* [referring to the materials Omar has with him] ‘Omar, can you explain to me what you are doing with that?’

Omar [high-proficiency]: *Bueno, primero tenemos lana ¿si?* ‘Well, first we have wool, right?’

Researcher: *Sí.* ‘Yes.’

Omar: *Y entonces la frotamos al balón y cuando la acercamos aquí...* [moving the wool closer to some pieces of paper] *[risas]*.

‘So, we rubbed the wool against the balloon and when we moved it closer to here... (laughs).’

Researcher: *Muy interesante ¿ah?* ‘Very interesting, ah?’

Omar: *Si, mira, se stick al balón.* ‘Yeah, look, it [the paper] sticks to the balloon.’

Researcher: *Bueno y ¿por qué crees que esto pasa?* ‘Good, and why do you think this happens?’

Omar: *Porque hay como ...espera* [he keeps playing with the balloon and the wool]. *Yo sé. Esto ¿qué?* [laughter]. ‘Because there is like...wait. I know. This, what?’

Researcher: *¿Por qué crees que el papel se pega a la lana?* ‘Why do you think the paper sticks to the balloon?’

Omar: *Porque la lana da electricidad* [the student moves the balloon closer to his hair] [laughter]. ‘Because the wool gives out electricity.’

From the collected data, it can be suggested that the training resulted in the students’ use of more complete descriptions of their tasks. It appeared that more than half of the students were able to produce more accurate and complete descriptions of their scientific experiments at the end of the intervention. The other students were still having difficulties doing so.

At the End of the Intervention

Now let us look at the same three students from different proficiency levels whose pretest data were presented above (Cristina, Paul, and Lucía). We can see that at the end of the study they were able to describe the task in a more meaningful, organized, and complete manner:

[Audio-taped data]

Researcher: *¿Cómo usarías una polea si tuvieras que rescatar un carro o un coche que se ha quedado atrapado en el lodo?* ‘How would you use a pulley to rescue a car or a bus that has become stuck in the mud?’

Cristina [low-proficiency]: *Un carro polea como que tiene esfuerzo y entonces tiene un camión grúa y se levanta y la grúa va a levantar y no va a necesitar como no mucho esfuerzo pero *pequeño* [instead of the adverb *poco*] *esfuerzo. No pequeño pero como medio esfuerzo porque los dos son--xx, pero éste es como más pesado.* ‘A car (acting as a) pulley is more likely to be strong and then you have a tow truck and it lifts and the tow truck lifts (it out) and it won’t need a lot of effort but a little. Not a little but some effort because both--xx, but this is heavier.’

Paul [intermediate-proficiency]: *Si tiene un carro de grúa que tiene una polea para attach más o menos el otro y puede jalar el carro. Y si hay una muy grande polea entonces pueden *atacharlo* [instead of *amarrarlo*] *al carro.* ‘If you have a tow truck that has a pulley to attach to the other (car) and you can pull the car. And if there is a bigger pulley, then they can attach it to the car.’

Researcher: *¿Cómo? ¿En dónde colocarías la polea?* ‘How? Where would you place the pulley?’

Paul: *En la parte de arriba, delantera del carro y para levantar del lodo.* ‘At the bottom part, in the front part of the car and lift from the mud.’

Researcher: *¿Y la otra parte de la polea?* ‘And the other part of the pulley?’

Paul: *En otra parte que no sea en el lado que se*atachó la otra.* ‘In the other part that is not on the side where the other was attached.’

Lucía [high-proficiency level]: *Puedes amarrar un lado de la polea al coche y después tú puedes como jalar en el otro lado de la cuerda y con menos esfuerzo peso levantando el coche.* ‘You can tie the pulley to the car and then you can pull from the other side of the rope and then with less effort you can lift the weight of the car.’

b. Oral Academic Vocabulary Use in History and Science Tasks

At the Outset

It can be said that at the beginning of the lessons, the students tended to use the general purpose word *cosa* when referring to objects that had a technical term. In other words, students avoided using words such as *girar*, *provisiones*, *luchar*, and *sobrevivir*, that they did not use for their everyday communication. For instance, at the early stages of the intervention, the teacher and the researcher presented the verb *girar*, which was an important verb for describing motion in science experiments. The students, however, used the strategy of circumlocution rather than producing the correct lexical item itself: *Hace como así* ‘it goes like this’ or *va como en círculo* ‘it goes around in a circle.’ Also, when the students did not remember the specific language they needed to describe what they were doing, they preferred to use English words instead of substituting the words. Here, for example, is one such instance when talking about scientific experiments:

[Audio-taped data]

Researcher: *¿Explícame qué está sucediendo ahora con tu experimento?* ‘Explain to me what is happening now in your experiment?’

Rosa [low-proficiency]: *Necesitas darle winds para llegar al otro end.* ‘You need to turn this around so that it goes to the other end.’

It was observed that even towards the middle of the intervention (the third month), when the students knew the academic language to use in certain circumstances, they would still wait until the teacher or the RA reminded them that they should be using the academic language modeled by the teacher and the RA:

[Audio-taped data]

Researcher: [She rubs the comb against her hair.] *Entonces cuando acerco el peine al papel ¿qué pasa?* ‘So when I place the comb next to the piece of paper, what happens?’

Lucía [high-proficiency]: *Se acerca al peine.* ‘It moves towards the comb.’

Researcher: *¿Quién, cómo? Usen el vocabulario que estudiamos ayer... aquí está* [pointing at the poster], *él de los rayos.* ‘Who, how? Use the vocabulary we studied yesterday. Here it is, the one about lightening.’

Andrea [native speaker]: *El peine atrae al papel porque...* ‘The comb attracts the paper because...’

Researcher: *Y ¿cómo llamamos al peine en este caso?* ‘And what do we call the comb in this case?’

Doris [intermediate-proficiency]: *Conductor.* ‘Conductor.’

Teacher: *Si ve, chicos, que ese vocabulario es necesario para hablar. Así que tendréis que usarlo mucho más.* [Pointing to the poster] ‘You see, guys, this vocabulary is useful when we talk. So, you have to use it more often.’

In the history lessons, students were also encouraged to use the academic language more often. It appeared that in history lessons, students were even more likely to want to use everyday words to transmit their messages. Here is an example from a discussion about the pilgrims in the Plymouth colony:

[Audio-taped data]

Teacher: *Pensar en los peregrinos de Plymouth por un momento. ¿Por qué pensáis que decidieron vivir allí, en esta parte de Estados Unidos?* ‘Think a second about the pilgrims of Plymouth. ¿Why do you think they decided to live there, in this part of the United States?’

John [low-proficiency]: *Porque ellos *puedo to grow corn allí.* ‘Because they can grow corn there.’

Teacher: *¿Cuál es la acción de...?* [while she acts as if she was planting and growing corn]. ‘What is the action of...?’

Aide [native speaker]: *Cultivar elote*⁵. ‘To grow corn.’

Similar patterns in the use of English were observed when students were working on history lessons. Here is an example from an observation of a history lesson where the students explained what a colony was by including English words, perhaps to finish their reports sooner and also to make it easy for them to explain the concept:

[Audio-taped data]

Researcher: *Entonces, ¿Por qué tenían este tipo de provisiones* [referring to different kinds of weapons, different clothing, etc]? ‘Why did they [the colonists] have these kinds of provisions?’

Flor [intermediate-student]: *Para ellos *poder tener una guerra.* ‘For them so they could have a war.’

Researcher: *¡Ah! ¿Para poder combatir? Muy bien. Y tú ¿Kim?* ‘Aha! So they could fight? Very good. And you, Kim?’

Kim [low-proficiency]: *¿Qué?* ‘What?’

Researcher: *¿Por qué los exploradores *tenían todo este tipo de provisiones?* [pointing to the poster with visuals of all the provisions] ‘Why did the colonists have these kinds of provisions?’

Kim: *Como ¿éstas?* [clarifying if the word provisiones meant the objects on the poster] ‘Like these?’

Researcher: *Si, todas estas provisiones.* ‘Yes, all of these provisions.’

Kim: *Como necesitas para to fight* [instead of using *luchar* or *combatir* ‘fight’] *con *otros* [instead of the feminine *otras*] *personas allí.* ‘Like you need to fight with others there.’

At the End of the Intervention

The use of academic vocabulary at the end of the intervention seemed to have increased for the majority of the students. For example, let us compare the amount of vocabulary used by a low-proficiency student at the beginning and at the end of the intervention. Even though the pre-measure was taken from the pre-test and the sample at the end of the intervention was taken from a classroom lesson, it can be seen that the students were more capable of producing language at the end of the intervention.

[Talking about a scientific experiment]

[Audio-taped data]

⁵ *Elote* is a word used for corn in México. There are other words that also mean corn such as: *maíz* and *choclo*.

Researcher: *¿Podrías nombrarme las partes del avión con el trabajaste el experimento de las variables?* ‘Could you name the parts of the plane with which you worked in your experiment?’

Patricia [low-proficiency]: – [no answer]

Researcher: *Tú recuerdas ¿cuáles son las partes del avión?* ‘Do you remember what the parts of the plane are?’

Patricia: – [still no answer]

Researcher: *Y tú sabes ¿cuál es el trabajo de la hélice del avión?* ‘And do you know what the role of the plane’s propeller is?’

Patricia: – [still no answer]

Researcher: *Tú recuerdas ¿cuál es la hélice, la que da vueltas?* ‘Do you remember which one is the propeller, the one that goes around?’

Patricia: *Si.* ‘Yes.’

Researcher: *Y cuando trabajaste en grupos, ¿qué variables aplicaron al avión?* ‘And when you worked in groups, what variables did you apply to your plane?’

Patricia: *¿Uh?* ‘Uh?’

Researcher: *Recuerdas que trabajaron en grupo y ustedes aplicaron una variable al avión, le ponían como cinta o una variable. ¿Qué hiciste?* ‘Do you remember that when you worked in groups and you applied a scientific variable to the plane, you put on it tape or another element. What did you do?’

Patricia [low-proficiency]: – [no response]

Researcher: *Y ¿por qué aplicaron esta variable?* ‘And why did they apply this variable?’

Patricia: *Si vas a ser más slowly.* ‘If your going to be slower [referring to the variable].’

[In this next example, Patricia responded as to where she would have settled with her children if she had been alive during colonial times.]

[video-data]

Researcher: *¿A qué colonia habrías llevado a tus hijos? ¿Por qué?* ‘Which colony would you have taken your children to? Why?’

Patricia [low-proficiency]: *A New Jersey.* ‘To New Jersey.’

Researcher: *¿Por qué?* ‘Why?’

Patricia: *Porque todos *estar como rights.* ‘Because everybody has rights.’

Researcher: *¿Derechos?*

Patricia: *Si. Eso ha sido lo que yo he hecho. Estábamos usando un espacio para *dara a los indios cosas para trabajar *con. Es un área y podemos sembrar granos y otras comidas y también nosotros tenemos dinero para que nosotros no *tener *vario dinero cada vez.* ‘Yes. That has been what I would have done. We would have given the Indians land to work on. [Note: Patricia intended the notion of conditional here although she did not use it in her Spanish.] It is an area and we can plant grains and other food, and we also have money so that we do not have (to get) some money all the time.’ [What Patricia was trying to say was that she would have moved to New Jersey if she had had this opportunity because there, the Indians had more space and more activities to do – that this was an area in which they could grow corn and other food, and could make money so that they would not have to keep asking for it.]

Notice that Patricia was using key academic language such as *area* ‘area’ y *espacio* ‘space,’ but not *derechos* ‘rights.’ Without academic terms like *derechos*, it was difficult for the students to communicate meaningfully what they were asked to communicate.

Other examples also demonstrate that the students were actually using academic language explicitly taught during the sessions such as *depende del peso, de la forma, del tamaño*, etc.

[This was perhaps the third lesson in which the teacher and RA were discussing how various ways pulleys were used in daily life to make the topic more real to the students.]

[video-data]

Researcher: *¿Cuántos libros podría empujar sin que rompa el hilo?* ‘How many books could you push before the chord breaks?’

Susana [low-proficiency]: *Depende del tamaño.* ‘It depends on the size.’

Paul [low-proficiency]: *Depende del peso.* ‘It depends on the weight.’

Julia [low-proficiency]: *Pero depende de la fuerza del cuerpo. Sí, porque depende de la fuerza *que tiras la caja.* ‘But it depends on the force of the object. Yes, because it depends on how hard you pull the box.’

c. Oral Grammatical Performance in Science and History Tasks

The Subjunctive

At the Outset

The subjunctive tense, a complex tense in Spanish, was almost completely avoided or used incorrectly as in the following example at the beginning of the sessions. Here, the class was discussing the Georgia colony – and how the people settled this colony, the difficulties encountered, and the leaders involved:

[video-data]

Researcher: *Entonces, ¿por qué George pensaba que era una buena idea llevarlos (a los prisioneros) a Georgia?* ‘Then, why did George think it was a good idea to take (the prisoners) to Georgia?’

John [low-proficiency]: **Para ellos tener* [using an English form instead of the required subjunctive in Spanish *para que ellos tengan*] *una segunda oportunidad.* ‘For them to have a second opportunity.’

So in this case the student used an English construction to convey the meaning in Spanish. This construction, however, requires the use of the subjunctive because there is a preposition before the verb and because it is not a real fact. Even though the subjunctive aspect of the verb was consciously included by the teacher and R.A. in most of the lessons, students seemed to prefer using strategies to avoid using it. Here is another example of how a student may have been avoiding the subjunctive at the beginning of the intervention.

[Audio-taped data]

William [intermediate-proficiency]: *Eso ha sido lo que yo he hecho. Estábamos usando un espacio para dar a los indios cosas para trabajar con. Es un área y podemos sembrar granos y otras comidas. Y también nosotros tenemos dinero para que nosotros no tener vario dinero a la vez.* ‘That’s what I have been doing. We were using the space to give to the Indians things to work with. It is an area and we can plant seeds and other food. And we also have money so that we not to have various money at once.’

The example above requires the use of the subjunctive because there is a prepositional phrase introduced by *para que*, which indicates its use. Even though the immersion students may have known the grammar rules, they still may have been avoiding the subjunctive here by using the infinitive, knowing that the rest of the class would understand the message.

At the End of the Intervention

The students' attempts to use more complex Spanish structures were in most cases inappropriate, even at the end of the intervention. Here is an example of how the research assistant modeled the use of the subjunctive and then how the students were still able to interact without using the subjunctive. It can be noticed that the native student used the subjunctive appropriately, but the intermediate-proficiency student tended to use a simple structure that was correct without the subjunctive, but still needs the use of the infinitive.

[Talking about the importance of levers]

[Audio-taped data]

Researcher: *Con la hoja de los dibujos, deben hablar sobre la importancia de cada una de las palancas. Por ejemplo* [she takes an overhead transparency and starts writing about the importance of using a can opener] *el destapador o abrelatas* [pause]... *Es importante que usemos el destapador para abrir las latas de ...¿de qué?* [asking the students] 'Using the sheet of paper with the drawings, you are requested to talk about why each one of these levers is important. For instance, the can opener...It is important for us to use a can opener to open cans of...of what?'

[For this lesson, students are supposed to write the sentences down by using the subjunctive form.]

[Audio-taped data]

William [intermediate-proficiency]: Cool! This is a steering wheel!

Andrea [native speaker]: *Una rueda, José. Es importante que la usemos para girar a la derecha o a la izquierda cuando manejamos.* 'A wheel, José. It is important for us to use it to turn to the right or to the left.'

Luis [intermediate-proficiency]: *Es importante para nosotros no chocar el coche.* 'It is important for us so that we do not crash the car.'

Indirect Object Pronouns

With regard to the indirect objects (*le, les*), the intervention seemed to demonstrate to the students that they were able to use indirect objects, but the majority of the students appeared to find this task hard to do, at least in oral language. The two native students and the high-proficiency students seemed to have a good command of this structure at the outset and their command lasted until the end of the intervention. Here is an example of the use of the indirect pronouns first at the outset and then at the end of the intervention by one of the native speakers.

At the Outset of the Study

[Audio-taped data]

Question: *¿Cuál fue la actitud de los exploradores hacia las personas nativas que vivían en esta tierra (America)?* 'What approach did the explorers have regarding the Indians who lived in this territory?'

Aide [native Spanish speaker]: *La actitud hacia los nativos fue muy dura. Le [indirect object] cogieron sus tierras y los botaron de sus propias casas.* ‘Their approach was harsh. They took their farms and kicked them out of their own homes.’

At the End of the Intervention

[Talking about what would happen if we add one more pulley to a set of pulleys]

[Audio-taped data]

Researcher: *¿Qué pasa con la fuerza de la polea entonces?* ‘What happens with the force of the pulley then?’

Aide [native Spanish speaker]: *Le hace que ésta sea menor y le tienes que jalar mucho menos.* ‘It (the pulley) makes it (the force) less. It is easier to pull.’

The intermediate and low-proficiency level students seemed to use the indirect object in very much the same way from the beginning to end of the intervention. This suggests that the intervention did not have any impact in their use of indirect objects. Here is an example at the outset and at the end of the intervention by intermediate and low-proficiency level students.

At the Outset

[Talking about a scientific experiment done with planes]

[Audio-taped data]

Researcher: *Tú podrías decirme ¿cuál es la función o el trabajo de la hélice?* ‘Can you tell me what the propeller does?’

Doris [intermediate-proficiency]: *Es...necesito pensar como dice tú...Pones en círculos [making gestures] y después le [referring to the propeller] ayuda al avión para mover hasta ..él levante.* ‘It is ...I need to think as you said... You swing it and then it [the propeller] helps the plane to move until...it flies.’

At the End of the Intervention

[Talking about a scientific experiment done with levers]

[Audio-taped data]

Teacher: *Doris, coloca tu palanca aquí para que todos la vean. Y muéstranos que le haces luego.* ‘Doris, place your level here so that everybody can see it. And show us what you do afterwards.’

Doris [intermediate-proficiency]: [Started to show her level but she is interrupted by the teacher.]

Researcher: *Bueno Doris, pero nosotros queremos saber que tú haces ahí. ¿Cierto?* [talking to the rest of the class] ‘Okay Doris, but we want to know what you are doing there. Right?’

Doris: **Le* (referring to the lever) *pones el fulcro en el centro de la y después Flor para ahí, como en la esquina.* ‘You put the fulcrum to the lever in the center of it and then Flor steps on it, there in the corner.’

d. Defining Academic Terms Orally in History and Science

At the Outset

At the beginning of the intervention it was noticed that students defined academic terms by using short sentences, everyday words, or simple tenses. In the breakdown of the oral language, students tended to use vague language rather than give a precise and comprehensible definition of the term. Students also tended to give examples that might explain part of the term rather than supplying a complete definition. For example if they were asked to define the word *oscilación*, their answer was: *es como un swing* 'it's like a swing', and if they were asked to define *una brújula* 'compass,' they would respond: *Es como un reloj para ubicar*. 'It's like a watch for finding where we are.' Other students preferred to define it by miming: *Es como esto, Tania* [while swinging his finger]. 'It's like this, Tania.'

Let us look at efforts by students of different proficiency level to define academic terms. In the following case, they were asked to provide an oral definition when they were defining what a variable in a science experiment was:

Low-proficiency level:

[Audio-taped data]

Researcher: *¿Podrías decirme que entiendes por variable?* 'Could you tell me what you understand by variable?'

Robert: *Variable es como decir algo que cambia, y como constante es algo que no cambia. El longitud del hilo.* 'Variable is like saying something that changes, and like a constant is something that does not change. The length of the thread.'

[Audio-taped data]

Researcher: *¿Qué entiendes por variable?* 'What do you understand by variable?'

Paul: *Es que cambia.* 'It changes.'

Researcher: *¿Qué es una brújula?* 'What is a compass?'

Rosa: *Es como un reloj.* 'It is like a clock.'

Intermediate-proficiency level:

[Audio-taped data]

Researcher: *¿Podrías decirme que entiendes por variable?* 'Can you tell me what you understand by "variable"?'

Susana: (no answer)

Researcher: *¿Sabes que es una variable?* 'Do you know what "variable" means?'

Susana: *Es un.. yo pienso es *un cosa *de que usas como variable...el peso, los ingredientes, el tamaño, esas cosas.* 'It is a...I think it is a thing that you use as a variable... the weight, the ingredients, the size, those things.'

In the case of William, another intermediate-proficiency student, his definitions were at times confusing to the point of unintelligibility. Even if he had the idea of the topic he was not able to explain it appropriately, as in the following example:

[Audio-taped data]

Researcher: *¿Podrías decirme qué entiendes por variable?* 'Would you tell me what you understand "variable" to mean?'

William: *Es algo que cam... No eso es. Si eso es lo otro. Es como los yo pienso que es una variable algo los materiales, *los cosas que hiciste necesita, que quiere hacer, que quieres hacer que cambia, que tu quieres que sea así que cambia que tu quieres cambiar. No sé.*

‘It is something that change... No, it’s not that. Yes, it is the other thing. It is like the...I think that is a variable, something like materials – the things that you did need, that you want to do, that you want to make change, that you want to be this way, that changes, that you want to change. I do not know.’

High-proficiency level:

[Audio-taped data]

Researcher: *¿Sabes qué es una variable?* ‘Do you know what a “variable” is?’

Lucía: *Si, es una cosa que haces diferente en un experimento.* ‘Yes, it is something we do different in a scientific experiment.’

Native speaker:

[Audio-taped data]

Researcher: *Y podrías decirme ¿qué entiendes por variable?* ‘And could you tell me what do you understand by “variable”?’

Andrea: *Es lo que cambia.* ‘It is what changes.’

As seen from the examples, the students provided brief definitions of the terms and in most cases used the word *cosa* ‘thing.’ This word is an uncertain word when defining terms in Spanish. Consequently, a session was devoted to showing students how to define terms more precisely. In that session the students learned to organize various elements needed to have a complete sentence. They learned the different parts that constitute a definition and were exposed to a better repertoire of adjectives and nouns used when defining specific terms in a task. A poster with the different parts of a definition was placed on the wall and the teacher and RA always referred to it when students were asked to define terms.

At the End of the Intervention

When looking at examples produced after the intervention, it appeared that intermediate-proficiency students were more confident when giving definitions and had more academic language that helped them to produce more accurate definitions. The intermediate-proficiency students began to replace simple terms like *cosa* or *algo* with more sophisticated academic language such as *instrumento* or *objeto*. Even though this was not the case for all the intermediate-proficiency students, the majority of them tried to plan, organize, and produce better definitions after the intervention. The following are examples of how Susana and William were defining academic terms in Spanish orally **after** the five months of intervention:

[Students were working on a science experiment with pulleys.]

[Audio-taped data]

Researcher: *¿Qué entiendes por fulcro?* ‘What do you understand “fulcrum” to mean?’

Susana [intermediate-proficiency]: *Un fulcro es el punto de la polea que puede mover de lado a lado. Es el punto medio para balancear.* ‘A fulcrum is the point on the pulley that can move from side to side. It is the middle point for balancing.’

William [intermediate-proficiency]: *Es la parte de una palanca que se balancea como la pesa.* ‘It is the part of a pulley that balances the weight.’

The low-proficiency students were also planning, organizing, and producing more complete utterances after the treatment. Here there is an example:

[Audio-taped data]

Researcher: *¿Qué entiendes por fulcro?* ‘What do you understand “fulcrum” to mean?’

Paul [low-proficiency]: *El fulcro es *la* [instead of the masculine article *el*] *objeto que balancea la palanca.* ‘The fulcrum is an object in which the pulley swings.’

As can be seen, the oral academic language used in these latter utterances was more complete and comprehensive. The students were following the model studied during the intervention where they had to use academic language and they even were able not only to provide an example of what they were defining, but also to describe more truthfully the term. Even though it can be suggested that students may use this model for only this class, further observations from the teacher indicated that some students were able to use the same model in other classes such as language arts and math.

Written Academic Language

a. Written Descriptions of Academic Problems

At the Outset

Regarding their written ability to describe tasks in the academic subjects, before the intervention most of the low-proficiency students were producing texts lacking information. Also, they were not using their powers of reason when called upon to draw conclusions. The following is a written instance of two low-proficiency students, the first writing about an academic problem at the outset of the intervention:

Researcher: *Describe el trabajo de la hélice del avión.* ‘Describe the role of an airplane propeller.’

Rosa: *Necesita darle *bueñas* [she meant *vueltas*] *como 79 veces para tocar *otro parte del línea.* ‘It needs to do turns like 79 times to touch the other side of the line.’

Camila: [She explained why she wouldn’t actually go to explore new territories, even though she would like to.] *No voy porque muchas cosas *males (malas) pueden pasar y puedo *murir (morir). Pero si *quería (quisiera) ir porque me gusta explorar.* ‘I wouldn’t go because many bad things could happen and I could die. But, yes, I would like to go because I like to explore (things).’ [Note that she does not use the conditional in her first sentence.]

The following are pre-intervention examples from Susana and Paul, two intermediate-proficiency students. Susana’s academic language was limited, and her response was both somewhat imprecise and limited to agreement or disagreement. Paul demonstrated slightly more academic language ability at that time:

Researcher: *¿Sabes por qué Marco Polo es importante en estos días?* ‘Do you know why Marco Polo is important nowadays?’

Susana [intermediate proficiency]: *Porque iba en un barco por mucho tiempo.* ‘Because he went traveling on a ship for a long time.’

Researcher: *¿Por qué tenemos que estudiar a Marco Polo?* ‘Why do we have to study about Marco Polo?’

Susana: *¿*Por qué (porque) hizo como América?* ‘Because he created America? [She may have meant that he was the one who discovered America.]

Researcher: *¿Sabes por qué Marco Polo es importante en estos días?*

Paul [intermediate proficiency]: *Porque *el (él) descubrió cosas como *porcelaine (porcelana) y otras cosas. También él viajó mucho tiempo a través del mar.* ‘Because he discovered things such as the porcelain and other things. Also he traveled a lot by the sea.’

Researcher: *¿Por qué tenemos que estudiar a Marco Polo?* ‘Why do we have to study about Marco Polo?’

Paul: *Porque las personas no creían a *el (él) sobre sus viajes por el mundo y porque no sé.* ‘Because people did not believe him about all his trips around the world and because I don’t know.’

At the End of the Intervention

The examples below of written language at the end of the study serve to support the claim that academic language from the same two low-proficiency students described above, Rosa and Camila, benefited from the intervention when asked to provide a more detailed written description of what they were doing.

Researcher: *Describe tu experimento con las poleas.* ‘Describe your experiment with the pulleys.’

Rosa [low-proficiency]: *Nosotros *coloca (colocamos) una polea y *coloca lápices para saber cuantos lápices la polea puede tener *en. Y después cuando jalamos, la polea pudo tener como 10 lápices.* ‘We put a pulley and then put some pencils in order to know how many pencils the pulley can hold. Then, when we pushed the pulley, it could hold 10 pencils.’

Researcher: *Describe tu experimento con las poleas.* ‘Describe your experiment with the pulleys.’

Camila [low-proficiency]: *La polea tiene como dos libros solamente porque *son pesan mucho. También cuando colocas la polea necesitas jalar para arriba porque se puede como bajar mucho si no jalas.* ‘The pulley has two books only because they are very heavy. Also, when you set the pulley you need to pick it up because otherwise it will go all the way down if you don’t pull (it up).’

With regard to the intermediate-proficiency learners, we return to the same learners described above, Susana and Paul, to provide two examples of how their explanations of science or history tasks improved. We also noticed that toward the end of the intervention these students were providing largely Spanish-language descriptions. In this exercise, the students were asked to write an academic description to send a postcard to themselves in the mail in which they included information about what they had learned from the topic “*Las máquinas simples*” ‘Simple machines’:

Susana:

Querida Susana:

*Palancas son máquinas simples. Máquinas simples son objetos que tiene en tu casa como un *abar lata o *un escoba. Todos esos objetos son *palanca. Hay muchas clases de *palanca y máquinas simples. ‘Pulleys are simple machines. Simple machines are objects that you have in your house such as a can opener or a broom. All these objects are pulleys. There are many classes of pulleys and simple machines.’*

Paul:

*Paul, ¿Qué quieres saber sobre palancas? ¿Qué es un palanca? *Un palanca es un tipo de *máquina (lacking the accent) simple. ¿*Cuántas tipos de clases de palancas? Hay 3 clases de palancas que *silve para *diferentes (diferentes) cosas. ¿Qué con las partes de un palanca? Las partes de *un palanca son carga, fulcro y *esfuerza. ¿Hay algo interesante de *un palanca? Si hay cosas interesantes como *un palanca dejas que puedes hacer cosas mas fáciles. ¡Adiós Paul! ‘Paul, do you want to know something about pulleys? What is a pulley? A pulley is a kind of simple machine. How many classes of simple machines are there? There are 3 kinds that are used for many things. What are the parts of a pulley? The parts of a pulley are the load, the fulcrum, and the force. Is there anything interesting about a pulley? Yes, there are interesting things such as that pulleys let you do things easily. Bye, Paul.’*

b. Written Grammar in Academic Tasks

Similar to the findings for oral grammar, the students’ written grammar was not seen to improve as a result of the intervention. Yet the overall improvement in their ability to describe the academic problems meant that students were generally able to communicate their ideas even if not in a grammatically appropriate way. As seen in examples above, low-proficiency students seemed to rely on simple tenses such as the present tense. Also the pronoun they used the most was the second-person singular.

The following examples from written work well into the intervention reflect several problems with the articles and agreement.

At the Outset

Researcher: *¿Qué funcionó bien en tu barco?* ‘What did it go well with your ship.’ [The students were reporting an experiment they had just finished with the teacher.]

Rosa [low-proficiency]: *Mi barco funcionó porque *la [instead of the masculine article el] tamaño estaba *porvecto, la forma estaba un poco *porvecto, la no *tener (yo no tenía) *mucho (muchos) materiales, yo tenía*espaseo (espacio) porque yo no tenía *mucho materiales.* ‘My ship worked because the size was perfect [word not clear], the size was a little perfect [word not clear], I didn’t have a lot of materials, I had space because I didn’t have many materials.’

At the End of the Intervention

Researcher: *Describe el trabajo de la hélice del avión.* ‘Describe the role of an airplane propeller.’

Rosa [low-proficiency]: *Necesita darle *bueñas (vueltas) como 79 veces para tocar otro parte del línea.* ‘It needs to do turns like 79 times to touch the other side of the line.’

Camila [low-proficiency]: [She explained why she wouldn’t actually go to explore new territories, even though she would like to.] *No voy porque muchas cosas *males (malas) pueden pasar y puedo *murir (morir). Pero si *quería (quisiera) ir porque me gusta explorar.* ‘I wouldn’t go because many bad things could happen and I could die. But, yes, I would like to go because I like to explore (things).’ [Note that she did not use the conditional in her first sentence.]

The phenomenon of being articulate in writing despite a lack of grammaticality can be seen in the example from William, an intermediate student, presented below. He stated his idea clearly despite the lack of full grammatical accuracy including verb conjugation and articles:

At the Outset

Researcher: *¿Qué harías diferente la próxima vez?* ‘What would you do differently the next time?’ [Relating to an experiment with ships they had just finished.]

William: [intermediate-proficiency student] *Unas cosas *a yo *va (voy) hacer diferentes y *unos cosas no *esos es *los cosas que *si (se) va a *cambio (cambiar). *Primero cosa que yo *va a cambiar es *la tamaño de mi barco porque es *demasiado (demasiado) *grade (grande) que no puede *cave (caber) en la cubierta; por eso yo *necesita (necesito) más *pequeña espacio. Después de *esos cosas yo *piensan (pienso) que mi barco buenísimo.* ‘Some things I will do differently and some things, not those, are the things I will change. [What he was trying to say was that the things that did not work were the things he would change.] The first thing I will change is the size of my ship because it is too big to fit into the bucket. For this reason I need a smaller space. After this, I think that my ship (will be) super.’

At the End of the Intervention

William: [intermediate-proficiency student] *Las palancas nos ayudan traer cosas que están pesadas más *fácil (facilmente) usando poco esfuerzo.* ‘The levers help us to carry things that are heavy more easily by using less effort.’

Nonetheless, there were cases where students did both convey their ideas clearly and used grammar appropriately as well. Here is an example from Doris, another intermediate-proficiency student:

At the Outset

Researcher: *¿Qué harías diferente la próxima vez?* ‘What would you do differently next time?’ [Referring to the experiment with the ship]

Doris [intermediate-proficiency]: *Lo que yo haría diferente la próxima vez es que voy a hacer más grande. Si hago más grande *husaré (usaré) los mismos materiales.* ‘What I would do differently is that next time I will make it [referring to the ship] bigger. If I do it bigger (I will use) the same materials.’

At the End of the Intervention

Researcher: *¿Cómo usarías una polea si tuvieras que rescatar un carro que se ha quedado en el lodo?* ‘How would you use a pulley if you were to save a car that is stuck in the mud?’

Doris [intermediate-proficiency]: *Usaría el carro como la carga y con muchas personas jalaría el carro del lodo.* ‘I would use the car as the weight and lot of people would pull the car from the mud.’

c. Written Vocabulary Use in History and Science

The low and intermediate-proficiency students were able by the end of the intervention to use a more extended repertoire of academic vocabulary when writing about specific topics. Here is an example in a response by a low-proficiency student, Roberto, where he was to use specific vocabulary that had been studied in a science lesson: First we provide an example from the outset of the study and then the one at the end of the intervention.

At the Outset

Researcher: *¿Qué es una variable?* ‘What’s a variable?’

Roberto [low-proficiency]: *Es como si cambias algo en un experimento. Como el pan cambia.* ‘It is like if you change something on an experiment. Like the bread changes.’

At the End of the Intervention

Researcher: *¿En un sistema de palancas, qué es un fulcro?* ‘In a pulley’s system, what is the fulcrum?’

Roberto [low-proficiency]: *El fulcro es un punto en el centro del palanca donde se mueve la palanca.* ‘The fulcrum is a point in the center of the pulley where the pulley can be moved.’

Roberto drew from the academic vocabulary that was used in specific science lessons during the intervention. In this latter instance, he used key words to define an academic term, suggesting some improvement. The same pattern can be seen in Rosa, another low-proficiency student, who started by using little academic vocabulary and using it more often at the end of the intervention.

At the Outset

Researcher: *¿Qué variables aplicaste en tu experimento?* ‘What variables did you apply to your experiment?’

Rosa [low-proficiency]: *La crema de cacahuate en la oscuridad.* ‘The peanut butter in the dark.’

At the End of the Intervention

The following is an example where the same low-proficiency student was able to remember a word that had been used to define a term. Here, Rosa answered the following question using the precise academic vocabulary:

Researcher: *¿Cómo llamamos a la polea que se mueve con la carga cuando esta está en uso?* ‘What’s the specific name of a pulley that can be moved when it is being used?’

Rosa [low-proficiency]: *Polea Móvil*. ‘Movable pulley.’ *Nosotros coloca una polea y coloca lápices para saber cuantos lápices la polea puede tener en. Y después cuando jalamos, la polea pudo tener como 10 lápices.* ‘We put a pulley and then we put some pencils in order to know how many pencils the pulley can hold. Then, when we pushed the pulley, it could hold 10 pencils.’

As mentioned before, the intermediate-proficiency students also showed improvement in their ability to use academic vocabulary needed for describing the different tasks in both history and science. Here is an example of the use of academic vocabulary to make a description.

At the Outset

Researcher: *¿Por qué aplicamos variables?* ‘Why do we apply variables?’

William: *Porque quieres como otra cosa en el experimento para ver como se mira diferente si haces algo diferente.* ‘Because you want like other thing in your experiment so that you can see how it looks different if you do something different.’

At the End of the Intervention

Researcher: *¿Por qué es importante que las personas sepan preparar un sistema de poleas?* ‘Why is it important for people to know how to build a pulley system?’

William [intermediate-proficiency]: *Para que no *necesitas (necesites) levantar la carga si es muy pesada.* ‘So that you do not need to lift the weight when it is too heavy.’

Doris [intermediate-proficiency]: *Para ver que puede hacer menos fuerza.* ‘So that one can use less effort.’

Notice that even though there were grammatical problems, the students were actually using specific academic vocabulary necessary to explain their ideas.

d. Written Definitions in History and Science Tasks

Toward the end of the intervention, most of the students had learned that giving examples was not the preferred strategy for defining terms, but was rather a last choice. Subsequently, when students were reporting or defining terms, the teacher and the RA were also able to request complete information. In fact, the teacher always referred back to the poster about definitions when a student did not offer enough information when she asked for it. Not so surprisingly, the native and high-proficiency students were providing more complete definitions than the intermediate and low-proficiency students. The following is a writing sample from a high-proficiency student, indicating her use of the appropriate forms for defining an academic term:

At the Outset

Researcher: *¿Qué entiendes por variable?* ‘What do you understand variable to mean?’

María [high-proficiency]: *Es cuando haces algo diferente en tu experimento para ver que cambia. Por ejemplo si colocas el pan en una bolsa de plástico y la dejas en la ventana, cuando vas a ver el pan luego como una semana, tiene moho y huele muy mal.* ‘It is when you do something different in your experiment to see what it changes. For instance, when you place a slice of bread in a plastic bag and put it by the window, when you go to look at the bread after a week, it has mold on it and it smells badly.’

At the End of the Intervention

Researcher: *¿Qué entiendes por la palabra fulcro?* ‘What do you understand the word “fulcrum” to mean?’

María [high-proficiency]: *Es un objeto que es el centro de una palanca o polea y de ello sale todas las otras partes que pueden mover.* ‘It is an object that is the center of a pulley or a lever from which the other parts came from and it allows them to move.’

We noticed that the students learned to follow the pattern for writing descriptions that was posted on the classroom wall. It was helpful for them to be exposed to a set of academic terms that they could use when making definitions – words such as *instrumento, elemento, vegetal, objeto* ‘instrument, element, vegetable, object.’

Discussion and Conclusions

Summary of Findings and Interpretations

The aim of this study was to determine whether it would be possible to improve the academic language of elementary school students in a Spanish full immersion program. With this aim in mind, an intervention was planned which included three basic elements intended to enhance second language acquisition, each deemed a potential contributor to the development of academic language. The first element involved exposing the students to modeling by the instructional staff (teacher and RA) as to how to solve science and history problems through Spanish academic language. The second element was that of enhancing the students’ inner voice in academic Spanish, along with heightening their awareness of their learning style preferences and their language strategy use repertoire. A class of 21 fifth-grade immersion students received 30 lessons in both science and history, with an emphasis on problem solving in academic Spanish both using their inner voice and in collaboration with fellow students.

With regard to the first research question about the effects of L2 inner voice development among immersion students on their problem solving in science and history, at the beginning of the intervention in October of 2001, the teacher’s modeling aloud and the students’ practicing aloud the process of solving problems were found to be rather strange both to the teacher and to the students. Nonetheless, the students’ use of their inner voice appeared to assist them in explaining the processes involved in problem-solving. Students practiced their inner voice by answering question to themselves while speaking to themselves with cardboard cell phones, looking at a picture of themselves, or looking at themselves in a small mirror. By the end of the intervention five months later, however, the students were not only able to solve problems in front of the class or in-groups but also to demonstrate the way they were able to solve them. It appeared that this activity did have both a cognitive and affective impact on their ability to use Spanish academic language.

With regard to the second research question concerning the effect of teacher modeling on students’ use of oral and written academic language, this qualitative analysis provides some evidence that the treatment may have had a positive effect on Spanish academic language performance. Students tended to show some improvement over the course of the intervention in their ability to describe academic problems in Spanish, use the appropriate academic vocabulary for the given science or history task, and define academic terms with greater accuracy. It was also observed that the two native students helped their peers with the academic vocabulary called for by the respective tasks and encouraged them to use it in class discussions. Furthermore, a

spill over effect was observed whereby the teacher applied the same principles to instruction in other areas of the curriculum (e.g., math and Spanish arts). This spill over only served to enhance the effects of the intervention since it provided the learners increased practice at using the appropriate Spanish academic language for the given task.

The one real challenge faced in the study, and one that continues to be a challenge, is that of improving the students' grammatical control, especially over complex structures in Spanish such as the subjunctive and the conditional. But as the transcriptions clearly demonstrate, the students had difficulty in numerous grammatical areas, even with the gender of definite and indefinite articles, which some might think should be basic by the fifth grade. Yet as Allen, Swain, Harley, and Cummins (1990) observed with regard to French Canadian immersion programs, the grammar of immersion pupils does not develop so rapidly, at least not in the elementary grades.

Limitations of the Study

Among the limitations of this study, the concern to set up a methodology that would provide several innovations at the same time made it impossible to keep tight control over just what transpired when and the specific impact that this had on the students. In other words, by having the teacher and the RA modeling how they thought through problems in academic language and by having students' develop their inner voice, it was not possible to determine the precise impact of any one of these innovations. Perhaps a tighter research design (e.g., such as in Day & Shapson, 1991) might have allowed for more rigorous statements about the impact of the intervention than was possible in this descriptive, more qualitative study. In addition, the fact that the sample included only one fifth-grade classroom make it difficult to generalize the findings across immersion classrooms in the same school and across different immersion programs need to be made with caution. In addition, the size of the sample group did not allow for the use of more rigorous statistical procedures.

With regard to the material used during the intervention, students indicated that the history unit used was boring and that they would rather have engaged in another topic. In fact, the history text (with its relatively high density) required of the students that they do extensive reading, deal with a host of new academic terms, and process numerous complex grammatical structures. In addition to this limitation, there was the further constraint that the textbooks were not allowed out of school. This meant the only time that students actually interacted with the history topics was in the classroom. It also meant that there were no homework assignments in this area. Of course, it is possible to view the density of the history text as a plus for the study in that it reflects the kinds of L2 texts that immersion students do, in fact, need to contend with. So it provided even more of a challenge than had the text been more succinct and had it dealt with such fascinating material that the students simply could not put it down.

Finally, it could be seen as a limitation of the study that there was also an extra adult in this fifth-grade classroom for five months. The presence of this extra adult created an intervening variable in that the average immersion classroom would not have this extra individual present. In addition, the students received more individual attention than usual and perhaps spent more time on task in Spanish. Furthermore, there could have been a halo effect in that the students knew that an experiment was happening in their classroom.

Pedagogical Implications

Despite the shortcomings of this study, it would still seem as if there is a pedagogical message for immersion educators. The message would be that if in their immersion programs, students are by grade 4 or 5 tending to demonstrate increasingly reduced proficiency in the academic language associated with the curriculum, then it may be appropriate for the instructional staff to intervene, as in this study, with an emphasis on academic language. That being the case, then this study has demonstrated how important it is to use techniques that will actually reinforce the development and use of academic language in the L2.

When students get accustomed to having the teacher teach both the content and specifically explain in detail the academic language to use, it increases the students' attention to the topic. Furthermore, having students working on academic language helps them learn how to define terms, make associations, and use the new academic language appropriately. This approach must be seen not as a way to fill the walls of the classroom with academic language or have the learners fill their notebooks with words that they will not use later, but to assist learners in developing academic vocabulary and grammatical structures, productive ways of thinking through the immersion language, and greater facility at both speaking and writing in the academic language. In addition, the necessity to use academic language in a series of tasks either helped them retain the language or at least led them to remember that there was specific language for what they needed.

Finally, it would appear that there is a real need for activities to encourage students to read more lengthy textbook passages in the L2, as in history lessons, and to emphasize vocabulary and grammar processing strategies that might make the effort easier. The challenge is to have the students persevere in such extended reading tasks rather than being dependent on somebody explaining to them in detail what to do in order to understand a text and to find the answer to reading questions.

Suggestions for Future Research

One suggestion would be to simplify the research design and to test for one intervention at a time and its impact on behavior. Another area of possible investigation would be to determine which teaching strategies in immersion programs are most likely to promote the development of complex grammatical structures among immersion students, especially those in the upper elementary grades. It might also be of benefit to conduct this type of intervention at other grade levels as well, starting, say, with the fourth grade. The problem with starting at younger levels is that academic language is not yet that prevalent in the material. It would appear that the language demands begin to be noticeable at the fourth grade level. The research effort could also extend into the middle grades to determine its relevance and impact at this level.

It would also be interesting to explore the enhancement of academic language proficiency among high-proficiency and native students in immersion programs. Although the advanced group of two natives and two others was too small to make definitive claims in this study, we can still speculate about why these learners did not benefit significantly from the pedagogical intervention in the current study. It may be that the treatment was not challenging enough for them, and if that were the case, then perhaps further research could explore what kinds of interventions would be most beneficial for the truly advanced students in immersion programs.

Conclusions

Despite its limitations, this study constitutes a departure from previous studies in language immersion in that it entailed the combination of different innovations: modeling by the teachers and the RA in the use of Spanish academic language to solve problems in science and history, and supporting the students in developing their own inner voice in Spanish, being mindful of their learning style preferences and language strategy choices. The presence of two native speakers of Spanish and the use of these innovations appeared to bring about a classroom environment in which immersion students paid more attention to Spanish academic language than they otherwise would have and made observable efforts to include more academic language in their own speaking and writing.

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Appendix A
Sample Lesson Plan

Level: Fifth grade

Area: History

Content objective: Students will look at the living conditions and problems that arose in the colonies and compare these with living conditions today.

Language objective:

Use of the conditional with regular verbs: *Yo viviría, comería, hablaría.*

Instructional strategy:

Activate background knowledge.

Rationale for the strategy:

Activate background knowledge – bringing to mind information that students already know about a topic that will be helpful in learning new information.

Intended impact on the students:

Students will activate their own background knowledge about family life in order to better interpret and explain problems encountered by settlers in the colonies.

Key academic vocabulary:

zona de contención ‘border zone’
zonas fronterizas ‘border limits’
presidio ‘prison, penitentiary’
provisiones ‘provisions’
hacienda ‘department of revenue’
misión ‘mission’

Language structure:

Past tense

Conditional: Pronoun + verb ending *-ía, -ías, -ía, -íamos, -ían.*

Verbs: *explorer* ‘to explore,’ *construir* ‘to build,’ *establecer* ‘to settle,’ *permanecer* ‘to remain,’ *mudar* ‘to move,’ *enviar* ‘to send.’

Instructional procedures:

1. Ask students warm-up questions about the students’ families and write possible answers on the board:

- *¿Alguien de la familia nació en otro país?* ‘Is there anyone in your family from another country?’
 - *¿Qué otro idioma hablan tus familiares? ¿Dónde lo aprendieron?* ‘Does anyone in your family speak another language besides English? Where did they learn it?’
 - *¿Por qué tus padres decidieron vivir en Minnesota?* ‘Why did your parents decide to live in Minnesota?’
 - *¿Tiene tu familia alguna tradición? ¿Cuál?* ‘Do your family have any traditions? Which traditions do they have?’ (provide an example from your family)
2. Read the paragraph about “*Nuestra Herencia Colonial*” ‘Our colonial heritage’.
 3. While you are reading, model how your students can perform think-aloud by asking yourself (out loud) the meaning of sentences or the meaning of specific academic vocabulary you encounter.
 4. Compare the reading to the warm-up questions, and write on the board similarities between the two topics. Focus on the traditions.
 5. Have the students look at the map and find the area where the colonies were established.
 6. Provide pictures or drawings of supplies or provisions that students might take with them on a trip to a new land. They are to choose one object from each category (e.g., *armamento* ‘weaponry’).
 7. Ask students to write on cards what they want to take and attach the cards to a poster (a photo of a colonial ship).
 8. Now, ask students to read all the cards and to choose from among them eight items they will take on the trip. Discuss with the students why working in groups may be useful. Demonstrate how you can work with another person by discussing with the research assistant what she would like to take on the trip.
 9. Have students present their list to the class, saying what object is the most important for them and why.
 10. Ask students if they can think about the problems that they would encounter when traveling to a foreign country for a long period. Model a sample sentence in which you use the conditional (e.g., *Yo no tendría mi comida preferida.* ‘I wouldn’t have my favorite food.’). Ask two or three students to write on the board verbs that they would use. Now, have students use their cardboard cell phones to answer the question to themselves.
 11. Now link the activity with the reading by having the students discuss in work groups the provisions were taken by members of each colony. (Include vocabulary from the lesson. For example, *cargamentos de maíz* ‘corn shipments,’ *barriles de agua* ‘water barrels,’ etc). Also have students talk about the difficulties each colony had when it was relocated in a new place and the problems that were encountered at the territorial borders.
 12. Each group then prepares a conceptual map of the problems encountered by each colony. Students are asked to use academic vocabulary for the lesson.

Expansion:

Ask the students to make puppets: a missionary, a slave, a colonialist, and to create a short monologue explaining their jobs during the colonization by using the vocabulary from the lesson.

List of Activities:

- Hang man
- Filling in the blanks
- Guessing and finding the right words
- Multiple-choice
- Drawings
- Crossword puzzles
- Matching with other words or with a drawing

Appendix B

Learning Strategies Used by Students in Each Lesson

Science	
<p><u>Lesson: Variables</u> <u>Learning strategy sample:</u> Predicting, collaborating with peers, summarizing, questioning for clarification.</p>	<p>The students put different substances (e.g. peanut butter, cream cheese) on a slice of bread. They had to predict what would happen to the bread when it was placed in different parts of the classroom (in the dark, in sunlight, etc). The students worked in groups to decide the results they would get and to prepare questions they may have.</p>
<p><u>Lesson: The pendulum</u> <u>Learning strategies:</u> Thinking of what is known about the subject, setting goals, collaborating with peers, self-talk, and prediction.</p>	<p>The students related the pendulums to real objects that have a pendulum, such as a clock. The students explained how these real elements work and then set up an experiment with a pendulum to find out what happens when a weight is applied to the pendulum.</p>
<p><u>Lesson: Thunders</u> <u>Learning strategies sample:</u> Self-talk, summarizing, verifying.</p>	<p>Students thought about how lightening and thunder are created and talked to themselves about this. Then, in groups they decided on the best theory, summarized it, and finally, compared their theory with what really happened.</p>
<p><u>Lesson: Electricity</u> <u>Learning strategies:</u> Summarizing, questioning for clarification, goal checking.</p>	<p>Students worked with different experiments and then summarized the results of the experiments to verify their predictions.</p>
<p><u>Lesson: Levers and pulleys</u> <u>Learning strategies:</u> Setting goals, collaborating with peers, self-talk, summarizing, verifying.</p>	<p>Students worked in groups to set up experiments, summarized the procedures and the results for each experiment.</p>

<p>History</p>	
<p><u>Lesson: The colonies: Difficulties settling in America</u> <u>Learning strategies:</u> Activating background knowledge.</p>	<p>Students discussed the difficulties encountered by their parents when they had to decide where to live, or which country to go to.</p>
<p><u>Lesson: Characteristics of the colonies: Central colonies</u> <u>Learning strategies:</u> Predicting, grouping characteristics.</p>	<p>Students were to predict the characteristics of each of the central colonies from learning about the place in which they lived. The students also grouped the main characteristics of each colony and prepared a graphic organizer.</p>
<p><u>Lesson: Characteristics of the colonies: Southern colonies.</u> <u>Learning strategies:</u> Note-taking, collaborating with peers.</p>	<p>The students listened to the reading and took notes about the topic. Then, in small groups they compared their notes and drew on them to rewrite the main ideas.</p>

Appendix C

“Vocabulary for the Lesson”

Instrucciones ‘instructions’: Trabaja con un compañero. Completen el cuadro con vocabulario que no conozcas de la lectura “Nuestra Herencia Colonial.” (‘Work with a partner. Fill in the chart with the vocabulary you do not know from “Our Colonial Heritage”’)

	<i>Vocabulario</i> ‘vocabulary’	<i>Vocabulario parecido</i> ‘similar vocabulary’
<i>Nombres o sustantivos</i> ‘nouns or substantives’	<i>Ejemplo</i> ‘example’: Zona de contención ‘border zone’	<i>Ejemplo</i> ‘example’: zona de obstáculo ‘obstacle area’
<i>Verbos</i> ‘Verbs’	<i>Ejemplo</i> ‘example’: establecer ‘to settle’	<i>Ejemplo</i> ‘example’: ubicarse nuevamente en otro lugar ‘to settle in a new place of residence or relocate’

Instrucciones ‘instructions’: Complete el cuadro. Escribe palabras que tu no conozcas en la primera columna y lo que piensas que es la palabra en la segunda columna. Después todos vamos a completar la tercera columna. (‘Complete the chart. Write the words that you do not know in the first column and a synonym in Spanish for what you think it means in the second column. Then, we will compare the meanings to complete the third column.’)

<i>Palabra nueva para mi</i> ‘new word for me’	<i>¿Qué pienso que es?</i> What do I think it is?	<i>¿Qué es?</i> What is it?
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Appendix D

Lección con Péndulos ('lesson plan with pendulums')

EL EXPERIMENTO CONTROLADO (<i>recuerda que sólo debes cambiar una variable</i>)	
<p>) Materiales: <i>haz un dibujo</i></p> <div style="border: 1px solid black; height: 100px; width: 100%;"></div>	<p><i>Escribe la lista de los materiales.</i></p> <ul style="list-style-type: none"> • • • • •
<p>) Variable modificada: <i>haz un dibujo de la variable que modificaste.</i></p> <div style="border: 1px solid black; height: 100px; width: 100%;"></div>	<p><i>Escribe una oración completa con vocabulario de la lección.</i></p> <hr/> <hr/> <hr/> <hr/>
<p>Resultados del experimento estándar: <i>escribe una oración completa con vocabulario apropiado.</i></p> <p>Longitud de la cuerda: _____</p> <p>Número de ciclos completos: _____</p> <p>Tiempo de oscilación: _____</p>	<p>Resultados del experimento controlado: <i>escribe una oración completa con vocabulario apropiado.</i></p> <p>Variable libre: (Variable es la característica que cambia)</p> <p>_____</p> <p>Longitud de la cuerda: _____</p> <p>Número de ciclos completos: _____</p> <p>Tiempo de oscilación: _____</p>
<p>Resultados: <i>Escribe una oración completa empleando una de estas formas:</i></p> <p align="center"> <i>más que</i> <i>menos que</i> <i>mucho más que</i> <i>mucho menos que</i> </p>	

Appendix E

Pre-Measures of Oral and Written Academic Language

A. History

Contesta a las siguientes preguntas basadas en la lectura sobre los exploradores de América.
'Answer the following questions _____.'

1. ¿De qué países eran los exploradores que llegaron a América en el siglo XV? Escribe los nombres de los exploradores.
2. ¿Cuál fue la actitud de los exploradores hacia las personas nativas que vivían en esa tierra?
3. ¿Si tú hubieras leído las historias de Marco Polo y te ofrecieran ir a un viaje de exploración irías? ¿Por qué o por qué no?
4. ¿Qué es una brújula?

B. Science

Instrucciones: Piensa en el experimento del pan hecho en la clase. Luego contesta a las siguientes preguntas empleando oraciones completas y el vocabulario necesario.

Nota: Recuerda que este no es un test sino una forma de observar el vocabulario y formas que empleas en español.

EL PAN Y LAS VARIABLES

1. ¿Qué elemento o material aplicaron a la tajada de pan? Por qué decidieron aplicar este elemento y no otro?
2. ¿Cuáles fueron algunos de los cambios que se presentaron en el pan durante la semana?
3. ¿Por qué crees que esos cambios se presentaron? ¿Qué razones hay para que sucedan esos cambios?
4. ¿Qué entiendes por variable?

Gracias por su colaboración!

APPENDIX F

**Measure of Oral Academic Language
When Problem-Solving**

Area: Circle the area: Science or History

Student's name: _____ Date: _____

1. Facility in describing the academic problem in comprehensible Spanish.

good		some		little
5	4	3	2	1

Problem description: _____

2. Quantity and variety of academic vocabulary.

good		some		little
5	4	3	2	1

Sample vocabulary: _____

3. Variety of academic language structures (adjective agreement, plurals, tenses, conditional, subjunctive, possessive pronouns, constructions with *gustar*, direct object pronouns, and indirect object pronouns).

good		some		little
5	4	3	2	1

Sample structures: _____

4. Ability to define academic terms in Spanish.

good		some		little
5	4	3	2	1

Terms defined: _____

Scoring guide:

1. Facility in describing the problem in comprehensible Spanish.

- 5 ___ The problem is fluently described and contains the proper amount of information.
- 4 ___ The problem is for the most part described fluently, and generally contains the proper amount of information.
- 3 ___ The problem is described moderately, calls for some interpretation to be understood, and may contain too little information.
- 2 ___ The problem is not described with facility but there are a few attempts to explain it. The ideas produced call for much interpretation to be understood, and the response generally lacks information.
- 1 ___ The student is completely lacking the ability to describe the problem. The message is not clear, and contains far too little information.

2. Quantity and variety of academic vocabulary.

- 5 ___ The student uses a wide variety and quantity of academic vocabulary. The student seems to have strong command of the necessary vocabulary.
- 4 ___ The student uses key academic vocabulary but compensates for other words using general terms. Sometimes the student does not find the right word, but is able to produce synonyms.
- 3 ___ The student uses more general or simple terms. The academic vocabulary is used only a few times. There are a few attempts to find the academic words.
- 2 ___ The student uses little if any academic vocabulary. The student does not make any attempt to find the words needed to explain the problem and relies on basic or simple words. The student code switches if s/he does not remember the word in the target language.
- 1 ___ No attempt is made to use academic vocabulary. The student relies on English words and does not worry whether s/he is understood.

3. Variety of academic language structure (adjective agreement, plurals, tenses, conditional, subjunctive, possessive pronouns, constructions with *gustar*, direct object pronouns, and indirect object pronouns).

- 5 ___ The student uses a wide variety of academic language structures (adjective agreement, plurals, tenses, conditional, subjunctive, possessive pronouns, constructions with *gustar*, direct object pronouns, and indirect object pronouns) that are fully appropriate for expressing the intended message.
- 4 ___ The student uses a variety of academic language structures which are mostly appropriate for expressing the intended message.
- 3 ___ The student uses some academic language structures but relies on simple or basic forms most of the time. There is some use of other language structures that are inappropriate for expressing the message.
- 2 ___ The student does not demonstrate command of any academic language structures, but there are a few attempts to use some. There is much use of inappropriate language structures for expressing the message.
- 1 ___ There is no attempt made to use academic language structures. There is continuous use of inappropriate language structures for expressing the message.

4. Ability to define academic terms in Spanish.

- 5 ___ The student effectively defines academic terms in Spanish.
- 4 ___ The student takes some time to define the academic terms in Spanish but does it mostly appropriately.

- 3 ___ The student communicates the meaning but does not define the academic terms.
- 2 ___ The student makes attempts to define academic terms, but no clear definition or meaning is communicated.
- 1 ___ The student does not define nor communicate the meaning of the academic terms. There is no attempt to do so.

Appendix G

Medida de Lenguaje Académico Oral Basado en el Conocimiento de Temas de Ciencias Después de Dar el Tratamiento

(‘Measure of Oral Academic Language Based on the Knowledge of
Science Topics after the Treatment’)

Nombre (name): _____ Fecha (date): _____

Instrucciones: *Contesta a las siguientes preguntas empleando oraciones completas.* ‘Answer the following questions by using complete sentences.’

PALANCAS Y POLEAS

1. *En un sistema de palancas, ¿qué es un fulcro?*

2. *¿Qué ventajas nos dan las palancas?*

3. *¿Cómo llamamos a la polea que se mueve con la carga cuando está en uso?*

4. *Por lo general, ¿qué le pasa al esfuerzo necesario para alzar una carga cuando aumenta el número de poleas del sistema?*

Da una buena razón por la cual es importante que las personas sepan preparar sistemas de poleas. ¿En tu sistema de poleas, qué le sucedió a la cantidad de cuerda que tiraste para alzar la carga cuando aumentó el número de poleas del sistema? ¿Cómo usarías una polea si tuvieras que rescatar a un carro o coche que se ha quedado atrapado en el lodo?

Haz un dibujo que represente la situación.

Appendix H

Measure of Teachers Modeling and Reinforcement of Spanish Academic Language*

At the Adams Elementary Spanish Immersion Magnet School, Fifth grade

Teacher: _____ Date: _____ Observer: _____
Lesson observed: _____ Start: _____ End _____ Number of students: _____

The Immersion teacher actions / behaviors	Observed	Not observed	Comments
1. Making input comprehensible			
Rephrases and repeats the processes she uses in solving the problem aloud.			
Explains and models her problem-solving processes she uses.			
Makes frequent use of comprehension checks that require the students to demonstrate their understanding.			
2. Attending to continuous language growth and improvement of accuracy			
Uses explicit correction procedures to check for development of accuracy (e.g. clarification request, explicit correction, and elicitation of correct form).			
Elicits self- and peer repair in academic language.			
3. Using teacher talk effectively			
Models accurate use of language structures			
Slows down and defines academic language when necessary.			
4. Promoting extended student output			
Encourages the use of academic language across the skills.			
Uses questioning techniques that encourage extended discourse and foster higher-order-thinking.			
Has students talk through history or science problems aloud.			
Encourages students to participate in the negotiation of meaning of academic language.			

* Based in part on the Immersion Teaching Strategies Observation Checklist presented by Tara Fortune, in the ACIE *Newsletter*, November 2000, pp. 1-4.