

CHEMICAL EDUCATION RESEARCH CUMULATIVE EXAM
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NOTE: The following refers to a paper in the *Journal of Chemical Education*, attached to the body of this cumulative exam.

This week marked the passing of Dr. Dorothy Gabel, one of the pioneers in chemical education. In work that dates back to the 1970s but especially through seminal qualitative and quantitative work in the 1980's and 1990's, she set the stage for a great deal of future work.

An important review paper in 1999 (attached) outlined her view of the field. It includes the following categories that she describes as "*Barriers to learning chemistry*" based on theoretical frameworks and empirical research.

- (A) Threefold representation of chemistry
- (B) Practical work (laboratory activities)
- (C) Unfamiliar materials
- (D) Use of language
- (E) Structure of the discipline
- (F) Conceptual understanding of chemistry
- (G) Constructing knowledge in a social context

For this cumulative exam, take **any three** of these and answer the following questions:

1. Why does this represent a barrier to learning?
2. In the time since her paper, what do you believe you can point to as an example of something we know that addresses this barrier? Ideally, accompany your example with mention of one or more studies that address this. You do not need to provide specific citations.
3. What is an example of a research study that could be done to address these barriers today? Your example should include (a) a clear indication of a theoretical framework; (b) a specific population to be studied; and (c) a description of a data collection plan to address this.

Each answer will likely span two to three pages of a blue book.