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| Title | Statistical Approach in Tertiary Physics Laboratory: Effects on Student Achievement, Attitude, and Psychomotor Skills |
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This study is on the effects of statistical supplementary materials for the General Laboratory information (GLI) of a physics first-year laboratory course offered at a leading university in the Philippines, to: (a) students' attitudes toward rules on decimal place and significant digits calculations, accuracy and precision, and probability interval estimation; (b) students self-perception of mathematics-/statistics-related attitudes and anxiety; (c)students' self-perception of the relevance of mathematics and statistics; (d) laboratory physics achievement; (e) knowledge of relevant statistical concepts; (f) students' self-perception of their psychomotor domain skills; (g) associations between one-semester changes in students' self-perception of attitudes and anxiety toward mathematics and statistics, on the other hand, and students' start-of-semester self-perception of their psychomotor domain skills, on the other hand; and, (h) correlations between laboratory physics achievement, on the other hand, and the attitudes and self-perceptions considered in (a), (b), and ( c), on the other hand.

The holistic evaluation of the new materials, modifies based on authoritative guidelines and directed at developing statistical thinking, involved all 48 enrolled students and the two instructors of the course, and included the students': attitude changes, sources of anxiety, and self-perceptions of these based on Osborne's (1976) semantic differential scales and the Mathematics and Statistics Perception Scale (Cherney & Cooney, 2005); actual physical performance in certain assigned laboratory experiments; and, final course grades and responses in the start- and end-of-semester assessments on basic statistical knowledge.

Among the findings of the study were: (a) except possibly for certain aspects of the concept of accuracy and precision dealing with physics laboratory difficulty, introducing the statistical supplementary GLI materials did not significantly increase students' positive self-perceptions of attitudes toward the concepts of rules on decimal places and significant digits calculations, accuracy and precision, and probability interval estimation; (b) although the differences between the conventional and experimental groups are not significantly different in many respects, there is an indication that using the statistical supplementary materials may mitigate the decrease in positive self-perceptions of one's attitudes and anxiety toward mathematics, statistics, and relevance of mathematics/statistics; (c)the use of the statistical supplementary materials does not significantly increase physics laboratory achievement; (d) without discounting the possibility of a Hawthrone effect and depending on the laboratory activity, the psychomotor skills of students taught from the statistical supplementary materials are better than those students not taught from them; (e) the statistical supplementary materials

do not significantly increase gains in basic statistical knowledge; (f) for the major part, there is no association between one-semester changes in any of either self-perception of mathematics-related attitudes and anxiety or statistics-related attitudes and anxiety, on the other hand, and start-of-semester self-preceptions of psychomoto domain skills, on the other hand; (g) using the new GLI materials effect a negative correlation between final course grade, on the one hand, and self-perceptions of attitudes that are highly related to the difficulty of the materials or tasks but not with those self-perceptions that deal with enjoyability or significance of the materials or tasks; and, (h) using the statistical supplementary materials does not effect a positive correlation between physics laboratory achievement, on the other hand, and any self-perception of mathematics/statistics.

Using statistical supplementary materials teaching the concepts of central location, central dispersion, and least squares in an introductory physics laboratory course for 16-17 year old freshman physics majors similar to the ones in this study, the instructor. With discretion, can thus lead the students to partly know, understand, and appreciate the statistical justification of the rules on significant digits calculations, accuracy and precision, and best fit line.