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# Connected and culturally embedded beliefs: Chinese and US teachers talk about how their students best learn mathematics

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**Abstract**

This study compares US and Chinese elementary mathematics teachers' beliefs about how students learn mathematics. Interviews with teachers in each country revealed that Chinese and US teachers have distinct ways of thinking about how mathematics should be taught and how students learn. Many Chinese teachers talked about developing students' interest in mathematics and relating the content of mathematics lessons to real-life situations. The US teachers talked about students' learning styles and using hands-on approaches to learning mathematics. Furthermore, these beliefs may be widespread and persistent within each country because the set of ideas among teachers appear to be internally consistent. Implications for teacher change and the study of teachers' beliefs are discussed.


*Keywords:* Teacher beliefs; Mathematics education; China; United States; Cross-cultural; Culture

## 1. Introduction

Teachers' beliefs about instruction and learning may be shaped largely by culturally shared experiences and values. This is critically important in understanding teaching around the world because research (e.g., Richardson, Anders, Tidwell, & Lloyd, 1991; Staub & Stern, 2002) has demonstrated a relationship between teacher beliefs, instructional practices, and student learning. If this relationship is as strong as past research suggests, then understanding the nature of teachers' beliefs may be essential to education reform efforts. Culturally shared beliefs about teaching and learning may be so ubiquitous and familiar that they become difficult to recognize. For this reason, a comparison of teachers' beliefs across cultures can be an especially revealing approach to studying beliefs (e.g., Stigler & Perry, 1990).

Comparisons of US and Chinese elementary-level mathematics education have revealed differences in student achievement (Stevenson et al., 1990) and teacher knowledge (e.g., Ma, 1999), but we know relatively little about teachers' beliefs about student learning. If Chinese and US teachers hold different sets of culturally shared beliefs, these beliefs might further explain differences in elementary mathematics

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teaching and learning in these two nations. Thus, we have chosen to examine Chinese and US elementary teachers' beliefs, with the dual intentions of exploring the cultural nature of teacher beliefs and identifying specific differences and similarities among beliefs in a sample of these two nations' elementary mathematics teachers.

### 1.1. The role of teacher beliefs in teaching mathematics

The term "teacher beliefs" (also known as "implicit theories," "orientations," and "teacher perspectives") has been used to mean many different things (Furinghetti & Pehkonen, 2002; Pajares, 1992), but for our purposes can be thought of as theories or ideas about what effective instruction looks like and how students learn. Additionally, teachers may hold related epistemological beliefs, or beliefs about what it means to know the subject matter (Thompson, 1992). Teachers' beliefs often guide their decisions in the classroom and can influence many facets of classrooms, including the degree of student autonomy and forms of assessment in the classroom (Stipek, Givvin, Salmon, & MacGyvers, 2001). Teachers' beliefs can also directly correlate with student achievement in mathematics (Staub & Stern, 2002). The relationship between teaching beliefs and practice is further evident in longitudinal studies, which suggest that beliefs and practice change together, often with a change in beliefs preceding changes in teaching practice (Lubinski & Jaberg, 1997). However, the interaction between teachers' beliefs and practice is complex, and a simple causal relationship should not be assumed (Cobb, Wood, & Yackel, 1990; Santagata, 2005). And, at times, teachers' reported beliefs may appear to be inconsistent with classroom practices (Fang, 1996).

#### 1.1.1. Teaching as a cultural activity

Teachers develop culturally shared ideas about what good teaching and learning look like even before they begin their teaching careers. For example, teacher educators find that students who are interested in a teaching career already hold strong conceptions of what good teaching should be like (Wilson, 1990). Where do these come from? Lortie (1975) suggested that teachers may unintentionally acquire culturally shared beliefs about teaching and learning in childhood, when potential teachers are students and participate in an "apprenticeship of observation." Furthermore, these notions about teaching and learning are consistent with broader values within a culture, or shared 'primordial values' such as individualist, community, or collectivist orientations (Alexander, 2001). Stigler and Hiebert (1999) suggested that "cultural activities, such as teaching, are not invented full-blown but rather evolve over long periods of time in ways that are consistent with the stable web of beliefs and assumptions that are part of the culture" (p. 87).

A cross-cultural investigation of teachers' beliefs can be particularly valuable because the comparison of two distinct culturally embedded belief systems can make implicit beliefs and assumptions more transparent. Teachers' ways of thinking about learning and teaching may be difficult to access without cross-cultural comparisons because, within a culture, we have widely held, often unexamined, assumptions. The advantage of a comparative process is that it can make familiar and widespread beliefs within one culture suddenly seem distinctive and unusual (e.g., Jacobs & Morita, 2002). Stigler and Perry (1988) described the benefits of cross-cultural research in mathematics education this way:

> Cross-cultural comparison also leads researchers and educators to a more explicit understanding of their own implicit theories about how children learn mathematics. Without comparison, teachers tend not to question their own traditional teaching practices and are not aware of the better choices in constructing the teaching processes (p. 199).

A comparison of Chinese and US teachers' thinking may lead to a more complete understanding of their beliefs than if either group of teachers was studied in isolation from the other.

#### 1.1.2. The nature of teacher beliefs

Teachers' beliefs may be difficult to change because teaching is a cultural activity, but they may also be exceptionally stable because of a high degree of connectedness among beliefs. In other words, beliefs may tend to be consistent with other beliefs so that one idea about teaching cannot be changed without affecting another. If this is true, teacher change may be exceptionally difficult to achieve without addressing the central assumptions that shape a teacher's collections of beliefs.