



Bilingual language supports in online science inquiry environments

Douglas B. Clark^{a,*}, Stephanie Touchman^b, Mario Martinez-Garza^a, Frank Ramirez-Marin^c, Tina Skjerping Drews^b

^a Vanderbilt University, Tennessee, USA

^b Arizona State University, Arizona, USA

^c Universidad Veracruzana, Veracruz, Mexico

ARTICLE INFO

Article history:

Received 6 July 2011

Received in revised form

19 November 2011

Accepted 23 November 2011

Keywords:

English language learners

Language minority students

Bilingual education

Online inquiry environments

Science education

ABSTRACT

Research over the past fifteen years has investigated and developed online science inquiry environments to support students engaging in authentic scientific inquiry practices. This research has focused on developing activity structures and tools to scaffold students in engaging in different aspects of these practices, but relatively little of this research has explored linguistic supports for language minority students studying science in their non-native language. These students are simultaneously learning science and the surrounding academic language in their second language. This study investigates the potential value of providing 8th grade Spanish-speaking English language learners access to content and supports in both English and Spanish as opposed to an English-only format in an online science inquiry environment. Learning outcomes are compared between the two conditions on an immediate post-test in English, a delayed post-test in English, a delayed post-test in Spanish, and a written essay in English in the form of a letter to the governor. The outcomes suggest significant benefits for providing ELL students with access to content and supports in both English and Spanish as opposed to the English-only format. The findings of this study carry important policy implications in light of the growing English-only political movements in the United States and similar political movements in other countries.

© 2011 Elsevier Ltd. All rights reserved.

1. Introduction

In recent years, the population of the United States has undergone a significant change in demographics, language, and culture. In 1990, 14% of the U.S. population spoke a native language other than English. By 2000, this number grew to 18% (U.S. Census Bureau, 2002). This change is reflected in the elementary and secondary school population where the percentage of students enrolled as English language learners (ELLs) grew 58.5% from 1994 to 2004 (NCES, 2004). According to the U.S. Department of Education (2007), the number of school age children (ages 5–17) who spoke a language other than English at home increased from 3.8 million to 10.6 million (the equivalent of 9%–20% of students) between 1979 and 2005. This demographic trend continues to expand across the United States and across other countries around the world.

It is generally agreed upon that second language learners cannot afford to postpone learning subject content, such as science, while they learn the second language (e.g., English in the U.S.). By middle school and high school, however, second language learners don't have access to grade-level appropriate content because the materials for which they are linguistically prepared do not match their cognitive levels (Cummins, 2007; Working Group on ELL Policy, 2009). Second language learners thus generally do not have access to the mainstream curriculum (Coulter & Smith, 2006; Valdes, 2001) and their native language resources are typically either ignored or treated as impediments (Gitlin, Buendia, Crosland, & Doumbia, 2003; Reeves, 2006).

Policy-makers in the U.S. have long debated over the type and duration of the programs to support English language learners in the U.S. in learning English (Hakuta, Butler, & Witt, 2000). While there is general agreement on the need for high standards and achievement expectations for all students in core curriculum, there is also strong disagreement on how best to bring about high academic achievement for English language learners. Some of the more common English language instruction programs in the U.S. include (a) English as a Second Language (ESL) pullout, (b) Structured English Immersion (SEI), (c) Specially Designed Academic Instruction in English (SDAIE), and (d) transitional bilingual education.

* Corresponding author. Peabody School of Education and Human Development, Vanderbilt University, Peabody #230, 230 Appleton Place, Nashville, TN 37203-5721, USA. Tel.: +1 615 322 5865; fax: +1 615 322 8999.

E-mail address: doug.clark@vanderbilt.edu (D.B. Clark).

This debate has grown increasingly heated between proponents of English-only instruction in the U.S. and those who promote the use of the students' home languages for instruction. Educators and policy-makers differ in opinions on how to best help second language learners obtain high levels of proficiency and literacy in English. This debate deserves careful consideration because some states in the U.S. (e.g., California, Arizona, and Massachusetts) have restricted or virtually eliminated program alternatives and instructional approaches, such as bilingual and English as a Second Language (ESL) programs, that may meet the diverse and complex needs of English language learners and because similar debates over native language access in schools could grow more prominent in other countries.

To further compound the problem, our schools are generally not succeeding in producing students who are scientifically literate (Lee & Luykx, 2007). This is usually a result of the way science is taught in schools, where curricula is often based on unconnected demonstrations and memorization of facts (Schmidt, McKnight, Cogan, Jakewerth, & Houang, 1999; Schmidt et al., 2001). This method of teaching prevents students from learning the nature of science or understanding how it is practiced by professional scientists because they are not learning the language of science (Lee & Luykx, 2007). Second language learners are therefore doubly challenged in terms of developing English language literacy as well as scientific literacy (Warren, Rosebury, & Conant, 1989).

Online science learning environments have proven effective for engaging students in science inquiry (e.g., Simons & Clark, 2004), and thus provide a potential solution for supporting science literacy (e.g., Clark, Stegmann, Weinberger, Menekse, & Erkens, 2008), but research on online science learning environments has not focused specifically on native language supports for second language learners studying science in their second language. In the current study, we investigate a strategy for increasing science learning by providing Spanish-speaking English language learners with access to linguistic supports in both Spanish and English as they learn about wolf ecology and population management in an online science inquiry environment. The study explores whether or not providing Spanish-speaking English language learners with access to linguistic supports and materials in their native language as well as English in an online inquiry environment result in those students demonstrating greater understanding of the science content than ELLs who have the linguistic supports and materials only in English.

2. Background and research question

This review first provides political context regarding the importance of research investigating optimal language supports for English language learners in the United States. The review next provides an overview of the research exploring supports and challenges for English language learners studying science. The review then considers the affordances of online learning environments to support all students, and language minority students in particular, studying science.

2.1. Political context and importance of further research data

The increased numbers of language minority students in U.S. schools has precipitated changes to local, state, and national education policy. The United States Congress passed the Elementary and Secondary Education Title VII Bilingual Education Act in 1968 requiring schools to provide equal educational opportunities for English language learners. *Lau versus Nichols* was a civil rights case in 1974 under Title VII that expanded on the rights of limited English-proficient students allowing them access to bilingual education when necessary. The Bilingual Education Act was effectively terminated, however, by the U.S. Congress with the implementation of No Child Left Behind in 2001.

The No Child Left Behind laws in the U.S. emphasize accountability in English by mandating that all students (including language minority students) be tested every year in English. Since the passage of No Child Left Behind (NCLB), the bilingual provisions of ESEA Title VII have not been reauthorized. The current reauthorization of the ESEA thus effectively eliminates federal support for, but does not prohibit, bilingual instructional programs. Legislation passed in California in 1998 and in Arizona in 2000 now requires public schools to use English-only immersion as the main method for teaching English language learners.

English-only immersion places the students in a "sheltered" classroom that teaches only English language skills for up to four hours each day. The students in these English language development (ELD) classrooms are taught oral English and conversation, reading, vocabulary, writing, and grammar. Once the student is determined to have attained proficiency, they are placed into mainstream English classrooms. This is in contrast to traditional bilingual programs that generally have no time limits. Given the scope of the policy implications, further research data regarding the efficacy of bilingual versus monolingual approaches for supporting second language learners is critical to inform these sweeping policy decisions.

2.2. Advantages of providing access to both native and second languages

While the provision of native language supports for learning is debated politically, the Working Group on ELL Policy (2009) has concluded that the use of the home language can promote students' English language development and academic achievement. From a linguistic perspective, providing content and supports in both English and Spanish obviously increases the range of learners who can engage in a curriculum. Furthermore, allowing students with resources in two languages to leverage and connect their resources in both languages can promote both higher levels of conceptual learning and English Acquisition (Cummins, 1979; Dressler & Kamil, 2006).

This is an important point – one clear distinction between English monolingual students and language minority students who are learning English as their second language is the existence and potential resource of the latter students' two languages (Cummins, 1979; Jiménez, García, & Pearson, 1995). Dual-channel models of memory and cognition propose that information is encoded and stored through both visual and sentential (verbal or written) channels (Paivio, 1971; Paivio & Lambert, 1981). From constructivist perspectives that students learn by building on their prior knowledge (e.g., von Glasersfeld, 1995; Piaget & Inhelder, 1967), prohibiting language minority students access to their native language and the content knowledge learned and encoded in that language may therefore likely impede learners' ability to build upon and harness that prior knowledge.

Supporting this perspective, research has demonstrated that Spanish speakers make use of their first-language knowledge to apply and adapt strategies (García, 1996). Other research shows that Spanish-English bilingual students make sense of text by translating text segments from Spanish to English and applying Spanish word knowledge to make sense of English words (Jiménez, García, & Pearson, 1996),

Download English Version:

<https://daneshyari.com/en/article/348758>

Download Persian Version:

<https://daneshyari.com/article/348758>

[Daneshyari.com](https://daneshyari.com)