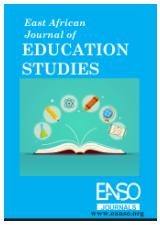
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Original Article

The Effect of the Affective Attitude on Academic Achievement in Biology among O-Level Secondary School Students in Sheema District

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Effect, Affective Attitude, Academic Achievement, Biology, Secondary School Students.

ABSTRACT

This study aimed to assess the effect of the affective attitude on academic achievement in Biology among O-Level Secondary School Students in Sheema District. A cross-sectional research design was employed, using a quantitative approach. The target population consisted of 1,400 learners, 6 head teachers, and 24 biology teachers, with a sample size of 332. Data were collected through structured questionnaires distributed to 324 learners and 6 head teachers. Quantitative data were analysed using descriptive statistics and multiple regression analysis. The study found a significant positive correlation between affective attitude and academic achievement in biology, with a correlation coefficient of 0.781. The study concluded that affective attitude plays a vital role in academic achievement in biology, with students who had a higher emotional connection to the subject performing better. Based on these findings, the study recommended that the government integrate motivational programs into the curriculum, including career guidance, emphasising biology-related fields.

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INTRODUCTION

Globally, the study of learners' attitudes and academic achievement in biology has been an ongoing research topic for several decades. One of the studies on learners' attitudes towards biology was conducted by Thomas and Hodges (1951). The study aimed to determine the factors that influenced learners' interest in biology and their academic achievement. The researchers found that learners' attitudes towards biology were related to their previous experiences, teacher characteristics, and the curriculum. Another early study was conducted by Rabgay (2018), who examined the relationship between high school learners' attitudes towards biology and their academic achievement. The study found that learners with positive attitudes towards biology had higher academic achievement than those with negative attitudes.

In recent years, several studies have investigated the relationship between learners' attitudes and academic achievement in sciences further. For example, a study by Onel and Firat (2019) identified the predictive power of biological literacy and attitudes toward biology in academic achievement in High school learners. The study found that learners' attitudes towards biology were positively correlated with their academic achievement. Another study by Mao et al. (2021) investigated the relationship between attitude toward science and academic achievement in science. The study found that learners' attitudes towards biology were positively correlated with their academic achievement and that this relationship was mediated by their motivation to learn biology.

In the early 1900s, science education in American high schools was primarily focused on rote memorisation and basic scientific concepts (Mohan, 2019). Biology was often taught as a standalone subject without much emphasis on practical applications or critical thinking skills. The mid-20th century saw a shift towards more hands-on and inquiry-based learning approaches in science education. This period marked the beginning of integrating laboratory experiments and real-world applications into the Biology curriculum in high schools. With the rapid advancement of technology and the increasing importance of scientific literacy, high schools in the U.S. have been incorporating more project-based learning and digital resources to enhance learners' understanding of Biology concepts (Loizzo et al., 2018).

According to Keiler (2018), in England, the history of academic achievement in science subjects like Biology in high schools has also undergone significant transformations over time. Science education in England during the 19th century was characterised by a traditional approach with an emphasis on theoretical knowledge rather than practical application. Biology was often taught alongside other natural sciences within a broader curriculum. The early to mid-20th century witnessed reforms in science education that aimed to make subjects like Biology more accessible and engaging for learners. Practical experiments became more common, fostering a hands-on approach to learning. In recent years, there has been an increased emphasis on promoting scientific inquiry skills and critical thinking abilities among learners studying Biology in English high schools. The curriculum has evolved to reflect advancements in biological sciences and address contemporary issues such as sustainability and bioethics.

In Africa, early studies on learners' attitudes and academic achievement in biology focused on the relationship between the two variables. For instance, research conducted in Nigeria by Gbore and Daramola (2013) assessed the relative contributions of selected teachers' variables and learners' attitudes toward academic achievement in biology among senior secondary school learners in Ondo State. The study found that learners' attitudes towards biology were significantly related to their academic achievement. Academic achievement in science subjects has been declining. According to the West African Examinations Council (WAEC) statistics from 2019 (WAEC, 2019), only about

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37% of candidates who sat for the Senior Secondary Certificate Examination (SSCE) obtained five or more credits, including English Language and Mathematics. In Biology specifically, the pass rate was around 48%.

Another study conducted by Ntaila and Mbaraka (2023) examined the impact of interactive multimedia instruction on the achievement of secondary school learners in Biology in Dedza District, Malawi. The study found that male and female learners had different attitudes towards biology, with male learners having more positive attitudes than female learners. Additionally, a study conducted by Mwanda et al. (2017) towards the adoption of a constructivist instructional approach in learning biology in secondary school learners in Kenya. The study found that the learner-centred learning approach significantly improved learners' attitudes towards biology and their academic achievement.

In South Africa, historically, academic achievement in science subjects was unevenly distributed along racial lines due to apartheid policies that segregated schools and limited opportunities for black learners. In Biology specifically, approximately 63% of candidates passed. While these figures represent improvement compared to past decades, they still indicate room for enhancement (Tokan & Imakulata, 2019).

In Uganda, during the colonial era, the education system was primarily designed to serve the interests of the colonial powers. The curriculum focused on subjects deemed important by the colonisers, with limited emphasis on indigenous knowledge and cultural relevance (Bude, 1983). After gaining independence, Uganda underwent various educational reforms aimed at decolonising the curriculum and making it more relevant to the needs of Ugandan society. The government introduced policies to promote science education, including biology, as part of efforts to drive economic development and technological advancement (Namayanja et al., 2021). Factors such as inadequate resources, teacher shortages, outdated teaching methods, and limited access to quality education continued to affect learners' learning experiences and academic achievement in biology. In recent years, there has been a growing recognition of the importance of addressing learners' attitudes towards biology to enhance their academic achievement.

In Secondary Schools in Sheema District, the lack of adequate resources and infrastructure has been a significant hindrance to science education in Uganda. According to a report by UNESCO (United Nations Educational, Scientific, and Cultural Organization), Uganda's educational system suffers from a shortage of teachers, classrooms, laboratories, textbooks, and other essential learning materials.

Learners are expected to develop a strong, positive attitude towards Biology, finding it interesting, relevant, and enjoyable to learn (Kurniawan et al., 2019). This positive attitude is critical as it directly influences academic achievement, leading learners to perform well in O-Level examinations. However, the current situation in Sheema District reveals a concerning disparity between expectations and reality.

Despite efforts to enhance science education through various initiatives, many students exhibit a lack of interest in Biology. According to the Sheema District Education Officer's report for the 2022/2023 academic year, a significant number of students demonstrate minimal engagement with the subject, which correlates with low academic achievement. In fact, academic achievement in Biology among O-Level secondary school learners in Sheema District is not meeting desired standards.

Statistics from the Uganda National Examinations Board (UNEB) reveal that only 15% of learners scored distinctions and credits in the UACE Exams in 2023. This alarming figure underscores the struggle many learners face in grasping biological concepts and performing adequately in assessments.

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The government has implemented various strategies, including curriculum reforms, teacher training programs, and resource provision, aimed at improving science education. However, these interventions have not effectively addressed the persistent issue of low academic achievement in Biology.

If the problem of low achievement in Biology is not urgently addressed, it will hinder Sheema District's ability to contribute to national development goals, particularly in sectors that require a skilled workforce in science and technology. The gap between learners' attitudes towards Biology and their academic achievement poses a significant challenge that demands immediate attention and intervention.

Purpose of the Study

To examine the effect of the affective attitude on academic achievement in biology among O-level secondary school students in Sheema District.

LITERATURE REVIEW

The effect of affective factors on academic achievement in biology has attracted considerable scholarly attention, as emotions and attitudes play a central role in shaping learning outcomes. Existing studies provide useful insights into how emotional and motivational variables influence students' performance, but they often fail to consider how learners' affective attitudes toward biology interact with these factors. This study addresses that gap by synthesising the literature across different dimensions, including self-efficacy, intrinsic motivation, emotional intelligence, and teacher-student relationships.

Atiyah et al. (2020) established that students with high self-efficacy in biology were more likely to adopt effective learning strategies, persist in the face of challenges, and ultimately achieve better results. Self-belief enabled them to view obstacles as opportunities for growth. However, their work did not consider whether learners' attitudes toward biology directly influenced their self-efficacy. It is possible that students with a positive orientation toward the subject are more confident in their abilities, whereas negative attitudes may undermine self-belief. This study builds on Atiyah et al.'s findings by examining how affective attitudes shape self-efficacy and, consequently, academic performance in biology.

Similarly, Kışoğlu (2018) demonstrated that intrinsically motivated students showed higher levels of engagement and success in biology, often pursuing independent study or extracurricular activities out of genuine interest. While this highlights the importance of motivation, it does not sufficiently explain how affective attitudes toward biology either enhance or diminish intrinsic motivation. Students with positive attitudes may find learning biology naturally rewarding, while those with negative attitudes may struggle to engage, regardless of their potential. By investigating this connection, the current study aims to clarify the role of affective attitudes in sustaining intrinsic motivation and improving academic achievement.

In addition, Stankovska et al. (2018) emphasised that students with strong emotional intelligence were better at managing stress and anxiety, leading to improved achievement in demanding subjects such as biology. Yet, this perspective does not fully address how learners' attitudes toward the subject shape their emotional responses. Negative attitudes may heighten stress and hinder coping strategies, whereas positive attitudes could foster resilience. This study, therefore, explores the interplay between affective attitudes, emotional regulation, and academic achievement, providing a more holistic understanding of students' emotional experiences in biology learning.

Furthermore, Gyeltshen and Gyeltshen (2022) highlighted the critical role of positive teacher-student relationships in fostering engagement and academic success. A supportive classroom climate enhances motivation and performance. However,

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limited research has examined how students' attitudes toward both biology and their teachers influence this dynamic. It is likely that attitudes toward the subject shape the quality of teacher-student interactions, which in turn affect academic outcomes. The present study integrates this dimension by exploring how affective attitudes toward biology impact achievement within the broader context of classroom relationships.

Taken together, these studies reveal that self-efficacy, intrinsic motivation, emotional intelligence, and teacher-student relationships are all crucial to academic success in biology. However, a consistent gap emerges: few studies directly consider how affective attitudes toward biology shape these factors and, in turn, influence academic achievement. The current study seeks to fill this gap by examining the multifaceted role of affective attitudes in learning biology. By doing so, it aims to provide educators with evidence to design interventions that foster positive attitudes, emotional resilience, and motivation, ultimately enhancing academic achievement in biology and related disciplines.

METHODOLOGY

Research Design

This study employed a cross-sectional research design, utilising a quantitative approach. The design involved collecting data that described events and then organising, tabulating, depicting, and analysing the data collected. It was selected because it allows the collection of data from a relatively large group of respondents at a single point in time, using questionnaires as the main instrument. This approach is efficient, cost-effective, and suitable for capturing learners' attitudes and academic achievement in biology within the study area.

Population and Sample Size

The study targeted head teachers, biology teachers, and learners. The total target population was 1,406, comprising 6 head teachers, 24 biology teachers, and 1,400 learners. From this population, a sample size of 332 respondents was determined (Table 1). The sample of 302 learners was selected based on Krejcie and Morgan's (1970) sample size determination table, which recommends approximately 302 respondents for a population of 1,400 at a 95% confidence level and a 5% margin of error. Head teachers and biology teachers were included purposively because of their direct involvement in academic administration and subject teaching, while learners were selected through stratified and simple random sampling to ensure representation across schools and classes.

Table 1: Target Population and Sample Size

Category of respondent	Target Population	Sample size	Sampling technique
Head teachers	6	6	Purposive Sampling
Learners	1,400	302	Simple random and stratified
Biology teachers	24	24	Purposive Sampling
Total	1,406	332	

Data Collection Tools

Data were collected using a structured questionnaire divided into three sections corresponding to affective, psychomotor, and cognitive domains.

Affective domain: The Attitudes toward Science in Biology Scale (ASBS) measured students' emotional responses and motivation toward biology using Likert-scale items. Reliability was established through Cronbach's alpha, while validity was confirmed by expert review and comparison with existing attitude measures.

Psychomotor domain: Students' practical skills in biology were assessed through hands-on tasks such as microscope use and dissections. Inter-rater reliability was achieved by multiple evaluators,

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while validity was ensured through alignment with curriculum objectives and expert verification.

Cognitive domain: A standardised test assessed comprehension and problem-solving in biology. The test was piloted to establish reliability, and content validity was confirmed by subject matter experts.

Academic achievement: Students' most recent biology exam scores were used as an objective measure of performance. Scores from multiple assessments were averaged to improve reliability and reduce variance from single exams.

Data Analysis

Quantitative data were analysed using SPSS version 28. Descriptive statistics, such as frequencies, percentages and summarised response patterns. Pearson correlation coefficients were computed to determine the relationship between affective attitudes and academic achievement. A significance threshold of $p < 0.05$ was used to assess the statistical relevance of the findings.

Ethical Considerations

This study was conducted in strict adherence to ethical principles to ensure the dignity, rights, and welfare of all participants. Ethical approval was obtained from the Bishop Stuart University Research Ethics Committee (BSU-REC) under approval number BSU-REC-2024-457 before any data collection commenced. Participation in the study was entirely voluntary, and no participant was coerced or unduly influenced to take part. Informed consent was obtained from all participants after providing them with clear and comprehensive information about the study's purpose, procedures, potential risks and benefits, and their right to withdraw at any time without penalty. This information was communicated through an introductory letter attached to each questionnaire.

The study also prioritised anonymity and confidentiality. No personal identifiers were collected, and all data were handled securely and used solely for academic research purposes. Participants were assured that their responses would remain confidential and that their identities could not be linked to the data in any way. The researcher took all necessary precautions to minimise any potential risks or harm, including emotional or psychological discomfort, by ensuring that the questions posed were respectful, non-invasive, and appropriate for the target group.

Furthermore, the researcher is committed to maintaining academic integrity by producing work that is entirely free from plagiarism. All secondary sources, including books, journal articles, and other scholarly materials, were properly cited and acknowledged in line with standard referencing guidelines. The findings of the study will be communicated transparently, and summaries of the results will be made available to relevant stakeholders, including participating schools and the academic community, upon request.

RESULTS

Table 2: Response Rate

Category of Respondent	No. of Instruments	Returned	Response Rate (%)
Head teachers	6	5	83.3%
Learners	302	295	97.7%
Biology teachers	24	24	100.0%
Total	332	324	97.6%

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The response rate was recorded as follows: Out of 6 head teachers, 5 returned the instruments, resulting in a response rate of 83.3%. Among the 302 learners, 295 responded, giving a response rate of 97.7%. All 24 biology teachers returned their instruments, achieving a 100.0% response rate. In total, 324 out of 332 instruments were returned, yielding an overall response rate of 97.6%.

Objective One: The Effect of the Affective Attitude on Academic Achievement in Biology among O-level Secondary School Students in Sheema District

The results were analysed using a 5-point Likert scale, where 5=Strongly Disagree, 4=Disagree, 3=Undecided, 2=Disagree, 1=Strongly Disagree. To calculate the mean scores, the frequencies for each response were summed and then divided by the total number of respondents. A mean score above 3 indicates agreement with the statement, while a mean score below 3 indicates disagreement.

Table 3: Frequencies, Percentages, and Mean Acores for Affective Attitude (n=295)

Statements on affective	5 f(%)	4 f(%)	3 f(%)	2 f(%)	1 f(%)	Mean	SD
I enjoy learning new topics in my classes.	47 (15.9%)	162 (54.9%)	44 (14.9%)	27 (9.2%)	15 (5.1%)	3.67	0.95
I feel excited when I achieve good grades.	27 (9.2%)	192 (65.1%)	35 (11.9%)	30 (10.2%)	11 (3.7%)	3.66	0.91
I feel a sense of accomplishment when I understand difficult topics.	3 (1.0%)	207 (70.2%)	41 (13.9%)	35 (11.9%)	9 (3.1%)	3.54	0.83
I am motivated to study outside of class.	83 (28.1%)	153 (51.9%)	30 (10.2%)	24 (8.1%)	5 (1.7%)	3.97	0.93
I feel anxious about exams and tests.	91 (30.8%)	159 (53.9%)	24 (8.1%)	18 (6.1%)	3 (1.0%)	4.07	0.85
I enjoy working with my classmates on group projects.	59 (20.0%)	183 (62.0%)	27 (9.2%)	21 (7.1%)	5 (1.7%)	3.92	0.85
I feel that my teachers care about my success.	44 (14.9%)	189 (64.1%)	30 (10.2%)	18 (6.1%)	14 (4.7%)	3.78	0.94
I look forward to going to school each day.	53 (18.0%)	171 (58.0%)	44 (14.9%)	21 (7.1%)	6 (2.0%)	3.83	0.88
I find schoolwork satisfying and rewarding.	65 (22.0%)	168 (56.9%)	35 (11.9%)	24 (8.1%)	3 (1.0%)	3.91	0.86
I believe that learning is important for my future.	41 (13.9%)	177 (60.%)	38 (12.9%)	27 (9.2%)	12 (4.1%)	3.71	0.96
Overall						3.81	0.90

5=Strongly Disagree, 4=disagree, 3=Undecided, 2=Disagree, 1=Strongly Disagree. SD=Standard Deviation

The majority of respondents (54.9%) agreed that they enjoyed learning new topics in class, with a mean score of 3.67, indicating a generally positive attitude toward learning. Similarly, most participants (65.1%) felt excited when they achieved good grades, yielding a mean score of 3.66. This suggests that academic success serves as a strong motivational factor, reinforcing the link between performance and affective engagement in biology. Furthermore, 70.2% of learners reported a sense of accomplishment when they understood difficult topics, with a mean score of 3.54. This indicates a moderate but meaningful confidence in tackling academic challenges, although the relatively lower mean compared to other items may point to persistent difficulties in mastering complex content.

In terms of motivation, a majority (51.9%) agreed that they were motivated to study outside class, with

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a mean score of 3.97, reflecting strong intrinsic motivation. This finding is consistent with earlier studies suggesting that learners with positive affective attitudes tend to pursue independent learning. However, 53.9% of respondents also reported feeling anxious about exams and tests, which yielded the highest mean score (4.07). This suggests that test-related stress remains a significant concern, potentially undermining the positive effects of motivation and enjoyment. The coexistence of strong motivation and high anxiety indicates a complex interplay where learners value success but may perceive assessment as a source of pressure rather than encouragement.

Collaboration also emerged as a valued aspect of learning, with 62.0% of respondents enjoying group work (mean = 3.92). This reflects a recognition of peer support in enhancing learning outcomes. Moreover, 64.1% believed their teachers cared about their success (mean = 3.78), suggesting that positive teacher-student relationships contribute to affective engagement. Still, this relationship may vary across groups depending on teacher availability, classroom size, or pedagogical style, factors which the current study did not disaggregate but are important for understanding variations in learner attitudes.

School engagement indicators were equally strong: 58.0% of learners looked forward to attending school (mean = 3.83), 56.9% found schoolwork satisfying (mean = 3.91), and 60.0% believed learning was important for their future (mean = 3.71). These findings highlight that students' affective attitudes are not only tied to immediate classroom experiences but also influenced by broader contextual factors such as future aspirations and perceived value of education. The overall mean score for affective attitude was 3.81, indicating a generally positive emotional and motivational outlook.

While the results demonstrate an overall positive affective orientation toward learning, the underlying factors influencing these attitudes appear multifaceted. Exam anxiety, for example, may be influenced by systemic issues such as high-stakes examinations in the Ugandan education system, while differences in teacher support or peer collaboration opportunities could create variations across schools or gender groups. Additionally, socio-economic background may shape learners' beliefs about the future benefits of education, with those from disadvantaged households potentially facing competing pressures that limit enthusiasm despite recognising its value. By considering these broader contextual dynamics, the findings suggest that fostering positive affective attitudes requires not only classroom-based interventions but also systemic reforms addressing assessment practices, resource allocation, and support structures for learners.

Table 4: Pearson Correlation Coefficient for Affective Attitude and Academic Achievement in Biology among O-level Secondary School Students in Sheema District

		Affective Attitude	Academic Achievement
Affective Attitude	Pearson Correlation	1	0.781
	Sig. (2-tailed)		0.002
	N	295	295
Academic Achievement	Pearson Correlation	0.781	1
	Sig. (2-tailed)	0.002	
	N	295	295

**. Correlation is significant at the 0.05 level (2-tailed).*

The results showed a strong positive correlation between affective attitude and academic achievement in biology among O-level secondary school students in Sheema District, with a correlation coefficient of 0.781. This correlation was statistically significant, as indicated by a p-

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value of 0.002 ($p < 0.05$). This suggests that a higher affective attitude was associated with better academic achievement in biology among the students. The above study findings imply that students' emotional engagement, motivation, and enjoyment of learning significantly influence their academic achievement in biology. A positive affective attitude, characterised by enthusiasm for learning, motivation to study, and a sense of accomplishment, enhances student participation and performance. However, high levels of exam anxiety may negatively impact achievement.

DISCUSSION OF FINDINGS

The study findings did not explore the specific factors that contribute to the development of positive emotional attitudes toward biology. It also overlooked how environmental influences, cultural backgrounds, and instructional approaches shape students' affective responses to the subject. These gaps limit a deeper understanding of how to effectively nurture and sustain positive attitudes that can enhance academic achievement in biology. This finding is consistent with the literature, which emphasises the importance of affective factors in learning. For instance, Rowe and Fitness (2018) note that positive emotions and attitudes towards a subject are strongly linked to academic achievement. Similarly, Azevedo (2020) found that students with positive attitudes towards biology tended to have higher levels of motivation and engagement, leading to better academic outcomes.

Al-Mutawah et al. (2019) also reported a significant positive correlation between students' attitudes towards biology and their academic achievement. Furthermore, the finding is also in line with the self-determination theory, which posits that intrinsic motivation is a key predictor of academic achievement (Kışoglu, 2018). Students who are genuinely interested in learning biology tend to be more motivated and engaged, leading to better academic outcomes.

Additionally, Franco and DeLuca (2019) found that involvement in extracurricular activities, such as science clubs or competitions, can foster a greater interest in biology, leading to better academic achievement. Overall, the findings suggest that affective attitude plays a crucial role in predicting academic achievement in biology, and that fostering positive attitudes and intrinsic motivation can lead to better learning outcomes.

CONCLUSION

The study concluded that there is a strong positive relationship between affective attitude and academic achievement in Biology among O-level secondary school students in Sheema District. This suggests that students who exhibited a higher emotional attachment, interest, and motivation towards Biology performed better academically.

Recommendations

The government should integrate motivational programs into the curriculum, including career guidance sessions that highlight opportunities in Biology-related fields.

School Administrators should organise extracurricular activities such as science clubs, Biology competitions, and field trips to stimulate students' interest in the subject.

Parents should encourage and support their children's learning by fostering a positive attitude toward science at home and providing resources such as books and educational videos.

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