Teaching and Teacher Education 32 (2013) 31–42

Contents lists available at SciVerse ScienceDirect

Teaching and Teacher Education

journal homepage: www.elsevier.com/locate/tate

Leveraging cultural resources through teacher pedagogical reasoning: Elementary grade teachers analyze second language learners' science problem solving

Cory A. Buxton [a,*], Alejandra Salinas [b], Margarette Mahotiere [c], Okhee Lee [d], Walter G. Secada [c]

[a] University of Georgia, College of Education, 630 Aderhold Hall, Athens, GA 30602, United States
[b] Boston University, United States
[c] University of Miami, United States
[d] New York University, United States

HIGHLIGHTS

- ► Teachers of second language learners analyzed students' science problem solving.
- ► Significant differences were seen across levels of pedagogical reasoning complexity.
- ► Teachers provided generalizations rather than explanations based on evidence.
- ► Teachers overlooked SLL students' strengths, focusing on perceived student deficits.

ARTICLE INFO

Article history:
Received 4 May 2012
Received in revised form
28 December 2012
Accepted 4 January 2013

Keywords:
Second language learners
English language learners
Teacher reasoning

ABSTRACT

Grounded in teacher professional development addressing the intersection of student diversity and content area instruction, this study examined school teachers' pedagogical reasoning complexity as they reflected on their second language learners' science problem solving abilities using both home and school contexts. Teachers responded to interview questions after watching a video of one of their students engaged in a science problem solving task. Over a 5-year period, 206 teacher interviews were conducted with a total of 133 teachers. Results indicated significant differences across the dimensions of pedagogical reasoning complexity as teachers expressed both deficit and resource oriented thinking.

Industrialized nations across the globe have seen increased levels of immigration over the past few decades, as citizens of less economically developed nations migrate in search of enhanced economic opportunity (Brown, 2012; Lipsmeyer & Zhu, 2011). While there are numerous sociocultural implications of these migration patterns, the youthfulness of immigrant populations often results in greater shifts in the demographics of school-aged children than in the overall demographics of the nation (Leyendecker, 2011; Passel, 2011). At the same time, the population of teachers in compulsory-grades education in industrialized nations continues to be dominated by socioeconomically middle-class females from privileged ethnic and linguistic groups (Blomeke, Suhl, Kaiser, & Dohrmann, 2012).

For example, the teacher pool in the United States continues to draw largely from White, female, middle-class demographics, whereas the student population reflects a steadily expanding racial/ethnic, cultural, and linguistic diversity (Jorgenson, 2000; Sable & Plotts, 2010). Certainly, teachers need not share their students' backgrounds in order to teach effectively (Ladson-Billings, 1994), and the diversity within individual classrooms often makes this impossible in any case. Still, many teachers, regardless of background, have only limited awareness of the cultural and linguistic knowledge that their nonmainstream students bring to the classroom (Garcia, Arias, Murri, & Serna, 2010; Gay, 2002; Villegas & Lucas, 2002). Too few teachers receive substantive professional development opportunities focused on how students' ethnic, cultural or linguistic backgrounds may affect educational experiences (Gere, Buehler, Dallavis, & Haviland, 2009; Morrier & Irving, 2007; Selwin, 2007). The teacher professional development literature also makes it clear that facilitating changes

* Corresponding author. Tel.: +1 706 424 4924.
E-mail address: buxton@uga.edu (C.A. Buxton).

0742-051X/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.tate.2013.01.003

in teachers' knowledge, beliefs, and practices is a long and demanding process, not conducive to quick fixes or one-time interventions (Wayne, Yoon, Zhu, Cronen, & Garet, 2008; Wilson & Berne, 2004).

Given the shifting student demographics, professional learning opportunities where teachers have ample time to explore their beliefs and practices regarding student diversity have an important part to play in helping teachers to develop effective classroom practices (Dilworth & Brown, 2001; Seidl, 2007). Calls for such professional development with a multicultural and multilingual focus have been heard in various nations with changing student demographics (Molto, Florian, Rouse, & Stough, 2010; Ricucci, 2008). Given the dominance of culturally and linguistically mainstream teachers in these settings, however, it is not surprising that much of the research on professional development focusing on cultural and linguistic diversity has involved a preponderance of teachers who are not demographically representative of the students they now teach. Thus, there is a unique value in studying teacher professional development where the participants are more culturally and linguistically representative of evolving student demographics. The present study took place in urban elementary schools in the United States where the teacher demographics were closely aligned with the student demographics – predominantly Latino, African American and Haitian.

Further, while much of the teacher professional development literature on supporting culturally and linguistically diverse learners has been built on broad ideas such as fostering culturally relevant pedagogy (Ladson-Billings, 1995) or funds of knowledge (González, Moll, & Amanti, 2005), there is more limited research on how to better connect students' cultural and linguistic experiences to specific content area learning (Lee & Luykx, 2005). One potentially fruitful way to make these connections is through having teachers explore their students' thinking about content-specific problems in both school and home contexts (Buxton & Lee, 2010).

The purpose of this study was to examine the relationships between teachers' pedagogical reasoning about their students' problem solving and those teachers' abilities to make connections to their students' cultural and linguistic strengths. We hypothesized that professional learning that supported teachers' pedagogical reasoning would translate into an improved awareness of how students express cultural funds of knowledge during problem solving tasks. To test this hypothesis, we asked teachers to respond to interview questions after watching a video of one of their students engaged in a science problem solving task.

1. Conceptual framework

This study was based on two distinct but complementary areas of research guiding the design and implementation of our teacher professional development that was aimed at promoting problem solving of second language learners (SLLs): (a) teachers' integration of students' linguistic and cultural resources into science instruction and (b) teachers' pedagogical reasoning about students' problem solving in science.

1.1. Students' linguistic and cultural resources in science classrooms

In order for teachers of science to take up the challenge of explicitly integrating students' linguistic and cultural resources into their instruction, teachers must believe that such efforts will enhance their students' academic performance (Lee & Buxton, 2010; Rodriguez & Kitchen, 2005). The literature, however, indicates numerous obstacles to implementing professional development that simultaneously supports culture and content. For example, many teachers are unaware of linguistic and cultural influences on student learning, do not consider "teaching for diversity" as their responsibility, overlook cultural or racial differences, accept inequities as a given condition, or resist multicultural views of learning (Luykx et al., 2007; Zhao, 2010). Additionally, teachers often work in policy contexts that assume that SLLs must acquire the dominant language of instruction before engaging in subject matter learning, despite research indicating that this approach typically leads SLLs to fall behind their dominant-language-speaking peers (Lyster & Ballinger, 2011; Teachers of English to Speakers of Other Languages, 2006). While these findings paint a rather bleak picture of the ways many teachers perceive their nonmainstream students, it is again worth noting that much of this research base has primarily involved teachers who are, themselves, members of the mainstream ethnic, cultural and linguistic group.

In our previous research with urban elementary school teachers who were predominantly the same ethnicities as their students (Latino and Haitian), we found that even at the beginning of the intervention, most participants acknowledged the importance of recognizing students' first cultures and languages when planning for science instruction (Lee, Luykx, Buxton, & Shaver, 2007). However, these same participants showed little change in their actual classroom practices regarding teaching for diversity, despite two years of involvement in a professional development intervention that included this focus. This discrepancy between teachers' positive beliefs about the value of students' diverse backgrounds and their failure to act on those beliefs in concrete ways was a deviation from the outcomes of other well-known studies of culturally and linguistically diverse students' funds of knowledge (González et al., 2005; Warren & Rosebery, 1995). These studies demonstrated changes in teacher practices that our project failed to realize. This unexpected outcome led us to consider a different approach in hopes of better facilitating teachers' integration of students' cultural and linguistic resources into their science instruction with SLLs.

Thus, in order to help teachers better support their culturally and linguistically diverse students' academic performance, we decided to focus on student problem solving. Student problem solving has been shown to engage and refocus teachers in other professional development efforts, particularly in mathematics education (Carpenter, Fennema, Franke, Levi, & Empson, 2000; Steinberg, Empson, & Carpenter, 2004). We noted that teacher analysis of student problem solving has not been a significant focus of professional development in science education (Lehrer & Schauble, 2000). We considered that encouraging teachers to think less about what they themselves were doing and to think more about what their students were thinking, saying and doing during problem solving tasks might serve to refocus teachers on the question of where students get their ideas. Consideration of the origins of students' ideas would, in turn, provide a natural bridge to thinking about their first cultures and languages since elementary grade students' ideas often have clear connections to their home and community contexts.

1.2. Pedagogical reasoning complexity

Our approach to understanding how teachers reason about their students' problem solving during science tasks focuses on the notion of pedagogical reasoning complexity, or the quality of an individual's reasoning about another person's engagement in a learning task. Duschl and Grandy (2008) have argued that worthwhile science learning tasks make student thinking visible for the purpose of helping teachers give feedback to improve