Running Head: EPISTEMIC BELIEFS, LEARNING, AND SELF-REGULATION

# Relationship of Epistemic Beliefs and Learning Beliefs in Self-Regulated Learning

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Abstract

Self-regulation is critical function of academic achievement. Self-discipline is important for lifelong learning regardless of where the learning takes place in the personal, professional, or educational life of an individual. Self-regulation is the mechanism of the cognitive self that plans, organizes and promotes the execution of behaviors toward attainment. The purpose of this literature review is to examine studies that explore the interplay between epistemic beliefs and learning beliefs in self-regulated learning. Specifically, this paper will examine how epistemic beliefs and learning beliefs may influence the decisions a learner activates in the self-regulation process. Moreover, this aim of this review of the literature is to understand the types of epistemic beliefs and learning beliefs that facilitate or hinder self-regulated learning.

# **Introduction**

What differences in learning behaviors exist between successful students and struggling students? What is the source of the internal mechanism that promotes learners to activate self-regulatory skills such as planning, monitoring, reflection and motivation? Do beliefs precede self-regulation, or is there a feedback loop occurring whereby the influence of one creates a reciprocated change in the other? Learning is messy! Thinking about thinking is even messier. The difficulty in understanding beliefs necessitates a clean up of how beliefs are defined and conceptualized by researchers (Pajares, 1992). A clear understanding of learner epistemic beliefs and learning beliefs is important, as researchers are in agreement that these beliefs guide the goals and strategies that individuals choose to put in place for attainment.

 This paper discusses research as it pertains to discovering the sources of epistemic beliefs, learning beliefs, and how these beliefs influence self-regulated learning. A review of theoretical papers and research studies from 1988 to 2012 was conducted on the topic of student epistemic beliefs, student learning beliefs and self-regulation learning. The focus of the search was for both research papers and theoretical studies examining epistemological beliefs, learning beliefs, and self-regulation learning. Search procedures included search terms such as belief, knowledge, student learning, epistemology, epistemic, self-regulation, motivation and learning beliefs. An exhaustive search in academic databases was conducted utilizing Elsevier, PsycInfo, Springer, APA Psycnet, JSTOR, EBSCO and ProQuest. Name specific searches were conducted for authors’ known to publish in the topics of interest for this paper and in the reference lists of identified works examined.

 This paper is organized by first discussing the constructs of epistemic belief, learning beliefs, and self-regulation along with relevant research. Next I attempt to synthesize the constructs, again by using research that supports the relatedness of the constructs. And finally a discussion about how epistemic beliefs and learning beliefs are situated within the literature about self-regulated learning.

**Epistemic beliefs**

 Beliefs are truths that individuals hold about the nature of knowledge and knowing (Vosniadou & Mason 2012). These truths guide how individuals conduct their learning behavior by influencing the types of strategies students choose when learning (Hofer and Pintrich, 1997). Epistemic beliefs guide individual’s course of action through the use of standards set-up using the belief held by individual’s beliefs about knowledge and knowing and about how that knowledge is acquired (Vosniadou & Mason, 2012). Individuals’ epistemic beliefs may be activated without their knowledge, tacitly, through the standards that enact cognitive and metacognitive processes and behaviors toward task attainment (Hofer & Pintrich, 1997).

 Marlene Schommer-Aikins (1990). introduced educational psychology to the idea of epistemological beliefs as a system of more or less independent beliefs with five dimensions: (1). structure, (3). certainty, and (3). source of knowledge, (4). control and (5)speed of knowledge acquisition. However, Hofer and Pintrich (1997). argue that in order to keep epistemological beliefs from becoming messy (pajares, 1992), they should be limited to the nature of knowledge and knowing. The conceptualization of these apart, they suggest, is easier to explore and understand when relating them to how individuals use epistemic beliefs to formulate epistemological standards that can facilitate or constrain learning. Direct instruction of epistemic beliefs, therefore, may be important for helping individuals’ revise beliefs about knowledge that are not conducive to learning. Namely, beliefs that knowledge is fixed, simple, and certain.

 Emerging empirical evidence suggests that epistemic beliefs may be a significant predictor for learning. For example, using Bromme, Kienhues, and Stahl’s (2008). theoretical framework, Muis & Duffy (2012). examine the relationship between epistemic change and epistemic climate in the context of a statics course. Muis & Duffy hypothesized that epistemic change would occur in constructivist learning environments, but not in traditional learning environments. Furthermore, they predicted that epistemic change would occur later in the course time frame, as epistemic beliefs change gradually. Additionally, Muis & Duffy believed that students in the intervention would gain critical thinking skills and other learning strategies, as well as increase self-efficacy, in the constructive environment.

 To control for prior knowledge, students were administered prior knowledge tests. Students completed questionnaires to assess their epistemic profiles, learning inventories, and motivation levels. Sixty-three graduate level students were placed in either a control group with traditional (teacher as source). classroom or an intervention classroom, where the professor posed questions, compared new material to previously learned material, and promoted group thinking. They found that epistemic beliefs of students who were in the intervention classroom began to shift in the 8th week of the semester. A shift in the their beliefs about the justification of knowledge was seen in the 12th week, and in the final week a significant change in their beliefs about the source of knowledge was evidenced. Higher self-efficacy was seen in the 4th week, with significant difference between groups in the 8th week. Finally, the intervention group showed significantly higher final grades than student in the control group. Moreover, Muis & Duffy report that students’ beliefs about the certainty and simplicity of knowledge negatively predicted achievement. Based on these results, Muis & Duffy concluded that interventions that focus on interventions to change students’ epistemic beliefs by focusing on the nature of knowledge and knowing.

 There is utility in Schommer the revisions of epistemic beliefs, and questioning whether epistemic beliefs about knowledge develop before learning beliefs, or whether the two are bootstrapped. Furthermore, to better inform intervention for learners with low motivation it is important to find out whether epistemic beliefs influence beliefs about learning? (Shommer-Aikin 2004).

**Learning beliefs**

 Learning entails an internal cognitive structure for acquiring knowledge. Contrary to epistemic beliefs, learning beliefs do not deal with the nature of knowledge or knowing, but with how a learner acquires knowledge (Hofer & Pintrich, 1997). Learners are individuals, and thus each individual acquires knowledge according to their own individualized cognitive structures. Learning beliefs are individual’s assumptions of how knowledge is acquired. Theories of learning consider acquisition of knowledge from the individual’s stance as information that is constructed (Murphy, Alexander & Muis, 2010) to obtain a goal. Some individuals construct knowledge by isolated pieces to memorize; while others construct it by actively joining and manipulating information for a more critical view. Learning beliefs that individual’s hold direct the goal orientation. Learners with an incremental view of knowledge acquisition are more likely to be mastery-learning goal oriented, and are more apt to demonstrate resilience and perseverance in the face of difficulty. On the other hand, learners with an entity view of knowledge acquisition believe acquisition of knowledge is accomplished as piece-meal process. They use memorization as their primary learning strategy, failing to develop the deeper processing thinking necessary for academic achievement. Moreover, these learners may fail to recognize when revision of strategies is necessary (Dweck & Leggett, 1988).

 Hofer and Pintrich (1997). question the inclusion of learning beliefs in Schommer’s multidimensional model of epistemological beliefs. They argue that beliefs about knowledge and beliefs about learning need to be conceptualized separately. Although they are related, separation of epistemic beliefs and learning beliefs allows a more robust examination of the sources of each, as well as an investigation about how they interrelate. In other words, do learning beliefs influence academic behaviors toward attainment? What does the relationship between epistemic beliefs and learning beliefs reveal about learning? Additionally, a separation of epistemic beliefs and learning beliefs may provide insight into the potential interaction between them, indicating a more cyclical relationship that is crucial for intervention programs. Hen & Pajares (2010), support this proposition. They report the results from a study of students’ science achievement indicating the importance of interventions for revising students’ beliefs about the nature of knowledge and intelligence.

 In their study, they surveyed 508 grade 6 science students’ belief about knowledge and knowing. They hypothesized that implicit theories of ability (acquisition of knowledge as constructed or acquired quickly) would directly relate to epistemological beliefs. Incremental acquisition would relate to development and justification of knowledge, as well as task goal orientations and fixed views for knowledge to beliefs about the source and certainty of knowledge. In the summary of the results, they report findings that an incremental theory of ability positively correlated with the development of epistemic belief about the nature of knowledge, in addition to positively correlating with holding a task goal orientation. Moreover, incremental theory of ability negatively correlated with holding a performance avoidance goal orientation, which the research on avoidance finds is a strong predictor of academic failure (Stoeger & Ziegler, 2008). These results indicate how students’ belief about knowledge influences their beliefs about how to approach acquisition of knowledge. Chen and Pajares suggest that holding a belief that ability is malleable influences the goal orientation of learners.

 Several studies have reported on the importance of understanding learning beliefs on how goal setting, to learn or not learn and what to learn, positively correlates to cognitive self-regulatory processes that predict attainment. For example, understanding that knowledge is constructed (learning the steps). Produces a significant effect on student belief about their ability to learn, comprehensions skills (Schunk, 1989), and effortful use of learning strategies (Stoeger & Ziegler, 2008). Similarly, negative relations were reported between goal orientation and academic performance when students are administered standardized testing (Kitsantas et al., 2009) or when motivation is low (Schmitz & Wiese, 2005). In summary, awareness of personal epistemic beliefs and learning beliefs can produce a readiness for learning and reconceptualization of learning behaviors such as goal setting, strategy use, monitoring and reflection— constructs of self-regulated learning.

**Self-regulation**

 Self-regulation is the self-directive process that learners use to activate cognitive, metacognitive, and behaviors toward academic achievement (Zimmerman 2002). Key processes of self-regulation include goal setting, time management, selecting strategic learning strategies, self-evaluation, self-reflection, and the ability to seek help. Two prominent theoretical models of self-regulation are the goal oriented model and the met cognitively focused model. This paper utilizes the social-cognitive framework.

Zimmerman (2000) developed the widely accepted model of self-regulated learning. He began work on SRL, focusing specifically on the cognitive processes. This work was informed by his research on modeling that examined how young children learn abstract concepts by watching and imitating skilled models. This early work led to research on cognitive modeling within a social learning theory. Zimmerman’s focus on self-regulated learning (1981) was influenced by his work on the role of self-efficacy during learning, and his research on how the “vicarious experiences influenced learners’ perceptions of self-efficacy regarding their own capabilities and their willingness to persevere during problem solving” (B. J. Zimmerman (2008). Personal interview with H. Bembenutty.

 The key processes of the social cognitive view of self-regulated learning include cognitive, behavioral, and social/environment (Schunk, 2012). Self-directed learners are aware of their strengths and weaknesses, and reflect on behaviors that impact their learning. Moreover, they are able to internalize feedback from experts to redirect their own behaviors. Conversely, students with low SRL skills lack the metacognition to understand how they learn, and often exhibit a lack of motivation and self-efficacy. It is this latter group, which lacks the ability to “self-generate thoughts, feeling, and behaviors that are oriented to attaining goals” (Zimmerman 2002), who might benefit most from Zimmerman’s widely accepted cyclical model of self-regulated learning with three phases: forethought, performance, and self-reflection. The

relationship between epistemic beliefs and self-regulation has been of interest to researchers for a over a decade (Hofer & Pintrich, 1997; Muis, 2007). The relatedness between epistemic beliefs and self-regulated learning, like learning, is messy.

 Epistemic beliefs are an important and primary process of ‘learning to learn’ because learners motivation and perseverance to access knowledge is based on held beliefs of the learner about the nature of knowledge ( Muis, 2007). Furthermore, Muis suggests, epistemic beliefs are one component of the cognitive and affective condition of a task, and influence the standards students’ set when goals are produced. These “epistemological standards serve as inputs to cognitive and metacognitive processes involved in self-regulation” (Muis, 2007, p. 174).

 Empirical studies support this proposition. Lonka et al. (1996). conducted an intervention study to determine if university psychology students’ learning beliefs would shift to a more constructivist view after a six-week intervention course. They found that training had a significant effect in changing the learning beliefs of low performing students. In other words, “they used constructivist terminology more frequently on the posttest than on the pretest (‘Learning is a cognitive process whereby the external world is incorporated through assimilation or accommodation into existing schemas,’).” However, they found no significant effect for active epistemology.

 In another study, Stoegler & Ziegler (2008) reported significant increases in student effort and learning goal orientation as a result of awareness training of learning behaviors (outcomes of learning beliefs) inside the self-regulation learning model. Using time-series diaries, surveys, and direct instruction, they found that students showed significant increases in their ability to set goals and monitor their learning behavior. They suggest these effects were a result of the self-evaluation training the students received. Conversely, other self-regulation learning models were shown to be ineffective for changing student learning task behavior but not cognitive or metacognitive aspects of learning processes. In a study by Forster et al. (1999) of first year ‘at risk’ college students enrolled in a skills course, no significant change in performance was reported. This study proved to be ineffective for low motivated student who received learning strategy training (time management, monitoring and reflection of work completion) without a treatment for maladaptive beliefs about how knowledge is formed or how knowledge is acquired.

 Taken together, these studies suggest that beliefs about the nature of knowledge and knowing, learning beliefs, and self-regulated learning are all related. Epistemic beliefs influence the cognitive, metacognitive, and behavior mechanisms activated during phase I of the self-regulated learning cycle (Muis 2007). Because self-regulation is conceived as a feedback loop that recycles over the entire process, it is reasonable to suppose that beliefs are reciprocally influenced by the self-regulation learning process as extolled by Zimmerman (1989b).

**Conclusion**

 Epistemic beliefs and learning beliefs are important components of learning. Indeed, as Muis & Duffy (2012) point out, the standards that learners use to prepare to learn are born from their held assumptions of what knowledge is and how it is acquired. It is not unreasonable to conjecture that epistemic beliefs and learning beliefs can be situated inside the already established social-cognitive SRL model. As an educator of ‘at risk’ high school students, adding beliefs to the SRL model seems to be an obvious conclusion. The students I work with often demonstrate the naïve belief that knowledge is simple, and that ‘smart’ kids know something because they have an innate ability to acquire it. I witnessed an example of this thinking in one of my students who refused to join a teacher-led exam prep study group taking part in a room adjacent to mine. He asked me, “What are all the smart kids doing in the study session?”

 More research is needed to fully understand the sources of epistemic beliefs and learning beliefs, and the influences they exert on self-regulated learning and vice-versa. In addition, the research community should decide to unite as a discipline with the mantra of cleaning the ‘messiness’ of terms and theories.

**References**

Bandura, A (1997). Self-efficacy: The exercise of control. New York: W. H. Freeman.Chapter 3.

Bembenutty, H., (2011). Meaningful and maladaptive homework practices: The role of self-efficacy and self- regulation. *Journal of Advanced Academics*, 22, 448-473.

Daw, N., & Shohamy, D., (2008). The cognitive neuroscience of motivation and learning. *Social Cognition*, 26 (5), 593-620.

Dweck, C. & Leggett, E., (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95 (2), 256-273.

Elliot, A.J., & Dweck, C.S (2005). The handbook of competence and motivation. Guilford Press. Ford, M.E (1992). Motivating humans: Goals, emotions, and personal agency beliefs. Sage Publications. Chapter 6 & 7.

Forster, B., Swallow, C., & Fodor, J. H. (1999). Effects of a college study skills course on at-risk first-year students. Naspa Journal, 36(2), 120-132.

Hampton, N. & Mason E., (2003). Learning disabilities, gender, sources of efficacy, self-efficacy beliefs, and academic achievement in high school students. *Journal of School Psychology,* 41, 101-112.

Hodis, F., Meyer, L., McClure, J., Walkey, F., & Weir, K (2011). A longitudinal investigation of motivation and secondary school achievement using growth mixture modeling. *Journal of Educational Psychology*. 103(2), 312-323.

**Hofer, B**. & Yu S (2003). Teaching self-regulated learning through a “learning to learn” course. *Teaching of Psychology*. 30, 31-33.

Kitsantas, A., Steen, S., Huie, F (2009). The role of self-regulated strategies and goal orientation in predicting achievement of elementary school children. *International Electronic Journal of Elementary education*. ISSN 1307-9298

McClure, J., Meyer, L., Garisch, J., Fischer, R., Weir, K., & Walkey, F (2011). Student’s attribution for their best and worst marks: Do they relate to achievement?. *Contemporary Educational Psychology*, 36, 71-81.

Muis, K. (2007). The role of epistemic beliefs in self-regulated learning. *Educational* Psychologist. 4(3), 173-190.

Neber. H., & Schommer-Aikins, M (2002). Self-regulated science learning with highly gifted students: The role of cognitive, motivational, epistemological and environmental variables*. High Ability* Studies, 13(1), 59-74.

Pintrich, P (1999). The role of motivation in promoting and sustaining self-regulated learning. *International Journal of Educational Research*, 31, 459-470.

Schmitz, B., & Wiese, B.S (2006). New perspectives for the evaluation of training sessions in self-regulated learning: Time-series analyses of diary data. *Contemporary Educational Psychology*, 31, 64-96

Schunk, D.H., (2012). Social cognitive theory. In Harts, S. Graham, and T. Urdan (Ed.),APA Educational Handbook 1, Vol. 1. Theories, Constructs, and Critical Issues (pp. 101-123). DOI: 10.1037/13273.005.

Souvignier, E., Mokhlesgerami, J., (2006). Using self-regulation as a framework for implementing instruction to foster reading comprehension. *Learning and Instruction*, 16, 57-71.

Stoeger, H., & Ziegler, A (2004). Evaluation of a classroom-based training to improve self-regulated learning: Which pupils profit the most? *Metacognition Learning*, DOI 0.1007/s11409-008-9027-z

Sungur, S., & Yerdelen, S (2011). Examination of the self-regulated learning processes for low and high achievers in biology. *The New Educational Review*, 24, 207-215

Usher, E. & Pajares, F (2008). Self-efficacy for self-regulated learning: A validation study. *Educational and Psychological Measurement*, 68(3), 4443-463.

Wentzel, K & Wigfield, A (2007). Motivational interventions that work: Themes and remaining issues. *Educational Psychologist*, 42(4), 261-271.

Winne, P., & Jamieson-Noel, D., (2003). Self-regulating studying by objectives for learning: students’ reports compared to a model. *Contemporary Educational* Psychology, 23, 259-276.

Vosniadou, S. & Mason, L. (2012). Conceptual change induced by instruction: A Complex interplay of multiple factors. *APA Educational Psychology Handbook*, 2, 221-246. DOI: 10.1037/13274-009.

Zimmerman, B.J (1989a). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, 81, 329-339.

Zimmerman, B.J (1989b). Models of self-regulated learning and academic achievement. In B.J. Zimmerman & D. H. Schunk Eds.), Self-regulated learning and academic achievement: Theory, research, and practice. New York: Springer

Zimmerman, B. J (2000). Self-efficacy: An essential motive to learn. C*ontemporary Educational Psychology,* 25, 89-91.

Zimmerman, B.J (2008). Investigating self-regulation and motivation: Historical background,

methodological developments, and future prospects, *American Educational Research Journal*. 45 (1), 166-183.

Zimmerman, B. J., & Campillo, M (2002). Motivating self-regulated problem solvers. In J.E.

Davidson & R.J. Sternberg (EDS.), The nature of problem solving. New York: Cambridge University Press.

Zimmerman, B.J., & Kitsantas, A (1999). Developing writing revision skill: Shifting from

 process to outcome self-regulatory goals. *Journal of Educational Psychology*, 91, 1-10.

Zimmerman, B.J., & Kitsantas, A (2005). The Hidden dimension of personal competence:

 Self-regulated learning and practice. In A. J. Elliot and C. S. Dweck (Eds.), Handbook

Of Competence and Motivation. New York: Guilford Press.