

Goal Setting Self-Regulated Learning as Correlate to Students' Academic Performance in Secondary School Biological Concepts of Genetics, Rhesus Factor and Skeleton

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Abstract

This study investigated on goal setting self-regulated learning as correlate to students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton in Onitsha north local government area of Anambra state. The design was correlational research type. The sample for the study was three hundred and thirty-two (332) Biology students (male: 146 and female: 186) drawn through stratified and simple random sampling techniques. two research questions and one hypothesis was raised to guide the study. The instruments used to elicit the relevant data were: A twenty item instrument questionnaire called Goal Setting Self-Regulated Learning (GSSRL) adapted from "Development and validation of an academic self-regulation scale for university students' by Nasir (2013) and a twenty objective test called Biological Concepts Test of Genetics, Rhesus Factor and Skeleton (BCTGRFS) adapted from West African Examination Council (WAEC) past question from 2020-2022. The reliability of Goal Setting Self-Regulated Learning was tested using Cronbach alpha with coefficient value of .845 obtained while Biological Concepts Test of Genetics, Rhesus Factor and Skeleton was used the way it is because it is a standard test. Pearson's Product Moment Correlation was used to answer research questions and test hypothesis at .05 level of significance. The results revealed that: there was a moderate positive relationship between students' GSSRL and their academic performance in Biology. Hence, there is a significant difference in relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton. There exists a direct low positive relationship between male and female students' academic performance in Biology concepts of genetics, rhesus factor and skeleton among secondary school students in Onitsha north local government area. From the findings it was recommended that teachers should be trained in skills to use materials within a critical gender framework, thus enabling students to study Biology materials critically from a gender perspective. Textbooks and other curricular materials should be critically evaluated for their gender inclusivity. Academic performance is not a gender issue, both genders should be encouraged to excel in academic achievement since equal opportunities is provided for both genders. Students should be discouraged from forming stereotyped towards certain subjects, because of their sexes. From the recommendation it was concluded that the correlation between students' goal setting self-regulated learning strategy and their academic performance in Biology concepts of genetics, rhesus factor and skeleton was moderate positive. Hence, there was a significant relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton

Keywords: Biology, Goal Setting Self-Regulated Learning and Performance

Introduction

Biology is the study of living things which includes plants and animals. Aarsal (2019) averred that Biology deals with living organisms including their structure, function, evolution, distribution and inter-relationships. Biology curriculum is designed to continue students' investigation into natural phenomena, deepening students' understanding, interest and retention in biological science and to encourage students' ability to apply scientific knowledge to everyday life. (Federal Ministry

of Education, 2009). Obikezie et. al. (2022) opined that a sound knowledge of Biology is a pre-requisite for entrance into professions as medicine, pharmacy, Agriculture, nursing, science teaching including engineering which contribute to the technological growth of the nation. Biology demonstrates the absolute dependence of man on all other forms of life. A lot of reasons are borne in mind while studying biology. These include understanding oneself and environment, appreciation of nature as well as pollution control (Opara, 2019). However, in spite of all these importance of Biology to man, many secondary school Biology students still experience weaknesses in Senior School Certificate Examination (SSCE).

West African Examination Council (WAEC) Chief Examiners' reports 2020, 2021 and 2022 outlined a number of reasons for the weaknesses of students which tantamount to level of academic performance in Biology. Among the reasons given were: (i) inability to explain why a Rhesus negative man should not marry a Rhesus positive to avoid losing her second pregnancy (ii) poor grasp of genetics (iii) not given title to diagrams (iii) poor diagrams (iv) inability to crossbreeding in the genetics properly (v) poor performance in questions that require application knowledge (vi) inability to identify parts of the skeleton. One can easily ask why would three years WAEC Chief Examiners' report be pointing at the biological concepts of genetics, rhesus factor and skeleton? All these have given many educators/stakeholders some concern and research has attempted to delve into causal factors.

Atmotoya (2014) averred there are factors suspected to be responsible for low level and weaknesses among secondary school students' academic performance in Biology. Some of these factors include lack of teaching material, interest, motivational orientation, attitude, self-esteem/self-efficacy, emotional problems, study habits, teacher consultation and poor interpersonal relationships among students' teachers' poor pedagogical and content knowledge of the subject matter, parental background, extrinsic motivation, anxiety, poor interest, attitude, low self-concept and inability to regulate self in learning secondary school Biology concepts (Okoye, 2023). For the purpose of this study self-regulated learning will be considered.

Self-regulated learning places more responsibility on the learner to participate actively in classroom environment where student-student and student-teacher interact. There are four basic self-regulation strategies that all students need to be able to use: goal-setting, self-monitoring, effective use of self-instructions or self-talk, and self-reinforcement (Bandura, 2010). The most effective one among the four is goal setting self-regulated learning because it helps students achieve excellence through practice (Bandura, 2010). Similarly, it takes planning, effort, and persistence over time. Goal setting self-regulated learning allows students to become autonomous learners who can pursue their own interests. Alben (2016) submitted that in goal setting self-regulated learning students are prepared each day to discuss and write down their thoughts on subjects outside their class and actively participating in learning among themselves. Active learning unlike passive learning is dynamic and has won unanimous support for its use in teaching learning of science subjects especially in Biology (Chorng et. al., 2019). Alben (2016) observed that there is a relationship between goal setting self-regulated learning and students' academic performance in science subjects. Alben maintained that active learning is an important aspect of goal setting self-regulated learning. Opara (2018) opined that there is a positive relationship between goal setting self-regulated learning and students' academic performance in Chemistry in Owerri municipal city Nigeria, which leads to students understanding of the subject in taking control of learning process.

Banu (2013) asserted that is a moderate correlation between goal setting self-regulated learning and high school students in Biology achievement in Turkish EFL. Long (2013) observed a moderate correlate between goal self-regulated learning and students' academic performance in Mathematics in Australian program in Malaysia. Ogbenevwe (2019) pointed that there is a

moderate correlate between goal setting self-regulated learning and students' academic performance in Biology in Delta Central Senatorial District. Ogbenevwede (2019) further reported that is a significant difference between male and female student in the relationship of goal setting self-regulated learning and academic performance of secondary school students' biological concept of unit of life in Delta Central Senatorial District in favour of female students.

Nanda et. al. (2020) observed that there is a positive correlate between goal setting self-regulated learning and learning motivation with metacognitive skill in Biology subject in Thailand. The authors further observed that is a significant difference in male and female high school students' goal setting self-regulated learning and learning motivation with metacognitive skill in Biology subject in Thailand in favour of female high school students. Meanwhile, Nwafor et. al. (2015) did not find a significant relationship between junior secondary school students' goal setting self-regulated learning and students' academic performance in Basic science. Furthermore, in a study designed to uncover psychological differences between academically weak and gifted students using the Tennessee self-concept scale (TSCS) and Tennessee cognitive development scale (TCDS), Garrido Vargas (2012) did not find the two 33-member groups to differ in mean goal setting self-regulated learning and mean academic performance.

A large body of literature has also reported a relationship between gender, goal setting self-regulated learning and students' performance reported that boys seem to have a more positive relationship in goal setting self-regulated learning and performance in a number of dimensions such as Biology than girls (Kadivar et. al.,2012; Matura, 2009; Nasir & Akhtar,2013)

From the foregoing, it appears the question of whether relationship exists or does not exist between goal setting self-regulated learning and academic performance of secondary school students in Biological concepts of genetics, rhesus factor and skeleton has not been concisely answered because both the theoretical and empirical studies reviewed in this study have produced diverse and contradictory results. Similarly, the issue of gender difference in goal setting self-regulatory learning and academic performance in Biology especially in Onitsha North Local Government Area of Anambra state has not been resolved and therefore subject to further investigation. Thus the researchers investigated on goal setting self-regulated learning as correlate to students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton in Onitsha North Local Government area of Anambra State.

Purpose of the Study

This study investigated on goal setting self-regulated learning as correlate to students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton in Onitsha North Local Government area of Anambra State.

1. The relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton.
2. The relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton as moderated by gender.

Research Questions

The following three research questions guided this study:

1. What is the relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton?
2. The relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton as moderated by gender?

Hypothesis

The sole null hypothesis was tested in this study at 0.05 alpha level of significance.

Ho1: There is no significant relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton.

Methodology

The study employed a correlation research design. The area of the study was Onitsha North Local Government Area of Anambra State. The population of the study comprised of all the 4500 Senior Secondary two (SSII) Biology students in the State owned co-educational secondary schools in the local government (2640 females and 1860 males). Using standard table of Yamane, sample size of 0.5% of population of 4500 is 333. One questionnaire was discarded for improper completion. Thus, sample size for which investigation was complete was 332 (146 males and 186 females).

Instrument

Two instruments were used for the study; Goal Setting Self- Regulated Learning (GSSRL) and Biological Concepts Test of Genetics, Rhesus Factor and Skeleton (BCTGRFS). Goal Setting Self-Regulated Learning Scale (GSSRL) was adapted from "Development and validation of an academic self- regulation of an academic scale for university students' by Nasir (2013) and their colleague researchers from school of education, university of Michigan and the National Center for research to improve post-secondary teaching and learning (NCRIPTAL) named academic self – regulated scale. The instrument is designed with 10 items regarding students' use of different cognitive and metacognitive strategies and 10 items concerning student management of different resource. Scale questions, where the scores range from 1 ("strongly disagree") to 4 ("strongly agree") was used. The researcher came up with twenty items (20) from Nasir's instrument named GSRL. GSRL is a 4-point scale of strongly agreed, agreed, disagreed, and strongly disagreed. To ensure the reliability of 20 items GSRL, the instrument was pilot tested using 25 students in Awka South Local Government Area which is outside the area of study, a coefficient of .85 was obtained using cronbach alpha indicating that the instrument is reliable.

The second instrument named Biological Concepts Test of Genetics, Rhesus Factor and Skeleton (BCTGRFS) was a standard question adopted from West African Examination Council past question papers 2020-2022. BCTGRFS is a 50 item multiple questions.

Both GSRL and BCTGRFS where validated by three experts, two from Department of Science Education Biology option Nnamdi Azikiwe University Awka and from Department of Education Foundations Nnamdi Azikiwe University Awka. Pearson product moment correlation was used to answer research questions and test the sole hypothesis at .05 level of significant.

Ranges of scores

$\pm 0.80 - \pm 1.00$

$\pm 0.31 - \pm 0.79$

$\pm 0.00 - \pm 0.30$

Decision

High positive or negative relationships

Moderate positive or negative relationship

Low positive or negative relationship.

In interpreting the null hypotheses, the decision rule is that when P-value is less than or equal to 0.05 ($P < 0.05$) the null hypotheses was rejected. On the other hand, when P-value is greater than the alpha level 0.05 ($P > 0.05$), the null hypotheses was not rejected (accepted).

Result

The result of this study was presented in line with the research questions and the hypothesis as follows.

Research Questions 1

What is the relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton?

Table 1: Pearson's Product Moment Correlation Analysis of the relationship between Goal Setting Self-Regulated Learning and Students' Academic Performance in Secondary School Biology Concepts

Variable	N	r	R ²	Magnitude & Direction	Sig	Decision
GSSRLS & Academic Performance	332	0.400	0.16	moderate positive	.000	S

R² = coefficient of determination

Result in Table 1 is correlation coefficients of analysis of students' goal setting self-regulated learning GSSRL and their academic performance in Biology. Results showed that the correlation between students' GSSRL and their academic performance in Biology was 0.40. This means there was a moderate positive relationship between students' GSSRL and their academic performance in Biology. The coefficient of determination associated with 0.40 is 0.16. The coefficient of determination (0.16) also known as the correlation or relationship value means that 16% of students' GSSRL accounted for the variation in academic performance in Biology. This is an indication that 84% of variation in academic performance in Biology of students is attributed to other factors other than goal setting self-regulated learning.

Research Questions 2

The relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton as moderated by gender?

Table 2: Pearson's Product Moment Correlation Analysis of the relationship between Goal Setting Self-Regulated Learning and Students' Academic Performance in Secondary School Biology Concepts as Moderated by Gender

Variable	N	r	R ²	Magnitude & Direction
Male Students' performance	146	0.38	0.15	low positive
Female Students' interest	186	0.44	0.19	

Difference in r

R²=coefficient of determination

In order to provide answer to research question 2, male students' responses on students' academic performance in Biology scores were correlated and the correlation coefficient obtained was 0.38 as shown on Table 2. This means that, there exists a direct low positive relationship between male students' academic performance in Biology. The coefficient of determination associated with the correlation coefficient of 0.38 was 0.15. This coefficient of determination indicates that, 15% of male students accounted for the variation in their academic performance in Biology. This implies that 85% of variation in their academic performance in Biology is attributed to other factors other than male students. Still in table 2 shows that, female students' responses on students' academic performance in Biology scores were correlated and the correlation coefficient obtained was 0.44 as shown on Table 2. This means that, there exist a direct low positive relationship between female students' and their academic performance in Biology. The coefficient of determination associated with the correlation coefficient of 0.44 was 0.19. This coefficient of determination indicates that, 19% of female students' accounted for the variation in their academic performance in Biology. This implies that 81% of variation in their academic performance in Biology is attributed to other factors

other than the female students. The relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton as moderated by gender was 0.06 in favour of female students.

Hypothesis

The sole null hypothesis was tested in this study at .05 alpha level of significance.

There is no significant relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton.

Table 1 revealed the Pearson correlation coefficient for the relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton. A moderate positive correlation was found $r(332) = 0.40$, $p = 0.00 < 0.05$) indicating a significant relationship between the two variables. The null hypothesis which stated that there is no significant relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton was there rejected. The inference drawn was that the higher students goal setting self regulated learning, the more their academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton.

Discussion

The results of the study were discussed under the following sub-headings:

The relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton.

Result in Table 1 is correlation coefficients of students' goal setting self-regulated learning strategy and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton. Results showed that the correlation between students' goal setting self-regulated learning strategy and their academic performance in Biology concepts of genetics, rhesus factor and skeleton was moderate positive. Hence, there was a significant relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton. This finding portrays that self-regulated learning do plays an important role in either to predict or to affect students' Biology performance as 16% of students' Self-regulated learning accounted for the variation in academic performance in the Biology concepts used. The finding of this study supported that of other previous researcher such as Banu (2013) who asserted that is a moderate correlation between goal setting self-regulated learning and high school students in Biology achievement in Turkish EFL. Also the finding is in line with Long (2013) who observed a slight positive correlate between goal self-regulated learning and students' academic achievement in Mathematics in Australian program in Malaysia and Ogbenevwe (2019) who averred that there is a moderate correlate between goal setting self-regulated learning and students' academic achievement in Biology in Delta Central Senatorial District. The study is also in consonance with Garrido Vergas (2012) who did not find the two 33-member groups to differ in mean goal setting self-regulated learning and mean academic achievement in a study designed to uncover psychological differences between academically weak and gifted students using the Tennessee self-concept scale (TSCS) and Tennessee cognitive development scale (TCDS). By virtue of this finding, this research has joined the school of thought that relates a significant relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton.

The relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton as moderated by gender.

In order to provide answer to research question 2, male students' scores on academic performance in Biology were correlated with those female students' scores on academic performance in Biology and the correlation coefficient obtained were found to have a weak positive relationship between male students' scores and female students' scores in thier Biology academic performance in favour of female students. The inference drawn was that, there was a significant relationship in the difference between male Biology students' academic performance among the students. Hence female students have high academic performance than the male students in Biology. This result is in line with Nanda et.al. (2020) and Ogbenwede (2019) who claimed that the female students had a better academic performance in Biology than the male students. There was a statistically significant difference between male and female students in their academic performance in Biology but the finding of the study is not in line with the findings of Nwafor et. al. (2015) who observed no significant relationship between junior secondary school students' goal setting self-regulated learning and students' academic performance in Basic science. By virtue of this finding, this research has joined the school of thought that relates the relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton as moderated by gender.

Conclusions

Based on the investigation into goal setting self-regulated learning as correlate to students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton in Onitsha North Local Government Area of Anambra state, it can be concluded among others that the correlation between students' goal setting self-regulated learning strategy and their academic performance in Biology concepts of genetics, rhesus factor and skeleton was moderate positive. Hence, there was a significant relationship between goal setting self-regulated learning and students' academic performance in secondary school biological concepts of genetics, rhesus factor and skeleton.

Recommendations

1. Teachers should be trained in skills to use materials within a critical gender framework, thus enabling students to study Biology materials critically from a gender perspective. Textbooks and other curricular materials should be critically evaluated for their gender inclusivity. This is because, when a Biology curriculum is presented in a framework familiar to both girls and boys, both genders are readily involved
2. Academic performance is not a gender issue, both genders should be encouraged to excel in academic achievement since equal opportunities is provided for both genders. Students should be discouraged from forming stereotyped towards certain subjects, because of their sexes. This will boost positive competition between males and females, and enhance academic performance and excellence.
3. The school environment is a powerful agency of nurturing students to have high goal setting self-regulated learning strategy. The teachers therefore should engage the learners in both curricular and co-curricular activities to enhance their goal setting self-regulated learning.
4. Teachers should guide and counsel students constantly to avoid a state of despair. Majority of the students who could not improve in academic performance did not see the urge to adjust and developed a stereotype thinking that will enhance their grades.

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