

Cognitive Effort and Academic Achievement with Different Locus of Control Orientations

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Abstract:

In spite of the widespread interest in Locus of Control, how Locus of Control influences behavior is not well understood. This Study aimed to conduct a casual correlational study which examines the mechanism through which Locus of Control predict the Degree of Cognitive Effort and Academic Achievement. The Sample comprised of 450 from Helwan university students enrolled in different Programs in Pedagogy College. Academic Locus of Control Scale, Attention Scale, Assessment report questionnaire, and Overall Academic Performance Grades were used for Data collection. Subjects were divided into two groups. The results of two groups showed that the group with internal Locus of Control had a better mean of their overall performance and high engagement on cognitively demanding tasks; whereas the external Locus of Control groups, showed a weak overall academic performance and underperform on demanding tasks. Results were discussed in relation to previous literature.

Key words.: Locus of Control (ILOC, ELOC), Cognitive effort, Academic outcomes.

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I. INTRODUCTION

Willingness to expand cognitive effort can impact numerous and diverse outcomes. It appears to be central and ubiquitous subjective phenomena which are affected by a number of variables including an individual's working memory capacity, attention, perceived efficacy, fatigue, motivational state and cognitive control, that they promote optimally (Westbrook & Braver 2015). It is a goal directed behaviour fundamentally implicated in the regulation of cognitive control during the pursuit of valuable goals with optimizing good selection (Dayan, 2012; Shenhav, Botvinich, & Cohen, 2013). According to (Kaplan & Berman, 2010) cognitive effort refers to the degree of engagement with demanding tasks. Dejong (2010) defined it as the amount of cognitive capacity that learners allocate to learning and task performance. Sweller (2010) suggests that encouraging learners to exert more cognitive effort is another measure crucial to the construction of cognitive scheme and controlling their cognitive load to improve automation for cognitive task performance (Kalyuga, 2011). Some researchers assume that measuring for perceived mental effort is indicative of cognitive load. Sweller, et al.(2011) propose that mental load and mental effort being different but in some cases positively correlated constructs; as ML is said to be task-related indicating the cognitive capacity which is needed to process the complexity of a task. In contrast, ME is subject-related and reflects individual's invested cognitive capacity while working on a task (Krell, 2017). And as long as a task is not too easy and not too difficult, ratings of task difficulty may correlate highly with ratings of invested mental effort, which indicate that mental effort is a voluntary mobilization process of resources, which

depends on the task's demands in relation to the amount of resources the learner is willing or able to allocate (Paas & Van Merriënboer, 2005). Kulas, et al. (2014) examined the effects of instructional design, motivation, emotional state, and expertise level on cognitive load and cognitive effort, which ultimately affect the working memory performance and learning. Other studies (Leahy & Sweller, 2005; Ginns, Chandler & Sweller, 2003) suggested that the demanded effort of difficulty level of a cognitive learning task and its instructional format should match the expertise level of facilitate schema construction and automation. In this sense, the more one acquires experience the less cognitive effort he/she consumes to resolve the same task. (Paas, et al. 2005), showed that low motivation decreases cognitive effort and cognitive performance, while high motivation produces the opposite result. Similarly, Moreno (2007) stated: "when learners lack motivation they may fail to engage in generative processing even when cognitive capacity is available". As earlier discussed; another determinant of cognitive effort expenditure leading to low or high academic success in learner perception of difficulty or challenge in attaining an achievement goal (Senko et al., 2011).

It is concluded that attributions to cognitive effort play an important role in determining the direction, magnitude and persistence of achievement-oriented activity. However, further studies are required to cast light on the dynamic interplay of the factors which would describe, explain and predict how learners can use their available cognitive capacity. Several researches (Arslan, et al., 2013; Sariçam, 2015, Kader, 2014; Smith, 2006; Carden et al., 2004; Shepherd, et al., 2006; Piatek, Pinger, 2015; Baron,

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Cobb-Clark, 2010) have demonstrated that an important contributor to academic performance is an individual's expectations about how they perceive any control over their academic successes and failure internality. According to that achievement motivation is influenced by the extent to which individuals attribute their success or failure in response to events that are either under or beyond their control. This is referred to as locus of control. This social-cognitive theory was developed by Rotter, (1966). His theory is basically a social learning theory integrated with personality theory. The theory has generated a great deal of research in a variety of areas, including educational psychology. It is conceptualized on an internal-external dimension. Individuals with an internal locus of control believe that events in their lives result primarily from their own abilities attributes and capacities. While an individual with an external Locus of control believe that events in their lives are a result of someone else's action or are due to luck, fate or chance. Internally oriented students believe in the connection between their behaviour and its outcomes and as such they strive to have more control over their academic experience than externally oriented students. Thus, internally oriented and externally oriented students tend to follow different strategies to acquire learning (Grimes et al., 2004).

Ahlin, et al., (2015) found that internal locus of control contributes to positive youth outcomes such as a general well-being, academic success and reducing negative behaviours like violence. While (Arslan, S. et al. 2013) explores that Student's Academic support levels were closely related to mental locus of control. The high self-supporting students were inclined to internal control and vice versa.

In this research, the academic locus of control is defined as a generalized expectancy held by student about the extent to which reinforcements are internal or external control. Sariçam (2014) refers to the internal academic locus of control as one's achievement that he or she has control over his or her own performance; while external academic locus of control is defined as the success that external factors such as teachers or friends having control over your performance. In light of the previous studies, This integration allowed us to examine the interactive impact of academic locus of control orientation on Egyptian university student's cognitive effort efficiency (preparation and engagement) and academic performance (lower and higher level of performance) based on the interpretation of previous research. In the present study, It is hypothesized that an internal academic locus of control would be correlated positively with cognitive effort and academic outcomes, whereas an external locus of control is expected to be associated negatively with cognitive effort and academic performance.

This model is represented schematically in figure (1):

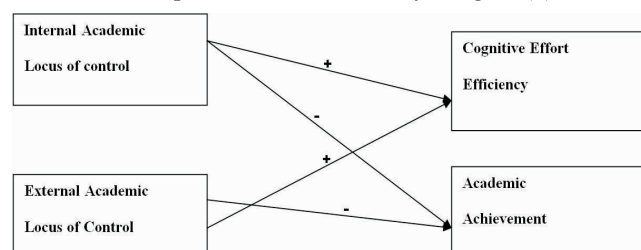


Figure 1: Hypothesized model of the relationship between cognitive effort and academic performance with academic locus of control.

II. METHOD

Design: Descriptive correlational designs were used that allow us to determine the casual relationships between cognitive effort and academic achievement with an academic locus of control (internal-external) orientations.

Participants: The pilot study, included 300 participants, selected randomly enrolled in various undergraduate programs at Helwan University, Faculty of Education, Egypt to determine the reliability and validity for the research's tools. The final study totalled (450) university students, of which 260 (57%) were female and 190 (42%) male, 250 were first year students, 200 were second year student's. Their ages ranged from 18-21 with mean age was 19.5 years.

Tools: Academic locus of control for college students is 30 item self-report scale using a five point Likert scale (1=strongly disagree to 5=strongly agree). Prepared by study's researchers, this scale has two sub-scales: External academic locus of control (11 items) and internal academic locus of control (19-items). While the amount of total variance explained by two factors was 75%, factor loadings ranged from .75 to .97 for the internal academic of control and from .63 to .94 for the external academic locus of control. Internal consistencies were ascertained to be .96 and .95, while the two-week test retest reliability estimate were found to be .93 and .98 for the two subscales and .95 for the whole scale respectively.

III. COGNITIVE EFFORT SCALE

The researchers used to measure the magnitude of cognitive effort using two scales.

1. Attention scale: which used to allow student to selectively attend to certain stimuli and inhibits attending to competing stimuli, the successful performance of CAS attention subtests require their cognitive processing to be focused, selective, sustained and effortful through using expressive attention test, number detection test, receptive attention test. The tasks present competing demands on attention therefore require sustained focus overtime to identify a target answer and avoid distractions (Naglier, J.A. & Das, J.P. 2013). Alpha Coefficient was calculated with split half method and corrected with Spearman Brown formula $r=.90$, Construct validity was calculated with CFA using AMOS. The findings of various goodness of fit and increment indexes indicated a good correspondence.

2. Student learning assessment questionnaire: to evaluate students' effort during instruction using rubrics of General Psychology course.

3. Academic achievement test: psychology test

IV. RESULTS

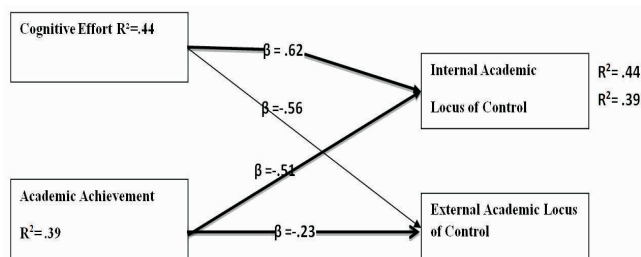
The descriptive date and inter-correlations.

Table 1: shows the means, descriptive statistics inter-correlations, and internal consistency coefficients of the variables used.

Variables	1	2	3	4
1.Cognitive effort	1.00			
2.Academic achievement	.60*	1.00		
3.Internal Academic Locus of Control	.66*	.63*	1.00	
4.External Academic Locus of Control	-.55**	-.39**	-.47**	1.00
Mean	54.72	63.35	24.32	26.44
Standard Deviation	6.77	5.88	3.78	4.11
Alpha	.77	.85	.72	.71

* $p < .05$, ** $p < .01$

As shown in table 1, there are significant relationships between dimensions of cognitive effort, academic achievement and academic locus of control. While internal academic locus of control related positively to cognitive effort and academic achievement respectively ($r = .66$, $p < .01$; $r = .63$, $p < .01$). There were negative relationships between external academic locus of control and cognitive effort ($r = -.55$, $p < .05$; $r = -.39$, $p < .05$)



Chi-square=52.16, df=39, $p=.036$, RMSEA=0.038

Figure 2 Path Analysis between cognitive effort, academic achievement and academic locus of control concerning the research hypothesis.

In order to state whether structural equation (SEM) model was statistical appropriate, fit indices were analysed using Amos v.23 based on latent interaction model (Marsh, W.H. et. al, 2012) which report a handful of goodness of fit indices, upon examining the following criteria for an indication of good model data fit using those indices; according to (Schreiber, J.B.,2008).

IFI, CFI, TLI, AGFI $\geq .95$, RMSEA $\leq .05$ Sun (2005) stated that in terms of the acceptability of the model the rate of χ^2/df being under 2 was enough. As a result of the analysis figure 2 shows that the model demonstrated excellent fit ($\chi^2/df=1.337$, CFI=.99, IFI=.99, TLI=.99, RMSEA=.038). Hence, in the light of the literature it was accepted that the model was correctly designed.

V. DISCUSSION AND RECOMMENDATIONS

This study is to determine that measure model which has been suggested can be used in structural model. Correlations and

path analysis confirm the hypothesis, showing that, a causative relationship exists between cognitive effort, academic achievement and academic locus of control for university student. Moreover, the goodness of fit indexes indicated that the model was acceptable and that correlations among measure were explained by the model. For the first time to researcher knowledge were examined the associations between cognitive effort and academic locus of control. According to the results, cognitive effort efficiency and functional academic outcomes were predicted positively by an internal academic locus of control and negatively by an external academic locus of control.

This model provides strong evidence that internal locus of control is related to how cognitive effort influences beliefs about outcomes, which it confirmed that students with an ILOC invest great amount of cognitive resources allocated to learning and be more aware of their different levels of their arousal, perception, and cognitive ability which may react to changes in perceiving task difficulty and evaluate task demand in different ways as they a belief that they are able to control the outcomes of any action's in order to be proud of their achievement (self-support), while feeling ashamed when they experience failure. So that students' beliefs about the marginal effect of completing their academic tasks – the return to cognitive effort are clearly increasing with internality which reconfirm the findings of researches in educational psychology which found that internally oriented students tend to be highly motivated and attained better academically with high meta-cognitive levels than externally oriented student (Anderson, A. et al. 2011, Arslan, S. et al. 2012; Ghasemzadeh, et al., 2011; Baron, et al., 2010; Piatek, et al., 2015; Shepherd, et al., 2006). In similar vein, (Moreno, R. 2010; Schnotz, 2010) confirmed that without intrinsic motivation, the academic courses which is solely aimed at controlling cognitive load, will remain in sufficient to allow learners to exert necessary cognitive effort and according to control-value theory of achievement emotions (Pekrun, 2009) the cognitive effort decreased by avoidance of expected failures and increased with attainment of success which are associated with positive and negative emotions related to academic outcomes. Further studies can investigate these relationships with SEM establishing a mediating or latent variable and focusing on variables which will help students approach their academic tasks with attributes conducive for academic attainment. The result of this study have limited the samples to the university students and generalizability of the explanatory model is restricted and it is critical for a future research to examine the model on sample groups composed of non-university students.

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