Abstract

An action research study on ESL learners in a high school chemistry course was conducted to determine the effectiveness of three teaching strategies for improving students’ scores on unit exams. Results indicated that the conceptual repetition strategy yielded the highest average scores for ESL students when compared to class averages. Research findings indicate that reinforcing previous knowledge of content, providing a clear conceptual focus for student work, and math ability contribute to successful scores on standardized tests.

Introduction

I have taught general science, biology, earth science, and chemistry in two states: New York and California. During this time, I identified two underlying components of successful test-takers: they understand the intent of the question being asked and they remember how to respond correctly.

Starting my first year of teaching chemistry in Virginia, I was presented with two acronyms: SOL and LEP. The Virginia Standards of Learning (SOL) are state mandated subject-specific curriculums that are followed by an end-of-course exam. Virginia’s SOL exams are similar to the New York State Regents exams. A limited-English proficient (LEP) student is a language minority student who is still learning aspects of speaking, reading, writing, and comprehending the English language. Because LEP students are in the process of learning English, they may have difficulty in learning successfully in a classroom where the language of instruction is English. One area of concern for our program is that, in the last three years, only 34% of LEP students have passed the chemistry SOL exam compared to the state’s passing rate for all students of 60%. For my research project, I wanted to explore techniques that might help my student score higher on unit exams, and therefore, retain more information for the final SOL exam.

Objective

This action research study focused on LEP students in a high school chemistry course. Its purpose was to identify teaching strategies that have a positive impact on LEP students’ standardized test scores. To mimic the conditions of the SOL exam, an outside source of standardized test questions was used for in-class quizzes. An industry standard software-testing program,
Examgen, was chosen based on its source of multiple-choice questions from the New York State Regents program.

Procedure

The year-long study was divided into six units, with each unit emphasizing different teaching strategies that were suggested by the ESL department to improve LEP students’ success. At the conclusion of each unit, 25-35 multiple-choice questions were selected from Examgen to represent the effectiveness of the teaching strategies. Average LEP scores were compared to class average scores in each unit to determine the impact of the teaching strategies.

The experimental group consisted of 12 LEP students that ranged from high intermediate to high (5th-6th grade reading levels) English proficiency. The control group consisted of 71 general education, native English-speaking students. Native language backgrounds and prior education levels of the ESL learners were also evaluated. Based on general information about ESL learners’ weaknesses, two types of curriculum repetition strategies were chosen: conceptual repetition and vocabulary repetition.

Method

Initially, the basic teaching strategy used with students was traditional lecturing while the students took notes. Beginning with the third unit, three new teaching strategies were used during this research project: (1) Giving students a handout before the lecture that had a bulleted list of the conceptual standards called the “essential knowledge”; (2) Retaining the essential knowledge format for the delivery of the unit material, the unit’s essential question was modified to support a short answer quiz; and (3) Removing the bulleted essential knowledge and replacing it with a vocabulary list that pertained to the unit. The essential question and short answer quiz was still given based on the essential knowledge.

During the first two units, a baseline teaching strategy and initial differences between LEP students’ and general education students’ scores was established. During the first unit I used a combination of worksheets and notes because this unit was a review of basic chemistry terms and concepts. The LEP students’ unit exam average was 3% lower than the class average. The second unit of study should be considered as setting the baseline for comparison for this study because it represented the most widely used teaching strategy: traditional lecturing while the students took notes. During this unit, the conceptual standards were not overtly revealed to the students. The difference in test scores between the experimental group and the control was 7.0%.

The first change in teaching strategy change occurred during the third unit. It focused on the conceptual repetition strategy, which was designed to review concepts throughout instruction. Students were given a handout before the lecture that had a bulleted list of the conceptual standards called the “essential knowledge.” Students were provided an essential knowledge list at the beginning of the unit and were tested through a series of essay questions before the standardized test was given. This change in teaching strategy was
accompanied by an essential question (EQ) and an essay quiz based on the essential knowledge. The difference in the unit test averages between the LEP group and the class average was reduced to 1.5%.

The next modification occurred during the fourth unit. Retaining the essential knowledge format, the unit’s essential question was modified to support a short answer quiz. This change caused the difference between the LEP group and class average scores to increase to 2.5%.

The fifth and sixth units emphasized vocabulary. In these units, the bulleted essential knowledge was removed and replaced by a vocabulary list that pertained to the unit. The ESL students were required to review selected vocabulary words throughout the unit in preparation for the standardized test. The essential question and short answer quiz was still given based on the essential knowledge. The difference in unit five and six test scores were 5.5% and 4.5%, respectively.

Conclusion

The objective of this study was to determine the specific teaching strategies that have a positive impact on the LEP students’ standardized test scores. Based on the results of this study, providing LEP students with an essential knowledge list before instruction and requiring them to prepare for an essay quiz had the most beneficial impact on their scores. Removing the essential knowledge list and adding a vocabulary list proved to be not as effective, but better than teaching in the traditional lecture/note-taking style. This study was limited because of the small population of LEP students. I suggest that this study be repeated using a larger population.