PREDICTING SCIENCE ACHIEVEMENT IN SENIOR SECONDARY SCHOOL IN IJEBU NORTH LGA, OGUN STATE: ROLE OF EMOTIONAL INTELLIGENCE AND SELF EFFICACY

Ezike Boniface Ugwumaduka, (Ph.D) & Bamiro Oladipupo Adekunle, (Ph.D)
Department of Educational Foundations and Instructional Technology, College of Specialized and Professional Education, Tai Solarin University of Education, Ijagun, Ogun State.

Abstract

The cutting edge trend in classroom pedagogy has shifted activities in the classroom from the teacher to the learners to make room for active involvement in the instructional process. To achieve this, learners' characteristics have to be explored and understood to enable the teacher to tap them for the benefits of the learners. Consequently, the researchers investigated learners' emotional intelligence and self-efficacy as predictors of academic achievement in Senior Secondary School Science. Correlational research design was adopted. Four research hypotheses were tested at 0.05 alpha level. 250 SS II Science students drawn from 10 randomly selected schools within Ijebu Igbo Metropolis participated. Three instruments were used viz; Trait Emotional Intelligence Questionnaire Adolescent Short Form (r = 0.85), Self-Efficacy Scale (r = 0.80) and Science Achievement Test (r = 0.75). Pearson Product Moment Correlation Coefficient and Simultaneous Multiple Regression Analysis were the analyses techniques used. Result showed that Emotional Intelligence had significant relationship with academic achievement (r = .351, p < .05), Self-efficacy had significant relationship with academic achievement (r = .400, p < .05), the predictors had significant relative contributions and their composite contribution was equally significant at ($F_{(2,243)} = 25.679$ P < 0.05). It was concluded that Emotional Intelligence and Self efficacy are essential learner features that influence achievement in Science. Though both predictors are necessary ingredients, Self-efficacy was better at predicting achievement (29.0%) than Emotional Intelligence (16.0%). Part of the recommendations was that both traits be developed or improved upon in learners, through designing activities that will lead to the development of emotional intelligence and self-efficacy.

Key Words: Emotional Intelligence, Self-efficacy, academic achievement

Introduction

It is the strong intention of every student to excel in every subject offered in the school and this excellence is also a major concern of teachers, parents and other stakeholders in education. This becomes particularly so for those subjects like Science and Mathematics that have become a must pass for all science students at the Senior Secondary School level wishing to study Science and Science-related courses at the tertiary level. Incidentally, Chemistry, Physics and Biology which are the focus of this study are regarded as core subjects for Science students (NPE, 2014) and this makes them mandatory for science students both to offer and to pass. In this paper these researchers have collectively labeled these three subjects as Science. A certain level of this pass (credit) is required in then in order to proceed to higher levels of academic aspirations or pursuits (JAMB Brochure, 2014).

Beyond the mandatory requirement of these subjects in the academics, Science has a lot of implications for the development of nations. Ezike (2007) wrote that the role of Science and Technology in raising the level of the productive

forces and hence the standard of living of any given society is well known. No wonder Boyler (2016) commenting on the importance of Science and Technology, noted that both are widely recognized as instruments of economic growth in advanced industrialized nations and once an economy achieves a "developed" status, innovation is the only sustainable driver of economic growth. Chopra (2015) said today Science is advancing at an amazing speed and everything of our life has changed beyond recognition. Science constitutes an attempt to conquer the forces of nature and aim to give man an increasing power over his surroundings. In this direction, invisible diseases can be cured or prevented entirely, and it can still provide hope for those with as-yet incurable diseases, people who love each other can talk to themselves whenever they want no matter how far apart they are in the world and can be together the next day (Brotherton, 2010). One of the most important things Science gave to humanity according to Barbos (2014) was security. The world would have been sluggish and even more torturous and deadly without Science. Science is therefore the reason for the ever increasing understanding that people have about the world around them. Susman (2013) however had some reservation about science. She argued that a lot of the time, what we are learning about and discovering in Science is not good news, it is a bummer to learn about climate change, and equally it is an unpleasant experience to think about cancer. On-going human-caused mass extinctions are kind of depressing to think about let alone to acknowledge.

For a field with this magnitude of importance, it should be expected that students would have flair for it with its associated outstanding achievements. But what is observed is almost a yearly recurrence of underachievement in the subject (WAEC 1999; 2000, Ezike, 2007). With this observation, the performance is not encouraging for a country like Nigeria seeking for technological advancement and self-sustaining economy through the exploration of Science and Technology. To qualify for admission into any Nigerian University to study any science-related course, the student must score at least a credit level pass in five subjects (Ezike, 2007) which must include at least two of the core Science subjects.

This situation has attracted the attention of various stakeholders in general education, Science Education, parents, teachers, institutions, academic societies and the society at large (Adeyemo, 2007) and a way forward is being sought. Different researchers have come up with various reports listing factors that might be responsible for underachievement of students not only in Sciences but other subjects as well, since these factors permeate the entire achievement continuum. For example, Alao (2014) identified student factors or causes arising from the learners such as academic interest (Ezike, 2018). Adeyemi (2010) found that inadequate facilities and instructional aids were responsible for the observed students' underachievement. Dike (2007), Smith (2013) contend that students perform poorly due to lack of adequate preparation, shortage of qualified teachers, inadequate teaching aids, lack of good school environment and infrastructural facilities. Ezike (2007), Bamiro (2011) identified faulty instructional strategies as factors contributing to underachievement among students. Most of these factors responsible for underachievement as identified here are extraneous or external to the students. This present study therefore intends to examine those factors that are inherent and innate to the learners which they come into the classrooms with. Such innate characteristics being investigated in this study are emotional intelligence and self-efficacy.

Salovey and Mayer (1990) in Sania and Sehrish (2016) defined emotional intelligence as the ability to monitor one's own feelings and emotions, to discriminate among, and to use this information to guide one's thinking and action. It is the ability to recognize one's own and other people's emotions, to discriminate between different feelings and label them appropriately and to use emotional information to guide thinking and behaviour (Coleman, 2008). It is also defined as the ability to identify, use, understand and manage emotions in positive ways to relieve stress, communicate effectively, empathize with others, overcome challenges and defuse conflicts (Segal and Smith 2015). These definitions according to Baron (2005) capture the

basic skills associated with emotional intelligence which are;

- the ability to recognize, understand and express emotions and feelings,
- the ability to understand how others feel and relate with them,
- the ability to manage and control emotions,
- the ability to manage change, adapt and solve problems of a personal and interpersonal nature, and
- the ability to generate positive effects and be self-motivated.

Supporting Baron (2005), Ogundokun and Adeyemo (2010) wrote that emotional intelligence is a confluence of developed abilities to

- know and value self
- build and maintain a very strong, productive and healthy relationships
- get along and work well with others in achieving positive results and
- effectively deal with pressures and demands of daily life and work.

In other words, emotional intelligence as an ability enables the student or learner to recognize and understand his or her emotions and using this awareness or understanding to manage himself or herself and relationship with others. This study is of the view that the basis of communal existence, collaborative activities that define present day lifestyle is espoused or incorporated by the principles of emotional intelligence. This becomes more important for classroom interactions where learners through the help of others are able to attain certain learning objectives. Understanding each other's emotions, feelings, likes and dislikes therefore is a defining factor for a successful group-oriented learning and other active learning processes. Emotional intelligence is therefore not only important in self-realization but also a strong ingredient in collaborative and cooperative classroom activities as it is important in the development of productive and healthy relationships and appreciation of other's emotion.

Although Ogundokun and Adeyemo (2010) reported a paucity of research on the influence of emotional intelligence on academic performance, some works however have shown the predictive effects of emotional intelligence on academic achievement (Ogundokun & Adeyemo 2010, Chamundeswari, 2013, Preeti, 2013). Since emotional intelligence is a master aptitude, a capacity that profoundly affects all other abilities, either facilitating or interfering with them (Goleman, 1995), an investigation of the predictive effect of emotional intelligence on academic achievement becomes imperative. Maizatul, Hassan and Norhafizah (2013) in the study of the relationship between emotional intelligence and academic achievement found that the two domains investigated were significantly and positively associated. Similar results were also obtained by other researchers (Mohammad, Asghar, Ejaz, Masud & Mohammad, 2011, Banat & Rimawl, 2014, Bunyan, Tan, & Loo 2015). Contrary results have also been obtained for example Sania and Sehrish (2016) in their study with Business students in Pakistan found a weak relationship between emotional intelligence and academic performance of students, Fatum (2008) equally found a weak, positive, significant relationship between emotional intelligence and academic achievement of students in English Language Arts, but a no statistically, significant relationship is indicated between academic achievement in Mathematics or Science and emotional intelligence.

As emotional intelligence assists individuals to know and value oneself, it therefore has implications for self-efficacy. This is why Pajares (2006) wrote that the physical and emotional states that occur when someone contemplates doing something provide clues as to the likelihood of success or failure. This current study is of the view that stress, anxiety, worry and fear (which are emotional states) all negatively affect self-efficacy and can lead to a self-fulfilling prophecy of failure or inability to perform the feared tasks. Bandura (1997) defined self-efficacy as an individual's belief in his or her capacity to execute behaviours necessary to produce specific performance attainments while Ormrod (2006) described it as the measure of one's own ability to complete tasks and reach goals. It is the belief in an individual's competence to tackle difficult or novel tasks and to cope with adversity in specific demanding situations (Luszczynska, Gutierrez-

Dona & Schwarzer, 2005). From these definitions, it implies that self-efficacy refers to the extent one trusts his or her ability or potential to execute a given task. So, if an individual believes and has the confidence of completing a task such as titrating or dissection, it is to a very large extent sure that such tasks will be completed with success. Self-efficacy is therefore a very important socio-psychological factor required for school subjects like the physical sciences and mathematics that relies heavily on confidence, will power and conviction to tackle. Bandura (1997) therefore noted that a strong sense of confidence and competence facilitates information processing and performance in a variety of settings, including quality of decision-making and academic achievement.

In 1999, Bandura showed that those who are high in self-efficacy are more successful in solving conceptual problems at school. Hawthorne (2004) noted that students who are self-efficacious are more likely to undertake difficult and challenging tasks than students who are not self-efficacious. They are also more likely to engage more, work harder, exert more effort and persist longer in the face of difficulties (Zimmerman, 2000). Empirical findings show that self-efficacy positively predicts achievement (Galyon, Blodin, Yaw, Nalls & Williams, 2012, Richards, Bond & Abraham, 2012, Ezike & Ajayi 2015). Shkullaku (2013) in a study exploring the gender difference in self-efficacy and academic achievement among Albanian students (using 102 females and 78 males) found a significant relationship between students' self-efficacy and academic performance. Also a research on Australian science students carried out by Wilma (nd) of the University of Wollongong, Australia (Wikipedia) showed that those with high self-efficacy showed better academic performance than those with low self-efficacy. Goulão (2014) working in Portugal with 63 adult students found a significant relationship between self-efficacy and academic achievement. From the foregoing theses, the researchers conclude therefore that an investigation on the correlative powers of emotional intelligence and self-efficacy on students' academic achievement in Science is worthwhile.

Statement of the Problem

One of the major concerns of teachers, parents and other stakeholders of education is the level of achievement by the learners. This is particularly so following the high rate of failure in the externally conducted examinations (WAEC & NECO). Results from these examination bodies have shown that students' achievement in the Science is not quite outstanding. Efforts have also been made by researchers and government to reverse this trend. Research efforts have mostly been geared towards extrinsic factors without much improvement. It is therefore the desire of this study to look closely at factors emanating from the learners themselves. Hence, a study of emotional intelligence and self-efficacy of the learners as predictors of Science achievement becomes compelling.

1.4 Research Hypotheses: The following null hypotheses guided the study

H_{O1}: There is no significant relationship between emotional intelligence and academic achievement of students in Senior Secondary School Science.

H_{O2}: There is no significant relationship between self-efficacy and academic achievement of students in Senior Secondary School Science.

H_{O3}: There is no significant composite contribution of emotional intelligence and self-efficacy to academic achievement of students in Senior Secondary School Science.

H_{O4}: There are no significant relative contributions of emotional intelligence and self-efficacy to academic achievement of students in Senior Secondary School Science.

Research Design

Descriptive survey research design using correlational approach was adopted for this study. The design was appropriate for the study as it sought for relationship among variables and manipulation of variables was not attempted.

Population

The population for the study comprised all the Senior Secondary School Science students in all the Senior Secondary Schools in Ijebu Igbo Metropolis, Ijebu North Local Government Area

of Ogun State, Nigeria but the target population was SSII Science students.

Sample and Sampling Technique

A random sampling technique was adopted for the selection of ten schools and participants to be used for the study from the population. The sample comprised two hundred and fifty SSII students.

Instruments

The following instruments were used for the collection of data. They are the Trait Emotional Intelligence Questionnaire–Adolescent Short Form (TEIQUE-ASF), Self-efficacy Scale (SES) and Science Achievement Test (SAT) The Trait Emotional Intelligence Questionnaire – Adolescent Short Form (TEIQUE-ASF) is adopted from Petrides, Sangareau, Furnham and Frederickson (2006). The TEIQue-ASF is a simplified version, in terms of wording and syntactic complexity, of the adult short form of the Trait Emotional Intelligence Questionnaire (TEIQue). The ASF comprised 30 short statements, two for each of the 15 trait EI facets, designed to measure *global* trait EI. The TEIQue-ASF consists of sections A and B. Section A dealt with the biodata of the respondents while B contained the item statements arranged on a four-point Likert scale type of SA, A, DA and SD. The instrument was administered to a parallel sample of students that did not take part in the study. Data generated were used for the calculation of reliability using Cronbach alpha and the r obtained was 0.85.

The instrument consists of two sections, A and B. Section A contains the biodata of the participants while section B contains twenty two items based on a four-point Likert scale type of strongly agree (SA), agree (A), disagree (DA) and strongly disagree (SD). The items used for the development of this scale were generated from the works of Sherer et al (1982) and Schwarzer and Jerusalem (1995) and adapted for local use (r = 0.65) by Ezike and Ajayi (2014). It is in this form that the instrument was adopted and used. The earlier validation notwithstanding, the instrument was revalidated and administered to a parallel sample of a school that did not take part in the study. Data generated were used for the determination of reliability using Cronbach's alpha, r = 0.80.

Science Achievement Test (SAT)

This is a thirty-item multiple choice objective test developed by the researchers with options lettered A-D, chosen from all the topics already covered by the sampled schools. Ten items were taken from each of the three core Science subjects. The SAT was administered to a parallel sample of SS II students who did not partake in the main study. The result of this administration was used for the determination of the reliability of the instrument using Kuder-Richardson 20 (KR-20) and r obtained was 0.75.

Data Analysis

The data analysis techniques used were Pearson Product Moment Correlation which was used to determine the extent of relationship between the two predictor variables (each) with the criterion variable and Multiple Regression Analysis was used to estimate the prediction power (composite and relative) of the two predictors on achievement.

Results

Hypothesis one ($\mathbf{H_{O1}}$): There is no significant relationship between emotional intelligence and academic achievement of students in Senior Secondary School Science. This hypothesis was tested using Pearson Product Moment Correlation Coefficient and the result is presented in table 4.1 below.

Table 4.1 Summary of Pearson Product Moment Correlation Coefficient showing relationship between emotional intelligence and academic achievement of students in Senior Secondary School Science.

Variable	Number	Mean	Std dev.	R	Sig	Remark
Emotional Intelligence	244	96.4	9.39	.351**	.000	Significant
Science Achievement	244	14.7	3.62			

***P < 0.01**

Results of analysis show that the correlation coefficient(r) is significant at P < .05 (r = .351, P < .05). This implies that the null hypothesis of no significant relationship is rejected, indicating a significant relationship between emotional intelligence and academic achievement of students in Senior Secondary Science.

Hypothesis one (H_{O2}).There is no significant relationship between self-efficacy and academic achievement of students in Senior Secondary School Science. This hypothesis was tested using Pearson Product Moment Correlation Coefficient and the result is presented in table 4.2 below.

Table 4.2 Summary of Pearson Product Moment Correlation Coefficient showing relationship between self-efficacy and academic achievement of students in Senior Secondary School Science.

Variable	Number	Mean	Std dev.	r	Sig	Remark
Self Efficacy	244	70.3	6.09	.401**	.000	Significant
Science Achievement	244	14.7	3.62			

***P < 0.01**

Result of analysis shows that the correlation (r) is significant at P < .05 (r = .401, P < .05). This implies that the null hypothesis of no significant relationship is rejected indicating a significant relationship between self-efficacy and academic achievement of students in Senior Secondary School Science.

Hypothesis three (H_{O3}): There is no significant composite contribution of emotional intelligence and self-efficacy to academic achievement of students in Senior Secondary School Science. This hypothesis was tested with Simultaneous Multiple Regression Analysis and the results are presented in the following tables.

Table 4.3(a): Model summary of the R, R square and adjusted R square in the Multiple Regression Analysis.

Model	R	R square	Adjusted R square	SE of the Estimate
1	.419[a]	.176	.169	3.29605

a. predictors: (constant), emotional intelligence and self efficacy.

From the table above, the R^2 is .176, which indicates that 17.6 percent of the variance in the dependent variable achievement is explained by the independent variables as listed below Table 4.3(a). This means that the two independent variables influenced achievement to the tune of 17.6%. The remaining unexplained 82.4% could be attributed to the effect of several other variables not covered by this study. This composite contribution is further interpreted by the ANOVA Summary below.

Table 4.3(b): ANOVA summary of significance level in the multiple regression analysis

Model		Sum of squares	df	Mean Square	F	Sig
1	Regression	557.942	2	278.971	25.679	.000[a]
	Residual	2618.205	241	10.864		
	Total	3176.147	243			

a. predictors: (constant), emotional intelligence and self efficacy.

Though the R^2 is slightly low (See Table 4.3a), the Analysis of Variance is highly significant (0.000, $F_{(2,243)} = 25.679$ P < 0.05). This indicates that there is a statistically significant relationship between the predictor variables (emotional intelligence and self-efficacy) and the criterion variable (achievement). Therefore it can be assumed that the two predictor variables could reasonably predict achievement in Senior Secondary School Science. The null hypothesis is therefore rejected.

Hypothesis four (H_{O4}): There are no significant relative contributions of emotional intelligence and self-efficacy to academic achievement of students in Senior Secondary School Science. This hypothesis was tested with Simultaneous Multiple Regression Analysis and the result is presented in the table below

Table 4.3(c): The beta (**β**) coefficients in the Multiple Regression Analysis showing relative contributions of Emotional Intelligence and Self Efficacy to academic achievement of students in Senior Secondary School Science.

Coefficients[a]

		Unstandardized coefficients		Standardized coefficients		
Model		**B**	**SE**	**Beta**	**t**	**Sig**
1	(Constant)	-3.674	2.577		-1.426	.155
	Emotional Intelligence	.062	.029	.160	2.111	.036
	Self-Efficacy	.177	.045	.298	3.926	.000

a. Dependent Variable: Mathematics Achievement

From table 4.3(c); the Beta (β) weightings of the two predictor variables are given in the standardized coefficient column. The constant is -3.674. Relative to each other, Emotional Intelligence has a positive effect on achievement. ($\beta = .160$) and this is statistically significant at (0.036, $P < 0.05$), Self-Efficacy had a positive effect on achievement ($\beta = .298$). From the result presented, it can be concluded that the independent variables had a statistically significant effect on achievement of students in Senior Secondary School Science. Their different Beta values represent their relative contributions to achievement in Senior Secondary School Science. Emotional Intelligence made a contribution of 16.0% and Self Efficacy made a contribution of 29.8%. Therefore self-efficacy predicts achievement in Senior Secondary School Science more than emotional intelligence.

Discussion

This study investigated the relationship between emotional intelligence, self-efficacy and academic achievement of Senior Secondary School students in Science. Four null hypotheses were tested in the course of investigation. The first hypothesis sought to establish a relationship between emotional intelligence and academic achievement of students in Senior Secondary School Science. The result of the analysis showed that a positive, significant relationship exists between the predictor and criterion variables. This result affirms the importance of emotional intelligence in learning among students. Emotional intelligence enables the learner not only to monitor but to understand his feelings and emotions and equipped with this information, he makes the right decision as to learn effectively and profitably. This right information will guide his thinking and actions in relation to any learning situation. Understanding his or her emotions will also enable him or her to develop a viable learning style and habit as he knows how and when to learn best. The capability to also recognize other peoples' emotions will enable him or her to interact successfully and meaningfully with others in group activity and in the process achieve the desired learning goal. This result agrees with the findings of Maizatul et al (2013), Banat and Rimawl (2014), Bunyaan et al (2015) but does not agree with Fatum (2008) who found a weak but significant relationship between emotional intelligence and academic achievement among English Language Arts students and a no statistically significant relationship between emotional intelligence and academic achievement among Mathematics and Science students. The disagreement arose because this present study found a positive and significant relationship between EI and academic achievement in chemistry while Fatum (2008) found that the variable does not influence achievement among mathematics and science students. The disparity might be due to differences in environmental conditions of the respondents and possibly other psycho-social factors.

The study also found a significant relationship between self-efficacy and academic achievement of students in Senior Secondary School Science. As a psycho-concept that deals with individual's competence to tackle difficult or novel tasks, it

follows that learners who are self-efficacious will have stronger belief in their capacity to complete learning tasks and achieve stated goals. Believing in one's ability is a strong intrinsic motivator to accomplish given tasks and goes a long way in determining level of success. This result agrees with Galyon et al (2012), Bond and Abraham (2012), Shkullaku (2013) and Goulão (2014).

Findings from the study indicated that the predictor variables (emotional intelligence and self-efficacy) jointly and separately made significant contributions to the achievement of students in Senior Secondary School Science. This is so because emotional intelligence helps the learner to monitor and understand his or her feelings and emotions. This positively affects the self-efficacy of the learner who as a result exerts more efforts to influence his or her ability to meet specific goals and or expectations even in difficult situations. The interaction between these two predictors in enhancing learning in children is therefore crucial. Though the two variables jointly explained 17.6% of the variance in the criterion variable, analysis further showed that self-efficacy made greater contribution (30%) to achievement than emotional intelligence that contributed 16.0% which was only slightly significant. This observation is congruent or consistent with many features of self-efficacy such as people having beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives, fostering intrinsic interest and deep engrossment in activities, setting for themselves challenging goals and maintaining strong commitment to them and heightening and sustaining their efforts in the event of failure (Bandura, 1994).

Conclusions and Recommendations

From the results of this study and several other related materials reviewed, the researchers reached the following conclusions. That emotional intelligence and self-efficacy are subtle but active ingredients for the academic achievement of students in various school subjects. That self-efficacy which is an individual's personal judgement of his capabilities to organize and execute courses of action to attain designated goals is a powerful psychological weapon to overcome fear of failure. That since emotional intelligence and self-efficacy are significantly related (Mikolajczak & Luminet, 2007), both constructs can be gainfully harnessed to fortify or strengthen each other in the learners.

It is therefore recommended that both traits be developed or improved upon in learners, through designing activities that will lead to the development of emotional intelligence and self efficacy. The development activities/strategies may include providing mastery experiences, vicarious experiences or modeling, social persuasion, providing empathetic environments and activities that can lead to building up of trust and creating situations that will exert pressure on the learners' emotions to test their levels of stress management

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