

Moderating Effect of Self-Efficacy in the Mediating Effect of Self-Regulation on Students' Academic Performance

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Abstract

In this study, the mediating effect of self regulation on self-efficacy – academic performance relationship was proposed to be further moderated by self-efficacy. Four hundred and sixty seven secondary school students drawn from schools in an education zone of Ogun State, Nigeria took part in the study. Data were collected using three validated scales and academic records of students. Analysis was carried out on SPSS version 21 using the moderated mediation macro (model 1) developed by Hayes (2013). Results indicated that there were significant and positive relationships between self-efficacy, self-regulation and academic performance. Results indicated that the indirect effect of self-efficacy on academic performance through self-regulation is conditioned on self-efficacy. Implications for theory, research and intervention programmes were stressed.

Key Words: Self regulation; Self-efficacy; Academic performance; Students; Moderated mediation effects

Introduction

Improving on students' academic performance has been a major concern of stakeholders of education. The huge cost of education cannot permit any form of neglect in the improvement of students' academic performance. Constructive interest in programmes and projects that would enhance students' academic performance has always been applauded.

Academic performance has been found to be influenced by factors within the family (Clark, Novak, & Dupree, 2002; Folorunso, Aremo, & Abogan, 2010), the school (Akinsolu, 2010; Lee & Shute, 2010; Midgley, Anderman & Hicks, 1995) as well as the students (Adeyemo & Torubeli, 2008; Onyeizugbo, 2010). Distinctively, family and home-related factors as parental educational level (Folorunso, Aremo, & Abogan, 2010) and parenting practices (Chapman & Mullis, 1999; Clark, Novak, & Dupree, 2002; Pomerants, Gronick, & Pricfe, 2005; Spera, 2005) have been identified. School and teacher-related factors like teachers' qualifications, experience and teacher-student ratio (Akinsolu, 2010) and teachers' sense of efficacy (Tschannen-Moran & Hoy, 2001) have also been noted. Finally, student-related factors like test anxiety (Onyeizugbo, 2010) and peer influence (Adeyemo & Torubeli, 2008) have been observed to influence students' academic performance. The influences of family, school and students' personal factors on academic performance remain extensive.

Research persists to investigate the intricacy of the numerous factors impacting on academic performance not only as univariate predictors with one independent variable, but also at the multivariate level with multiple predictor variables. Whereas, the contextual factors seem uncontrollable by the students, some researchers have focused on multiple students' related factors of academic performance (Pajares & Schunk, 2001; Onyeizugbo, 2010, Edun & Akanji, 2008).

Self-efficacy refers to beliefs about one's capabilities to learn or perform behaviours at designated levels. This is the capacity to organize and execute the courses of action required to manage prospective situation (Bandura, 1977; 1986; 1997). Self-efficacy is entrenched in a larger theoretical framework of the social cognitive theory, which suggests that human achievement depends on interactions between one's behaviours, personal factors (e.g., thoughts, beliefs), and environmental conditions (Bandura, 1986; 1997). Students gather information to assess their self-efficacy from their actual performances, their vicarious experiences, the persuasions they receive from others, and their physiological reactions (Bandura, 1997). Much research shows that self-efficacy affects task choice, effort, persistence, resilience, academic motivation, learning, and achievement (Pajares, 1996; Schunk, 1995).

Research findings indicate that self-efficacy correlates with achievement outcomes (Bandura, 1997; Pajares, 1996; Schunk, 1995), self-oriented perfectionism (Bandura, 1989; Mills & Blankstein, 2000), and indexes of self-regulation, especially use of effective learning strategies. Self-efficacy, self-regulation, and cognitive strategy use are positively inter-correlated and predict achievement (Pintrich & De Groot, 1990). Self-efficacy beliefs have been found to be sensitive to subtle changes in students' performance context, to interact

with self-regulated learning processes, and to mediate students' academic achievement (Pintrich, 1999; Zimmerman, 2000). Study findings have persistently revealed that self-efficacy is positively related to academic performance (Caprara, Barbaranelli, Steca, & Malone, 2006; Ferla, Valcke, & Schuyten, 2008; Griffin & Griffin, 1998; Jackson, 2002; Lane & Lane, 2001; Lane, Lane, & Kyprianou, 2004; Pajares, 1996; Pajares & Kranzler, 1995; Pintrich & De Groot, 1990).

Self-regulation is defined as the process by which learners set and maintain cognitions, affects, and behaviours in motion, which are thoroughly geared towards achieving their goals (Zimmerman, 1989). Great evidence exists in support of self-regulation as the systematic efforts to direct thoughts, feelings, and actions, toward the attainment of one's goals (Zimmerman, 2000).

Self-regulation involves the ability to both control one's impulses and engage in a particular behaviour on demand (Bodrova & Leong 2008; Zimmerman, 1990). It is a skill used not just in social interactions (emotional self-regulation) but in thinking (cognitive self-regulation) as well. Self-regulation of learning is a process that required students to get involved in their personal, behavioural, motivational, and cognitive learning tasks in order to accomplish important and valuable academic goals (Bembenutty, 2007).

Self-regulation has assumed increasing importance in the psychological and educational literatures in enhancing academic outcomes such as effort, quality of conceptual learning, school performance, and intention to persist in school (Bembenutty, 2007; Bodrova & Leong 2008; Cleary & Chen, 2009; Fortier, Vallerand, & Guay, 1995; Vallerand, 1997; Winters, Greene & Costich, 2008). Research (Bodrova & Leong 2008) shows that children's self-regulation behaviours in the early years predict their school achievement in reading and mathematics better than IQ scores. Even stronger evidence exists to show that self-regulation is positively related with self-efficacy (Hodges, Stackpole-Hodges, & Cox, 2008; Scott, Dearing, Reynolds, Lindsay, Baird, & Hamill, 2008; Schunk & Zimmerman, 2007) and to a larger extent academic performance (Nota, Soresi, & Zimmerman, 2004).

Studies have also indicated that perceived self-efficacy moderated the relation between performance-avoidance goals and reported use of self-regulatory strategies for students in a competitive, performance-oriented context (Braten, Samuelstuen, & Stromso, 2004), and effect of child behaviour problems on fathers' anxiety (Hastings & Brown, 2002). Several moderated mediation studies have been conducted with academic performance as outcome variable (e.g. Tabakr, Nguyena, Basuraya, & Darrowa, 2009)

Literature (D'Lima, Pearson, & Kelley, 2012; MacNeil, Kosberg, Durkin, Dooley, DeCoster, & Williamson, 2010; Moneta, 2011) exists on this modelling wherein the independent variable in a mediation model also function as a moderator of its own indirect effect on a dependent variable through a moderator. This, according to Hayes (2013), is "an intriguing form of conditional process" (p. 332).

The moderating effect of self-efficacy in a moderated mediation study involving self-regulation and academic performance has not been tested. Pajares (1995; 1996) demonstrated that, when self-efficacy is included in statistical models with other, more global, self-beliefs (such as self-concept, anxiety, and attributions), and with variables such as academic background, gender, ethnicity, ability, and socioeconomic status, self-efficacy is a strong predictor of academic performance and mediates the influence of other determinants. If the assertion that self-efficacy is a strong factor in any model would be taken seriously, self-efficacy would be expected to further moderate, the mediating effect of self-regulation in the relationship between self-efficacy and academic performance.

The present study therefore sought to determine whether self-efficacy would further moderate the mediating effect of self-regulation on the self-efficacy and students' academic performance relationship. Hence, the model (Figure 1) was built for the study.

It was hypothesized that (i) there are significant positive relationships among self-efficacy, self-regulation and academic performance, and (ii) self-efficacy will significantly moderate the mediating effect of self-regulation on self-efficacy and students' academic performance relationship.

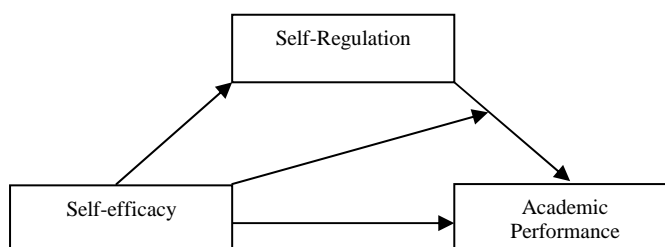


Fig. 1. Conceptual model for the relationships among study variables

Method

Participants

The sample for this study consisted of 467 school-going adolescents randomly sampled from senior secondary class one in ten secondary schools in Ijebu North Education Zone of Ogun State, Nigeria through stratified random and purposive sampling techniques. First, ten senior secondary schools were selected randomly from the existing nineteen schools in the education zone. Five each were selected from Ago-Iwoye and Ijebu Igbo axes of the zone. From the selected schools, one of the classes in senior class one was selected by random sampling while all students in the selected classes constituted the participants for the study. The sample was made up of 230 males (49.3%) and 237 female (50.7%) students with a mean age of 14.96 and a standard deviation of 3.56. Data were collected at the beginning of the second Term of the three-term school academic year. Participants at this period are just adjusting to the transition to the higher school from the Upper Basic School

Instruments

The following instruments were used to collect data for the study.

Academic Performance

To assess the academic performance of the participants, scores in English language, Mathematics, and Biology for the terminal examination prior to data collection were collected from the school records. Transformation to standard T-score was done for each of the subjects for the classes selected. Aggregates of the scores were recorded for the participants and used as their academic performance scores.

Self Regulation Questionnaire- Academic

Self-Regulation was assessed using the 26-item Academic Self-Regulation Questionnaire (SRQ-A: Ryan & Connell, 1989) developed to measure student's styles of self-regulation in the academic domain. The SRQ-A uses four subscales: external regulation, introjected regulation, identified regulation, and intrinsic motivation. External Regulation items (nine items, $\alpha = .81$) assess the degree to which initiation of a behaviour is external to a person, such as a reward or threat of punishment (e.g., "Because that's what I'm supposed to do"). Introjected regulation items (nine items, $\alpha = .87$) assess the degree to which a person adopts, but does not accept, a regulation as one's own. These items were designed to get at perceived pressures to do things (e.g., "Because I want the instructor to think I'm a good student"). Identified regulation items (seven items, $\alpha = .78$) assess the degree to which one has come to value a behaviour, identify with it, and accept it as one's own (e.g., "Because it's important to me to work on my class work"). Intrinsic motivation items (seven items, $\alpha = .91$) assess the degree to which a person initiates and engages in activities because they are genuinely interested or satisfied by the activity itself (e.g., "Because I enjoy each question used a 4-point Likert scale from Very True = 4; Sort of True = 3; Not Very True = 2; and Not at All True = 1. A higher score will indicate a higher level of endorsement of that regulatory style.

General Self Efficacy Scale

Self-efficacy was measured using the General Self-efficacy Scale developed by Schwarzer and Jerusalem (1995). The instrument is a 10-item scale that assesses self-efficacy based on Bandura's (1977) definition of self-efficacy. Examples of items on the scale include "It is easy for me to stick to my aims and accomplish my goals" and "If I am in trouble, I can usually think of a solution." The scale was measured on a 4-point Likert scaling model with options ranging from 1 = not at all true, to 4 = exactly true. Higher scores on the self-efficacy scale indicate high self-efficacy. The original version of this scale which has been used in numerous research projects yielded internal consistencies ranging between $\alpha = .75$ and $.90$ (Schwarzer & Jerusalem, 1995). The scale is parsimonious, reliable and culture fair. It has also proven valid in terms of convergent and discriminant validity.

Procedure

The instruments were administered on the sample in their various schools. The instruments were collected back immediately and later scored. Scores of students in each of the sampled schools in English language, Mathematics and Biology were collected and standardised to T-score. The data obtained from the instruments were analysed using descriptive statistics (mean and standard deviation), Pearson Product Moment Correlation, and to test the moderated mediation effects hypothesis, the modmed macro (Hayes, 2013) for exploring the moderation mediation effects was used to determine the interaction between self-efficacy

(independent and moderator variable) and self-regulation (mediator variable) in predicting students' academic performance (dependent variable). The results were tested for significance at the .05 level.

Results

Preliminary Analysis of data

Table 1: *Descriptive Statistics of the Dependent, Independent and Moderator variables of the Study*

(N = 467)

	Min.	Max.	Mean	SD.	Skew	SE	Kurt	SE
Self-efficacy	11.00	40.00	29.486	4.897	-.394	.113	.124	.225
Academic self-regulation	53.00	128.00	107.936	12.822	-.701	.113	.557	.225
Academic achievement	34.00	76.00	56.512	7.903	-.413	.113	-.304	.225

Table 2: *Correlation Matrix of the Dependent, Independent and Moderator variables of the Study*

	Self-efficacy	Self-Regulation	Academic Performance
Self-efficacy	1		
Self-regulation	.202***	1	
Academic Performance	.581***	.655***	1

* $p < .05$; ** $p < .01$; *** $p < .001$

The results in Table 2 revealed that there are significant and positive relationships between self-efficacy and self-regulation ($r = .202$; $p < .05$); self-efficacy and academic performance ($r = .581$; $p < .05$); as well as between self-regulation and academic performance ($r = .655$; $p < .05$).

Table 3: *Descriptive Statistics and T-statistics of the Dependent, Independent and Moderator variables of the Study*

	Male (n = 230)		Female (n = 237)		Statistics
	Mean	Std. Dev.	Mean	Std. Dev.	
Self-efficacy	29.491	4.750	29.481	5.045	$t_{(465)} = .023$; $p = .982$
Academic self-regulation	106.774	13.474	109.063	12.078	$t_{(465)} = -1.935$; $p = .054$
Academic achievement	55.957	8.198	57.051	7.585	$t_{(465)} = -1.498$; $p = .135$

Conditional Process Analysis

Table 4: *Regression Results for the Moderated Mediation Analysis*

	M (Self-regulation)			Y (Academic Performance)		
		coeff	se		coeff	se
Self-efficacy	a_1	.528***	.119	c_1'	.754***	.046
Self-regulation		-	-	b_{1i}	.341***	.018
Self-regulation X Self-efficacy		-	-	c_{21}'	-.008*	.004
Constant		.000	.582		56.615***	.224
		$R^2 = .041$; $F(1,465) = 19.716***$			$R^2 = .643$; $F(3,463) = 278.360***$	

* $p < .05$; ** $p < .01$; *** $p < .001$;

The results presented in Table 4 showed an evidence of direct effect of self-efficacy on students' academic performance, independent of self-regulation (coeff = .754; se = .046; $p < .001$). The result also revealed that there is a highly indirect effect of academic self-regulation on the relationship between self-efficacy

and academic performance (coeff = .341; se = .018; $p < .001$). This implies that students who differ in one unit of self-efficacy are estimated to differ by 0.34 units in their level of academic performance as a result of the tendency for students under relatively more self-efficacy to feel more in academic self-regulation which in turns translate to greater academic performance.

The results also showed that the self-efficacy and self-regulation interaction was significant on academic performance (coeff = -.008; se = .004; $p < .05$). This suggests that a moderated mediation effect emerged as indicated by the interaction between self-efficacy and self-regulation according to model 74 of Hayes (2013). So, the conditional indirect effect of self-efficacy on academic performance through self-regulation is conditioned on self-efficacy. Bootstrap statistics were calculated to advance the understanding of the relationship. The results are presented in Table 5.

Table 5: Conditional indirect effect of self-efficacy on academic performance through self-regulation at specific value(s) of self-efficacy

Self-efficacy	Effect	Boot SE	Boot LLCI	Boot ULCI
-4.896	.201	.047	.115	.302
.000	.180	.043	.102	.270
4.896	.159	.042	.090	.254

* $p < .05$; ** $p < .01$; *** $p < .001$

Values for quantitative moderators are the mean and plus/minus one SD from mean.

Bootstrapping analysis (bootstrap sample = 1,000) indicated that self-efficacy moderated the indirect effect of self-regulation on academic performance. Results in Table 3 indicated that the mediating effect of self-regulation between self-efficacy and academic performance occurred at all levels of self-efficacy. At one standard deviation below the mean score (self-efficacy = 24.590), there was a significant mediating effect ($p < .05$). Also, at the mean score (self-efficacy = 29.486), and at one standard deviation above the mean (self-efficacy = 34.383), significant mediating effects ($p < .05$) and ($p < .05$) were respectively observed. Consequently, students are most vulnerable in the translation of their self-efficacy into self-regulation and subsequently academic performance when they have average self-efficacy.

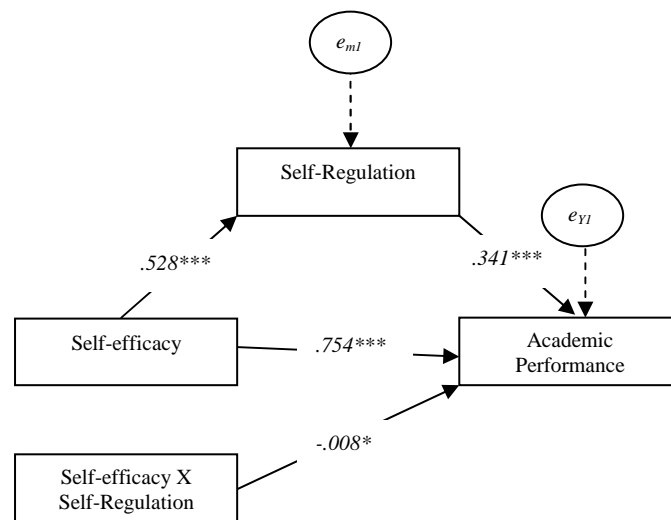


Fig. 2. Coefficients of relationships among study variables

Discussion

This study undertook an exploration of the relationships among self-efficacy, self-regulation and academic performance. In addition to this, an extension of the relationship between self-efficacy and academic performance through self-regulation as moderated by self-efficacy was undertaken.

As predicted, self-efficacy was positively related to self-regulation. Self-efficacy was also positively related and academic performance. Self-regulation was also found, as posited to be positively related to academic performance. These results are supported by previous findings for the relationship between self-efficacy and self-regulation (Seo & Ilies, 2009), self-efficacy and academic performance (Carroll *et al*, 2009; Weiser & Riggio, 2010), and self-regulation and academic performance (Nota *et al*, 2004). In fact, the results further corroborate and extended the literature on these variables.

The mediating role of self-regulation on the relationship between self-efficacy and academic performance was also established by this study. This indicates that for students' academic performance, the manifestation of self efficacy would not suffice but the ability to self-regulate. The observed moderating effect of self-efficacy in the mediation of self-regulation on the relationship between self-efficacy and academic performance was not amazing. Rather, it was revealing as it further establishes the strength of self-efficacy in theoretical models as proposed by Pajares (1996). Students with high self-efficacy for successful problem solving have been found to display greater performance monitoring and persist longer than do students with lower self-efficacy (Bouffard-Bouchard, Parent, & Larivee, 1991).

Conclusions

From the findings of this study, it would be concluded that self-efficacy, self-regulation and academic performance are severally related and that self-regulation slightly mediates the relationship between self-efficacy and academic performance. Further, the mediation effect of self-regulation on students' academic performance is further moderated by self-efficacy in that the vulnerability of students' self-efficacy to translate to academic performance through self-regulation is most effective with students who possess average self-efficacy.

Implications and Recommendations

The study findings have implications for theory, research and intervention. Foremost, the findings justified the claim that self-efficacy is a strong variable when included in models with theoretically related constructs. The declaration by Pajares (1996) was therefore sustained. The findings also portends serious implications for research as intricate models would be required to further extend the literature on self-efficacy, especially as it affects students' academic performance.

Intervention programmes involving the enhancement of self-efficacy should be done with caution for the fact that though the moderating effect of self-efficacy in the mediating effect of self-regulation on self-efficacy and academic performance relationships was significant for all levels of self-efficacy, the average level presents the most momentous effect in the moderating effect of self-efficacy on academic performance through self-regulation. Experiences should be provided both with the home and school to provide students with cues that can make them develop the required sense of efficacy.

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