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English language learners in the integrated middle school science classroom

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English language learners in the integrated middle school science classroom

Abstract

This paper will answer three questions relating to limited English-proficiency students. First, what historical changes have occurred to improve education for the LEP student? Second, what information do teachers with adolescent LEP students, especially students who have recently immigrated, need in order to run a happy and successful class? Last, what strategies and philosophies should be used to help ESL students compete academically with their American born classmates?

**English Language Learners in the Integrated Middle
School Science Classroom**

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MAE: Professional Development
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English Language Learners in the Integrated Middle School
Science Classroom

Chapter One

Introduction

English as a second language (ESL) was a class offered to teachers in the 1970s, but not one that future teachers expected to use. In 1979, only a handful of ESL students existed in the Waterloo Schools, and those were primarily refugees from Laos and Viet Nam. One ESL teacher worked in the middle schools, and ESL students were placed in regular classrooms to allow the ESL teacher a lunch break, and a planning period. This author, a former remedial reading teacher, was given a class of two Laotians, two Vietnamese, and two Hispanic middle school students. With no experience, guidelines or curriculum, it was sometimes a question of who was teaching whom. There was a lot of gesturing, arguing, and learning. It proved to be a valuable experience. It wasn't until 1998, when an influx of Bosnians entered Waterloo, that general education classroom teachers were faced with the challenge of classes integrated with ESL students.

Math and science classes were the first to integrate these students. At first, students were just being socialized, but as their English and the ESL program improved, a greater effort was made to educate these children. Many of these students had been

in relocation camps or living in Germany and had no experience with science. Their life was that of survival, not of the scientific method, experiments, or labs. Certain noises or topics could send a student into hysterics because of flashbacks. Inservices on teaching these new students were short but frequent. Developing a new teaching style was essential, but there was little expertise within the district. The first wave of students has now graduated or dropped out, but the students visit and share their memories. The success stories are exciting and fill teachers' hearts with pride, but it is the failures that keep teachers awake at night wondering what we need to do to meet the needs of all ESL students.

Statement of Research Question

Suddenly, immigrants to the United States are nothing new. Our nation is built on the blending of many rich heritages from countries throughout the world. This diversity adds greatly to the American classrooms.

The educational plight of immigrants can be chronicled from the 1860s to the present through the United States Judicial System. Legislation has changed as the number of immigrants and foreign-born children has increased. Larger urban areas have dealt with limited English-proficiency (LEP) students for years; now rural schools that once had classrooms filled with only

English-speaking students find themselves with an unprecedented influx of LEP students.

Curricular modifications to meet the needs of these students are essential, but are either slow to happen or not supported by the district. Teachers still have had to adjust to these needs with very little professional development or inservice.

Modifying instruction takes the forefront, allowing educators limited time to get to know the background of their students and their families. Best practice for LEP students is another area which teachers have limited exposure. Additionally there is a pedagogical debate on which strategies are most effective.

This paper will answer three questions relating to limited English-proficiency students. First, what historical changes have occurred to improve education for the LEP student? Second, what information do teachers with adolescent LEP students, especially students who have recently immigrated, need in order to run a happy and successful class? Last, what strategies and philosophies should be used to help ESL students compete academically with their American born classmates?

Definition of Terms

Equal Educational Opportunity Act (EEOA): Legislation was passed in 1974 barring segregation and making it mandatory to provide equal educational opportunities to students with language barriers.

English language learners (ELL): Students in the process of learning English.

English as a Second Language (ESL): Teaching English to LEP students; teachers have training in language acquisition and in language teaching skills but are not fluent in their students' native languages

ESL Pull-out: Pulls students out of the mainstream class for a part of the day to receive ESL instruction.

Limited-English-proficiency (LEP): those from language-minority households who are not proficient in English.

No Child Left Behind of 2001 (NCLB): An act designed to close the achievement gap with accountability, flexibility, and choice.

Realia: Concrete, hands-on materials such as rock samples, bones, or feathers

Sheltered English or Content-based programs: Uses English adapted to the students' level of comprehension along with gestures and visual aids to provide content area instruction.

Structured Immersion Program: Use English to instruct, but teachers have a bilingual education or ESL credentials and understand the students' native language

Title VI: Part of the Civil Rights Act of 1964 prohibiting discrimination on the basis of race, color, or national origin

The terms limited-English-proficiency (LEP), English as a second language (ESL), and English Language Learner (ELL) are often used synonymously. The LEP and ELL students are learning English, while ESL denotes a program used in teaching English to LEP or ELL students.

Chapter II

Review of Research

Legal History of Limited-English-Proficiency

Limited-English-proficiency (LEP) is defined as a person, in this case a student from a language-minority household, who is not proficient in English (Berman, Minnicucci, MacLaughlin, Nelson, & Woodworth, 1995). LEP students can be immigrants just coming to the United States or they can be American-born with English not being the first language spoken in the home. The ratification of the Fourteenth Amendment in 1868 could be considered the beginning of acknowledgement for limited English-proficiency students. It gave all citizens a chance for life, liberty, and a right to legal protection under the law.

Historically, LEP curriculum consisted of students being subjected to an immersion or "sink-or-swim" philosophy; remedial programs were few with students being held at the same grade level until they were able to master the subject area (Texas Education Code, 1999). In 1954, *Brown v. Board of Education* 347 U.S. 483 (1954) overruled the *Plessy v. Ferguson* case, a landmark case in 1896 that required separate but equal facilities for blacks and whites (Cozzens, 1999). *Brown v. Board of Education* required not only desegregation of American schools, but it also stated ". . . where a state has undertaken to provide an opportunity for an education in its public schools, such opportunity is a right which must be made

available to all on equal terms (Mora, 2002, Para 2). This landmark decision applied to all minorities, including LEP students, requiring states to provide equal education to all children; however, it did little to change the way LEP students were educated.

Laws dealing with integration and the rights of minority students continued to make progress in the 1960s. The Civil Rights Act of 1964: Title VI prohibited discrimination on the basis of race, color or national origin, but did little to hold schools accountable for struggling immigrants, most of whom are LEP. Four years later, The Bilingual Education Act, Title VII of the Elementary and Secondary Education Act of 1968 provided supplemental funding for school districts so that they could put into practice programs to address the unique educational disadvantages encountered by non-English speaking students (Mora, 2002; Texas Education Code).

Though the Bilingual Education Act provided the impetus for addressing the needs of the LEP students, it wasn't until 1970 that much progress was made. The Office of Civil Rights, in their May 25, 1970 memorandum, put some teeth into the English Language Learner (ELL) program. All school districts with five percent or more LEP enrollment were notified of the interpretation of the Title VII regulations. The first interpretation said that districts must take steps to rectify the language deficiencies in order to open their instructional

programs to these students. The second interpretation said that LEP programs must not assign their students to classes for the mentally retarded due to language skills. Thirdly, any grouping or tracking system employed by the school system to deal with special language skills must meet those needs as soon as possible and must not run on an educational dead-end or permanent track. The last interpretation said that schools have a responsibility to notify all parents about school activities which are called to the attention of other parents even if those messages have to be translated to other languages (Taber 2003).

In 1974, though Title VII regulations were being enforced, LEP students were still not receiving the help they needed to be successful academically. A group of LEP students of Chinese ancestry living in San Francisco filed a class action suit, *Lau v. Nichols*, stating that being given the same facilities, textbooks, teachers, and curriculum, but not understanding English, closed them to a meaningful education. Of the 2,800 Chinese students in San Francisco, only 1,000 received supplemental English instruction. The lower court did not see this as a violation of the 14th Amendment, but the US Supreme Court overturned their ruling on this case citing Title VI of the 1964 Civil Rights Act and the 1970 OCR Memorandum (Mora, 2002; Taber, 2003). The Equal Educational Opportunity Act of 1974 (EEOA) was adopted a few weeks after the *Lau v. Nichols* case. This law said that educational agencies must take

appropriate action to overcome language barriers that impede equal participation by students in its educational programs.

While this amendment spoke to the *Lau v. Nichols* suit, it did not define "appropriate action." The Department of Health, Education and Welfare (HEW) established some basic guidelines in 1980 for schools with LEP students. These guidelines were referred to as the Lau Remedies or Lau Mandates; however they were discontinued in 1981 by the Reagan Administration (Mora 2002). Thus, by the late '70s, the major concern with ELL classes was no longer if classes should be established, but what type of program was best for LEP students.

In 1978, the *Guadalupe Organization v. Tempe Elementary District #3* (Lyons, 1988) again brought up the issue of "appropriate action." The plaintiffs from the Guadalupe Organization claimed that their students, Mexican American and Yaqui Indian, had been denied bilingual instruction that allowed them to be competent in both English and their native language. They demanded that such instruction include all courses of instruction, testing procedures and instructional materials. They also insisted that ". . . the district reflect in its program of instruction the particular history of the parents of each child attending the school" (Lyons, 1988, Para 3). A district court rejected this suit, and it was sent to the Ninth Circuit Court of Appeals. They upheld the District Court's decision stating ". . . there exists no constitutional duty

imposed by the Equal Protection Clause to provide bilingual-bicultural education" (Lyons, Para 4). It further stated that ". . . diversity limits unity" (Lyons, Para 4) making the point that diversity, while having its advantages, can also impede the progress of public education. The Courts found no reference in the Constitution that required or prohibited bilingual and bicultural education.

There were many more lawsuits arguing what was the best type of LEP program. In 1981, *Castaneda v. Pickard* addressed the long standing question: what is "appropriate action?" In this lawsuit, parents charged that a Texas school was violating their children's rights by "ability tracking" the students, thus causing segregation of Hispanic students (Lyons, 1988; Taber, 2003). The Courts agreed with the plaintiffs and formulated a three-part test to measure compliance with the EEOA requirements. First, a program needs to be in place that shows sound educational theory as recognized by some experts in the field or a legitimate experimental strategy. Secondly, sufficient and qualified staff must implement the program. Lastly, a system needs to be in place to evaluate the program's effectiveness. This criteria was mandated by the Fifth Circuit Court of Appeals whose jurisdiction included Texas, Louisiana, and Mississippi; however, the ruling has been applied in different states and still provides important criteria for determining schools' compliance with the EEOA of 1974 (Lyons).

In 1982, the Supreme Court ruled that public schools were prohibited from denying immigrant students access to a public education. The Plyler vs. Doe ruling obligates all schools to allow undocumented immigrant students the right to a free, public education. Schools are not allowed to ask students for Social Security numbers nor are parents required to produce a Social Security number to qualify for the Free and Reduced Lunch Program (Carrera, 1999). Schools are not allowed to release any information about students to the Immigration and Naturalization Service unless they are served with a valid subpoena. Non-legal immigrant students also should receive all of the services of an ELL student. According to the 2000 Census, this ruling currently benefits over 1.1 million undocumented K-12 students (Fix & Passel, 2003).

With the three-part test in place from *Castaneda v. Pickard*, concern turned to teacher training with the 1989 META Agreement. The Multicultural Educational Training Advocacy Inc. (META), along with nine other agencies sued the states of California, Texas and Florida with concerns about the lack of appropriate standards, curriculum and teacher training (Taber, 2003). Since this suit, Florida requires all teachers to have English Speakers of Other Language (ESOL) training. The time requirement varies for each subject area, but is consistent throughout the state.

On August 30, 2000, the Office for Civil Rights (OCR) released a document stating the most current guidelines for working with LEP students (U.S. Department of Education, 2000). "Title VI of the Civil Rights Act of 1964; Policy Guidance on the Prohibition against National Origin Discrimination as It Affects Persons with Limited English Proficiency" combines the OCR's 1970 Memorandum and the results of *Castaneda v. Pickard* on serving LEP students. In order to serve LEP students effectively, a district must:

- identify students who need assistance;
- develop a program which has a chance for success;
- ensure that there is a proper curriculum and staff;
- develop appropriate assessments and program exit criteria;
- assess the progress of the program and modify the program as necessary.

The report specifically mentions *Lau v. Nichols* and the fact that the same curriculum and facilities are not enough; if a student doesn't understand English they are "effectively foreclosed to meaningful education" (U.S. Department of Education; Lyons, 1988).

Limited-English-proficiency students have gained much ground since the ratification of the 14th Amendment in 1868; however, new legislation has yet to be challenged. In 2001, the No Child Left Behind Act (NCLB) made all states accountable for their LEP students through testing. Under NCLB, LEP students will be

assessed on comprehension, speaking, listening, reading and writing in English (U.S. Department of Education, 2002). It still remains to be seen how effective schools will be in implementing programs to assist students in becoming proficient in the affected areas.

What Every Teacher Should Know

Richard Ruiz stated, "The idea that one can prepare teachers for classrooms in which all students speak English is a fantasy, yet we continue developing programs as if the fantasy were true" (Avila-Rubinstein, 2003 p.6). The American classroom has seen a dramatic change over the past decade due to the increasing diversity among the nation's population (Garcia, 2000). Children of immigrants now make up one in five students in grades kindergarten through 12 (Fix & Passel, 2003). While legislation has undoubtedly helped LEP students, they still remain at-risk due to a variety of factors including teachers' inexperience. According to the National Center for Educational Statistics, out of 3 million public school teachers, only 12.5% have received eight or more hours of training in the instruction of LEP students (Fu, 2004). Teachers need to understand why the concern for educating LEP students has increased, factors that make learning more difficult for limited-English-proficient students to learn, and simple steps educators can take to make a more comfortable learning environment.

Why the concern for LEP education has increased.

The social and economic reality at the turn of the 20th Century for adolescent immigrants differs drastically from that at the turn of the 21st Century. Then, education was not a necessity for a good job. The adolescent immigrant was quickly absorbed into the work force consisting of factory and mill workers. These adolescents were able, through hard work, to realize the American dream of owning their own home and providing a better life for their children. In today's economy, skilled and educated workers earn the top-level jobs, while students with high school diplomas and limited literacy skills are left with poor paying jobs and a restricted chance for advancement (Avila-Rubinstein, 2003). In order to be successful in today's economy and not become a burden to taxpayers, adolescent LEPs need to obtain higher levels of education and develop solid proficiency in English.

What makes it more difficult for LEP students to learn.

Teachers must realize that there is no typical LEP student. Students can get lumped together by their culture and are overlooked as individuals (Avila-Rubinstein, 2003). However, many variables make up these learners. Forty to forty-five percent of LEP students are foreign born while the remaining

fifty-five to sixty percent are native born (Fix & Passel, 2003; Garcia, 2000).

A parent's proficiency in English is one major factor in a LEP student's success in school. Educators sometimes incorrectly assume that all LEP students are children of immigrants. Native American and Mexican American families may have lived in their communities for numerous generations, but many are still not proficient with the English language. If a parent is not proficient with the English language, then it is doubtful that the child has had any pre-reading support such as being read to out loud, rhyming, or educational games. Research shows that LEP students, who have not had pre-reading support, high quality daycare, and early childhood services, start school at a disadvantage, and it gets continually worse throughout their school career as opposed to their more advantaged and typical English proficient peers (Garcia, 2000).

Schooling in their native country is a second major variable in English language acquisition for immigrant LEP students. Limited-English-proficiency students who have attended school and have learned in their native language bring with them a background and experiences that will help them in the American classroom (Cornell, 1995; Tekavec, 1995; Torres, 2001). If their parents are well educated, then the parents can better understand and provide the support needed for their child's education. Garcia says that one can infer that LEP students who

arrive at school with experiences in their native countries probably have a high level of native language skills, and perhaps an acquaintance with English. On the other hand, children who have immigrated due to unrest in their countries may have little, if any, educational experiences due to frequent disruptions. Again, students with limited education in any language start behind their English proficient peers and often stay behind them academically throughout their school careers.

Poverty is the third variable associated with language acquisition. In the year 2000, foreign-born and U.S.-born children of immigrants represented 20% of the total U.S. population and 25% of all low-income children (Fix & Passel, 2003). Often LEP students attend school with other poor children and research shows that schools with high concentrations of poor students tend to be poorly maintained, structurally unsound, fiscally under-funded, and staffed with large numbers of minimally prepared and unlicensed staff. These families are also likely to move at least once during the year from one school to another within the district, disrupting learning even further (Garcia, 2000). Teachers who work with poorer at-risk students generally spend more time on basic skills and repetitive drill. These lower order thinking skills are less likely to hold the students' attention and motivate them to learn. In addition, these schools generally offer limited educational technologies, as well as fewer early childhood and preschool activities.

These disadvantages make it very difficult to acquire a second language.

What teachers of integrated LEP students should know.

Helping LEP students to develop their oral language is crucial. "They cannot master the language unless they can speak the language" (Fu, 2004, p. 11). Avila-Rubenstein (2003) advocates giving LEP students ample time to work cooperatively with English-speaking peers and encourages face-to-face interaction. However, teachers sometimes assume that because students can converse comfortably in English; they are in full control of the language. Research shows however, that learning oral communication skills in a second language can take two to three years and it can take four to six years to acquire the level of proficiency for understanding language in its instructional form such as standardized testing (Garcia, 2000).

Reading and writing are key parts of language proficiency and a major part of standardized testing. No Child Left Behind legislation, while recently offering some flexibility in working with LEP students, has put pressure on schools to show significant growth with LEP students. New arrivals are exempt from being tested in English during their first year. After the one year transition period, students are tested annually and watched closely for Adequate Yearly Progress. When students are no longer classified as an English language learner, usually

after two to three years, they may remain under the subgroup of Adequate Yearly Progress for two more years (Alicea, 2004).

Educators in Fairfax County, Virginia expressed frustration with the amount of testing and paperwork involved in carrying out NCLB; they feel it significantly reduces actual instruction time with students (Alicea, 2004). While testing monitors progress and holds school districts accountable, it also can impede academic growth by limiting instructional time.

Variables such as a child's immigration status, previous educational experience, socioeconomic status, and national testing standards are not within a teacher's control, but empathy and understanding towards LEP students is something that teachers have power over. Avila-Rubenstein (2003) cites eight authors when she says, ". . . empathy and understanding are essential for students who are members of subordinate groups. In fact, the bond ELLs create with their teachers has a great impact on their achievement" (p. 6). Myriam Torres (2001) did case studies on three teacher-researchers who sought to discover the ways their LEP students learned. LEP students reported what they valued most from their teachers was the time they took to walk the new students around the room and point things out even if they didn't understand them. They also commented that when the teachers made eye contact with the translators and not the student, it made them feel they were non-people. Frank, a fifth grade teacher working on a research project with LEP students,

was quoted as saying, " When monolingual students feel accepted, then their own motivation will increase and their anxiety will be alleviated somewhat. Because of these factors, the chances that the student will be successful are incredibly greater" (Torres, 2001 p. 285).

No LEP child needs greater understanding than the refugee. A refugee is a person who has fled from the familiar, although dangerous, to the new and unknown. When children who have not completely acquired their first culture are suddenly immersed in another, they may have problems with their self-concept, identity, and the ability to distinguish between right and wrong (Vershok, 2003). Refugee teenagers are operating out of four identity systems: their native culture, becoming an American, being a refugee, and being an adolescent. At times these systems overlap but often they conflict (Ascher, 1989). Refugee adolescents' stress often manifests itself as problems in the same ways as American adolescents: gangs, drugs, suicide, alienation, and poor school achievement.

It is important for teachers to understand that underlying causes of these problems may be due to pre-immigration, migration, and post-immigration factors. These experiences may include ethnicity, class status, and the general cultural values of their native country. The conditions of their departure such as the atrocities they may have witnessed or experienced in

their countries, their escape, and migration experiences contribute to stress.

A final factor can be the adjustment to the United States. Adolescents living with their families and in a community with other refugees from the same culture can contribute positively to the change (Ascher, 1989, Ousseimi, 1995, St. Pierre 1995). School personnel should also be aware that refugee youth may cope well during their initial settlement period, but the trauma may show itself later after the basic needs of safety, housing, jobs, and language are fulfilled. It is very important in these cases for teachers to work with the parents, counselors, ESL staff and interpreters to understand the refugee's history and the families' situation (Ascher, 1989; Vershok, 2003). It also allows parents an opportunity to discuss their own stress, grief, and concern. School staff can often get parents in touch with community services such as legal assistance, charities, or job information.

Teachers also need to educate their students about the variety of cultures within the classroom and community to help with the bonding between students. Books such as *La Mariposa* (Jimenez, 1998) and *The Cello of Mr. O* (Cutler, 1999) are excellent ways to share other cultures. The internet has multiple lesson plans for these books and sites such as Teaching Tolerance (<http://www.teachingtolerance.org>), a free bi-annual publication to help teachers with ideas for discussion and

activities. Armed with background knowledge, parental support, and a tolerant classroom, teachers can make the transition easier for refugee adolescents.

Classrooms with LEP students are now the norm. Because teachers are not receiving the preparation necessary for being effective with LEP students, teachers need to request and look for inservices that give them the background necessary for working with these students. It can be something as simple as having a community leader for a particular culture come in to discuss the students' native language, customs, religious beliefs, and if appropriate, their reasons for immigrating. Poverty and immigration status can be negative factors that impede educating LEP students, and there is little a teacher can do about these variables. Empathy and compassion are variable over which teachers have power and LEP students report that a show of concern is a great motivator. Teaching all students to show understanding to their classmates creates a tolerant environment that allows all students to feel safe and learn at their own pace. It is essential that LEP students obtain a quality education in order to be a contributing member of society.

Middle School Science

The National Science Education Standards are very specific about the goal of science education. They state that all students, regardless of age, sex, cultural or ethnic background,

disabilities, aspirations, or interest and motivation in science, should have the opportunity to obtain high levels of scientific literacy (Rice, Pappamihiel, & Lake, 2004). The No Child Left Behind Act of 2001 is also mandating that schools provide appropriate assistance to all students, including LEPs (North West Regional Educational Laboratory, 2003; Rice, Pappamihiel, & Lake, 2004). The question is how do teachers meet the needs of LEP students?

There are numerous LEP programs in place to assist LEP students. Often times the same or similar programs are given different names which can cause confusion. These programs divide into four major approaches: instructional methods using native language, instructional methods using the native language as support, instructional methods using English as a Second Language (ESL), and content-based instruction. Depending on the source, these four approaches break down into multiple programs. For example, El Paso, Texas, has two types of ESL programs; one where LEP students from different backgrounds are in a self-contained class with a teacher who does not necessarily speak their native languages, the other a pull-out program where students spend part of their day in a mainstreamed program (Education Service Center Region 19, 2000). Another source, North West Regional Educational Laboratory (NWREL), discusses the three major types of ESL programs: Grammar-Based ESL, Communication-Based ESL, and Content-Based ESL (North West

Regional Educational Laboratory, 2003). A third source taken from another NWREL publication refers to only Content-Based ESL as a specific program (North West Regional Educational Laboratory, 04). Is it any wonder that teachers are confused about LEP programs?

In many districts, LEP students are integrated into content-based classes with no ESL support. Middle school science teachers will find themselves dealing mainly with a submersion program. Submersion is a "sink or swim" situation with no instructional system in place to support the LEP student. In order to meet federal standards and NCLB mandates, teachers need to find a way to meet the special needs of LEP students. Science curriculum cannot be "watered down"; LEP students must be held to the same high standards as their non-LEP peers. Yet, Verplaetse's research in 1998 found that "teachers often do not pose such higher level questions to ELLs, engaging in a 'benevolent conspiracy' intended to save ELLs from embarrassment, but consequently deprives them of learning opportunities" (Rice, Pappamihiel, and Lake 2004, p. 121).

One way to address this problem is to use content-area material as a medium for language and science development (Riggs & Allen, 1989). Content-based instruction is also known as structured immersion, content-based ESL, and sheltered English. Regardless of the name, content-based instruction involves teaching grade-level science, or any content area, in ways that

are comprehensible and engage students academically, while increasing English language development (North West Regional Educational Laboratory, 2003). There are many approaches to developing content-based programs. They include lesson plan adaptation, differentiating instruction, activity based learning, language acquisition theory, and structured programs such as Cognitive Academic Language Learning Approach (CALLA) and sheltered content instruction.

Adapting plans include several steps. First of all, teachers need to analyze the language demands of their lesson. Unknown vocabulary for LEP students can be considered "content obligatory" or "content compatible." A science teacher can teach the concept of scientific method without the student having a clear understanding of the term "hypothesis"; this is "content compatible." A teacher, however, cannot teach the concept of rain if the child does not understand the word "water"; that is an example of "content obligatory" (Rice, Pappamihiel, & Lake, 2004). Secondly, the instructor needs to match the objectives with the students' language proficiency. The objective may need to be more concrete for a LEP student (Rice, Pappamihiel, & Lake, 2004) and students may need to be placed in small homogeneous groups that would allow students to interact and carry out the objective. An interpreter could help with this process, but would not be necessary (Riggs & Allen, 1989).

Brown and Bentley (2004) suggest the best way to bridge the achievement gap between LEP and regular education students is by differentiating instruction. Differentiating instruction is a concept-focused approach to planning; it can be taught to a class while still meeting students' individual needs. It usually offers tiered sense-making activities for content learning to address the differences in students' readiness and interests. This can be achieved through inquiry-based investigations (Brown & Bentley, 2004). It uses the idea of constructivism and allows students to investigate and hypothesize using the data that they have accumulated. This style takes students away from the textbook and allows them to have real life experiences (Brown & Bentley, 2004).

Differentiating instruction can be facilitated by collaborating with ESL teachers with mainstreamed LEP students. When an LEP student is integrated into the class ". . . we cannot expect that these students will simply walk into our rooms, join our chorale, and immediately start where we are (Fu 2004, p. 9). The ESL teacher usually has a better understanding of the child's background and language needs while the content area teachers know what knowledge is needed to bring the student up to grade level. The two teachers should meet regularly to assess their students' language and content progress. From there, goals can be established for individual students and

suggestions made for making the subject more coherent for the LEP students (Fu, 2004).

Application instead of text is a popular theme when discussing LEP education. Hudelson, (Riggs & Allen, 1989) in her five principles for developing learning activities, focuses on activity-based learning. She states that students learn content and language by being active and not through isolated practice. She also encourages using oral and written language in a variety of ways and for a variety of purposes. According to Hudelson, (Riggs & Allen, 1989) reading and writing authentic texts and developing background knowledge through other texts will lead to greater science knowledge. For example, when teaching a unit on nutrition students should keep logs of their food intake for a day. These logs would then be shared in small groups and menus could be created reflecting the foods they like to eat and the foods that are nutritious. Students could also bring in cereal boxes and read the label for nutritional elements. Content learning takes place through language skills such as discussion, reading, writing, and listening.

Language acquisition theories concentrate on four key principles: increased comprehensibility, increased interaction, increased thinking skills, and the use of native language. Increasing comprehensibility draws from Stephan Krashen's idea of comprehensible input. In order to make content more understandable, teachers need to include nonverbal clues such as

pictures, realia (concrete examples), gesturing and intonation cues as well as graphic organizers, and hands-on learning opportunities (North West Regional Educational Laboratory, 2003). In the second principle, increased interaction, students need to discuss real-life situations in small groups, large groups, and one-to-one interactions to increase their language skills. The third principle, increasing thinking skills, requires students to develop higher order thinking skills and will be covered in greater details when discussing the CALLA program. The final principle is using the students' native language. Research has shown the advantages of incorporating students' native languages into their instruction (North West Regional Educational Laboratory).

CALLA

The CALLA program takes many of the principles of language acquisition and places them into a structured framework. The Cognitive Academic Language Learning Approach was designed to assist students with the transition from ESL or bilingual programs to grade-level content classrooms. This approach points out that science is difficult for LEP students because it's very different from students' previous English experiences, textbooks become increasingly complex, all four academic language skills are required, and student's previous misunderstandings about

science can get in the way of learning (Chamot & O'Malley, 1994).

One chapter of the CALLA book is dedicated to the teaching of science and explains in detail how to begin a CALLA program. The school's curriculum is not used; instead a middle school CALLA teacher would select one area of science study and develop a year long thematic unit that would have application across life, physical, and earth science. The American Association for the Advancement of Science's Project 2061 lists its recommended themes as systems, models, constancy, patterns of change, evolution, and scale. Once the theme is established, the CALLA teacher sets up units that tie into the theme.

Every CALLA unit starts off by sharing students' prior knowledge. Teachers make note of any misconception so that they can be addressed later. Resource materials such as library and reference books, realia, computer programs, photos, and bulletin boards are made available and teachers make sure they have the appropriate materials for hands-on activities and experimentation. Activities are based on using the science process skills. The CALLA instructor encourages students to increase their language skills by planning activities that utilize discussion, listening, describing observations, reading graphics, and text information, and writing about science experiences (Chamot & O'Malley, 1994). A variety of learning strategies are used to implement the science process activities.

The CALLA handbook supplies a checklist of strategies in the areas of asking questions, making hypotheses, collecting data, recording data, and solving the problems. Students are encouraged to elaborate, plan, infer, cooperate, classify, take notes, summarize, and self-evaluate.

The framework used in CALLA includes five sequential phases. The first phase is preparation. The teacher and students brainstorm and create a graphic organizer that illustrates the students' knowledge about the topic. Presentation is the second phase. The teacher presents a demonstration or experiment that engages the students' interest. Students then move into the third phase, the practice segment, where they explore the phenomenon by trying out different experiments. This allows them an opportunity to practice using process skills such as observing, classifying, measuring, communicating, predicting, and inferring. During the fourth phase, evaluation, students generate opinions and explanations for the phenomena they observed. This prepares them for the final phase, expansion. Expansion allows the student to continue their inquiry through observations and experimentation using the science process skills. Students can also broaden their schema by searching out both print and non-print materials (Chamot & O'Malley, 1994).

Research for the CALLA started by asking effective language learners what methods or "special tricks" they used for learning English. These strategies were then taught to other LEP

students. The research convinced the authors that most students can benefit from instructions in learning strategies. Since the focus of this approach is metacognition, assessments should be performance based and should reflect process rather than progress. A strong emphasis is placed on student and teacher self-evaluation and checklists are provided (Chamot & O'Malley, 1994).

Sheltered content instruction.

Sheltered content was developed by Stephen Krashen as a way to use language acquisition strategies while teaching content. It is content-based instruction with many similarities to CALLA and is designed to teach content matter to LEP students using comprehensible language, content, and information taught by a certified content area teacher trained in ELL.

The word "shelter" indicates it provides refuge from the mainstream classroom (Echevarria & Graves, 2003). Like the CALLA program, sheltered instruction is not designed for an integrated class, it is used only with LEP students. Unlike CALLA, sheltered instruction does not have guidelines for science specifically; it gives guiding principles for how to use it in all content areas. Sheltered instruction incorporates effective instruction used in all classes with unique features designed to assist LEP learners. This program is divided into three parts that make a quality lesson: preparation, instruction, and

review. An observation sheet (Echevarria & Graves, 2003, p. 56) lays out the format and is easy to follow.

When preparing for a sheltered instruction lesson instructors need to make sure they have clearly defined language and content objectives for their students. The content concepts should be appropriate for age as well as for the background level of the students. Teaching a lower grade level lesson is not advisable as students will lose interest. Content should be adapted to all levels of student proficiency, and meaningful activities that integrate reading, writing, speech, and listening must be included. Supplementary materials like realia, models, books, graphs, and maps need to be a part of the classroom environment.

The instruction phase of sheltered content is broken into six different categories. First, background building needs to occur, this is developed by linking whatever concept is being taught to students' past learning and experiences. Key vocabulary should be introduced, written, repeated, and highlighted for students to see. Next, speech should be appropriate for the students' proficiency levels. Teachers need to speak more slowly, enunciate, and use simple sentence structure when presenting to students. A variety of techniques should be used to make the concept clear. Teachers should incorporate modeling, visuals, hands-on activities, gestures, and body language into the lesson. Strategies, the third phase,

should be taught and used. Scaffolding techniques should be utilized throughout the lesson and a variety of questions should be asked, especially higher order thinking level inquiries. Appropriate wait time is essential for students to think through questions and give elaborated responses. Student interaction, the fourth phase, allows ample opportunities for students' interaction and gives children situations where they can clarify key concepts in their native language. Practice is the fifth category. Activities need to integrate language skills and allow students to apply content knowledge using hands-on materials.

The final category of instruction phase is the lesson delivery. The lesson's delivery should clearly support the content and language objective. It is recommended that students be engaged for 90% to 100% of the lesson. In order to do this the teacher must have the ability to multitask. According to Echevarria and Graves (2003, p.62) teachers should have ". . . the ability to do two or more things simultaneously without having to break the flow of classroom events; a talent for moving along at a good pace without confusion or loss of focus; the ability to offer a variety of seatwork at the proper difficulty level and that maintains the students' interest and attention; and the ability to look around the classroom, select randomly, lead students in choral response, and call on everyone frequently when questioning students. In terms of organization of instruction, effective instruction is characterized by well-

planned lessons and high levels of academic engaged time." If teachers run their classes in a task-oriented, businesslike manner using small sequential steps, this huge task should be manageable.

The third and final part of the observation sheet deals with review and assessment. Key vocabulary and content should be continually reviewed. Assessments should be conducted throughout the lesson with spot checks and group response. Students should receive feedback on their output.

The sheltered content process also encourages teachers to engage in self-evaluation and to set goals focusing on areas with the lowest scores. Collaboration with school personnel is also advised to assist with planning and to make schoolwide changes.

Overall, when integrating students into a middle school science classroom, teachers need to reduce the risk of failure for LEP students. They can do this by helping to integrate the child both academically and socially into the classroom (Cornell, 1995). Teachers can initiate cooperative learning activities, but they need to be cognizant of how they partner children. While it makes sense to pair a child with a peer who has had similar experiences, it can also become a burden to always be the "child paired with the LEP kid." In order to get to know the whole class, integrated students need to take turns working with all of their classmates (Fu, 2004). Instructors can

also direct class discussion to display the LEP students' expertise in a given area. Finally, teachers need to be sensitive and work with different learning styles (Cornell, 1995). "Teachers who don't believe in using multiple books, having small-group instruction, or giving different assignments to meet individual needs shouldn't be teaching ELL students (Fu, 2004).

Chapter III

Analysis and Interpretation/Summary of the Research

Historical Changes and LEP Education

There is no doubt that LEP education has improved since 1868 when the 14th Amendment was passed. The 14th Amendment gave the right to life, liberty, and legal protection under the law; however, it did little to improve the quality of education. The legislation concerning equal education was based around race and not English-proficiency. *Plessy v. Ferguson* in 1896 allowed for equal but separate facilities in education, but history tells us that this was not true. Even the Civil Rights Act of 1964 did little to help education; it forbade discrimination, but there was no government accountability for English language learners.

It wasn't until 1968 that money was finally allocated for LEP students. In 1970, progress was seen when the OCR mandated that the programs be opened to all children, LEP students could not be placed in mental disability classrooms, and students with LEP needed to be tracked. While the intentions were good, this just led to placing students in regular classrooms with the same materials as regular education students. As one would expect, limited progress was seen. *Lau v. Nichols* brought to light the inequity of providing materials but not the help necessary to understand those materials.

It was agreed that "appropriate actions" be put in place to help students overcome language barriers, but government agencies could not agree on what was appropriate. This was evidenced by the Reagan Administration discontinuing guidelines set up by HEW in 1981.

The battle continues today over what are appropriate actions. The META Agreement established in 1989 requires teacher training in the area of ESOL. While Florida is mandating the training for all teachers, only 12.5% of the educators in the United States have had eight or more hours of training. Again, if this is what is best for students, why isn't it being enforced?

In 2000, the OCR listed yet another set of requirements. These provisions call for identification of the student, developing a successful program, ensuring proper curriculum and staff, developing assessments, and program exit criteria, and continual assessment and modification of the program. However, one year later, NCLB declares that the quality of the LEP programs can be determined by standardized test scores and funding will be based on this high stakes testing.

One of the more effective bits of legislation for LEP students was Plyler v. Doe. This case allowed non-legal immigrants the right to a free public education and the right to services provided for LEP students. Currently, 1.1 million

undocumented school-aged immigrant children are receiving services, most of whom are LEP.

From 1868 to 2005, we have seen improvement in services provided for students with limited-English proficiency. Guidelines are in place, and there is more accountability for schools than ever before. Schools need to continue to working towards educating their teachers and staff, producing quality curriculum and constantly assessing the changing needs of their LEP population.

Developing a Successful Integrated Science Class

The importance of keeping LEP students in school and making sure they are successful has never been greater than now. In the early 1900s, adults with limited-English proficiency could find their place in the job force and go on to earn adequate wages that would support a family. This is no longer a reality; to be financially self-sufficient, a command of the English language and an education are essential. Teachers need to find ways to keep their students engaged and learning.

The major philosophy adopted by American public schools is that every child should have the opportunity to obtain high levels of scientific literacy. The methods and strategies used to achieve this goal are limitless. Since all children learn differently, it is safe to assume that there is not one single strategy or program that is best. It is critical that teachers

find ways to educate themselves on how to best reach LEP students. Workshops, classes, literature, and support groups are ways that teachers can acquire the skills they need to increase their knowledge of teaching science to LEP students.

Content-based instruction is one of the most commonly used programs when integrating middle school LEP students into a science classroom. It can be adapted in countless ways although most methods involve the same high quality teaching techniques used for all students.

Assessing the child's prior knowledge is an important part of almost all programs. It allows the teacher to discover what gaps and science misconceptions about the concept exist. This fits with constructivist philosophy that promotes student reflection on their own experiences in order to construct their own understanding. "Content compatible" words can be developed throughout the unit while "content obligatory" words must be established before the LEP student begins learning about the concept.

Developing higher level thinking skills should be a priority in any sound science program. This can be achieved through real life experiences. Students are more likely to be engaged when they understand how science can affect their lives. Since LEP students may be at a different level of understanding, it is important to have lots of visuals, hands-on materials, and other pieces of concrete realia. When students are encouraged to use

the scientific method, they are delving into higher level skills such as planning, asking questions, and solving problems.

Inquiry based activities allow students to be active and involved collecting their own data and working at a level that is comfortable for them.

Educator should also find ways to include language acquisition into the science classroom. In order to learn English, LEP students need to have time to practice speaking. This can be encouraged by discussions, small groups, and one-on-one time with the teacher or a peer. It is important to remember that speech generally is mastered first; it will take students longer to be proficient in writing, reading, and listening. Students need opportunities to use their language skills. Chances to discuss with classmates help LEP students develop their own speech as well as require them to use their listening skills. Reading textbooks and supplemental materials allow students to build their knowledge and learn about varying view points on a topic. Science also provides ideas that can be utilized in writing.

Educators also need to know the background of their students in order to meet their needs. It is probably not possible for science teachers to make home visits and meet every family, but they may find ESL teachers a valuable resource. English-as-a-Second Language teachers tend to work one-on-one with students or in small groups and are able to find out more about students'

families and backgrounds. Religious organizations or refugee groups are often willing to come in and share information about a particular ethnic group, their trials, and culture. LEP parents or interpreters of the language can also be called upon to teach mini-courses about their native language, history, and culture.

The integrated science classroom needs to be a safe, inviting and well-managed environment for the LEP student. Tolerance needs to be taught, modeled, and required. Teachers need to set up opportunities for LEP students to show off their unique knowledge. It can be as simple as translating a word, sharing a memorable experience, or telling about the seasons or landforms in their native countries. It also needs to be subtly pointed out that the LEP students are not lacking in intelligence; they are simply trying to learn the same information in a language that is new to them.

Integrating middle school LEP students into a classroom takes perception, planning, and patience. Educators need to keep their eyes open for opportunities to draw LEP students into learning. They need to know their students and pursue ways to become more knowledgeable in adapting lessons. They must set high expectations for all students. Teachers must also remember that there is no one perfect LEP program and that changes and modifications are a part of effective teaching.

Programs like CALLA and sheltered content instruction incorporate the above mentioned strategies. Both of these programs are effective, but a true CALLA program does not allow teachers to follow their district's curriculum. Consequently, students can be left with gaps in their science knowledge. Sheltered content instruction does not allow for integration. While its strategies and methods are outstanding, in its pure form it can only be used with LEP students. That is why it is necessary to pick and choose the best parts of existing programs to custom fit them to a particular classroom.

Chapter IV

Implications for Practice/Applying the Research

An Integrated Middle School Science Program

An ideal science program for LEP students would have bilingual and content teachers team-teaching in a large classroom equipped with computers, videos, DVDs, photos, lab equipment, a multi-lingual library and reference books. Planning and assessment time would be equal to instructional time, and the class size would consist of 24 integrated students with supportive parents and a desire to learn. Realistically, this would never occur in a public school, so what would a quality, LEP integrated science classroom look like?

Since the science classroom is thought to be mainly hands-on, it is usually one of the first subject areas to be integrated and it is likely that LEP students will be put into an English submersion science classroom. They will be instructed entirely in English with a possibility of having an interpreter present. The LEP student may be pulled out several times a day to receive small group instruction in English language development with an ESL teacher.

The chances are high that class size will range from 25 to 40 students and contain students labeled as Talented and Gifted,

LEP, and Special Needs sprinkled in with regular education students. Classroom teachers may have experience in dealing with all levels of students, but it is unlikely they will have extensive training in any area but regular education. Due to attrition, budget cuts, and class sizes, it is very likely that the science teacher will have expertise in another content area or in elementary education and therefore will have limited science content knowledge.

No Child Left Behind legislation will target science in 2007 requiring all students to be proficient on standardized tests in science. Recent focus was placed on raising scores for reading and math. Because of this, elementary schools took time away from science and social studies programs to supplement math and reading time (Brown & Bentley, 2004). Students are coming to middle school with less science background than before. Many middle school teachers are spending more of their planning time working on increasing math and reading standardized test scores, giving them less time to plan for their content area.

When all of these factors: student diversity, lack of teacher content preparation, larger class sizes, limited student background, and minimal planning time are taken into account, teachers need to plan smarter and more efficiently. The lessons need to be challenging and yet understandable to all students with few modifications required for subgroups. They should allow students to learn and progress at their own level.

Sheltered Content Instruction and the Cognitive Academic Language Learning Approach (CALLA) have practices that could be combined and easily modified to fit any science classroom. Sheltered Content Instruction is more of a content-based language instruction, while CALLA is a task-based instructional method. These two programs encourage the use of visuals, modified texts, and experiential learning that can be adapted to a wide range of students. Along with effective classroom management, all students should be able to understand and practice science and be able to show proficiency on standardized tests.

The Classroom Environment

A classroom's environment sets the tone for the class. An organized and structured class provides the LEP students with an setting that is safe and predictable. Educators need to reflect on classroom management, time management, furniture arrangement, and areas for supplemental materials.

The first step to a successful science program is effective classroom management. One crucial aspect of management is students understand limits and requirements for their science classroom. When students understand the expectations in a structured classroom, anxiety is reduced, allowing students to be engaged (Herrell & Jordan, 2004). Teachers need to immediately establish and enforce rules and consequences for

behaviors and procedures in their classroom. Students also need to understand the teacher's expectations when it comes to independent, lab, or group work. Teachers need to establish what students should do if they have a question while the instructor is working with other children. LEP students should have a peer or interpreter available to assist them if they are struggling with a word or directions. During cooperative learning situations, students should be instructed to inquire within their group for an answer before asking the teacher for assistance. Dr. John Rosemond, a psychologist, said in a lecture in Waterloo in 2004 that students ask 80% of their questions because they don't want to take the time to find out the answers for themselves. Students need to be encouraged and sometimes even forced to "dig" for an answer.

A great deal of class time can be wasted during the transition at the beginning and ending of a science class period. Journaling or keeping a notebook with a daily science-related review question is one way to get students on task immediately and gives the teacher insight into the students' thinking. Since writing is a language skill that is often difficult for LEP students, a simple written review question is a great way to review not only current material, but information from previous units. The review journal can also be used as a preparation for standardized tests by analyzing the most frequently missed test questions and using those for review.

These questions should be discussed, corrected, and can be assessed and used as a participation grade.

Classroom arrangement is an often overlooked factor in creating an environment conducive to learning. Desks and tables should be arranged so that students have maximum space to utilize laboratory materials and participate in activities, yet be close enough to their peers so they can easily pair up. Tables or lab stations should be numbered or labeled so that groups can easily identify their assigned area. Materials should be in locations where they are accessible, and there is a flow allowing students to pick up materials and exit without wasting valuable learning time. This clearly mapped out environment helps LEP students know exactly what is expected.

Both the CALLA and sheltered instruction encourage the use of supplemental materials and realia in the learning environment. Reference and library books should be available for the students to use during class and peruse during their free time. Computers with programs pertaining to the current unit should be available for the same purpose. Posters, photos, and models of the human body, rock cycle, or planet should be on display along with student-made pictures and models. Maps and timelines also help students get a clearer sense of the topic at hand. Realia such as rock samples, batteries, light bulbs, wires, bones, fossils, shells or any concrete object that is

part of a science unit will help all students build background knowledge and vocabulary.

Strategies and Lessons

The current trend in science has students moving away from the textbook and taking a more active approach to learning science. While this is definitely a meaningful way to learn science, there still needs to be an emphasis placed on using a science textbook, thus making content area reading important. A science textbook is set up differently from textbooks in other subjects. It is important that students understand that there is a great deal of information to be gained by looking at the pictures and illustrations and reading the captions as well as the text. They need to know that bold-faced words indicate key vocabulary. Students also should practice outlining and be able to use headings and find the main idea in each paragraph. If the text is too difficult, teachers can create their own text by combining information from several texts and writing short, well-written chapters. If the budget allows, each student should have a copy of the rewritten text and should be able to write on or highlight their copy. Students with limited English can work with a partner; if the text contains unfamiliar vocabulary. While it is important to understand the use of textbooks, students need the opportunity to experience science with hands-on and real life activities. The Cognitive Academic Language

Learning Approach has a very structured five-phase framework for inquiry-based activities, whereas sheltered instruction encourages review, presentation, and practice. By blending the two, a variety of valuable learning experiences can be designed for all students.

Demonstrations are an excellent way to pique students' curiosity. After discussing air pressure, a simple demonstration might be to place a peeled, hard boiled egg on the neck of a bottle that was filled with warm water and drained. When the egg slides into the bottle, students can be asked how to get the egg out. Leading questions, testing possible solutions, and referring back to the text should guide the students to a correct outcome.

While it is important to understand the use of textbooks, students need the opportunity to experience science with hands-on and real life activities. The Cognitive Academic Language Learning Approach has a very structured five-phase framework for inquiry-based activities, whereas sheltered instruction encourages review, presentation, and practice. By blending the two, a variety of valuable learning experiences can be designed for all students.

Practice can take on many forms such as hands-on activities, experiments, skits, letters, simulations, or constructing models. Some activities can be independent while others may require a partner or a group. When grouping LEP students, they

should be with students who will make them feel comfortable and allow them to talk. The decision on how to group will vary from activity to activity. Students should have opportunities to work with a variety of students. Heterogeneous grouping may allow LEP students a chance to observe and model students who are proficient in English and may be knowledgeable with the science concept. It also allows regular education students to discover that while their LEP classmates might still be struggling with English, they possess science knowledge and background.

Homogeneous grouping can work well when students still need to converse in their first language. An interpreter can be a valuable asset in homogeneous groups, but it is still up to the teacher to make sure that the students are on task, using their English when possible, and are grasping the concepts.

Reading, listening, speech, and writing are the four language skills necessary to become proficient in English. Activities in science should include all of these key elements whenever possible. Activities should go beyond the labs suggested in the textbooks. When discussing weather, students could write and perform skits that show how to dress appropriately in cold weather, how to prevent and treat hypothermia or frostbite, or how to handle being snowbound in a vehicle. Students can make checklists on what they need to be prepared for during severe weather such as blizzards, tornadoes, or hurricanes. While exploring a unit on nutrition, students can

keep food logs, breaking them into the appropriate food groups. This is a good opportunity to discuss ethnic foods and how they fit into the food groups. Students can group their servings into the same format as the food pyramid and see how their diets compare. After studying the rainforest, students can write letters sharing their new found knowledge or asking for changes in legislation. A unit on geologic time is an excellent opportunity to learn about word parts relating to dinosaurs, and to learn basic archaeological techniques by excavating layers of gelatin or the classroom's paper recycling bin.

The activities students can do to practice a skill are limitless. It is important that instructors model the behaviors required to successfully complete the task before ever starting. Modeling should start with how students are expected to get materials and how to use them. They should understand the duty of each group member and be walked through the steps required to complete their activity. All directions should be displayed in writing so that students can refer to multi-step instructions and the teacher is free to assist groups rather than use valuable class time repeating the directions.

Assessment of LEP students should not vary greatly from that of the rest of the class. Activity results, participation, the daily science question or journal, quizzes, tests, and effort should all be a part of the student's final grade. Expecting any middle school child to regurgitate an entire unit of information

on one test is unreasonable. Assessments should be authentic and performance based, reflecting the students' science knowledge not their reading ability. Students could be asked to explain the steps in digestion, create their own lab, make a neuron out of four colors of Play-doh, or compare and contrast the inner and outer planets. When necessary, LEP students should be allowed to take their test orally. If students are able to write out their test, the teacher should avoid subtracting points for spelling, grammar, and other written language skills. A word bank could be made available or students could have access to their notes. Because standardized tests are now a critical part of a student's education, teachers need to give occasional quizzes using a standardized test format and review with the students how to select correct answers.

Teacher Reflection

Creating an LEP friendly classroom goes beyond the environment, lessons, and testing. Science teachers with integrated classrooms need to assess and reflect on their teaching. It is essential that these teachers slow down their speech by pausing for several seconds between sentences allowing the LEP students time to translate. Instructors should make sure their vocabulary is appropriate for the students' proficiency level, and synonyms should be used along with key vocabulary words until the students are comfortable with their use. It may

take an LEP child longer to decode a question, so wait time is vital.

Too many times, teachers look back at a lesson and think of how they could have made it more meaningful for their LEP students. Educators need to take more time during the planning phase of the lesson to mentally "walk through" the lesson trying to find trouble spots and modify when necessary. There is a difference between challenging and frustrating students, and the mainstream science teacher needs to realize that it is not only acceptable, but important to challenge their LEP students.

Teachers should share their background experiences and strategies with science such as think-aloud strategies, personal stories about weather, or misinformation they once had with a science concept. Educators also need to understand the importance of their silence and let students contribute their experiences.

As the number of LEP students continues to increase dramatically in the United States, science teachers will be faced with greater demands of integrating LEP students. Trying to teach a class within a class is rarely effective and extremely time consuming. Teachers need to continually keep informed about new teaching styles, techniques, and strategies; however they must avoid trendy teaching styles. No one method works for all students. If they are building language skills, working on thinking skills, and keeping students engaged; they

will always be effective no matter how diverse the group.
Quality teaching always prevails.

Chapter V

Conclusion

Limited English-proficient students are now part of almost all middle school science classes in the United States. One out of five students in kindergarten through twelfth grade is labeled LEP. In contrast only 12.5% of the 3 million public school teachers have eight or more hours of LEP training. Colleges need to be preparing incoming teachers to deal with this new reality. Professional development, time, resources, and support are all required to assist teachers in meeting the needs of this ever growing population.

Professional development needs to be made available for teachers who are already in the classroom. Many quality programs exist, but educators need to be given the opportunity and encouragement to explore them. They also need to have time to plan for the individual needs of their students. Resources need to be made available so that science classes have the supplemental materials necessary to engage students in learning.

Government agencies continue to develop legislation and mandate what is required to meet the needs of LEP students, but frequently they become unfunded mandates. Also it is necessary to see if these objectives are being met. If they are not being met, what are some of the reasons? Are problem solvers being

sent to help solve the difficulties or is there just the threat of losing funding? If the latter, how does the loss of program support or money help to improve an LEP program?

It is essential that we meet the educational needs of these LEP students. Unlike earlier times in our nation's history, top jobs are only offered to skilled and educated workers. Our economy needs high employment to keep it strong. All students need to graduate and achieve high levels of language proficiency. It is the inalienable right of all of our children.

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