Chapter 4
Promoting English Language Acquisition in Secondary Mathematics through Dialogic Integration of Instructional Technology

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ABSTRACT

This chapter uses the theoretical perspective of dialogism to examine how two suburban secondary math teachers use technology in the classroom to enhance language and content knowledge development for English learner students. Data for this study includes teacher lesson plans, transcripts of recorded lessons, and teacher reflections and is analyzed using a collective case approach. Results indicate that communicative acts in the classroom fall along a communication spectrum, and uses of specific technologies to increase dialogic interaction among students and between students and teachers are discussed. Thoughtful use of certain technologies may enhance opportunities for English learner students to claim a voice in the classroom and improve their language skills.

INTRODUCTION

STEM educators have increasingly relied on learning-focused technologies as cognitive tools for the promotion of conceptual mastery in K-12 classrooms. Technologies as varied as spreadsheet programs (Moore & Huber, 2009), online simulations (Glynn, 2008; Limson, Witzlib, & Desharnais, 2007), computer-based investigations (Eslinger, White, Frederiksen, & Brobst 2008; Tabak & Baumgartner, 2004) and digital devices (Freeman, 2012; López, 2010; Morgan & Alshwaikh, 2012) have become commonplace in sci-

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ence and mathematics classrooms. Similarly, growing numbers of language educators have emphasized how instructional technologies can serve as linguistic tools for the promotion of language acquisition among English learners (ELs), or students for whom English is not a first language (Cummins, Sayers & Brown, 2006; Meskill et al., 1999). This growth stems partially from the potential of technology integration to provide ELs with opportunities to make more authentic use of English, and hence to acquire ability in a second language. When effectively integrated with instruction, technology can afford ELs the opportunity to practice performing a wide variety of *speech acts* (i.e., make purposeful discursive moves) in English such as asking for help, requesting confirmation or clarification, giving directives, posing questions, declaring their opinions, agreeing, disagreeing, thanking, apologizing, challenging others' ideas, building on others' ideas, acknowledging, etc. This practice can help develop ELs' *speech act ability* (Cohen, 2005), that is, help them learn how to use a second language in accordance with the social conventions of the English-speaking classroom community. As emphasized in the specialized literature, acquiring a second language entails learning its social *pragmatics* as well as its grammatical forms and vocabulary. Speaking a language fluently involves not only skill in referring to states of affairs in the world but also ability to verbally perform a variety of social acts (i.e., do things with words).

Despite this potential, educational researchers have yet to examine the extent to which technology integration in secondary STEM classrooms does indeed provide ELs with such opportunities for acquisition of the pragmatics of English. The present study attends to this issue by examining the types of speech acts that ELs have a chance to perform as a result of their teachers' integration of technology. More specifically, this study seeks to answer the research question: What types of speech act opportunities are English learners' afforded by their mathematics teachers' integration of technology? In this study, the term *technology integration* is used in reference to teacher pedagogical action centered on mobile network devices such as iPads and/or interactive whiteboard systems (SMART boards). Rather than serving as an immersive environment for electronically mediated instruction, digital technology is utilized in support of face-to-face teacher-student interaction, namely whole-class discussions.

BACKGROUND

Technology and Language

New technology has been shown to impact language use in certain social settings and drastically change traditional modes of communication (Cook, 2004). Affordances such as higher speeds of information exchange, additional modes of communication (texts, images, videos, etc.), and relative freedom from spatial confinement give new technology the potential to engender major changes in established patterns and norms of verbal interaction. Not only is new technology accompanied by the emergence of new language varieties such as Netspeak (Crystal, 2011) but it also often produces social changes such as the emergence of new rules of discourse and new patterns of identity construction that change how people see themselves in the real world (Richardson, 2001). A good example is the common emergence of a *cyberself* (a hybrid, virtual identity) in electronically mediated communication (Kolko et al., 2000). As such, new technology has the potential to provide users with an emancipatory sphere of interaction as well as the possibility of socio-cultural transformation. In the specific context of STEM classrooms, this transformative potential can result in a shift away from institutional discourse (formal and authoritative) and toward dialogism (language use that resemble real-life dialogue).