

article:1065**Contributing to Success in an Introductory Computer Science Course: A Study of Twelve Factors**

The compelling reason for this author to study factors contributing to success in the first computer science course was the high attrition rates associated with the first course in CS (sometimes 50-60%). Previous studies had included previous experience, work style preferences, mathematical ability and self-efficacy as they relate to success in computer science courses. Attribution theory has been used in decision to continue studies in science but had never been used in studies of computer science. Attribution theory involves explanations that people give for their successes and failures. The theory suggests that when people attribute their successes to unstable causes (luck or effort) and their failures to stable causes (ability or task difficulty), the probability of persistence is low.

The twelve factors chosen for this study were math background; attribution to luck, attribution to effort, attribution to difficulty of task and attribution to ability; domain specific self-efficacy; encouragement; comfort level in the course; work style preference; previous programming experience; previous non-programming computer experience; and gender. Success was measured by the score on a programming exam given in the class. A multiple regression study of these twelve factors was conducted using a questionnaire, a CS self-efficacy instrument, and test scores from 105 students enrolled in CS1 at Southern Illinois University.

A pilot test was given to enable the researcher to find any ambiguities in the questionnaire, and revisions were made appropriately. One expert in the field of psychology research and two experts in the field of testing and evaluation were asked to evaluate the face validity of the questionnaire. Four seasoned computer science professors examined the content of the instrument. The questionnaire was found to have high content validity for measuring the variables in the study. A test-retest was used to examine the reliability of the questionnaire. The instrument was administered to students in two sections of an introductory computer science course at another university. Because the questionnaire was intended to measure different attributes, it was necessary to determine eight correlations. The Pearson Correlation coefficients were 0.98 for math background, 1.0 for previous programming course, 0.72 for previous self-initiated programming experience, 0.95 for previous non-programming experience, 0.80 for work style preference, 0.88 for comfort level, 0.72 for attributions to success/failure, and 1.0 for encouragement. The Computer Programming Self-Efficacy Scale was used to collect data on domain-specific self-efficacy as it relates to tasks in the C++ programming language. The authors reported an overall alpha reliability of 0.98 on the instrument.

The study revealed three predictive factors in the following order of importance: comfort level, math, and attribution to luck for success/failure. The proportion of variance in test score accounted for by the linear combination of the 12 factors was approximately 0.44, $R^2 = 0.4443$, which was statistically significant, $F(12, 92) = 6.13$, $p = 0.0001$. Three of the predictor variables contributed a significant difference in the midterm grade at the .05 level even after being considered last in the model. They were comfort level, math background, and attribution of success/failure to luck with p-values of 0.0002, 0.0050, and 0.0233 respectively. Comfort level and math background were found to have a positive influence on success, whereas attribution to luck had a negative influence. The study also revealed, by considering the different types of previous computer experiences (including formal programming class, self-initiated programming, internet use, game playing, and productivity software use), that both a formal class in programming and game playing were predictive of success (as measured by the exam.) Formal training had a positive correlation and games a negative correlation with class grade.

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