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THE EFFECTS OF TEACHING SELF-EFFICACY ON STUDENTS' COGNITIVE ENGAGEMENT

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Abstract
The purpose of this study was to examine the effects of teaching self-efficacy on students' cognitive engagement. The sample size consisted of 50 high school students, 25 in each experimental and control groups; the sampling method we used was of a random cluster multiple-stage type. The measurement instrument was the Cognitive Engagement Questionnaires (Greene & Miller, 1996) which were administered as a pre-test for both groups. After this initial stage of testing, only the experimental group received a 15 session teaching course in self-efficacy. After the training, a post-test using the aforementioned instrument was realized for both groups. The gathered data was analyzed by calculating the analysis of covariance (ANCOVA) coefficient. The results of the study indicated that the teaching of self-efficacy has had a significant effect on students' cognitive engagement. Teaching self-efficacy enables students to be positively influenced by cognitive strategies, which they can employ to guide their learning.

Keywords: motivation, self-efficacy, cognitive engagement

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Introduction

Recent social cognitive theory has begun exploring the complex process of cognition related to goal-orientation (goal perspective), self-efficacy, and attribution theory, which are the main theories of cognitive motivation (Roberts, 1992).

Pintrich (2004) believes the future of society is dependent on the level of motivation and the current progress that its students have made. One motivational construct that is important for understanding student achievement is self-efficacy, or the belief that one is capable of successfully performing a particular task (Bandura, 1986). Recently, students' beliefs about ability, knowledge and knowing, or self-efficacy, have received increased attention from researchers (Zeldin & Pajares, 2000). People are considered to have high self-efficacy for a task when they believe they possess the capabilities necessary to perform the task successfully. However, if they believe that they do not have the necessary capabilities, then they would be considered as having low self-efficacy for that task. Research has demonstrated that students with high self-efficacy are more likely to seek challenges, persist in the face of those challenges, and adopt effective strategies to mediate those challenges when compared to their classmates with low self-efficacy (Bandura, 2001; Schunk, 2005; Zeldin & Pajares, 2000). Furthermore, many researchers have empirically demonstrated that the level of confidence a student has regarding his/her ability to succeed academically is related to the use of cognitive strategies that translate into higher academic performance and/or achievement (Greene & Miller, 1996; Greene, Miller, Crowson, Duke, & Akey, 2004; Miller, Behrens, Greene, & Newman, 1993; Zimmerman, 2008).

Bandura (1997, 1986) pointed out that there are four sources, which are involved in self-efficacy judgments: performance accomplishments, vicarious experience, verbal persuasion, and physiological arousal. Performance accomplishment refers to the experience and the level of task mastery; when individuals have successful experiences, these will enhance their self-efficacy. On the other hand, those with the experience of failure will experience a reduction in their self-efficacy. This kind of information about self-efficacy can be influenced by task difficulty, effort, and the physical condition or task characteristics. Vicarious experience refers to how individuals gain their

perceived competence through observing others' behavior. When individuals observe those with similar ability achieve successful performance, they will enhance their self-efficacy. When individuals observe those with similar ability put in effort and experience failure, they will reduce their self-efficacy. Verbal persuasion refers to situations in which individuals gain support from the social environment such as from teachers and peers; it also includes verbal explanation, self-talk, imagery, and other cognitive strategies. Physiological arousal refers to the individuals' efficacy evaluation response through their physiological arousal. For example, when the individuals' heartbeats, breath, and blood pressure are raised and they feel anxious, their self-efficacy is not so high for their task performance. In brief, through appropriate manipulation of these sources, students can be taught to change their own behavior. Clearly, there is a need for educators to know more about self-efficacy so that they can use this knowledge in assisting students develop more regular cognitive activity habits.

Bandura (1986) characterized self-efficacy as being both a product of our interactions with the world (active engagement) and an influence on the nature and quality of those interactions. In the first case, our cognitive interpretations of successes and failures influence subsequent self-efficacy beliefs (e.g., Schunk, 1981).

One important outcome of motivation is cognitive engagement in learning tasks. Cognitive engagement refers to the amount and type of strategies that learners employ. Cognitive engagement in academic work has been defined by Marks (2000) as, "a psychological process involving the attention, interest, investment, and effort students expend in the work of learning" (pp. 154-155). Newmann, Wehlage, and Lamborn (1992) defined cognitive engagement in academic work as, "the student's psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote" (p. 12). Both of these definitions involve psychological investment and effort.

An important distinction has been observed between meaningful and shallow processing (Craik & Lockhart, 1972). Meaningful processing is associated with cognitive elaboration of the to-be-learned material. Meaningful processing involves relating the new information to one's existing knowledge; thus creating a more complex knowledge structure (Kardash & Amlund, 1991).

Shallow processing, on the other hand, involves rote memorization, basic rehearsal, and other types of superficial engagement with the new material (e.g., simply re-reading one's class notes). Shallow processing will not typically involve connecting new information with existing knowledge nor will it involve creating integrated knowledge (Walker, Greene, & Mansell, 2006).

Research has consistently found that meaningful processing strategies lead to greater performance on achievement measures over the material studied than shallow strategies (Greene & Miller, 1996; Kardash & Amlund, 1991). In the present study, our measure of cognitive strategies focused on the use of meaningful strategies. As a result, our model indicates that student achievement is positively influenced by the cognitive strategies they employ to guide their learning. Meaningful cognitive engagement has been defined as strategy use that combines meaningful processing and self-regulatory strategies such as planning and checking one's work (Greene & Miller, 1996). Schunk (1991) argued that students who possess and engage in meaningful cognitive strategies enhance their current perceptions of ability and are more likely to utilize the same meaningful cognitive strategies in the future. A substantial body of research has shown that meaningful processing leads to enhanced performance on achievement measures relative to study approaches utilizing only shallow strategies (Greene & Miller, 1996; Kardash & Amlund, 1991; Pintrich & Garcia, 1991). In the latter, our self-efficacy beliefs influence our effort, persistence and the cognitive resources we bring to bear in our attempts to interact with the world around us. Research has reliably shown that self-efficacy is positively correlated with measures of meaningful (deep) cognitive strategy use (Greene & Miller, 1996; Zimmerman & Martinez-Pons, 1990).

The basic assumption is that achievement is related to the cognitive strategies that students use in order to learn. Based on the influential "levels of processing" and subsequent "elaborative processing" theory (Anderson & Reder, 2000) we believe that the use of different types of strategies result in different learning outcomes, and, thus, different levels of achievement; students with higher self-efficacy are more likely to experience higher cognitive engagement in the classroom.

Despite the importance of research investigating cognitive engagement, several key limitations of cognitive engagement research exist. These limitations are detailed below. In detailing with these limitations, however, we

also recognize the contribution of previous studies, and indicate the manner in which these contributions relate to the limitations that have been identified. Most of the early research regarding cognitive engagement has focused on the relationship between self-efficacy and cognitive engagement, and typically finding that a positive correlation between cognitive engagement and self-efficacy exists. Also, few studies have investigated cognitive engagement in non-Western contexts. This is a critical limitation in the literature because hypotheses concerning factors affecting cognitive engagement may not hold across cultural contexts, even if there is support for such hypotheses in research emanating from Western contexts.

For the reasons above, we sought to investigate cognitive engagement: (a) in a non-Western context and (b) using experimental design. From the theoretical notions and empirical findings discussed above, the aim of the present study is therefore to explore the effects of teaching self-efficacy on students' cognitive engagement.

Method

Participants

The participants in this study were 50 high-school boys (25 in the experimental and 25 in the control group); the sample consisted mainly of freshmen students, randomly chosen by the cluster method and divided into experimental and control groups. The participants' age ranged from 14 to 17 (M=15,84). All the students were from Karaj, Iran.

Instruments

Cognitive Engagement (CE). Greene and Miller (1996) measure of cognitive engagement - contains 15 meaningful processing and 10 shallow processing items. Participants are asked to respond to each question using a 1 to 5 scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). Fifteen of the questions are used to measure meaningful cognitive engagement while 10 questions were used to measure shallow cognitive engagement. Greene and Miller found a Cronbach's alpha of .90 for this version of the meaningful engagement subscale and .81 for this version of the shallow engagement subscale. In this research the reported internal

consistency (by Cronbach's alpha) was .84 for this version of the meaningful engagement subscale.

Procedure

This research is a quasi-experimental study with an experimental and control group in a pre-test and post-test design. This design maybe depicted in standard notation where O1 refers to the pre-test used prior to treatment to make sure the participants in both the experimental and control groups were comparable; O2 refers to post-test measurements, including cognitive engagement; NR stands for non-random assignment and X represents experiment. Table 1 above illustrates the design of this study. The study was conducted in the spring semester of 2012 from the first week to the fifteenth week. The experimental group was taught self-efficacy strategies for 15 sessions and the control group did not receive any training.

Table 1. Design of study

NR	O1	X	O2
NR	O1		O2

Results

Due to the importance of the pre-test a covariance analysis was used for investigating the hypothesis of the study. First, we examined whether a linear relationship and a homogenous regression exist between the covariate variable and the dependent variable before we could run the covariance analysis.

In table 2, the descriptive statistics for the cognitive engagement of the 25 students of the sample in each group are presented**.**

Table 2. Mean and standard deviation of variable in control and experimental groups

Variable / Groups	Cognitive engagement			
	Pre test		Post test	
	M	SD	M	SD
Control	6/56	60/25	6/80	58/41
Experimental	5/23	69/87	7/91	57/05

For the experimental group the increase of the average of the cognitive engagement score (in post-test) in comparison with the control group can be observed (see, table 2).

To check the homogeneity of the variances we calculated the Levene's test for the equality of group variances. This test is not dependent on the assumption of normality (see, table 3).

Table 3. Levene's Test of Equality of Error Variance. Dependent Variable: post- test of self-efficacy

F	df_1	df_2	Sig.
.351	1	48	.724

In order to determine the effects of the self-regulated strategy training on students' cognitive engagement a covariance analysis was performed. The results obtained for the research hypotheses are reported below.

Table 4. Analysis of covariance on post-test of self-efficacy dependent variable

Source	Sum of Squares	df	Mean square	F	Sig
Pre-test	15/73	1	15/73	4/06	.05
Group	756/37	1	756/37	195/20	.000
Error	182/110	47	3/87		.000

Regarding the hypothesis, which states that the teaching of self-efficacy increases students' cognitive engagement, table 3 demonstrates based on the results of the analysis of covariance (for investigating the effects of the instruction on the cognitive engagement) that there is a significant difference between the cognitive engagement of the experimental group in comparison to that of the control group ($p<.001$). Finally, the results indicate that the teaching of self-efficacy increases the students' cognitive engagement.

Conclusions

The major purpose of this current study was to evaluate the effectiveness of the teaching of self-efficacy, on cognitive engagement in a community school setting. The findings of this study indicated that the intervention was helpful for learners, it improved their cognitive engagement. This implies that students who received self-efficacy teaching have higher level of cognitive engagement. This finding can contribute to the existing educational system by adjusting the level of expectations from students.

The relationship between student achievement and both meaningful strategy use and self-efficacy is also consistent with previous research (Greene

& Miller, 1996; Miller et al., 1993). It is important to note that the relationship of self-efficacy with achievement includes both confidence related to cognitive strategies measured in our strategy use instrument and confidence in the use of strategies not measured by our instrument. Additionally, self-efficacy reflects other cognitive (e.g. knowledge) and motivational (e.g. persistence) factors that influence achievement.

Elliot and Thrash (2001) have recently argued that self-efficacy can be seen as a precursor of achievement goal adoption, and a study by Greene and colleagues (Greene et al., 2004) provides empirical support for this assumption. Bandura (2001) sustains that a strong sense of efficacy enhances personal accomplishment in many ways. People with high efficacy approach difficult tasks as challenges to be mastered rather than as threats to be avoided.

Teachers could help students enhance their use of learning strategies by focusing them on assessing, understanding, and evaluating their own system of beliefs and values. Also, teachers should adjust their teaching methods, attitudes, and evaluation in order to decrease students' sense of failure and frustration and increase students' self- confidence and self-efficacy.

Self-efficacy and cognitive engagement are important constructs because they have an impact on the learning experience and academic success of students. Students who are able to engage in self-efficacy are more likely to have better cognitive engagement and educational outcomes. It might be useful for teachers to teach students self-efficacy. Future studies should try to find effective methods for reducing the participant dropout rate and also to establish longitudinal and tolerable interventions for continued effects.

The small sample size of this current study might have affected the reliability of the study results, and thus limit their general value. Therefore, future research is recommended to re-examine the effects of the intervention with a larger sample size, more sophisticated study materials and maybe more advanced data analysis methods.

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