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Keeping their attention: Classroom practices associated with behavioral engagement in first grade mathematics classes in China and the United States☆

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ABSTRACT

This study investigated variation in students' behavioral engagement across mathematics classes in China and the United States. Student behavioral engagement was examined along with two aspects of the classroom (group size and teacher instructions given about classroom behavior). Video observational data were collected and coded over 1051 time intervals in 35-minute mathematics sessions in Chinese classrooms ($n = 8$) and comparable American classrooms ($n = 7$). Latent growth analyses revealed that overall, behavioral engagement declined over time, although the drop-off was dramatically sharper in American classrooms relative to Chinese classrooms. In addition, larger group size and the timing of teacher instructions (given before versus after the behavior) were significantly associated with increased engagement. This study revealed compelling cultural differences as well as patterns in student and teacher behaviors associated with students engaging in on-task behaviors in the classroom. Implications for ways to promote effective classroom behavior are discussed.

The mathematics achievement of American students has received increasing attention as educators and policymakers strive to help the United States remain competitive in an emerging global economy (Heckman, Stixrud, & Urzua, 2006). International comparisons typically have found that students in Asian countries show the highest levels of average mathematics performance (Akiba, LeTendre, & Scribner, 2007; Beaton et al., 1996; Crosswhite, Dossey, Swafford, McKnight, & Cooney, 1985; Robitaille & Garden, 1989; Stevenson & Stigler, 1992). Achievement differences reported in international and comparative studies have motivated policy initiatives focused on mathematics education reforms in the United States (Romberg, 1997, 1999).

Differences in achievement almost certainly reflect differences in teaching and learning processes. Practices exist within a larger context of beliefs and resources relevant to education; nonetheless, investigating educational practices in nations with strong mathematics performance can be a useful tool for understanding factors that promote achievement in this critical subject area (Stigler, Gallimore, & Hiebert, 2000). We will review some of the known differences in early teaching

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and learning practices between China and the United States before describing a study that looked at classroom practices in China and the United States during a mathematics lesson related to a critical behavioral predictor of achievement – students' engagement during a lesson. The present study focuses on young children (first grade elementary school children) who have begun systematically learning mathematics and developing learning and regulating skills in China and the U.S.

1. Cross-cultural differences in mathematics education

Substantial differences in achievement in East Asian countries and the United States have been systematically linked to differences in how families, teachers, and society-at-large treat the teaching and learning of mathematics. For example, American parents and teachers are more likely to attribute mathematics competence to ability, whereas Japanese and Chinese adults tend to believe that learning comes with effort and persistence (Stevenson, Lee, Chen, & Stilger, 1990). Since 1995, the Third International Mathematics and Science Study (TIMSS), which compares competence in different societies, has documented cultural differences in attitudes, practices, and achievement in mathematics. In general, East Asian countries emphasize explicit mathematics instruction, promote a deeper conceptual grounding than American students typically receive, and encourage students to put significant and sustained effort into learning math (Ma, 1999; Miller, Kelly, & Zhou, 2005; Stevenson & Stigler, 1992). These differences are connected to multiple factors, both distal and proximal to the classroom. East Asian societies are known to be collectivistic and Western societies individualistic (e.g. Nisbett, 2003), such differences may influence both societies at curriculum and classroom levels. Asian countries have a more centralized curriculum system (Schmidt, McKnight, Cogan, Jakwerth, & Houang, 1999), and those curricula are more focused, integrated, and coherent across schools and grade levels. In contrast, the U.S. system for adopting curricula is heavily subject to marketing pressures, with decisions made primarily at the district and school level. This contributes to American mathematics curricula being less authoritative and less consistent across years and among districts, compared to the single, national curriculum taught in Asian countries (Cohen & Spillane, 1992; Peak et al., 1996).

Difference among American curricula may underlie the widely observed variability in teaching in the United States (National Institute of Child Health and Human Development Early Child Care and the Research Network [NICHD ECCRN], 2002). For example, one study found substantial variation in amount of teacher organization as well as transition, teacher-, and child-directed instruction (Cameron, Connor, & Morrison, 2005). Classroom-based work has also revealed American and Asian cross-cultural variation in instructional practices, including how teachers promote conceptual mathematics understanding (Hiebert & Stigler, 2000; Perry, 2000; Stigler & Perry, 1988; Stevenson & Lee, 1995; Stigler & Hiebert, 1999). For example, Yang and Cobb (1995) found that Chinese teachers encouraged students to construct composite, multiunit numerical conceptions (e.g., 14 is composed of a unit of ten and four ones) and to justify their solutions (The Chinese language also facilitates such representation as 14 is pronounced as "ten-four"). On the contrary, U.S. teachers in the study encouraged students to construct unitary concepts (e.g. 14 is the number after 13) with little justification. Furthermore, compared to American teachers, Chinese teachers engaged in more extended discourse, such as using a student's answer to a question to begin a larger discussion about the mathematical algorithms, rules, and reasoning needed to find that answer (Schleppenbach, Perry, Miller, Sims, & Fang, 2007). Finally, East Asian students spend substantially more time than American students studying mathematics (Stevenson, Lee, Chen, & Lummis, 1990).

Taken together, these findings reveal significant differences in how mathematics is taught and learned in the United States and Asian countries, including China. But effective learning involves factors that extend beyond the curriculum or formal instructional strategies. Another key is student engagement, the importance of which was highlighted in a report on mathematics learning from the National Research Council (Kilpatrick, Swafford, & Findell, 2001). Student engagement, as well as the strategies that teachers use to ensure that students remain engaged, can also be a central predictor in accounting for student achievement (Fredricks, Blumenfeld, & Paris, 2004; Greenwood, Horton, & Utley, 2002).

2. Teacher organizational instructions

The National Council of Teachers of Mathematics (1991, 2000) has called for teachers to use organizational strategies, including instructions that allow students to effectively learn mathematics. A significant body of research (mostly in the United States) has documented how teacher organization for instruction sets the stage for effective classroom functioning by helping students become behaviorally engaged and regulate their own actions (Bohn, Roehrig, & Pressley, 2004; Brophy, 1985; Brophy & Good, 1986; Cameron et al., 2005; Evertson, Emmer, Sanford, & Clements, 1983; Pressley et al., 2001; Sanford & Evertson, 1983). Organizational strategies include teacher efforts to preview classroom activities, present instructions about their completion, and provide clear expectations for student behavior (Anderson, Evertson, & Emmer, 1980). Teacher practices such as giving clear instructions about tasks in advance have been associated with greater behavioral engagement (Carta, 1991). Such efforts are thought to help prevent behavioral difficulties and curtail potential disciplinary distractions by creating a predictable, organized learning environment (Brophy, 1988).

Though limited, the existing cross-cultural comparison literature indicates that Chinese teachers, when compared with American teachers, are able to use their teaching time more effectively for student learning and to develop better-organized whole-class instruction– even in their typically large classes (Yang & Cobb, 1995). A key indicator of organizational strategies on the part of the teacher may be the timing of instructions. Instructions given before students begin a task can provide them with a model of what they should be doing, and in turn promote self-regulation. Instructions given after a task begins may