

Learner Control, Expertise, and Self-Regulation:
Implications for Web-Based Statistics Tutorials

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by

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Abstract

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Many statistics students have only a rudimentary understanding of distributions and variability, fundamental concepts in statistical inference. Computer-based instruction can improve understanding, but its effectiveness may vary due to interactions between instructional features and learner characteristics such as domain expertise and self-regulated learning ability (planning, monitoring, and evaluating one's own learning). Especially in computer-based instruction, learning can depend upon the learner's control over instructional processes.

The current study manipulated levels of learner control over exposure to feedback and supplementary questions in a Web-based tutorial on standard deviation. The study examined how learner control and learning are related to domain expertise, self-regulation of learning, self-efficacy (belief that one will succeed on the tutorial), and task value (importance of learning about standard deviation).

Although the tutorial significantly improved understanding of standard deviation for all learners, $t(200) = 6.75, p < .001, d = .42$, experts (who had

completed one or more statistics courses) benefited more from learner control than did novices (who had not completed their first statistics course). In contrast, novices benefited from greater control exercised by the program and suffered from greater learner control, as reflected by impaired learning and increases in reported frustration and difficulty with the tutorial. Experts, who experienced less cognitive load overall, learned equally well with either level of control.

However, the prediction that program control would be more beneficial for low self-regulating learners than high self-regulating learners was not supported. Self-regulation of learning, self-efficacy, and task value (all self-reported) were positively and significantly associated with learning; however, when expertise was statistically controlled, these predictors were no longer significant. Perceived cognitive load was negatively associated with learning.

Supporting Cognitive Load Theory, these results have implications for the design of computer-based instruction. Learner expertise must be considered so that cognitive load can be managed via instructional control that enables learners to focus on essential material and make connections with prior knowledge. A high level of learner control that allows experienced learners to exercise efficient learning, may be detrimental to novices, who possess limited domain expertise and may not effectively self-regulate their learning.