

## The Relationship Between Epistemological Beliefs and Self-regulated Learning Skills in the Online Course Environment

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### Abstract

Epistemological beliefs and self-regulated learning skills, as meta-cognitive constructs, have been suggested as being associated with positive learning outcomes. Results from research literature, however, have been mixed as to the impact of epistemological beliefs, self-regulated learning skills, or some combination of the two meta-cognitive constructs as being associated with academic achievement. The relationship between epistemological beliefs and self-regulated learning skills as associated with academic achievement among online learners was examined in this study.

**Keywords:** Epistemological beliefs, self-regulated learning, online learning, meta-cognition

### Introduction

Research has suggested that the epistemological beliefs of learners may influence the learning processes that students choose to engage in (Hofer, 2001), which have been referred to as acts of self-regulated learning. In the online learning environment, the development of self-regulated learning skills is particularly important as the online learning environment has been indicated as requiring students to employ more self-regulated learning skills (Fisher & Baird, 2005). Additionally, self-regulated learning skills have been positively associated with academic achievement (Nota, Soresi, & Zimmerman, 2004; Schunk & Zimmerman, 1998; Zimmerman & Schunk, 2001). Tsai and Chuang (2005) explored the association between epistemological beliefs and the meta-cognitive learning preferences among learners in the online environment. In finding a significant association, Tsai and Chuang (2005) suggest that educators must be aware of the epistemological beliefs of learners in order to successfully implement self-regulated learning activities in the online learning environment. The current study presents an examination of the relationship between epistemological beliefs and self-regulated learning skills in the online learning environment as associated with academic achievement.

Bell (2006) examined the effects of self-regulated learning behaviors and epistemological beliefs on learner outcomes in the online learning environment while controlling for student computer self-efficacy and prior academic achievement. In studying a sample of 201 undergraduate students enrolled in a web-based program, he did not find epistemological beliefs a significant predictor of academic achievement in the online learning environment. However, he did find evidence to support the association of self-

regulated learning skills with positive academic achievement among online learners. Yet, in examining the relationship of epistemological beliefs and self-regulated learning skills with academic achievement separately, he did not examine the relationship between epistemological beliefs and self-regulated learning skills among online learners.

In another study, Pieschl, Stahl, and Bromme (2007) investigated the relationship between the epistemological beliefs and self-regulated learning behaviors among biology students learning the topic of genetics with hypertext. They found that more sophisticated or more constructivist-oriented epistemological beliefs were significantly associated with students being able to process more information as well as being associated with more positive learning outcomes. With regard to self-regulated learning skills, they concluded that how students *calibrate* (p. 25) their learning through self-regulated learning skills was impacted by epistemological beliefs along with prior task or domain knowledge. The results of this study indicate that epistemological beliefs and self-regulated learning skills among online learners may be associated with each other and each in turn associated with academic achievement separately.

The purpose of this study was to examine the relationship between epistemological beliefs and self-regulated learning skills in the online course environment and its association with academic achievement among online learners. The distinguishing factor in this study is that the relationship between epistemological beliefs and self-regulated learning skills and how this relationship is associated with academic achievement was examined simultaneously by employing structural equation modeling. To achieve the purpose of the current study, two research questions were examined as follows:

- What is the relationship between epistemological beliefs and self-regulated learning skills?
- How is the relationship between epistemological beliefs and self-regulated learning skills associated with academic achievement?

## Method

### *Participants*

The sample consisted of 434 students enrolled in a course having an online format at a large, public university located in the Southwestern United States. Of those who self-selected to participate, 54% ( $n = 235$ ) of the sample were female. Approximately 74% ( $n = 321$ ) of the sample identified themselves as White or European American followed by 13% ( $n = 56$ ) identifying themselves as Hispanic, 9% ( $n = 39$ ) as African American, and 4% ( $n = 18$ ) Asian Americans. A total of 18 different academic disciplines were represented. Self-reported, cumulative grade point averages (GPA) ranged from 0 to 4 with a mean of 2.80 and a standard deviation of .643. The cumulative earned credit hours of the student respondents ranged from 0 to 158 hours with a mean of 43.03 earned hours and a standard deviation of 10.51 hours. This distribution of cumulative earned hours indicates that the majority of students were classified as freshman and sophomores.

### *Measures*

To measure epistemological beliefs, the researchers utilized the Epistemic Belief Inventory (EBI). Epistemological beliefs refer to those beliefs about knowledge and the nature of knowing that an individual develops and comes to hold (Hofer, 2004). The EBI is a 28-item scale consisting of five point Likert-type response format ranging from 1 (strongly disagree) to 5 (strongly agree) (Schraw, Bendixen, & Dunkle, 2002). The instrument contains five subscales representing the five hypothesized domains comprising epistemological beliefs. The following are two examples of items with one item negatively-scored and one item positively-scored respectively:

- Really smart students don't have to work as hard to do well in school.\*
- Absolute moral truth does not exist.

Higher scores on this instrument indicate more sophisticated epistemological beliefs while lower scores indicate less sophisticated, more naïve epistemological beliefs. The reported internal consistency of scores for this instrument was  $\alpha = .83$  (Schraw et al., 2002). For this study, the overall internal consistency of scores for data obtained was  $\alpha = .82$ .

To examine the self-regulated learning skills, the researchers employed the short form of the Online Self-regulated Learning Questionnaire (OSLQ; Lan, Bremer, Stevens, & Mullen, 2004; Barnard, Lan, & Paton, 2008). The short form is a 24-item scale with a 5-point Likert-type response format having values ranging from strongly agree (5) to strongly disagree (1). Higher scores on this scale indicate better self-regulation in online learning by students. The internal consistency of scores obtained for the short form of the OSLQ in study was  $\alpha = .92$ . Examples of two items from the time management and goal setting aspects of the scale respectively from the short form are as follows:

- Although we don't have to attend daily classes, I still try to distribute my studying time evenly across days.
- I set standards for my assignments in online courses.

#### *Procedure*

Students were recruited from a pool of 936 students enrolled in a computer-based literacy course that satisfies a university general education requirement. As 434 students self-selected to participate in the study from this sampling frame, the resulting response rate was 46%. After data were collected, some items were recoded and reversed per instrument instructions. No modifications were made to either instrument. All analyses were performed in *MPlus* (v. 5.00; Muthén & Muthén, 2007). Values for missing data were analyzed using full information maximum-likelihood (FIML) as the method of estimation. As an extension of maximum likelihood, FIML takes advantage of all possible data points in analysis. Enders and Bandalos (2001) indicated that full information maximum-likelihood is superior to listwise, pairwise, and similar response pattern imputations in handling missing data that may be considered ignorable.

#### *Analysis*

To answer the first question, a Pearson's  $r$  bivariate correlation was calculated between the total scale scores. To answer the second research question, structural models were employed. Four indices reflecting fit were reported: the chi-square ( $\chi^2$ ) test statistic, the Tucker Lewis Index (TLI) also known as the Non-Normed Fit Index (NNFI); the Comparative Fit Index (CFI); and the root mean square error of approximation (RMSEA). The researchers then modeled the indirect effect of self-regulated learning skills among online learners as a mediator in the relationship between epistemological beliefs and GPA.

#### **Results**

In answering the first research question, the relationship between epistemological beliefs and self-regulated learning skills was strong, positive, and significant,  $r = .66$ ,  $p < .01$ . This result indicates that as epistemological beliefs become more sophisticated self-regulated learning skills among online learners also increase.

To answer the second and final research question, the researchers hypothesized that self-regulated learning skills in the online learning environment may mediate the relationship between epistemological beliefs and achievement as measured by GPA while controlling for participants' age on epistemological beliefs. First, the researchers evaluated the fit of this model as represented in *Figure 1*. The chi-square goodness of fit statistic was not significant,  $\chi^2 (2) = 3.284$ ,  $p = .1936$ , indicating that the model may fit the data. The root mean square error of approximation (RMSEA) compensating for the effects of model complexity was 0.042, which according to Browne and Cudek (1993) indicates an acceptable fit of the model being less than or close to 0.05. The value of Tucker Lewis Index (TLI), also known as the Non Normed Fit Index (NNFI) was .978 and value of the Comparative Fit Index (CFI) was .993. Hu and Bentler (1999) note that fit index values of .95 or better are indicative of good fit. In evaluating model fit, these results indicate that the proposed model may fit the data.

After determining that the model may fit the data, the researchers next examined the results of the model in terms of standardized path coefficients. The relationship between epistemological beliefs and self-regulated learning skills among online learners appeared to be strong, positive, and significant at the .01 level with a standardized path coefficient value of .786. This path value indicates that, as epistemological beliefs become more sophisticated, self-regulated learning skills also increase among online learners. The relationship between self-regulated skills and GPA was small, positive, and significant at the .05

level with a standardized path coefficient value of .131. This weak path value indicates that as self-regulated learning skills increase achievement as measured by GPA also increases. The relationship between epistemological beliefs and GPA was not significant, indicating no significant relationship between these two variables.

The indirect effect from epistemological beliefs to self-regulated learning skills as the mediator to achievement was estimated by GPA among online learners (the dashed paths *a* & *b* from *Figure 1*). In modeling the indirect effect of paths *a* and *b*, self-regulated learning skills as a mediator appeared to be small but statistically significant with a standardized path coefficient value of .103. The *a* and *b* paths represented by the dashed lines in the *Figure 1* below are to indicate the direction of the indirect effect as calculated. This result indicates that self-regulated learning skills may be viewed as positively mediating the relationship between epistemological beliefs and GPA.

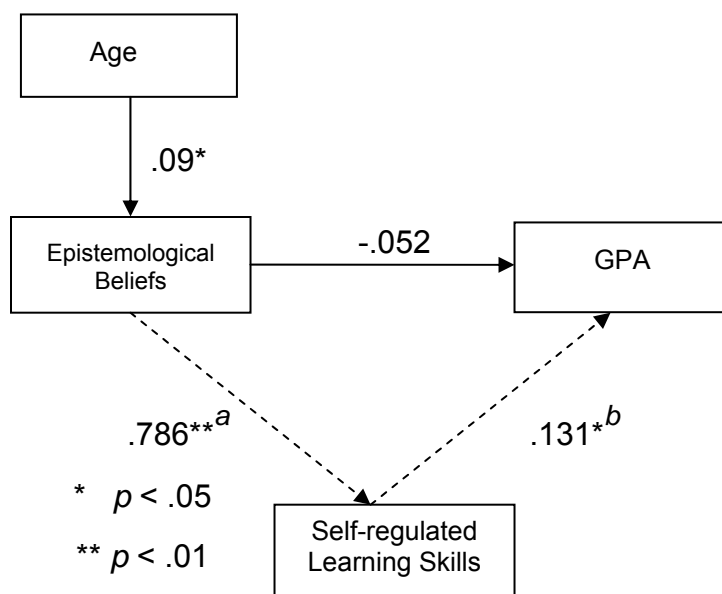


Figure 1. Path diagram for epistemological beliefs and self-regulated skills

## Discussion

The results of the current study suggest a significant relationship between the epistemological beliefs and the self-regulated learning skills of online learners. This finding supports current theoretical understanding of epistemological beliefs and self-regulated learning skills as being related with there being a statistically significant relationship between as being two meta-cognitive constructs of epistemological beliefs and self-regulated learning skills (Ormrod, 2008). By employing structural equation modeling techniques, the impact of the relationship between epistemological beliefs and self-regulated learning skills on academic achievement among online learners was examined as a whole. The results of this study indicate that self-regulated learning skills in the online learning environment may be viewed as mediating the relationship between epistemological beliefs and academic achievement as measured by GPA.

As in the results of Bell (2006), the relationship between epistemological beliefs and academic achievement in the current study was small and non-significant. Self-regulated learning skills appeared to mediate this small, non-significant relationship between epistemological beliefs and academic achievement with an estimated indirect effect larger than the direct effect between epistemological beliefs and academic achievement. This larger indirect effect indicates that self-regulated learning skills may function as a suppressor variable rather than a mediating variable. Suppressor variables have been

noted as being difficult to interpret as these variables enhance the relationship between desired independent and dependent variables by their presence given their correlation with other variables (Tabachnick & Fidell, 2007). The researchers suggest that the strong, positive, and significant association between epistemological beliefs and self-regulated learning skills would enhance the relationship between epistemological beliefs and academic achievement when self-regulated learning skills are inserted into the model. The researchers conclude that epistemological beliefs are associated with academic achievement only through the suppressor variable of self-regulated learning skills.

This finding is especially relevant to provide instruction and interventions to online learners. For online instruction, educators must be concerned with the development of epistemological beliefs in relation to self-regulated learning skills as being associated with academic achievement in tandem and not simply separately. As such, Winne (1995) as cited in Hofer and Pintrich (2002) has theorized that, "epistemological beliefs serve an important role of setting standards for students' self-regulated learning," (p. 106). The combination of these two meta-cognitive constructs appears to play an important role on the academic achievement of online learners. Future research should consider the interaction of epistemological beliefs and self-regulated learning skills as being associated with academic achievement rather than in isolation of one another. The researchers also suggest the examination of self-regulated learning skills as possibly a complete mediator (rather than suggested suppressor variable as found in the current study), where self-regulated learning skills function as a light switch to the connection between epistemological beliefs and academic achievement. The researchers furthermore suggest examining the development of epistemological beliefs and self-regulated learning skills longitudinally and in relation to one another across time.

Several limitations emerged as part of the current study. For instance, the relationship between self-regulated learning skills in the online learning environment and academic achievement were not as strongly related as the researchers would have expected with a standardized path coefficient of .131. This small, positive but significant association between self-regulated learning skills and academic achievement may be explained by how the variable of academic achievement was operationalized. For the purposes of this study, we obtained cumulative grade point averages, which would include grades from coursework delivered online and in a traditional face-to-face course format. In this case, cumulative grade point average would reflect academic achievement achieved in both online and traditional coursework.

## Conclusions

Previous research has indicated a possible relationship between student perceptions in the online learning environment and their subsequent self-regulatory learning skills (Barnard, Paton, & Rose, 2007). Indeed, Barnard, Paton, and Lan (2008) found that online self-regulatory learning skills behaved as a mediator in the relationship between student perceptions of the online course environment and academic achievement. The results of the current study extend this line of research to examining whether these self-regulatory learning skills in the online learning environment may function as a mediator in the relationship between epistemological beliefs and academic achievement. In complementing previous research, our results indicated that these self-regulatory learning skills in the online learning environment may be viewed as mediating this relationship.

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