A Structural Equation of a Course Evaluation Instrument Based on Academic Motivation Theory

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The purpose of this study was to use structural equation modeling to examine the relationships among four academic motivation factors (attention, relevance, confidence, satisfaction) of a course evaluation instrument and the prudence of combining measures of these variables into a composite measure of academic motivation. A group of 199 students enrolled in eight sections of an undergraduate measurement course completed the 34-item Academic Motivation Profile. The results indicated that course relevance and satisfaction were the only substantial predictors of attention. Further investigation yielded a unique curvilinear relationship between confidence and attention, indicating the impropriety of creating academic motivation composite scores without first performing a transformation of confidence scores.

Introduction

In formative evaluation of instruction, many educators use measures of student attitudes as one indicator of course quality. Developing valid measures of students' attitudes is complex, with critics citing the absence of theoretical underpinnings (Rotem & Glasman, 1979), inadequate psychometric characteristics (Marsh, 1984), and inconsistent relationships among measures of attitudes and achievement within a course (Cohen, 1981; Feldman, 1977; Marsh, 1982). John Keller (1983) summarized principles from academic motivation theory into the ARCS model (attention, relevance, confidence, satisfaction) and demonstrated effective use of his model for designing instruction. Since these academic motivation variables provide an effective basis for designing instruction, they also may be useful for developing course evaluation instruments. The purpose of this study was to use structural equation modeling to examine the relationships among the four academic motivation variables in a course evaluation instrument and the prudence of combining them into a composite measure.

Theoretical Framework

Academic motivation as defined in this study encompasses the variables of attention, relevance, confidence, and satisfaction. Attracting students' attention is challenging and can be accomplished through students' sensation-seeking needs (Zuckerman, 1971) and arousing their basic curiosity (Berlyne, 1965), but it is sustained through posing problems to be solved which trigger knowledge-seeking behaviors (Berlyne, 1965; Kaplan & Kaplan, 1978). Sustaining attention also requires that tasks presented satisfy students' immediate needs (McClelland, 1976), appear prerequisite to attaining future goals (Raynor, 1984), and be congruent with the values of students' reference groups (Keller, 1983). Weinert and Kluwe (1987) propose that perceived relevance of learning tasks affects personal aspirations, performance expectations, and effort allocations. Students' confidence is affected by their causal attributions of prior successes and failures, emotional reactions to these experiences, and confidence in future performances (Bandura, 1977; Fibel & Hale, 1978; Jones, 1977). Students who lack confidence become frustrated and withdraw attention as do

students who are overconfident and exhibit boredom (Kopp, 1982); students who perceive a learning task as a reasonable challenge, however, maintain high levels of attention. Students who are intrinsically satisfied with instruction (Lepper & Greene, 1978) or extrinsically satisfied (Adams, 1965; Deci, 1975) are more attentive to instruction than those who believe that the outcomes do not justify their efforts.

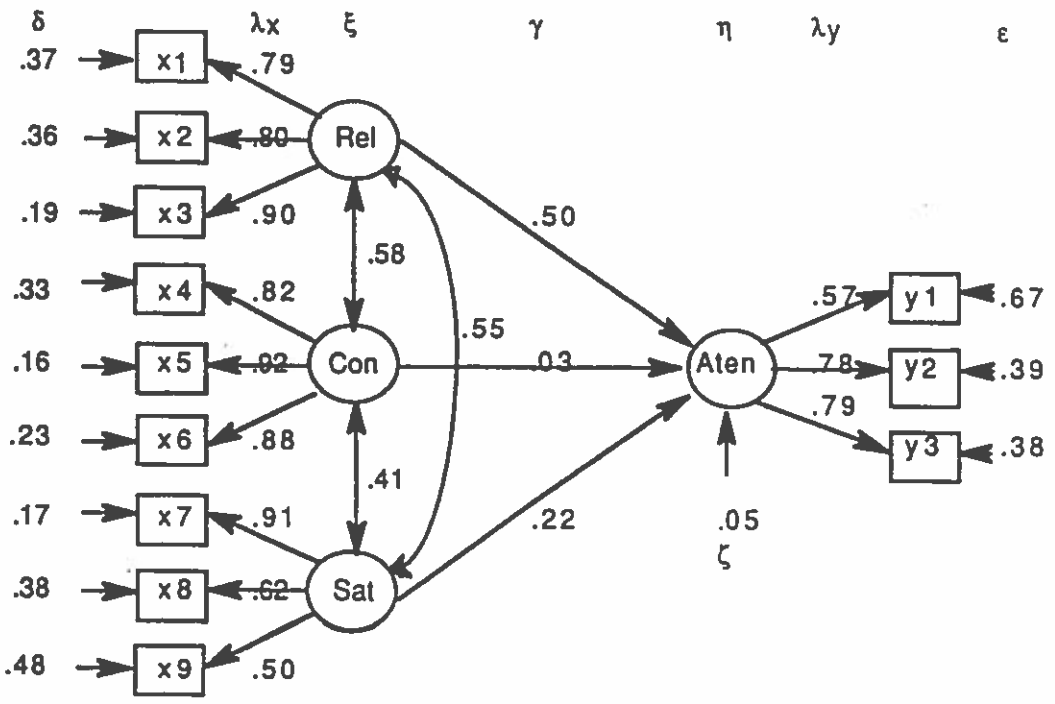
While research supports the inclusion of these four factors under an academic motivation umbrella, it indicates differing structural relationships among the factors. Siegler (1986) concludes that the relationship among these factors is not equal and that sustained attention is an outcome of the other three attributes (e.g., [(Relevance + Confidence + Satisfaction = Attention) = Academic Motivation]. Research indicates that both relevance and satisfaction share linear relationships with attention, and gains in either factor lead to gains in attention. In contrast, the relationship between confidence and attention is curvilinear, with very high and very low confidence resulting in lower levels of attention. Structural equation modeling was used to determine whether the relationships observed in prior research could be replicated in a course evaluation instrument based on the ARCS variables. Should these relationships hold, questions about the prudence of combining scores from the four variables into a composite score of academic motivation arise. Should they not hold, questions about whether the instrument actually measures academic motivation arise.

Method

The sample included 199 education students enrolled in eight sections of an undergraduate testing and evaluation course during the spring semester of 1991. All sections used the same syllabus, textbook, and examinations, and contained students from all major areas of study. All students in the measurement course completed the course evaluation instrument during the class session immediately preceding the final examination.

The course evaluation instrument, named the Academic Motivation Profile (Carey, 1989; Pearson & Carey, 1990), was developed to link the four factors of Keller's ARCS model to instructional experiences in the course. It measures students' perceived levels of *attention* to: (a) the textbook, (b) lectures, and (c) exercises; their perceptions of the course's *relevance* for their: (d) immediate academic program needs, (e) transition to teaching needs, and (f) long-range professional needs as a teacher; their *confidence* in performing skills acquired during the course related to: (g) designing tests, (h) analyzing data, and (i) communicating progress; and their *satisfaction* with: (j) the course, (k)

Figure 1
Structure of the Academic Motivation Profile



themselves, and (l) the instructor. The 34 Likert-style items on the Academic Motivation Profile (AMP) were collapsed into these 12 continuous subscales, with three subscales for each of the four main variables.

Structural equation modeling through LISREL VII (Joreskog & Sorbom, 1989) was used to evaluate how well Siegler's hypothesized model fit the data generated from the AMP. Item means, variability, skewness, kurtosis, and internal consistency reliability were obtained for the 12 continuous variables. All variables demonstrated adequate variability, and there were no serious violations of the assumptions underlying the structural equation model--i.e., normality.

Results

Cronbach internal consistency reliability estimates were .82 (Attention), .93 (Relevance), .94 (Confidence), and .88 (Satisfaction). The LISREL estimates and standard errors were determined from the correlation matrix (See Figure 1), and as usual for large samples, the χ^2 was significant ($p < .001$). The goodness-of-fit indices, however, indicated an excellent fit of the model to the data (GFI, adjusted GFI, Bentler-Bonet Index, and Tucker-Lewis Index were all greater than .90). All 12 continuous variable subscales had significant loadings (based on t-values) on their designated factors, and the errors associated with the subscales were reasonably small (Epsilon). The Gammas indicated that both relevance (.50) and satisfaction (.22) had significant linear relationships with attention. In contrast, confidence and attention were not linearly related (Gamma = .03). Post hoc examination of other possible links between confidence and attention using regression analysis yielded a curvilinear relationship ($p < .01$).

Conclusions

The model of academic motivation proposed by Siegler (1986) was used to examine the AMP. The structural equation analysis and follow-up regression analysis support previous research which found linear relationships between attention and both relevance and satisfaction and a curvilinear relationship between attention and confidence. The fidelity of structural relationships, high internal consistency reliability, and satisfactory factor structures demonstrate the potential for using academic motivation theory as a basis for designing course evaluation instruments. The unique curvilinear relationship between confidence and attention, however, indicates the impropriety of creating academic motivation composite scores without first performing a transformation of confidence scores. Failure to transform the confidence measure before creating an academic motivation score may partially account for the inconsistent relationships among academic motivation scores and between academic motivation and measures of achievement within a course (Keller, Kelly, & Dodge, 1978).

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