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Mathematics from Another World: Traditional Communities and the Alienation of Learners

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This article reports upon a study of students learning mathematics in six English schools. Interviews with 76 students from the schools are analyzed in order to understand the nature of the classroom communities in which students work; the students' perceptions of these communities, and the impact of their perceptions upon knowledge development and use. The students in the study reported that social interactions, variety, and meaning were central to positive learning experiences, yet dominant school practices they experienced were memorization, reproduction of procedures, and individualized work. It is argued that teaching and learning practices are central to the knowledge students learn and that those of traditional classrooms are sufficiently strange and other-worldly to create a limiting effect upon students' use of mathematics in non-classroom situations.

1. INTRODUCTION

Psychological theories of learning have been dominant within mathematics education since its inception as a research domain. But we are now, as Resnick (1991) has claimed, in the midst of attempts to merge the social and the cognitive (Schoenfeld, 1999). Increasingly, researchers are drawing upon anthropological, sociological, and other disciplinary perspectives (Watson, 1998) in their work, thus bringing what Davis (1997, p. 2) described as "other forms of human thought ... to bear upon efforts to understand the teaching and learning of mathematics." Situated perspectives on learning have made a particularly significant contribution over recent years, presenting knowledge, not as a stable, individual characteristic, but something that is distributed between people and the activities and systems of their environment (Brandsford et al., 2000; Lave, 1988, 1996). Learning, in the situated perspective, becomes a process of changing participation in changing communities of practice (Lave & Wenger, 1991) and a person's knowledge-ability is regarded to be a function of the environments in which he or she operates. Such perspectives allow for knowledge variance between contexts and situations, which many researchers have observed to be characteristic of human behavior (Lave, 1988; McDermott, 1993; Säljö & Wyndhamn, 1993). Within mathematics education, the classroom community, including the implicit and explicit norms and practices that prevail, becomes extremely important, not as a vehicle for learning, but as an intrinsic

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part of the knowledge that is generated and used. Part of my aim in this article is to examine the nature of classroom communities, from a situated perspective, and to consider the implications of traditional teaching and learning practices for students' learning of mathematics.

Traditional teaching practices appear to be based upon assumptions of knowledge independence and stability, which lead to expectations of unproblematic knowledge transfer (Greeno, Smith, & Moore, 1993; Lave, 1988). When teachers encourage students to spend their time in mathematics classrooms practicing standard procedures, this often reflects an assumption that such procedures will be internalized and ready for general use elsewhere, such as the examination hall and the workplace. A number of studies have now demonstrated that such transfer is extremely rare, as new situations provide a whole nexus of structuring relations with which people engage (Lave, 1988). Thus, even when students learn mathematical ideas in the classroom, if their engagement in practices of interaction, adaptation, and reflection were absent, their learning is likely to be of little use in situations that require such practices (Boaler, 1997; Greeno & MMAP, 1998). This is because people constitute their knowledge differently in different situations, which is an idea that has been underplayed in many psychological theories of learning. But we are now entering a new era, and mathematics education is changing (Kieran, 1994), partly due to the increasing consensus that "the power of the unaided mind is overrated" (Norman, 1993, p. 2). This may be witnessed by the number of studies that have moved beyond the individual as the primary unit of analysis to the communities in which students operate, the relations they form there, and the personal and cultural histories that they bring to their knowing (Boaler, 1997; Brown, Collins, & Duguid, 1989; Cobb, 1994; The Cognition and Technology Group at Vanderbilt, 1990; Watson, 1998).

Theories of situativity may be characterized by their "focus on interactive systems that are larger than the behavior and cognitive processes of an individual agent" (Greeno & MMAP, 1998, pp. 5–6). Students do not just learn methods and processes in mathematics classrooms, they learn to *be* mathematics learners and their learning of content knowledge cannot be separated from their interactional engagement in the classroom, as the two mutually constitute one another at the time of learning. The importance of this interaction has not been fully recognized in mathematics education, and researchers are only now beginning to realize that the constraints and affordances provided by different settings co-constitute the knowledge students learn (Greeno & MMAP, 1998; Watson, 1998). Thus, mathematics is learned through practice, in the same way that an author "does not speak in a given language . . . but he speaks, as it were, through language" (Bahktin, 1981, pp. 299–300). Wenger (1998) acknowledges the importance of the communities in which students learn and their degrees of affiliation with these, when he proposes that learning is a process of identity formation, and that students locate themselves within particular communities of practice in a process of belonging and ultimately, knowing:

> Because learning transforms who we are and what we can do, it is an experience of identity. It is not just an accumulation of skills and information, but a process of becoming—to become a certain person or, conversely, to avoid becoming a certain person. Even the learning that we do entirely by ourselves contributes to making us into a specific kind of person. We accumulate skills and information, not in the abstract as ends in themselves, but in the service of an identity. (Wenger, 1998, p. 215)