The purpose of this study was to determine the effectiveness of computer-based instructional (CBI) approaches used in statistics classrooms at the university level over the past 40 years. Findings suggest that when some method of CBI is compared to traditional lecture approaches, CBI approaches tend to improve student achievement by almost 1/3 of a standard deviation ($d = 0.28$). Interpreting these results in terms of percentiles, students exposed to some form of CBI would be expected to perform better than approximately the 61% of the students instructed by the traditional lecture approach. These findings are similar to those reported in other syntheses focusing on the effectiveness of CBI in relation to student achievement. These findings should provide researchers with a sound foundation from which to interpret past research and guide future research. While much research has been conducted in the area of CBI in this content domain, still more research is necessary because of the constant and often dramatic changes that are occurring in computer technology.

THEORETICAL FRAMEWORK

In 1967, the Joint Committee of the American Statistical Association and the National Council of Teachers of Mathematics on the Curriculum in Statistics and Probability was formed to plan and coordinate improvements in the science and teaching of statistics and probability at all levels of education. Since this time, one of the most notable developments in the statistics classroom has been the extent to which computers have been incorporated into the curriculum at the university level. The driving force behind the use of computer technology in the statistics classroom has been, and continues to be, the assumption that its use would improve student learning of statistics content.

In the early 1960's the first computer-based instructional approaches were developed and utilized in the college classroom (Suppes & Macken, 1978). Early applications of computer-based instruction (CBI) in the statistics classroom combined versions of Skinner's programmed instruction and Keller's personalized system of instruction with a computer-based delivery system (see for example; Lorber, 1970; Wagner & Motazed, 1972; Wassertheil, 1969). While these early applications essentially served as a vehicle to deliver instruction that had traditionally been delivered in a lecture or text format, it was assumed that they would have positive effects on student learning of statistics content because: 1) programs allowed students to proceed through modules or units at their own pace, and 2) programs were capable of delivering immediate feedback to the students in terms of whether or not answers to programmed questions were correct or not. While computer use in the statistics classroom has advanced far beyond these initial uses, results from evaluations on their effectiveness are inconsistent in terms of the effects related to student learning. Although many studies have reported positive effects on student learning in the statistics classroom, others have reported conflicting and sometimes inconclusive results.

RATIONALE AND PURPOSE

In order to obtain a more complete understanding of the effectiveness of computer-based instructional approaches employed in the statistics classroom over the years, and to determine the extent of inconsistencies across studies, a synthesis of the research in this area is warranted. The primary purpose of this study was to investigate the overall effect of the various computer-based instructional approaches employed in the statistics classroom at the university level using meta-analytic procedures. A secondary purpose was to investigate how various study characteristics influenced this relationship.