Chapter 61
English Language Learners' Online Science Learning: A Case Study

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ABSTRACT

English Learners may struggle when learning science if their cultural and linguistic needs are unmet. The Collaborative Online Projects for English Language Learners in Science project was created to assist English learners' construction of science knowledge, facilitate academic English acquisition, and improve science learning. The project is a freely available, online project-based, bilingual instructional website designed for English learners of Hispanic origin. The project website contains two units: Let's Help Our Environment and What Your Body Needs. To create these collaborative online projects, two constructivist approaches were combined: The Cognitive-Affective Theory of Learning with Media and Project-Based Learning. These approaches to science education were used as the basis for culturally and linguistically relevant science instruction, which was delivered within a collaborative, online instructional platform. Using a case study design, two teachers demonstrated implementation of the project with fidelity, and students showed statistically significant gains in science content assessments. The Collaborative Online Projects for English Language Learners in Science project provides educators with a strong model for creating instructional materials that support English learners' science learning by combining culturally-relevant, constructivist, collaborative projects using online, multimedia technology.

ORGANIZATION BACKGROUND

Collaborative Online Projects for English Language Learners in Science is a publically available, digital, Project-Based Learning and teaching platform for delivering bilingual science content to Spanish-speaking English learners. The Collaborative Online Projects for English Language Learners in Science project received funding from the National Science Foundation to

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design, translate, enhance, and evaluate culturally relevant and linguistically appropriate collaborative online projects in science for secondary level Spanish-speaking English learners. The project website (http://copells.uoregon.edu) houses two classroom-tested and supported collaborative online projects, the *What Your Body Needs* life science unit and the *Let's Help Our Environment* life science unit. Both units target 7th grade U.S. National Science and Engineering Curriculum Standards. Collaborative Online Projects for English Language Learners in Science was made possible through a strong partnership between the Center for Advanced Technology in Education at the University of Oregon, the Instituto Latinoamericano de la Comunicación Educativa in Mexico, and the Biological Sciences Curriculum Study group in the United States. Over the past three years, these organizations have been creating science units and studying their feasibility and usability, addressing both the cultural and linguistic needs of English learners in science education.

The Center for Advanced Technology in Education at the University of Oregon is a research and development group within the University of Oregon's College of Education, working in the area of technology-supported solutions to student challenges in reading, writing, and studying. The center has more than 20 years of research and development experience behind computer-based study strategies to support student learning in the general education curriculum, more than 10 years designing and evaluating online learning environments, and more than 10 years designing, developing, and evaluating supportive resources for learning in electronic environments. Currently funded projects include: The National Center for Supported eText; Mathematics eText Research Center; and Project SOAR: Strategies for Online Academic Reading.

The Instituto Latinoamericano de la Comunicación Educativa is a non-profit organization with 15 years of experience designing collaborative online projects. Over this time period, the Instituto has designed approximately 150 collaborative online project units in the areas of reading, math, science, social studies, and language arts covering 1st to 9th grade curriculum for schools in Mexico and Latin America. The Instituto's collaborative online projects have been designed using a constructivist theoretical approach, in which the teacher is a co-participant in the students' construction of knowledge. The Instituto's units were most recently aligned to the United Nations Educational, Scientific and Cultural Organization standards for Information and Communication Technologies. The Instituto's collaborative online project units have been implemented in 53,265 schools in Mexico and 180 schools from 14 countries throughout Latin America and the Caribbean, Spain, and the United States. The Instituto provided an online instructional model that the Collaborative Online Projects for English Language Learners in Science project further refined. The Instituto also provided an online platform for delivering instruction in a culturally and linguistically relevant multimedia rich environment. The Instituto has also supported this collaboration by offering the two science units developed through the Collaborative Online Projects for English Language Learners in Science project to students in Mexico at the same time as students in Oregon. Using their wide network of schools, students in Oregon and Mexico were able to take advantage of the project's asynchronous forums to communicate with each other across borders about what they were learning in science.

The Biological Sciences Curriculum Study group in the U.S. is a 501(c) 3 non-profit organization that has over 50 years of experience using and generating research for the development of materials and services that promote teaching and learning. The long-standing goal of this group has been to educate U.S. students in biology so that the general public will be better able to understand the science of life. With a particular focus on the science education community, their aims are to assist students in learning science by examining the following areas: