Technology Attributions and Achievement: Effects of Computer and Performance Attributions on Academic Achievement

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Background

The present study is based on Weiner's Attribution Theory (1985, 2000, 2010), which states that an individual's perceived attributions of causality following success and failure events influence subsequent emotions and actions. Weiner asserts that actions are influenced by perceived causes of failure, which are determined by three properties: Locus of causality, controllability, and stability. Weiner further proposes that attributions perceived as controllable by the individual should increase motivation, whereas attributions perceived as personally uncontrollable tend to have the opposite effect.

The growing use of computers in education has become a recurring interest in recent research, particularly in secondary education. As computer use continues to integrate itself as a standard in all fields of education, it is essential to examine implications for academic tasks, performance and overall achievement. The present study examines the effects of college students' attributions for computer problems, as experienced in the context of using computers to complete academic tasks, on academic achievement outcomes. The present research extends attribution theory to how college students respond to technological difficulties experienced during academic computing (e.g., computer crashes, errors, etc.), and further, how causal attributions and corresponding emotions concerning academic computing challenges impact objective achievement outcomes.

Method

Participants & Procedure

A self-report questionnaire concerning academic computing was completed by college students at a mid-western, research-intensive Canadian university. Students were recruited from eight sections of Introductory Psychology course and participated in exchange for experimental credit (N = 788). The questionnaire was completed using a web-based format so as to prime students' computer-related perceptions, and was conducted six months into the academic year. The sample was comprised of 512 females and 286 males, with an average age of 19.91 (SD = 3.92) and course performance of 71.86% (SD = 11.86).

Method (cont.)

Independent Measures

Attributions to computer problems. Six 10-point items (1 = *not at all*, 10 = *very much so*) were used to assess attributions for computer problems based on Weiner's attributions, and were derived from parallel items previously used to evaluate attributions for academic difficulty (Hall et al., 2007, 2011). The attributional items consisted of attributions to ability (M = 4.43, SD = 2.52), effort (M = 5.14, SD = 2.71), strategy (M = 5.32, SD = 2.48), luck (M = 4.17, SD = 2.59), computer quality (M = 6.90, SD = 2.41), and program difficulty (M = 6.24, SD = 2.36). Individual attribution items were not combined into composite variables (e.g., controllable attributions) based on principal components factor analyses.

Attributions to poor academic performance. Six 10-point items (1 = *not at all*, 10 = *very much so*) were used to measure attributions for poor academic performance. The attributional items consisted of attributions to ability (M = 5.43, SD = 2.27), effort (M = 8.04, SD = 1.92), strategy (M = 6.95, SD = 2.02), luck (M = 3.99, SD = 2.22), teacher quality (M = 6.86, SD = 2.33), and test difficulty (M = 7.22, SD = 2.08).

Dependent Measures

Grade percentage. Final grade percentages for students in Introductory Psychology courses were obtained from their professors at the end of the academic year.

Analysis

A preliminary correlation analysis was performed to test relationships between attributions to computer problems experienced in the context of academic computing and poor course performance.

A regression analysis was conducted to assess the effects of academic performance attributions and computer-related attributions on final grade percentages. Covariates included in the regression analysis consisted of gender, age, self-reported high school grades, English as a first language, credit hours registered for, and enrolment in courses with computer components to control for potentially confounding personal and academic background variables.

In the first step, the effects of performance attributions on achievement were evaluated. In the second step, the effects of computer-related attributions on achievement were evaluated while controlling for the effects of academic attributions.

Results

Correlation analyses revealed attributions to ability, effort, strategy, luck, computer quality, and program difficulty for computer-related problems to have significant relationships with corresponding attributions for poor academic performance, as shown in Table 1.

The regression analysis showed ability and effort to significantly predict achievement for both academic and computer-related attributions. The final model shows computer attributions of ability and effort to significantly predict grade percentage while controlling for effects of performance attributions, as shown in Table 2.

Table 1

Correlations of Computer and Corresponding Academic Performance Attributions

Attributions	r	Attributions	r
Ability	.317**	Teacher/Computer	.147**
Effort	.132**	Quality	
Strategy	.109*	Test/Program	.273**
Luck	.312**	Difficulty	

**$p < .001$; *$p < .01$

Table 2

Effects of Computer-Related and Academic Performance Attributions on Grade Percentages

Step 1		β	Step 2		β
Performance Attributions	Ability	-.081*	Computer Attributions	Ability	-.105**
	Effort	.119**		Effort	.147**
	Strategy	.079*		Strategy	.026
	Luck	-.020		Luck	.082*
	Teacher Quality	-.045		Computer Quality	-.011
	Test Difficulty	-.021		Program Difficulty	-.035

**$p < .01$; *$p < .05$

Discussion

Findings revealed attributions for academic computing problems to significantly correlate with equivalent attributions for poor course performance. Computer-based and performance attributions to ability and effort in particular were found to significantly predict grades at the end of the semester. Most importantly, findings revealed computer-related attributions to significantly predict grades over and above the effects of performance attributions.

Discussion (cont.)

Consistent with Weiner's Attribution Theory, attributions to ability were found to negatively predict achievement outcomes, whereas attributions to effort were found to positively predict achievement outcomes for both computer-related problems and poor academic performance. Interestingly, there were marginally significant effects of strategy attributions for poor academic performance and luck attributions for computer-related problems as well.

Overall, these findings demonstrate important effects of motivation related to academic computing on academic achievement. The present findings suggest that relations between computer-related attributions and academic achievement are significant even when controlling for academic performance attributions, thus warranting additional research in which attribution theory is applied to this domain.

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