

INSTRUCTIONAL METHODS AND STATISTICS ACHIEVEMENT
AT THE UNIVERSITY LEVEL: A META-ANALYSIS.

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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 then the research on and innovations related to the teaching of statistics at the university level has advanced rapidly. A search of several on-line research databases revealed over 500 articles and papers related to the teaching of statistics at the university level from 1967 to 1997. While most of this literature was found to be nonempirical, over 200 studies were empirical in nature. The focus of these studies varied greatly with the majority focusing on the effectiveness of different teaching methods. The remainder focused on the effectiveness of computers to teach statistics and the impact of various teaching activities employed in the statistics classroom.

To date, while several articles have been written detailing various resources available for those who teach in this field, no quantitative review of this literature exists. As a result, a clear and concise understanding of which teaching methods and activities work in the statistics classroom has eluded the research community. The primary purpose of this study was to investigate the effect of different teaching methods and activities on student learning in statistics at the university level using meta-analytic procedures.

Several searches were completed to identify relevant studies for this meta-analysis. Searches were conducted using ERIC, psych-INFO, and Dissertation Abstracts. In addition, the conference proceedings of the International Conference on the Teaching of Statistics (ICOTS) and the proceedings of the section on statistics education of the American Statistical Association (ASA) were also searched. All searches were conducted using key descriptors which included, TEACHING, INSTRUCTION, STATISTICS, and COLLEGE STUDENTS. In order to investigate the influence of study characteristics on the effect sizes reported these were coded. Characteristics that were coded included methodological features (e.g., whether or not there was random assignment of students to

groups), ecological features (e.g., the duration of the instructional approach), as well as publication features (e.g., whether the source was published or unpublished).

The statistical procedures developed by Hedges and Olkin (1985) were followed in this analysis. The findings suggest that student achievement in statistics was moderated by type of instruction. Specifically, when compared to the traditional lecture approach, students performed as well or better when exposed to computer assisted instruction, cooperative group work, and self-paced instruction. However, these results should be interpreted with caution as the effects for each of these instructional approaches were not homogeneous. That is, these effects were further moderated by study characteristics such as the duration of the instructional approach, the level of the statistics course, and whether the source was published or unpublished.