Ph.D. Qualifying Examination G

Mathematics Education:
Theories of Learning and Teaching

1. Some research on the learning and teaching of algebra refers to the
development of algebraic habits of mind. Identify and describe these
habits of mind and discuss how they are consistent (or inconsistent) with
the National Council of Teachers of Mathematics Standards for learning
Algebra.

2. Discuss major research findings concerning the development of students'
interpretation and uses of symbolic variables and equations. Discuss the
kinds of learning and understanding difficulties students might develop in
classroom situations. Discuss how you, as a middle school or high school
teacher could address one of the learning challenges in a manner
consisted with suggestions from research and the National Council of
Teachers of Mathematics.

3. Give the authors(s), date of publication, and discuss the findings of at
least one research publication indicating that students create composite
units in their visual reasoning. Describe implications of these findings for
classroom geometry teaching.

4. Discuss the meaning and value of making and justifying conjectures in
geometry at the middle school or high school levels. Describe differences
between formal and informal approaches in making and justifying
conjectures. Explain how these approaches might be used to encourage
understanding of interconnected geometry relationships. Cite references
to published research and/or NCTM publications.