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Abstract

The main purpose of this dissertation was to investigate interventions in statistics education of health sciences' students. The aim of the interventions was to improve conceptual understanding of these students and their motivation toward statistics. First, a method for the assessment of conceptual understanding was studied. Results show that scoring the answers to questions that explicitly asked from the participants to explain in their own words the relations between the concepts with an answer key, seems to be a practical, reliable, and valid way to measure what learners understand from subject matter. Second, a statistics motivational model was tested. The model included the constructs: causal explanations, perceived outcome expectancy, affect, study behaviour and achievement. A confirmative factor analysis and a path analysis were done with Lisrel. It was shown that students who think that they lack *control* over, for example, causes for failing the statistics exams, did not expect to profit from studying statistics. Students who think that there are *stable* causes for failing, but in spite of that do invest time, started to dislike statistics. A second finding concerns the importance of students' affect. Students who appreciate the value and relevance of statistics, who think it is interesting, challenging, and who like statistics, appear to study statistics more and qualitatively better, and perform better on the exams. The two main interventions in the statistics education that were studied are the distribution of practice and guidance of student learning through directive questions. The results of the studies consistently show that massed practice negatively affected students' conceptual understanding and that directive guidance leads to improved conceptual understanding. Long term retention also improves by directive guidance and by distributed practice. The directive questions indicated the students *how* to deal with the subject matter. This made their reasoning more accurate, more focussed on relevant subjects and hence lowered extraneous cognitive load. The directive questions also forced the students to elaborate on difficult topics. Consequently, the questions increased germane cognitive load by activating students' reasoning processes. In sum, asking directive questions seems to be a very effective instruction tool in the teaching of statistics. Students' affect toward statistics should be a point of special interest in statistics education. To increase the possibility of distributed practice, courses should be spread out more in time, or subject matter should recur after the course is terminated.