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Book Review: *Experiencing School Mathematics* by Jo Boaler (1997) Buckingham: Open University Press, ISBN 0-335-19962-3

In her book, *Experiencing School Mathematics*, Jo Boaler provides a comparative study of the mathematics teaching, learning and attitudes at two United Kingdom schools. Boaler's work is a pertinent contribution to mathematics education. Firstly, she reports on a comprehensive research study comparing students' learning in a traditional mathematics classroom and a 'progressive' (Boaler's usage) mathematics classroom. The book captures some of the processes and results of the two very different approaches to mathematics teaching. Secondly, Boaler uses situated learning theory to analyze the nature of the learning and teaching in the school context. Previously, situated learning theory has been used to explain and characterize the mathematics used by people in various informal contexts (e.g. Saxe, 1991; Lave, 1988). Consequently, Boaler's work demonstrates new analytic possibilities for situated learning theory.

In this review I provide a brief description of the two schools. This is followed by a summary of Boaler's analysis of learning that occurred in the two contexts. Then I describe my primary concern with the nature of the claims and evidence provided in the book. Lastly, I raise a challenge to situated learning theory derived from the work presented in the book.

Boaler provides a detailed description of the contexts at the two schools. Both schools are set in middle income communities. Amber Hill teachers perceived their students as lower level mathematics achievers and consequently relied on teacher dominated explanations and concise textbooks. Consequently, students perceived mathematics as 'rules to follow.' To complete the curriculum the teachers maintained a fast pace set to the (perceived) ability of the average student in the group. The result was that many students were either bored or frustrated. In contrast, at Pheonix Park mathematics lessons were problem-based and characterized by an open learning environment, student independence, a good number of students off task and tasks that related, in varying degrees, to contexts outside of school. Students at Pheonix Park perceived mathematics in various ways and developed diverse attitudes towards the learning of mathematics. Changes in attitude and expectations for learning are useful, but how do these two teaching strategies influence students' mathematics learning?

Boaler provides compelling quantitative and qualitative evidence supporting a problem centered approach to mathematics teaching. To illustrate the compelling evidence presented by her, I will briefly summarize two of the sets of data used as evidence in the book. Firstly, she presented quantitative data from the GCSE (school leaving) mathematics exam results for both groups of 11th grade students. The results of the two schools were comparable. However, the Amber Hill students who took the exam were from the top two ability groupings. In contrast the Pheonix Park students were from mixed ability groups and completed the exam without receiving specific instruction directed at exam content. Secondly, Boaler provides a qualitative description of the performance of Pheonix Park and Amber Hill students in an 'architectural' activity. This activity required students to apply council regulations to their evaluation of a given house design. The Pheonix Park students were better able to make sense of the task and produced reasoned and reasonable responses. Amber Hill students tended to introduce irrelevant considerations and applied inappropriate mathematical procedures to the task. In summary, the problem-centered approach did not disadvantage the Pheonix Park students in the traditional test while clearly enhancing their ability to reason mathematically. The results presented in the book clearly indicate the benefits of 'progressive' mathematics education and are some of the first research results to so comprehensively support reform efforts in mathematics teaching.

In addition to the impressive results of the research, there are other features of the book that will appeal to the reader. Boaler references many theoretical positions in her discussion of the students, teachers and two schools. Her conclusions are primarily argued from a situated cognition perspective and more particularly Jean Lave's (1988, 1991) work. However, her reference to diverse social, education and psychological theories as she explains various events that occurred at the two schools provides the reader an intriguing meander through theory and practice. What impressed me the most about this book was Boaler's frequent use of the students' and teachers' voices, through verbatim transcripts, to illustrate her claims. The writing stays close to the classroom, making it an enjoyable read. The transcripts provide direct access to the data used to evidence her claims and allows the reader to draw his/her own conclusions from the given data.

In some cases, Boaler was prone to draw conclusions from limited evidence. For example, in chapter eight, she argues that the different contexts in which the students operated produced qualitatively different forms of knowledge. She claims that, "the communities of practice making up school and the real world were not inherently different" (p. 106). As evidence Boaler uses the lack of uniforms and teacher demands as well as the freedom students experienced in the organization of their work and mathematics learning. Firstly, more compelling evidence could have been obtained from discussions with students about their perceptions of their school. Secondly, there are many attributes of schooling that make it inherently different from the "real world," for example, forced attendance and timetables. More detail and evidence comparing the students' (and teachers) perceptions of the differences between school and the real world would have added substance to her claim.

Secondly, I wish to address a feature of Boaler's book that can be found in other writings on situated learning and cognition. Boaler provides a comprehensive analysis of the differences in mathematical knowledge between the two groups of students operating in a school context. In addition, she reports on the many students from Pheonix Park who suggested that they used mathematical techniques developed in school in contexts outside of school while students from Amber Hill saw little practical relevance in their school mathematics. I was, however, disappointed not to find evidence or examples of Pheonix Park students' use of their mathematics in everyday life. When Boaler introduces students' perceived uses of mathematics to out of school problems she creates an imperative to address the nature of the students' mathematical activity outside of school. That many students recognized possible applications of mathematics to experiences outside of formal schooling is a valuable contribution to mathematics education. It demonstrates how learning environments influence students' perceptions of the value of mathematics in other contexts or communities of practice. However, what remains unclear is if, when, and how they actually choose to employ their mathematics learning to these contexts.

This leads me to a question that needs to be addressed more thoroughly by researchers in the field of situated cognition. A central aspect of understanding the mathematical practices of various communities of practice is providing evidence or examples of their practice. Besides Saxe (1991), research in situated learning, particularly as it relates to the role of formal school mathematics education applied to other contexts, tends to evaluate the participants' ability to make sense of mathematics in contexts significant to the researcher rather than describing the participants' use of mathematics in contexts that are significant to them. In the case of this book, Boaler provides quotes from students that demonstrate they were able to perceive uses for mathematics outside the classroom. However significant it is for students to recognize the usefulness of mathematics outside the classroom, it is vital that as a mathematics education research community we begin to understand how they use their mathematics in contexts that are significant to them. This is a difficult but necessary task. Therefore, we must ask, what school mathematics do students apply to contexts that are significant to their lived experience?

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