2007

Mexican immigrants learning science in rural America: a case study of a 9th grade science classroom

Edna Monica Lopez Ceballos

Iowa State University

Follow this and additional works at: https://lib.dr.iastate.edu/rtd

Part of the Elementary and Middle and Secondary Education Administration Commons, Linguistics Commons, Science and Mathematics Education Commons, and the Secondary Education and Teaching Commons

Recommended Citation
Lopez Ceballos, Edna Monica, "Mexican immigrants learning science in rural America: a case study of a 9th grade science classroom" (2007). Retrospective Theses and Dissertations. 14881.
https://lib.dr.iastate.edu/rtd/14881

This Thesis is brought to you for free and open access by the Iowa State University Capstones, Theses and Dissertations at Iowa State University Digital Repository. It has been accepted for inclusion in Retrospective Theses and Dissertations by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
Mexican immigrants learning science in rural America: a case study of a 9th grade science classroom.

by

Edna Monica Lopez Ceballos

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

Major: Teaching English as a Second Language / Applied Linguistics
(English for Specific Purposes)

Program of Study Committee:
Dan Douglas, Major Professor
Viviana Cortes
Katherine Richardson Bruna

Iowa State University
Ames, Iowa
2007
DEDICATION

I dedicate this thesis to my parents Fernando and Rosa Maria for their unconditional support and love. I also dedicate it to David, my husband, friend, and confident for always been there for me, and to my children and motivation in life; David Fernando, Andrea Isabel, and Daniel Abraham.
# TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION 1

CHAPTER 2. LITERATURE REVIEW 7

CHAPTER 3. METHODOLOGY 18

CHAPTER 4. RESULTS AND DISCUSSION 24

CHAPTER 5. LIMITATIONS, PRACTICAL APPLICATIONS, AND SUGGESTIONS FOR FURTHER RESEARCH 36

REFERENCES 39

APPENDIX 43
CHAPTER 1
INTRODUCTION
The number of Latino immigrant students in American schools has been increasing rapidly during the last decades in parts of the United States that until recently had not had experienced this demographic shift. As a result, and due to the novelty of this phenomenon, research about how the schooling system in these communities is coping with these new students is necessary. Such studies would help better understand what these students are learning in schools, how much are they learning, and how they are learning.

Also, it is vital to research on this topic, since the drop out rates of Latino students are the highest in the country, revealing a lack of effective learning programs for this particular group, nationwide. The statistics suggest that from the Latino population enrolled in high schools, about 44 percent drop out (U.S. Department of Education, National Center for Education Statistics. “The Educational Progress of Hispanic Students,” in The Condition of Education, NCES 98-470, Washington, D.C., 2002).

Mexican immigrants exceed by far the number of Latino immigrants from other nationalities that have made the United States their home. Over the last 30 years immigration from Mexico has come to account for almost 40% of the total national immigration increase, from 800,000 in 1970 to near 8 million in 2000 (Camarota, 2001). While Mexicans traditionally have settled in metropolitan cities such as Los Angeles, New York, Denver, Chicago, Seattle, and San Antonio, to mention some, during the last decade Mexican immigrants have settled in medium sized cities and towns across the United States.
The growth of the Mexican population in communities that are becoming new settlements for this population represents both challenges and opportunities for policy makers, program planners, and service providers who have to adapt and fund services to cover immigrants’ needs. Historically, these school systems had not had the educational infrastructure in place to accommodate these students. Among other things, they needed to make considerable expenditures to find teachers qualified for providing intensive education in the English language, to develop classes, and to provide the necessary classrooms (U.S. G.A.O., 1998).

While research has traditionally been done in large school districts around the country, information from new settlement communities is lacking. For example, research in large school districts in California has shown that students do not uniformly acquire the English language skills necessary for academic achievement despite the current trend to shift from bilingual to English-only instruction (Davidson, 1994; Abedi, Leon, & Mirocha, 2000; Butler & Castellon-Wellington, 2000; Butler & Stevens, 1997). However, little research on how teachers and schools are dealing with immigrant students has been conducted in cities and towns considered new settlements for Latino immigrants (Richardson Bruna et al., forthcoming; Richardson Bruna, Vann, & Perales, 2007; Richardson Bruna et al., forthcoming; Richardson Bruna & Chamberlin, forthcoming; Richardson Bruna, 2007; Richardson Bruna, Chamberlin, Levis, & Lopez Ceballos, 2007). In these contexts, content area teachers who have no experience working with culturally and linguistically diverse students who do not know the language, come from a very different schooling system and yet need to fulfill the academic language demands to perform and learn in their new schooling environment.
While schools may offer a range of curriculum interventions - bilingual classes, sheltered programs, and ESL pullout instruction-tailored to students’ English language needs-immigrants in new settlement communities are most likely to receive content area instruction from a teacher underprepared to adapt pedagogies with English language development in mind. Even the language intervention programs are likely to be focused mainly on language in a broad sense having students develop the four basic language skills that are speaking, reading, listening, and writing. They are not likely to tailor instructions toward the academic language demand of the content areas (Schleppegrell & Colombi, 2000). In this sense academic language will refer to all the cognitive and linguistic processes required to participate in the school’s context.

Science is considered to be a particularly challenging content area for students whose first language is not English because it utilizes the full range of linguistic domains, including unique discourse structures, complex grammar, and a high concentration of specialized content vocabulary not necessarily found to the same extent in other subject areas (Bailey, 2000a). Studies that document how science teachers with little to no experience and training working with English Language Learners (ELLs) come to teach their newcomer Mexican students are needed to understand the role teachers are playing in helping immigrant students achieve academic improvement. The current study addresses this gap by focusing on how an experienced high school science teacher copes with the language needs and challenges of immigrant students in a town in heartland America.
Over the last ten years 13% of the residents in this town, which I would call Gardston\textsuperscript{1}, have come to be Latino, the majority Mexican or of Mexican descent, most of them originally from the same town in Mexico situated in the central state of Michoacan. This town is considered one of the largest sender regions of Mexican immigrants to the U.S. (Richardson Bruna, 2007). As a result of a decade’s demographic shift, schools in this town are facing challenges not seen before such as teachers of content academic subjects, like science, confronted with instructional issues related to second language acquisition (Richardson Bruna, 2006. The reasons for choosing this school in this particular town are; 1) this community is an example of the recent trend of Mexican immigration in the Midwestern United States and was recently identified as the first school district in Iowa where ‘‘minority students outnumber White students’’ at 52\% (Bolten, 2003). 2), this community is located in the middle of a rural area that has not been involved in research efforts until very recently (Richardson Bruna, 2006; Richardson Bruna, Vann, & Perales 2006; Richardson Bruna & Gomez 2007; Richardson Bruna et al. 2007).

This study is an attempt to document the challenges immigrant students faced in schools where teachers are not prepared for them. Hopefully, the information this study provides will help stakeholders, policy makers, administrators and teachers better understand the culture and linguistic background, and school experiences of Mexican immigrant students. It will address the efforts the science teacher makes to integrate his content area instruction with the students’ particular language needs to complete tasks in 9\textsuperscript{th} grade science. This is a

\textsuperscript{1} Gardston is a pseudonym.
qualitative case-study focused on one science teacher’s instruction, following the definition by Goode and Hatt (1952).

In order to guide the present investigation the following question has been posed:

1) How does a veteran science teacher, who is a novice in integrated instruction, begin to include integrated instruction in his class?

Integrated instruction will be defined here as the model of instruction which includes the learning of English language along with the learning of the content area. Knowledge of both subjects, namely English and Science, separately does not ensure the successful employment of integrated instruction techniques. For this reason, a better documented understanding of how a veteran science teacher puts this model into practice is vital for its validation and future use.

The current study builds on a series of studies regarding Mexican immigrant students’ learning situation in this rural area (Richardson Bruna, 2006; Richardson Bruna, Vann, & Perales 2006; Richardson Bruna & Gomez 2007; Richardson Bruna et al. 2007). The school’s population is changing in this community due to the influx of immigrants, mainly from Mexican origin, and as a result, there is a need for teachers to understand those changes to serve these students. The data for this study – a set of videos from a science classroom, from a high school in Gardston, were collected by Dr. Richardson Bruna in 2006. The videos were filmed on different occasions during a period of four months; the class is a 9th grade Earth Science class where most of the students were designated English Language Learners
(ELL). The teacher responsible for the class, George Roberts\(^2\), was at that time the chair of the Science department in the high school, and he had agreed to have all the English Learners assigned to his classes. Because he did have to some extent the preparation necessary and the goodwill to help these students, I considered him the best candidate for this study. At the time he had attended some conferences and workshops intended to help him as well as other teachers use an integrated approach in his classes. An approach that would help him teach language and content area at the same time. In order to answer the current research question I watched the videos and used the Sheltered Instruction Protocol (Echevarria, Vogt, & Short, 2000, 2004) which is an instrument that helps keep the objectivity of the observation, while providing time to take notes for further analyzes and comments, to provide an overall rate for each class.

This thesis has been organized as follows: chapter 2 will present the literature related to the central topic investigated here, chapter 3 will provide a description of the methodology and data used in this study, chapter 4 will present the results and discussion of the findings, and finally, chapter 5 will conclude discussing the limitations, practical applications of the findings and suggestions for further research.

\(^2\) The name of the science teacher is a pseudonym to protect his identity.
CHAPTER 2

LITERATURE REVIEW

To situate this study a review of previous research and literature related to the central topic, which is the education of immigrant children in the American system, is needed. An overview of the current policies on education and research conducted in different settings across the United States involving immigrants in the school system will be presented. Next, research done regarding immigrants’ education in rural areas in the Midwest will be discussed to provide background and justify the motivation for this study. Then, the investigation of how science as a content area is taught will be explained to provide information, supporting the fact that, among the research community science is considered to be one of the most difficult content area for non-native speakers of English. Finally, an approach of integrated instruction will be described to support the participant’s attempts to follow it in his class.

EDUCATION IN THE NEW LATINO DIASPORA

An increasing number of Latinos are settling both temporarily and permanently in areas of the United States that have not traditionally been home to Latinos – for example, North Carolina, Maine, Georgia, Indiana, Arkansas, rural Illinois, Iowa, and Colorado. Instead of arriving in settings, like the Southwest, where Latinos have lived for centuries, those in the New Latino Diaspora arrive in unfamiliar places where long-term residents have little experience with Latinos (Hamman, Wortham, & Murillo Jr, 2002). This new trend has been called The New Latino Diaspora (Murillo & Villenas, 1997). Research has been done in some of the new communities mentioned above focusing mainly on policies currently used
which instead of promoting literacy, marginalized these students and resulted in slowing down the academic development (Hamman, Wortham, & Murillo, 2002; Villenas, 2002; Beck, & Allexsaht-Snider, 2002; Hamman, 2002; Zuniga, et al., 2002; Martinez, 2002; Brunn, 2002; Murillo, 2002; Gibson, 2002). Some of these studies show how immigrants’ children struggle to maintain their identities in communities where long-term residents have little experience with immigrants and where schools’ common educational accommodation to immigrant needs is to pull them out from content classes for ESL work disrupting their acquisition of content knowledge (Hamman, et al. 2002). Furthermore, in some communities, ESL (English as a Second Language) classes are held in every available closet, portable classrooms buildings being placed on the playground, and storage spaces ‘converted’ into classrooms for immigrant students (Wortham et al., 2002), the purpose of which is to keep these students segregated, with limited supplies, making teaching very difficult. Other studies show that schools and teachers are unprepared for this influx of “new” students, resulting in settings that implemented the sink-or-swim submersion to the language without taking into account research-based pedagogies currently used with some success in other communities (Beck & Allexsaht-Snider 2002; Hamman, 2002; Zuniga, et al. 2002). The main arguments in these studies are that in the Latino Diasporas communities there is little to no willingness to accept immigrants as part of the communities; rather, they are perceived as just low-wage workers, who need to be Americanized, mostly by teaching them English. Nevertheless, there have been attempts to implement bilingual programs in some school districts (e.g. Conasagua, 2000) with very little success due to the resistance of education administrators and policy makers to see the benefits of helping immigrant students’ succeed academically (Beck & Allexsaht-Snider, 2002).
English Language Learners’ (ELL’s) education in the United States continues to create controversy and challenges as the studies mentioned above showed. Previous research findings suggest that further studies are essential to bridge the gap between what has been done to what are happening nowadays and more important studies that give voice to immigrant students’ language needs that promote a change in current teaching practices.

EDUCATION OF ENGLISH LEARNERS IN RURAL IOWA

Migration from rural areas to larger cities has been a trend for several decades in the Midwestern United States, as family-owned farms decrease in number and corporate farming becomes more common (Alsbury, Watkins, & Shaw, 2003). As a result of this trend, the number of American students attending rural schools has decreased, and the number of immigrant students increased. As a result, the human and budget limitations in these schools make it difficult to retain quality-trained teachers to address all students’ academic needs (Coley, 1999). This migration has other implications though. On the one hand, these communities are becoming ‘The New Latino Diaspora’, where immigrants are settling in and occupying labor positions available. On the other hand, immigrants’ children are been enrolled in schools that neither have the appropriate infrastructure, nor human resources, or academic experience for these new students. (Richardson Bruna, Forthcoming). For example, when new immigrants are enrolled in schools in Iowa they are placed in ESL classes implying that there are no differences in the levels of English proficiency among them. The result is the segregation of these students from mainstream classes that would allow them to develop not only their social English language skills by interacting with their American peers but more importantly their academic skills through scaffolding and
collaboration when working with their American peers (Valdes, 2001). Valdes adds that “The
challenges of educating students who do not speak the societal language are enormous. In the
United States, it is not just a question of teaching English; rather, it is a question of providing
large numbers of students with access to the curriculum at the same time that they are
learning English” (p.14).

In the setting this case-study was conducted and until 2005 all newcomer students were
placed in courses that held English Learners (EL) designation. The year this research started,
the decision was made to put ELLs together with Americans in mainstream classes.

**SCIENCE EDUCATION**

Newly arrived immigrant Latino students who enter American schools and secondary school
levels face particularly difficult challenges, because most of the teachers do not know how
second-language learners acquire the English language (Chamot, 1992; Davis & Mcdaid,
1992; La Fontaine, 1987; Lucas, 1992; Minicucci & Olsen, 1992; Portes & Gran; 1991;
Rumbaut, 1990) cited in (Valdes, 2001). For this reason many of those teachers choose to
have very little to do with these students who, according to them, speak and write very
“imperfect” English (Valdes, 2001). Immigrant students enrolled in schools in secondary
levels need to learn English and more specialized content area subjects simultaneously,
which at these levels become more specialized; the classroom discourse in content area
classes becomes more linguistically complex and cognitively demanding. Science, in
particular, utilizes unique discourse structures, complex grammar, and a high concentration
of specialized content vocabulary not necessarily found to the same extent in other subject
areas (Bailey, 2000a). Specifically, using science language means, observing, describing,
comparing, classifying, analyzing, discussing, hypothesizing, theorizing, questioning, challenging, arguing, designing experiments, following procedures, judging, evaluating, concluding, reporting, writing, lecturing, and teaching in and through the language of science (Lemke, 1990).

The approach to science offered by Halliday and Martin (1993) explains that “…literacy in science has to be considered from the point of view of field (the knowledge that is being constructed) and genre (the global patterns of text organization that package this knowledge)…” (p.201). Lemke (1990) states that in science “…we devise useful ways of talking about things and processes, and useful systems of technical action (e.g. measurements, technologies). We construct systems of meanings by using language, mathematics, diagrams and techniques. They are our social tools, and they differ from one social community to another. A community deploys its semiotic resources in certain habitual ways, and these are its semiotic formations. A formation is a sort of ‘institutionalized’ way of talking, gesturing, or behaving (p.185)”.

Students’ academic success will depend on a lot of factors, one being how well they master the language of science. However, students whose first language is not English are in disadvantage compared as their American classmates for several reasons; first, they are learning the language at the same time they are learning science. Second, they are not familiar with the schooling system that expects from them an active participation in class, as opposed to attend lectured classes, memorizing formulas, and write down dictations from the teacher. Also, these students due to their limited-proficiency in English learn academic content in classes that do not provide them with exposure to the same kind of scientific
language to which their proficient English-speaking grade-level peers are exposed to but with instruction geared “to below age-appropriate levels”(National Center of Educational Statistics, 1997). As I mentioned before, keeping these students away from the mainstream classes may affect the expectations for learning, planning for teaching, and student engagement in science. The academic language of science is part of the hidden curriculum that can allot privilege to those with access to its rules and penalty to those without (Cazden, 2001; Christie, 1985) as cited in (Richardson B., Forthcoming).

As Fink (1998) notes, in a study done in the rural Midwest:

“Public schools culled students by social class, a fact that working class youth could not escape and middle-class youths could not confront. Even those working-class students who showed aptitude for learning in their early years frequently faded away from school as they realized how different their lives were from those whose classroom experiences progressively mirrored and confirmed the lives of their parents and families (p.169)”.  

The fact that immigrant students are in a school setting unfamiliar for them, where they have to learn the specialized register in their science class, where teachers are not aware of their science background knowledge, and where they lack the means to communicate what they know using that register, results in immigrant students not seeing the purpose of continuing or finishing their education. In a recent study conducted by Richardson-Bruna (On pigs & packers: Problematizing the practice of science with Mexican immigrant students, in press), in the same setting the present study took place, the science teacher, in a class designed specifically for ELL’s, told her students that they will be dissecting a pig as preparation for their future job in the town’s meatpacking plant. When one of her students resisted doing it
alleging that she would not become a butcher, the teacher in a sarcastic way replied; “Good, good, you are going to college”. This is just an example of the limitations and discrimination ELL’s face. The author concludes that by making this comment the teacher is assuming that all her students are going to work in the meat plant after graduating from high school. Such discrimination and low expectation of Mexican immigrants as low-wage workers can only be perceived as a lack of cultural knowledge from the teacher. In another section of the same study, a student that is evidently more fluent in English that his classmates, not only serves as teacher aid explaining the pig dissection procedures to his classmates but also answering most of the teacher’s questions since he was already familiar with the process through his work with animals on his farm in Mexico. This example suggests that once the students have the language knowledge needed to communicate effectively using the appropriate register they can succeed in learning science. This student represents a mediator between the science teacher and his peers and could be a valuable help for the learning process.

According to Richardson-Bruna et al. (2007) any examination of attempts to integrate language teaching in content area classes must take the view that “language [is] a social process that contributes to the realization of different social contexts” as explained in (Schleppegrell, 2004, drawing on Halliday & Hasan, 1989).

As Swales (1990) defines “…a genre comprises a class of communicative events, the members of which share some set of communicative purposes. These purposes are recognized by the expert members of the parent discourse community, and thereby constitute the rationale for the genre. This rationale shapes the schematic structure of the discourse and influences and constrains choice of content and style” (p.58).
In science, this refers to how the specialized language of science is used to make sense of the world, and to make sense of and to one another. It means doing science through the medium of language, since language is a system of resources for making meanings (Lemke, 1990). Learning science involves developing new ways of thinking about the world through investigations that predict and control natural phenomena. Controlling the discourse of science requires mastering the grammatical features of the language that construe science knowledge as well as the reasoning, values, and assumptions of the discipline (Schleppegrell, 2004). “The language of science teaching is ‘expository’ or ‘analytical’ most of the time…used to express relationships of classification, taxonomy, and logical connection among abstract, terms, and processes” (Lemke, 1990). Students need to be able to understand the language used to give instructions, to follow procedures, to name the materials involved, and to produce scientific language to write reports, to make classifications, to describe events, and so on. Four science genres, Procedure, Procedural Recount, Science report, and Science explanation, are presented in table 1 based on Martin (1993a, 1993c), Veel (1997), and Wignell (1994) as cited in (Schleppegrell, 2004).

Table 1. Common Genres in Science Education

<table>
<thead>
<tr>
<th>Genre</th>
<th>Purpose</th>
<th>Register Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure</td>
<td>To provide instructions for experimental activities.</td>
<td>Material process clauses, imperative mood to direct the reader, thematic markers of sequence in time (next, then, etc.), reference to tools and materials assumed to be in the immediate context (e.g. put the solution in the beaker.)</td>
</tr>
</tbody>
</table>
Table 1. (continued)

<table>
<thead>
<tr>
<th>Genre</th>
<th>Task Description</th>
<th>Language Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural Recount</td>
<td>To record what has been done in an experiment already conducted.</td>
<td>Material process clauses, declarative mood, past tense verbs, specific participants and events, passive voice.</td>
</tr>
<tr>
<td>Science Report</td>
<td>To organize information about things by setting up taxonomies of classes and subclasses; or by dividing a phenomenon into its parts or steps, or through description or listing of its properties.</td>
<td>Technical terms, generic participants, timeless verbs in simple present tense, large percentage of relational process clauses.</td>
</tr>
<tr>
<td>Science Explanation</td>
<td>To describe how and why scientific phenomena occur, dealing with interactions of factors and processes rather than a sequence of events.</td>
<td>Material and relational process clauses, generic participants, timeless verbs, organized in a logical sequence through grammatical metaphor.</td>
</tr>
</tbody>
</table>

These genres represent general descriptions of the different kinds of tasks that students typically are asked to do in science classes (Schleppegrell, 2004). There are many other kinds that students work within the science class, such as descriptions, comparisons, and definitions. However, they are a good example of the tasks and language students are exposed to and need to use in order to learn science.

In science classes students need to get acquainted with that specific register in order to be able to communicate and be understood, using the language common to the scientific community. Whereas American students have been exposed to the scientific register since they started school, Mexican students have been taught science in a very distinct way in their own native language. Differences in the way science is taught in both countries range from a more dynamic, student-centered, hands-on approach, in the US, to a more linear, teacher-centered, lecture-based classes in Mexico. Lack of financial resources and materials explain
why Mexican students’ experience in science class seems to be quite more limited than the Americans (Richardson-Bruna, Chamberlin, Lewis, and Lopez Ceballos, in press).

American science teachers need to do more than just teach explicitly language forms and vocabulary; they need to provide sufficient and comprehensible input, use appropriate speech for students’ proficiency level, and provide ample output opportunities to practice the particular grammatical structures needed to express the taxonomic relationships so important to science. Content area teachers’ understanding of academic language are limited, as researchers noticed, to the idea of teaching only vocabulary ignoring other important linguistic features, as mentioned in the tables above, that include specific genres of a content area like science such as recount, narratives, and reports (O’Toole, 1996; Solomon & Rhodes, 1995)

**SIOP**

The Sheltered Instruction Protocol (SIOP), which is a framework and a guide of sheltered instruction, was used as a tool to record and evaluate what the participant teaching practices were at that time. The SIOP is an instrument first designed to guide pre-service and in-service teachers into the SI (Sheltered Instruction) Approach which draws from and complements methods and strategies developed for both second language and mainstream classes. According to the authors Echevarria, Vogt, & Short, (2004) the theoretical underpinning of the SI model is that language acquisition is enhanced through meaningful use and interaction. That is, in effective SI courses language and content objectives are systematically woven into the curriculum of one particular subject area (p.13). This protocol was originally used by researchers to measure teacher implementation of sheltered
instruction. After research conducted by the national Center for Research on Education, Diversity, & Excellence (CREDE), the SIOP model was field tested and became a training and evaluation instrument (Echevarria, Vogt, & Short, 2004). The SIOP is used for two major purposes; to measure teacher fidelity to the Sheltered Model and to give the teacher suggestions for improvement in different categories. This protocol is divided into three large categories; Preparation, Instruction and Review/Assessment. Each of these categories is divided in several different components. (See appendix 1). Finally, the SIOP can be used by researchers, like in this case, to determine the extent to which integrated instruction is implemented in a class as well as to measure consistency and fidelity of implementation.
CHAPTER 3

METHODOLOGY

This chapter describes the methodology used in this research study. As mentioned earlier this is a qualitative case study which draws on research from various disciplines such as sociology, education and linguistics. This study uses different data gathering techniques such as videotaped classes, the 9th grade Earth science text book, and informal interviews. The triangulation of three data gathering techniques used in this kind of research, namely observations, interviews, and document analysis is an attempt to achieve credibility (Fraenkel & Wallen, 1993).

As Mexican I am familiar with the immigration phenomenon. I know that because of the economic model followed by the government many people mostly in rural communities are left without options but to immigrate to the United States in order to be able to make enough money to support their families and their farms in Mexico. As a resident in one of the bordering states with the United States I have first-hand information about the misconceptions and stereotypes many Americans have regarding Mexican immigrants. As a university English teacher I have been educated in both educational systems. My access to this data came form my work with Dr. Richardson Bruna and I felt very much connected to her work, therefore the topic of this study is very important for me.

This study’s contribution to the larger ethnographic research from which this is part is to provide information to professors, administrators, curriculum developers, and ESL teachers that will help them understand the struggles a science teacher faced when teaching Mexican immigrant students so they act upon and provide them with the classes, materials, and the
support necessary to fulfill their language needs and consequently improve their learning. For those reasons, I consider that this study will add to the current body of research in this area.

In the setting this case-study was conducted and until 2005 all newcomer students were placed in courses that held English Learners (EL) designation. This meant that students were learning content area classes while acquiring the English language and the language used in the former was simplified for them. The year this research started, the decision was made to put ELLs together with Americans in mainstream classes. This was made due to the No Child Left behind Act (NCLBA) and had tremendous negative implications mainly for ELLs, among others the school made the decision to let go the English as a Second Language (ESL) teacher, who was at that time teaching science to these students. The reason was that according to the NCLFA standards this particular teacher was not highly qualified to teach science nor she had ESL Endorsement. ELLs are now facing a most difficult situation since they do not have any language support for content area classes.

PARTICIPANT

George Roberts, the science teacher, white, middle class, in his mid 40’s, was at that time the chair of the Science department in the high school at Gardston, Iowa and had been a 9th-grade Earth Science teacher for 10 years. He graduated from The University of Northern Iowa in Earth Science Teaching and was almost finishing his master degree in Science Education when the data was collected. Before coming to Gardston, he taught students whose language is different from English for several years while he was a teacher in Waterloo, Iowa which had a large Bosnian population. George admitted that he has spent some time in
Ukraine in a program called ‘Supreme Program’ and that that experience had a great impact on him. He recalled having to learn survival phrases in Russian and Ukrainian and how difficult it was. Because of that, he empathized with ELLs and the way he felt regarding their limited proficiency in English. He considers he speaks a little Spanish and his goal is to learn more about the needs of English Learners in Gardston and to arrive at a set of techniques he could share with the rest of the science team (Richardson- Bruna et al., forthcoming). He is interested in keeping up to date with current practices and methodologies that involve ELLs and for that reason he has attended several workshops such as the EASEL (Enhancing and Advancing Science for English Learners) during the summer of 2005. The EASEL project was designed to assist in enhancing science instruction, especially in classes with students whose primary language is not English. The model draws on insights from recent research on: a) effective science pedagogy, b) strategies for building ELL-inclusive science classrooms, and c) best practices in professional development (EASEL Binder 2005. Enhancing and Advancing Science for English Learners. Summer Institute. Amana). He also took part in a conference offered by the school district which supports the English Only movement. During the interviews, George acknowledged that it has been difficult for him to develop a philosophy of teaching when he faced on one hand supporters of diversity and linguistic differences and on the other hand supporters of the English Only movement. He thinks that talking once in a while with the ESL teacher would provide him with the information necessary to get to know his ELLs students, their cultural and linguistic background, family’s relationships, and so on. George appreciates the help the bilingual teacher aide provides him in his classes with the majority of ELLs, since he mentions this class is mandatory for high school graduation. This science teacher was the perfect candidate
for this study because of his experience teaching science, his position as head of the department, and his willingness to help ELLs learn science.

SITE

The study took place in Gardston, Iowa for several reasons: 1) Gardston is just one of many “traditionally non-ELL” cities in Iowa where the immigrant Latino/Mexican population has been gradually increasing. According to the Iowa Data Center, in 1980 the Hispanic or Latino population in Iowa was 25,536 being 18,161 of Mexican origin, and in 2000 the same population was 82,473 being 61,154 of Mexican origin. In the same period of time Gardston increased its Hispanic or Latino population form 4.2% to 12.6%. This means that in 2000, 77% of Gardston’s total foreign-born residents were of Mexican origin, while Iowa’s average in the same year was 30% of its total population. In 2005, Gardston’s school district total population was 4,922 students with 62.7% white students and 37% was Hispanic or Latino. In the same period of time Gardston’s high school population was 1,491 among this 74% were White, 21% Hispanic, 3% Black, and 2% Asian.

The 9th grade science classroom in Gardston’s High School is a large room with two long tables facing the board; each table can accommodate up to 16 students sitting comfortably. The classroom has a large white screen. The walls are covered with colorful posters that describe, explain, or show different scientific processes. There are counters on both sides of the classroom where the teacher keeps class materials and laboratory instruments. The classroom is well illuminated and at the front of the classroom there is a desk for the teacher. There were fourteen students in this science class, twelve of Mexican origin and two Americans.
MATERIALS

Interviews

Four informal interviews with the science teacher were recorded and transcribed. These interviews were carried out from October to December 2005, lasted approximately one hour each, and were done in the same setting. The analysis of the participant’s answers helped answer the research question, namely ‘How a veteran teacher who is a novice in Integrated Instruction begins to include it in his class?’ The interviews were carefully read and the participant’s perceptions of his teaching practices were highlighted.

Observations - Videotaped classes

In order to answer and documented the research question nine videotaped science classes taught by the participant of this study, George Roberts were watched and a Sheltered Instruction Protocol (SIOP) was filled out for each one. These classes were videotaped between October 2005 and January 2006.

This tool provided me with a detailed pedagogical description of the classes focusing on how language is delivered as well as the strategies and techniques used. The SIOP provides a framework and a guide to teach quality sheltered instruction by using specific techniques and it is suggested for teachers, such as in this case-study, who have special training in a subject area but not in second language acquisition. One limitation to this methodology is the fact that only one person used the protocol to evaluate these classes, more raters could provide a more objective description.
PROCEDURE

The science classes were videotaped in a four months period of time from 2005 to 2006. The videotaped classes were watched one time and the SIOP protocol was filled out for each one in order to get pedagogical information on the participant’s teaching practices. The same videotapes were watched a second time and notes were taken to get more specific information about how the science language was delivered and what language support ELLs were given. Next, the interviews were analyzed to try to answer the research question.
CHAPTER 4
RESULTS AND DISCUSSION

In the previous chapter the participant, site, data collection techniques, and procedure used in this study were described. This chapter will present the results and a qualitative discussion of the research question.

RESULTS

In order to answer the research question I filled out one SIOP (see appendix 1) for each class. However, I focused only in the section called “Instruction” and I left out the other two sections. I decided to do this to keep the objectivity of the study and because the data I had access to was not enough to answer the other sections. Also, since the focus of the study is the participant and the way his is teaching I only filled out the protocol for the instruction section. Question: How a veteran teacher who is a novice in integrated instruction begins to include it in his class?

In all the videotaped classes watched the teacher presented the scientific content material without any language support for ELLs, as if in all students in his class Americans. In fact, when he was teaching the lesson and a vocabulary questions arose, he asked ELLs to look for the meaning of the words in their dictionaries first and then asked him. The use of dictionaries in ESL classes is a common strategy that helps students develops their independence while learning. Nevertheless, students need to be taught how to do it, for example students need to know what type of word they are looking for, otherwise there is a chance students would not get the definition they need.
The Integrated Instruction approach suggests that teachers should state at the beginning of each class their languages objectives as well as the content objectives for students to know what are they going to be learning each day. “For English learners, content and language objectives for each lesson need to be stated simply, orally and in writing, and they need to be tied to specific-grade level content standards” (Echevarria & Graves, 2002), as cited in Echevarria et al. (2004) (p.22).

Moreover, ELLs also need to be able to use the grammatical structures of the genre. For instance, in a class about indirect measurements, students were watching a video about the solar system, stars, etc. the video was in English with Spanish subtitles. The teacher asked students to take notes in English while watching the video. It is incredibly cognitively demanding to code switch between watching the video in English, reading the subtitles in Spanish, and take notes in English. To complete this task students would need to understand and be able to use clauses, adjectives, verb tenses, different voices (active/passive) to write observations and to make hypothesis. All of these are included in the common genres in Science Education based on Martin (1993a, 1993c), Veel (1997), and Wignell (1994). However, there was no evidence that these features where included in the class.

In most of the classes copying on the board the directions of what students were supposed to do such as use your senses, describe as many characteristics as possible, write observations down, make a description of the object, make an inference of the object is not enough. The teacher needs to provide examples for students to follow.

The results from the videotaped classes were summarized in the following table dividing the SIOP model into the main category used in this study along with its correspondent indicators. For each indicator an example from the videotaped classes is provided whenever possible.
Table 3. **Instruction**

<table>
<thead>
<tr>
<th>1) Building Background</th>
<th>Highly Evident 4</th>
<th>Somewhat 3</th>
<th>Evident 2</th>
<th>Not 1</th>
<th>Evident 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts explicitly linked to students’ background experiences</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Links explicitly made between past learning and new concepts</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key vocabulary emphasized (e.g. introduced, written, repeated, and highlighted for students to see)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2) Comprehensible Input</th>
<th>Highly Evident 4</th>
<th>Somewhat 3</th>
<th>Evident 2</th>
<th>Not 1</th>
<th>Evident 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech appropriate for students’ proficiency level (e.g. slower rate and enunciation, and simple sentence structure for beginners)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explanation of academic tasks clear</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uses a variety of techniques to make content concepts clear (e.g. modeling, visuals, hands-on-activities, demonstrations, gestures, body language)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
There was no evidence in the videotaped classes watched that the teacher attempted to link the concepts of the class to students’ background experiences. In one of the classes, the theme was ‘Identifying Rocks’ The teacher provided each student with a pile of rocks and by drawings on the board he explained the characteristics of each type of rock. The teacher said: “I want you to copy these drawings from the board to start with on you notebooks, as you see them, copying them down. You will categorize these (pointing to the plastic containers in front of the students) remember…igneous rocks have no pattern, (showing a model) is what we call random order, they are just everywhere. A sedimentary rock was one that has layers that were parallel, they can run diagonal, or any other way, but they have to be the same thickness. And then, the metamorphic one is where we have foliated and non-foliated, foliated is wavy layers or crystals that were smashed, layers are not consistent here are not parallel, so in your kits, you will try to make three piles, one igneous, one sedimentary, and one metamorphic”. The task then consisted of having students recognized the patterns from the drawings in their rocks and classify them accordingly. At the end of the class only half of the students could classify their rocks correctly. (Videotaped class #6, 02/20/06). However, in the same class the teacher kept making references to previous classes; he said “Remember that on Friday we learnt about the three types of rocks…”.

One of the strategies observed in these classes was the use of L1 to try to emphasize the key vocabulary of the lessons. The teacher asked students to give the translation of certain key words, but the same words were not introduce prior to this exchange, and only sometimes they were written on the board.

As I mentioned before, the teacher teaches the class as if all students were Americans. He did not use an appropriate speech for these students’ proficiency level. What he did was to
use Spanish commands trying to keep students attention during the procedural part of the lesson. In a class about measuring the hardness of minerals the teacher said: “Mira, (see)”.

(Videotaped class # 2, 10/11/2005)

Table 3.1. Strategies and Interaction

<table>
<thead>
<tr>
<th>3) Strategies</th>
<th>Highly Evident</th>
<th>Somewhat</th>
<th>Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides ample opportunities for students to use strategies</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Consistent use of scaffolding techniques throughout the lesson, assisting and supporting students understanding, such as think-alouds</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Teacher uses a variety of question types, including those that promote higher-order thinking skills throughout the lesson (e.g. literal, analytical, and interpretive questions).</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4) Interaction</th>
<th>Highly Evident</th>
<th>Somewhat</th>
<th>Not Evident</th>
<th>Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent opportunities for interaction and discussion between teacher/student and among students, which encourage elaborated responses about lesson concepts</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Grouping configurations support language and content objectives of the lesson</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Table 3.1. (continued)

| Consistently provides sufficient wait time for students response | X |
| Ample opportunities for students to clarify concepts in L1 | X |

There was no evidence of the use of any of the strategies described in the protocol in the videotaped classes. Although, there were some attempts to use scaffolding techniques, these were only seen through the teacher aide while assisting and providing support to ELLs to help them understand the tasks. The teacher aid explained in Spanish the task: “Fijate lo que vas a hacer,…como vas a medir aquí?”. (Pay attention to what you have to do….how are you going to measure here?). The questions that were observed were interpretive questions those to check for understanding. For instance in a class describing the different methods to test the hardness of a mineral, the teacher tried to get students hypothesized about the results of the task by asking questions like “how does it feel if you scratch my table top?”, “do you think you could scratch it?”, “how about using a nail?” etc. The teacher used students’ answers even if they were wrong to keep building from there and did not discouraged students from answering even when they were incorrect.

Table 3.2. Practice Application and Lesson Delivery

<table>
<thead>
<tr>
<th>5) Practice/ Application</th>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides hands-on materials and/or manipulatives for students to practice using new content knowledge</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Evident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat Evident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Evident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3.2. (continued)

| Provides activities for students to apply content and language knowledge in the classroom | X |
| Uses activities that integrate all language skills (i.e., reading, writing, listening, and speaking) | X |

**6) Lesson Delivery**

| Content objectives clearly supported by lesson delivery | X |
| Language objectives clearly supported by lesson delivery | X |
| Students engaged approximately 90% to 100% of the period | X |
| Pacing of the lesson appropriate to the students’ ability level | X |

There were plenty of hands-on activities during these classes to practice using the new content knowledge, but it was also observed that ELLs did not have a clear idea of the purpose of the activities, something that was evident when ELLs asked each other in Spanish: “Qué hacemos?” (What are we doing?). This also links to the concept of students not having the content and language objectives clearly stated at the beginning of each lesson as the SIOP suggested.

The activities observed in these classes did provide opportunities for students to apply content knowledge in the class, but not language knowledge except in those cases where the bilingual teacher aide was present. The teacher aide, who is bilingual in English and Spanish,
usually explained the language ELLs needed to know, use and how to use it to successfully complete the task. She helped the students during the classes with grammar, and vocabulary. The content objectives were supported through the delivery of the lesson, but since these objectives were not stated from the beginning of the lesson, ELLs did not seem to notice them. There was no evidence of language objectives in any of the videotaped classes watched. Students did not engage in the class 90% to 100% of the period. During the observations, probably half of the class time students were talking to each other in Spanish about anything else but the theme of the class. Others were standing up and walking around the classroom comparing their tasks to other students or asking questions about what the next step was, and so on.

The Learning Cycle is an instructional model that is consistent with how people learn. Research indicates this model is very effective for all students (Abraham, 1992; Shymansky, Kyle, & Alport, 1983) as cited in the EASEL binder (Amana, 2005). It is said that this model progresses form concrete experience toward greater abstraction, and then asks students to apply their growing knowledge to a novel, concrete situation. However, in the nine videotaped classes watched, only some of the features described in the Learning Cycle above were mainly present in all classes, namely, physical models, and symbolic representations.

DISCUSSION

In order to have a clearer idea of the situation this science teacher was facing at the time of the study, it is necessary to understand his background, teaching practices, experience with
ELLs, his philosophy of teaching and the support he is receiving from the school and outside to serve these students.

George seemed concerned about ELLs learning struggles in his class, mainly for the lack of language proficiency he has seen this as a problem that needs to be tackled. He mentioned: “…One of the things that I wanted to tackle was the repeating students in Earth Science and Earth Science is a required class. And if students fail a semester then they got to come back to satisfy graduation requirements. And one thing that we would see is that a high population of Hispanic students failing Earth Science and so one of the things I wanted to do is try to tackle well why that is.” He considered that being the head of the Science department made him aware of the confusion among the high school science teachers regarding ELLs. He said: “…there is a lot of confusion among teachers especially in our department here at the high school about what’s the best practice…. We’re just starting in relatively new in the last few years doing things that are specific designed foe ELLs and trying to get at a solution to that problem.” He recognizes his lack of knowledge of SLA and for that reason he was using the ‘trial and error’ approach, until he attended workshops and conferences that were specifically designed for teachers of students whose language was different from English in his words; “… my consensus was you take kind of a shot gun approach to teaching and you go through and try new things …and I guess at this point, where I am at is I am just trying things that I have gotten from each one ( talking about the workshops and conferences he has attended) to see what’s working best.” He felt the conference and workshop did not help him enough because the information provided was contradictory; on one hand, the EASEL Institute, designed by Iowa State University researchers, promotes an integrated instruction model (language and content area) taking into account students’ linguistic and cultural diversity,
and provides ample practical strategies, techniques and activities to implement in the classroom. On the other hand, the Ron Rohac conference, supported by the school district, that is based on the English Only Movement and which suggests the exclusive use of English in the classrooms as the means of teaching and learning. Probably that is the main reason George did not clearly state what his philosophy of teaching is. Instead, he only mentioned that he tended to look back to the things he learned at The University of Northern Iowa where he got his B.A. in Earth Science Teaching and put them into practice in his classes. One thing he mentioned was the idea of using different teaching styles to address students’ different learning styles.

Before attending the EASEL Institute George was determined to avoid the use of Spanish in his classes. He was concerned about the common practice of ELLs copying the tasks form one another and he recognized that he thought it was disrespectful. Also, he did not allow ELLs to take notes or answer the activities in Spanish. After attending the workshop he understood that ELLs copy “to try to survive the system anyway they can.” Clearly, this situation shows that this teacher lacked training regarding SLA theories and strategies and he changed his mind after attending the workshop. He realized that this practice was not harmful because ELLs rely on L1 (their native language) when acquiring a second one mostly at the beginning stages. For instance, in the videotaped classes watched, those ELLs who did not know how to write in English relied on their classmates’ proficiency of the target language to complete the tasks in the classroom. The use of L1 with ELLs is in most cases a good technique that helps lower the anxiety level in the class at the same time that promotes the use of ELLs’ background knowledge to link it to the new one.
A similar situation the teacher talked about was the misconception other teachers have when ELLs nodded their heads during class time, he said: “...I noticed that every time I talked to them (ELLs) at the beginning, and I am just talking in English, they are just sitting there nodding their heads and most teachers take that as a compliment that they understand what’s going on and it’s just the actual reverse you know there’s absolutely nothing getting through and they are just being polite so not to offend anyone. So we’ve had conversations with students to say don’t give that up and down if you don’t understand what I’m talking about, rather you just say I don’t get it and then we’ll figure out a way for you to get it.” This example shows that this teacher is noticing some of the strategies ELLs are using to avoid showing and being exposed due to their lack of English language knowledge.

George’s knowledge of ELLs’ educational and language background consisted of several informal conversations he had with the EL teacher. However, he was intrigued in knowing what the motivations for teaching science in ELLs’ places of origin were. Having this kind of information might provide him with elements to use in his class, linking students’ previous experiences with science and the new scientific content he is trying to teach. This could lead to a more integrated class in which language and content develop at the same time.

Science education researchers have provided evidence of the importance of recognizing and including in the lessons the linguistic and cultural experiences students have (Lee, 2001; Warren, Ballager, Ogonowski, Rosebery, & Hudicourt-Barnes, 2001). This implies that is important for teachers to be familiar with ELLs cultural and linguistic background so they can include these factors in their classes.

In the last two decades several attempts to reform the way science is taught from having students memorizing concepts and formulas to help them become critical thinkers. With the
No Child Left Behind Act, policy makers simply call for change without guidelines to support teaching and learning. While researchers proposed a long term change including; established visions for science learners; standards for content, and assessment; standards for science teaching, professional development, programs, and systems (the American Association for the Advancement of Science (AAAS) and the National Science Teachers Association (NSTA) (working in conjunction with the National Research Council [NRC], 1996). Researchers have shown that there are ways to improve what has been done so far, but they realized that their project is constrained to time and budget. Meanwhile, teachers and students in general and ELLs in particular are caught in the middle of this battle, not knowing, like the teacher in this study, what to do.

Summarizing, research has shown that the teaching practices observed in this study reflect a current trend in many schools across the United States. Also, research has suggested the integrated instruction model as an effective one to improve these practices. The purpose of this study is not by any means to blame the teacher for the things not been done, its purpose is to inform stakeholders involved in this process- i.e. administrators, policy makers, principals, and other science teachers- how science has been taught to ELLs in this particular setting by this particular teacher. It is hoped that this information would help make the necessary changes on the current teaching practices in the science classroom, and to provide professional development support for teachers serving these students. It is the only way to help ELLs succeed academically and to narrow the gap between them and their American mates.
CHAPTER 5
LIMITATIONS, PRACTICAL APPLICATIONS, AND SUGGESTIONS FOR FURTHER RESEARCH

LIMITATIONS OF THE STUDY

There are some limitations in the study presented here. First, I only watched the video tapes of the science classes used as part of the data as opposed to observed the actual classroom. This may leave important information out from the researcher since the camera was static in one position all the time. I could not follow the teacher around the classroom to get more information about how did he help his Mexican students. As I mentioned before, the interviews were part of a larger project, with a different focus. As a result, I did not have the opportunity to ask more questions or to build on answers. Finally, an interview with the schools administrators needed to be done which provided with information about the current school policies regarding ELLs and the support the school is providing to teachers’ professional development. Unfortunately and due to time and budget constrains this was not possible.

PRACTICAL APPLICATIONS

The information gathered from this study suggests that there are a lot of factors influencing this teacher teaching practice. He is an experienced science teacher, he knows the scientific genres but he lacks the appropriate language training to address these students, he does not know how to integrate language and content, even though he has attended the EASEL conference in which all the components of design, planning, and lesson delivery for these specific students were addressed, explain and model. And this is one of the main claims
research has shown about teachers being unprepared for ELLs and who do not take into account research-based pedagogies for implementation in their own classes because they are not used to the idea of changing their teaching practices (Beck & Allexsaht-Snider, 2002; Hamman, 2002; Zuniga, et al., 2002). Also this teacher lacks of knowledge regarding SLA theories and strategies and this stopped him from using them to benefit his students. For instance, instead of using Spanish words as commands in his classes or numbers in Spanish to give instructions or to show a result, he could use phrases in Spanish that included content language to keep students motivated and he could do this with the help of the bilingual teacher aide. Another example could be allow students to take notes in Spanish and have them translate them to hand-in their assignments, this could be done in pairs or small groups and by doing this students through scaffolding and collaborative work (Valdes, 2001)

One important support this teacher had in his classes that had been underused is the bilingual teacher aide. The science teacher recognized that she helps him a lot but she could be doing more things other than help students in class. For instance, if they met regularly, and the teacher let her know in advance the themes they would be seen, she foreseeing possible problems could prepare supporting materials for ELLs that include, like in the videotaped classes watched, content language and objectives, instructions, explanations, etc. As a result she would cut the time the teacher spends repeating instructions and explanations and ELLs would have enough time to finish the tasks during the class time. The collaboration between the Science teacher and the bilingual aide in crucial for the success of this proposal also these lessons should include strategies to promote ELLs’ critical thinking using the scientific genres previously described, plenty of opportunities for students to practice language and content in all language skills, it should follow the pre, while, and post model to allow
students activate their prior knowledge, enhance them in the task, and assess their performance.

Summarizing, is the teachers’ responsibility to make sure his students are learning what they are supposed to, and give all the support they need to accomplish that objective. This should include a change in his teaching practice. He needs to include language and content strategies in his classes that promote students’ academic achievement. Also it is the school responsibility to provide the teacher with more conferences and workshops that show him current methodologies for him to implement in his classes. Finally a supportive and collaborative network between all science teachers, the ESL teacher, and the teacher aide in this high school needs to be created to share information about ELLs, experiences in the classes, to suggest techniques, and to serve ELLs as an academic body.

SUGGESTIONS FOR FURTHER RESEARCH

What will be really helpful would be a study following a teacher before and after the professional development training supported with student’s assessments before and after the training to really notice if a change is happening and this would help to obtain data to document improvements.
REFERENCES


Association for the Advancement of Science (1989): *Science for All Americans: Project 2061*


Bolten, K.A. (2003, February 4). District’s minority students ‘‘in the majority.’’ Des Moines Register, 1ff.


Richardson, B., K. et al. (Forthcoming). On pigs & packers: Problematizing the practice of science with Mexican immigrant students. *Cultural studies of science education*.


APPENDIX

Observer(s): __________________________ Teacher: __________________________
Date: __________________________ School: __________________________
Grade: __________________________ Class/Topic: __________________________
ESL Level: __________________________ Lesson: Multi-day Single-day (circle one)

Total Points Possible: 120 (Subtract 4 points for each NA given)
Total Points Earned: __________ Percentage Score: __________

Directions: Circle the number that best reflects what you observe in a sheltered lesson. You may give a score from 0-4 (or NA on selected items). Cite under “Comments” specific examples of the behaviors observed.

<table>
<thead>
<tr>
<th>I. Preparation</th>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Clearly defined <strong>content objectives</strong> for students</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2. Clearly defined <strong>language objectives</strong> for students</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3. <strong>Content concepts</strong> appropriate for age and educational background level of students</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4. <strong>Supplementary materials</strong> used to a high degree, making the lesson clear and meaningful (e.g., computer programs, graphs, models, visuals)</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5. <strong>Adaptation of content</strong> (e.g., text, assignment) to all levels of student proficiency</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6. <strong>Meaningful activities</strong> that integrate lesson concepts (e.g., surveys, letter writing, simulations, constructing models) with language practice opportunities for reading, writing, listening, and/or speaking</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Comments:

<table>
<thead>
<tr>
<th>II. Instruction</th>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1) Building Background</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>7. Concepts explicitly linked to students’ background experiences</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8. <strong>Links explicitly made</strong> between past learning and new concepts</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>9. <strong>Key vocabulary emphasized</strong> (e.g., introduced, written, repeated, and highlighted for students to see)</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Comments:

<table>
<thead>
<tr>
<th>*2) Comprehensible Input</th>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Speech appropriate for students’ proficiency level (e.g., slower rate and enunciation, and simple sentence structure for beginners)</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>11. <strong>Explanation of academic tasks</strong> clear</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>12. Uses a variety of <strong>techniques</strong> to make content concepts clear (e.g., modeling, visuals, hands-on activities, demonstrations, gestures, body language)</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Comments:

<table>
<thead>
<tr>
<th>*3) Strategies</th>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Provides ample opportunities for students to use strategies</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Comments:
14. Consistent use of scaffolding techniques throughout lesson, assisting and supporting student understanding, such as think-alouds

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

15. Teacher uses a variety of question types, including those that promote higher-order thinking skills throughout the lesson (e.g., literal, analytical, and interpretive questions)

Comments:

4) Interaction

16. Frequent opportunities for interaction and discussion between teacher/student and among students, which encourage elaborated responses about lesson concepts

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

17. Grouping configurations support language and content objectives of the lesson

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

18. Consistently provides sufficient wait time for student response

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

19. Ample opportunities for students to clarify key concepts in L1

Comments:

5) Practice/Application

20. Provides hands-on materials and/or manipulatives for students to practice using new content knowledge

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

21. Provides activities for students to apply content and language knowledge in the classroom

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

22. Uses activities that integrate all language skills (i.e., reading, writing, listening, and speaking)

Comments:

6) Lesson Delivery

23. Content objectives clearly supported by lesson delivery

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

24. Language objectives clearly supported by lesson delivery

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

25. Students engaged approximately 90% to 100% of the period

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

26. Pacing of the lesson appropriate to the students' ability level

Comments:

III. Review/Assessment

27. Comprehensive review of key vocabulary

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

28. Comprehensive review of key content concepts

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

29. Regularly provides feedback to students on their output (e.g., language, content, work)

<table>
<thead>
<tr>
<th>Highly Evident</th>
<th>Somewhat Evident</th>
<th>Not Evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

30. Conducts assessment of student comprehension and learning of all lesson objectives (e.g., spot checking, group response) throughout the lesson

Comments: