Advances In Multidisciplinary & Scientific Research
A Multidisciplinary & Interdisciplinary Journal
Volume 10, No 3, September 2024 Series

Using 7E Instructional Model on Attitude of Students Towards Biology With Moderating Effect Of Learning Styles: How Do Students Behave In Nigeria?

[1]Jolaosho, F.A, [2]Afuwape, M.O. & [3]Ifamuyiwa, A.S.
[1]Department of Biological Sciences, Nigerian Navy Secondary School, Onikoko Abeokuta,
[2&3]Department of Science and Technology, Olabisi Onabanjo University, Ago-Iwoye
E-mails: jolaoshofatimah@gmail.com; afuwape.moses@oouagoiwoye.edu.ng;
ifamuyiwa.adebola@oouagoiwoye.edu.ng

ABSTRACT

This study investigates how attitudes of Students is influenced using the 7ES Instructional model with moderating effect of Learning Styles . The study adopted a non-randomised pre-test, post-test, control group quasi-experimental design on 200 intact SS2 students offering Biology from two purposively selected secondary schools, one from Abeokuta North and the second from Abeokuta South Local government areas of Ogun state. The two schools were randomly assigned to the experimental and control group. The experimental group was exposed to 7E instructional model and the control group, to the conventional method. Three major instruments were used: Attitude Scale For Students ASS, (r=0.73), Learning Styles Classification Test LSCT,(r=0.76) and 7E Instructional Model Guide.Data were analysed using mean gain , standard deviation and analysis of covariance.The study affirms that learners subjected to 7E Instructional model have the highest posttest mean attitude score of 101.25 with a positive mean gain of 55.94 whereas learners taught using the conventional method recorded a lower score of 50.89 with a mean gain of 3.25. These findings also showed consistent gains in mean with respect to attitude scores across the four Styles of learning examined by the study. Findings confirmed main effect of treatment to be statistically significant ($F_{(1,183)} = 29995.997$, $p < 0.05$) in influencing the attitude of students towards the subject since there is a significant difference in the mean attitude scores of students in post-test after subjecting to the treatment. Futher more, the result revealed that the learners' mean attitude scores in post-test is not sensitive to their learning styles ($F_{(3,183)} = 0.327$, $P > 0.05$). Also the interaction effect of treatment and learning styles did not significantly influence the attitude scores of learners towards Biology. This study concludes that the 7E Instructional model positively impact the behaviour of learners and is effective for enhancing the attitude of Students toward Biology regardless of their styles of learning.

Keywords: 7E Instructional Model, Attitude, Students, Biology, Learning Styles, Behaviour, Nigeria

Aims Research Journal Reference Format:
Jolaosho, F.A, Afuwape, M.O. & Ifamuyiwa, A.S. (2024): Using 7E Instructional Model on Attitude of Students Towards Biology With Moderating Effect Of Learning Styles: How Do Students Behave In Nigeria?Advances in Multidisciplinary and Scientific Research Journal Vol. 10. No. 3. Pp 13-24. www.isteams.net/aimsjournal. dx.doi.org/10.22624/AIMS/V10N3P3

1. INTRODUCTION

The focus of science education is the acquisition of conceptual and analytical skills as well as problem solving ability (Ibrahim & Zulkipli, 2022). Additionally, education in science involves the dissemination of scientific contents and processes with those who are not traditionally considered as members of the community of science. This category of people may be farmers,women in the markets, students or the entire community. In Nigeria, the education of science involves teaching scientific concepts, methods of teaching and at the same time, addresses misconceptions held by learners concerning scientific concepts (Aina, 2013). Wai (2023) also observed that citizen need better science education to make the country more competitive internationally.

Biology, as one of the science subjects solve science related challenges on daily basis. (Nwachukwu and Nwosu, 2007 in Bilesanmi-Awoderu et al 2017a). The subject is at the heart of many science related courses like Pharmacy, Medicine, Physiology, Biochemistry, Agriculture etc. In view of this centrality, it studies living organisms and their important processes (Michael 2023). It provides a platform for teaching students the aptitude to apply learned concepts of science and principleas a result,it is given wider attention by the scholars and developers of curriculum.Despite this, the attitude of Students toward the Subject has not been impressive as emphasized by (Yoursuu 2024). The negative attitude of Students in Senior Secondary School toward Biology has not been awe-inspiring,this cynicism has led to lackadaisical nature which has affected their interaction in Biology class.

Therefore, there is need to expose the Students to teaching strategy that can positively enhance their attitude toward Biology.7E Instructional model was developed by Esienkraft (2003) and it has seven stages which are : elicit,engage,explain,explore,elaborate,evaluate and extend. This model has provided ample opportunity to Students which encompasses knowledge building, transfer of learning, right thinking and good perception to teaching and learning process. 7E model encourages the integration of real- world experiences into instruction, which can help to make abstract scientific concepts more relevant and engaging for students. This approach permits students to see the practical use of scientific thoughts in everyday life. In addition, this model is pliable and adjustable to different teaching contexts and subject areas. Teachers can modify and adjust the model to meet the needs of their pupils and curriculum.

Ahmad et al. (2022) defined Attitude as a complex and definite concept which is positive,negative,cognitive,affective conceptions and preferences by an individual towards an object. Mao et al. (2021) emphasized that attitudes of Students toward academic Subjects is a burning issue of educational research and have been documented to be predictors of learning outcomes. Saheed and Williams (2022) also stressed that attitude is linked with success in academic and behaviors of learners determine the development of their positive attitude. Abdullah and Asniza (2020) on exploring the influence of 7E instructional model on general learners' attitude for the subject and tutor-centered strategy, reported that the general attitude of learners using the model had positive impact relative to those with the conventional method. In the same vein, Shaheen and Kayani (2017) also examined learners' attitude towards Biology and found that learners in the experimental set displayed positive behavioural inclination.

This study considers Learning style of students in which an individual absorb, process, understand, store and recover information. The styles of learning adopted for this study are in four levels: visual, auditory, reading, kinesthetic (VARK). Azida et al. (2019) found preferences among undergraduate learners in the faculty of computing with respect to learning styles. The scholars found the most preferred learning style to be uni-modal dimension, involving only the visual style, suggesting that the bulk of the students have strong visual modality. This was followed by the kinesthetic style with the least preferred being auditory. Similarly,Ibrahim and Zulkipli 2022 examined the styles of learning and Achievement in Biology and revealed that appropriate match between styles of teaching to styles of learning can enhance learners' attitudes and behaviour.Hence, this study investigates students attitude towards Biology using 7E Instructional model with moderating effect of learning styles.

1.1 Research Questions

1. Can 7E instructional model bring about change in attitude of students?
2. Is there a significant effect of Learning Style on Attitude of students?

1.2 Research Hypotheses

H_{01}: The Main effect of Treatments does not significantly influence the Attitude of learner towards Biology.

H_{02}: The Main effect of learning styles does not significantly influence the Attitude of learners towards Biology.

H_{03}: The interaction effect of treatment and learning styles does not significantly influence the Attitude of learners towards Biology.

2. METHODOLOGY

The study uses a non randomized pre-test and post-test control group design in a quasi-experimental setting. Two public Secondary schools were purposively selected from two Local Government Areas (LGA): Abeokuta South and Abeokuta North. A sample size of two hundred Students with intact classes of SS2 in Abeokuta South and Abeokuta North local government areas out of the 20 LGAs in the state were purposively selected. One public secondary school randomly picked from each Local Government Area, Ogun State, Nigeria. The two schools were randomly assigned into control and experimental groups. A sample of one hundred students in intact classes were used from each school to obtain a total of two hundred SS2 Biology students from the two LGAs. 100 in experimental (though two students were absent from the class) and 100 in the control group.

The Biology teachers in the two schools helped as research assistants. The Students in both group were classified into the four styles of learning using the scoring sheet after responding to sixteen items to distinguish the styles of learning relevant to them on the Learning Styles Classification Test (LSCT).The Students were also exposed to pre-test before and post-test after treatment.The Students in the experimental group were taught with 7E Instructional Model and the control group were taught using conventional method.

2.2 Instrumentation

Three Instruments were used for this study namely : Attitude Scale For Students (ASS) Learning Style Classification Test (LSCT) and 7E Instructional Model Guide.

2.2 Attitude Scale for Students(ASS)

The 26-item attitude scale adapted from Volker (1970) was used in this study to measure attitude toward expectation, content, and method. It comprises of two sections: A and B. The former requested for names, schools and students' gender, while the latter consists of 26- item attitude scale which were positively worded. The Students that were exposed to both experimental and control treatment were also evaluated with attitude measures. Five items were included on the expectation, five on content and sixteen on method. The two groups (experimental and control) were subjected to ASS, for pre- and post- test. Four-item Likertscale was used and scored as Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1). The students responded and indicated the extent to which their feelings and opinions agree or disagree with the statements presented.

2.3 Validity and Reliability of Attitude Scale for Students

The items were validated using content and face validity by giving it to experts in Biology Education. Reliability was determined using Cronbach alpha coefficient which yielded 0.73.

2.4 Learning Styles Classification Test (LSCT)

This is a learning style test comprising of the Visual style, Auditory style, Reading style and Kinesthetic style (VARK). It was employed to classify the students into different learning preferences. This reflect the learning styles classification mode as adopted from the learners' guide to improve learning by Fleming and Bonwell (2019). VARK was segmented into sections A and B with the former requesting for names, schools and sex of the students while latter, permits the students to respond to sixteen items to distinguish the learning styles relevant to them. The students were classified into the four styles of learning using the scoring chart.

2.5 Validity and Reliability of the VARK Learning Styles ClassificationTest

The face and content validity was done The reliability of the tool was determined by Cronbach's Alpha reliability coefficient which yielded a coefficient of 0.76.

3. RESULTS AND DISCUSSION

Research Question 1: Can 7E instructional model bring about change in attitude of students?

Table 1: Pre and Post-test Attitude Scores of Students in Biology by Treatments

Treatment	No	MeanScore	St Dv	Mean Score Gain	Min	Max Max
7E Instructional Model						
Pre-test Attitude	100	45.31	3.13		30.00	49.00
Post-test Attitude		101.25	1.96	55.94	94.00	103.00
Conventional Method						
Pre-test Attitude	100	47.64	3.33	3.25	31.00	53.00
Post-test Attitude		50.89	2.22		35.00	55.00
Total						
Pre-test Attitude	200	46.48	3.43	29.59	30.00	53.00
Post-test Attitude		76.07	25.32		35.00	103.00

The result in table 1 affirms that learners subjected to 7E Instructional model have the highest post-test mean attitude score of 101.25 with a positive mean gain of 55.94 whereas learners thought using the conventional method recorded a lower score of 50.89, though with attitude mean score gain of 3.25. The mean score gain of the 7E Instructional model is about seventeen times more than that of the conventional method.

Research Questions 2: Is there any effect of Learning Style on Attitude of students?

Table 2: Pre and Post-test Attitude Scores of Students in Biology by Learning Style

Learning Style	No	Mean Score	St Dv	Mean Score Gain	Min	Max
Visual	84					
Pre-test Attitude		46.24	4.08		30.00	53.00
Post-test Attitude		75.96	25.44	29.72	35.00	103.00
Audio	48					
Pre-test Attitudes		46.67	2.74		40.00	51.00
Post-test Attitude		76.33	25.41	29.66	48.00	103.00
Reading	40	47.08	3.14	29.05	41.00	51.00
Pre-test Attitude		76.13	25.64		49.00	103.00
Post-test Attitude						
Kinesthetic	28					
Pre-test Attitude		46.00	2.64	29.86	41.00	51.00
Post-test Attitude		75.86	25.81		46.00	103.00
Total	200					
Pre-test Attitude		46.48	3.43		30.00	53.00
Post-test Attitude		76.07	25.32	29.59	35.00	103.00

The results in Table 2 indicates that the students' mean scores and their standard deviations in line with their attitudes toward Biology and based on their learning styles before and after the treatments. On the average, the students who preferred learning by Visual (n = 84), reported mean score of 46.24 (S.D = 4.08) in their pre-test attitude and mean score for post-test attitude of 75.96 (S.D = 25.44)thus, ending in a positive mean gain of 29.72.With respect to the auditory learners (n = 48), a mean pre-test attitude score of 46.67 (S.D =2.74) and mean post- test attitude score of 76.33 (S.D = 25.41) yielding a positive mean gain of 29.66 were observed.

Furthermore, those learners (n = 40), who preferred reading as their mode of learning, returned a mean pre-test attitude score of 47.08 (S.D = 3.14) and mean post-test attitude score 76.13 (S.D = 25.64), thus resulting in a positive mean gain of 29.05. Lastly, the learners in the kinesthetic group (n =28), recorded mean pre-test score of 46.00 (S.D = 2.64) and mean post-test score of 75.86 (25.81), resulting in a positive mean gain of 29.86. These findings also showed consistent gains in mean with respect to attitude scores across the four learning styles examined by the study.

Main and Interaction Effects of Treatments, Gender and Learning Style on the Attitude of students towards Biology

Table 3: ANCOVA Results for Learners' Attitude towards Biology by Treatment, Gender and Styles of Learning

Variation Sources	Sum of Squares	Df	Mean Square	F-values	Sig. of F-values
Main Effects (Combined)	114425.985	5	22885.197	6017.663	.000
Covariates (pre-test)	12500.426	1	12500.426	3286.987	.000
Treatment	114074.899	1	114074.899	29995.997	.000*
Gender	12.827	1	12.827	3.373	.068
Learning Style	3.731	3	1.244	.327	.806
2-Way Interaction					
Treatment*Gender	22.897	1	22.897	6.021	.015*
Treatment*Learning Style	.689	3	.230	.060	.980
Gender*Learning Style	18.829	3	6.276	1.650	.179
3-Way Interaction					
Treatment*Gender*L/Style	11.955	3	3.985	1.048	.373
Model	126981.070	16	7936.317	2086.855	.000
Residual	695.950	183	3.803		
Total	127677.020	199	641.593		

* Means significant F-value at .05 level; R^2 = .994; Adjusted R^2 = .994

H_{01}: Main effect of Treatment (7E Instructional model and Conventional Method of Teaching) does not significantly influence attitude of students towards Biology.

Findings confirmed main effect of treatment to be statistically significant ($F(1,183) = 29995.997$, $p < 0.05$) in influencing the attitude of students towards the subject since there is a significant difference in the mean attitude scores of students in post-test after subjecting to the treatment. Consequently, the study failed to support the acceptance of hypothesis1.

H_{02}: Main effect of styles of learning does not significantly influence attitude of students towards Biology

Table 3 revealed that the learners' mean attitude scores in post-test is not sensitive to their learning styles ($F(3,183) = 0.327$, $P > 0.05$). Consequently, hypothesis 2 was accepted.

H_{03}: Interaction effect of Treatments and Learning Styles does not significantly influence Attitude of students towards Biology

Table3 also revealed that interaction effect of treatment and learning styles did not significantly influence on attitude scores of learners towards Biology. This findings documented that mean attitude scores of the students in post-test, upon contact with the treatment, does not vary significantly with styles of learning preferred by the students, that is, not sensitive to the learning styles at $F(3, 183) = 0.060$, $p > 0.05$. Expectedly, hypothesis was retained.

4. DISCUSSION

The findings demonstrated a change in the attitude of students toward the subject. The mean scores of attitudes for the students exposed to 7E instructional model is higher than the control which is the conventional method. There are many factors that contributed to the high significant difference of the change in attitude of the students toward Biology. The 7E Instructional model gave the students the opportunity to actively participate throughout the learning and teaching process. Since it is an activity-based model, the students interacted with one another with joy and great enthusiasm making it easy to grasp their attentions and prepare them for class work. This means that students showed interest in the teaching and learning when exposed to 7E instructional model and this has revealed the effectiveness of the model in improving the attitude toward Biology.

The application of this model makes students' engagement in learning activities faster and optimal implementation of the tool that facilitate active involvement of pupils in the learning. The interest in the task or activity shown by students as earlier discussed led to motivation and subsequently prepared them for learning by increasing their concentration to acquire new knowledge. The findings further showed that 7E Instructional model played a pivotal role at improving attitude of students towards Biology compared with conventional method. The ability of this model to improve learners' attitude toward Biology has contributed positively to the learning and teaching.

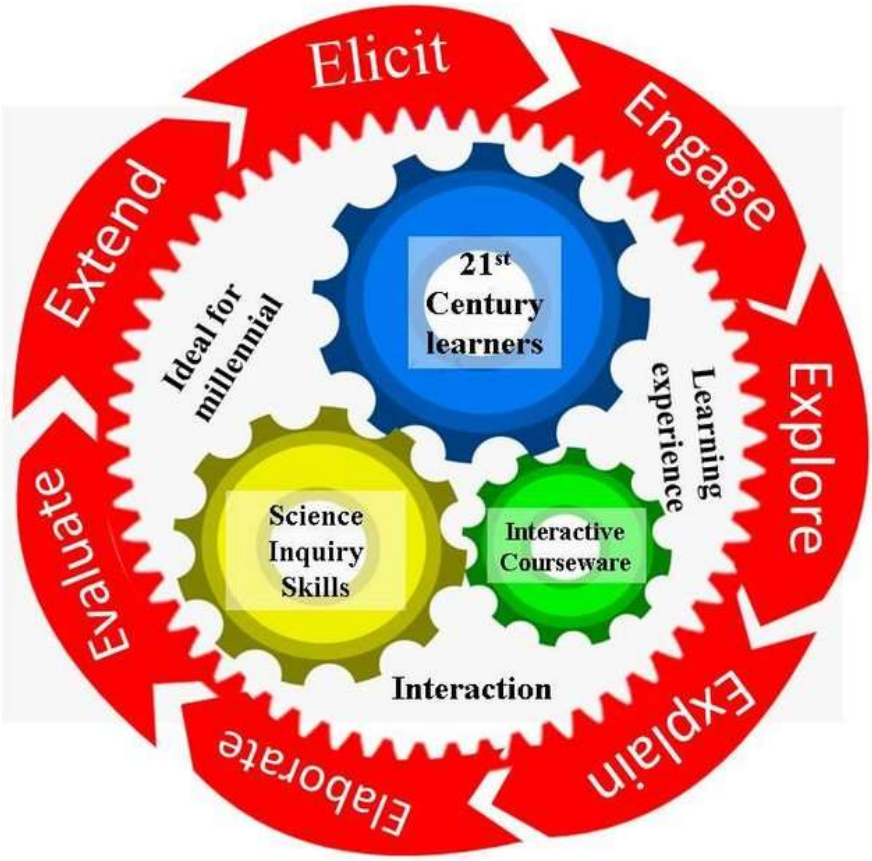

Fig 1: Enhanced 7E Instructional Model
Source:https://www.researchgate.net/figure/Enhanced-7E-Instructional-Model-integrating-the-Interactive-Courseware_fig1_351797639

This submission is in congruent with the reports of Shaheen and Kayani (2017) that documented positive behavioural tendency that produced improved outcomes in teaching and learning process in Biology which remained consistent in their study. Khan et al. (2020) also recorded significant improvements with the attitude of an experimental set towards physical education as a subject in schools. Similarly, Turgut et al. (2016) revealed positive findings with respect to predetermined educational goals such as high performance and desirable attitude.

This assertion is also in consonance with the findings of Abdullah and Anisah (2020), also Andrew et al. (2018) that documented a positive attitude of students exposed to 7E instructional model. Other related studies that are in agreement with this finding is Adesoji and Idika (2015) that also recorded a positive attitude of students in Senior Secondary School chemistry when they were exposed to the Model.

Evaluation of the main effect of styles of learning on the attitude assessment of students in the subject revealed no significance thus, implying that students' attitudes towards Biology is insensitive to their styles of learning. That is the preferred way of learning by the students showed no significant effect on their attitude. Studies that are in consonance with this submission include that of Shih and Gamon (2001) that reported a neutral attitude about web- based instruction and those of Adedapo (2013), Afolabi and Adebanjo (2022) who reported no evidence for the effect of styles of learning on the attitude of learner.

This study also discovered that interaction effect of styles of learning and treatments do not significantly influence scores of learners in attitude towards the subject as seen in (Tables 3) since the attitude scores of learners in post-test by treatments and for the four learning styles do not vary significantly. This agrees with the findings of Nurgul (2019) that reported a moderately significant relationship of learning styles and attitude of Student toward computer-assisted language learning. This is contrary to the report of Fumei et al. (2018) that documented a pronounced effect on learning styles and attitude of learners using multimedia.

5. CONCLUSION

The study concludes that 7E Instructional Model enhance the teachers' and learners' teaching and learning effectiveness of Biology in secondary education, irrespective of the styles of learning. The application of the 7E Instructional model should be encouraged for teachers' delivery of Biology at the level of the secondary school education in the country to advance the academic performance of students in Biology.

REFERENCES

Abdullah, S. & Asniza, I. N. (2020). Effect of the 7E Instructional Strategy on the overall Attitude of Students in Biology in Public Secondary Schools in Adamawa State, Nigeria. Asia Pacific Journal of Educators and Education, 35(2), 171-186.

Adedapo, Y. A. (2013). Impart of three microteaching modes on trainee teachers' learning outcomes in selected teaching skills. Unpublished Ph.D. Thesis, Olabisi Onabanjo University, Ago-Iwoye, Ogun State.

Adesoji, F. A. & Idika, M. I. (2015). Effects of 7E Learning Cycle Model and Case-Based Learning Strategy on Secondary School Students' Learning Outcomes in Chemistry. Journal of the International Society for Teacher Education, 19(1), 7-17.

Afolabi, O & Adebanjo, A. (2022). Learning Styles and Gender Effects on Secondary School Students' Learning Outcomes in Ijebu-Ode Community, Ogun State, Nigeria. *KIU* Journal of Humanities,4(4),155–169.

Ahmad,S., Sultana, N., & Jamil, S. (2022). Students' Attitude Towards Biology and Academic Achievement in Biology at Secondary Level in Islamabad, Pakistan. American journal of Educational Research, 10 (5), 268-275.

Aina, J. K. (2013). Effective teaching and learning in science education through information and communication technology. Journal of Research and Method in Education, 2(5), 43-47.

Andrew, J. M. & Collie R. J. (2018). Teacher–Student Relationships and Students' Engagement in High School: Does the number of negative and positive Relationships with teachers matter? Journal of Educational Psychology, 111 (5), Doi: 1037/ Edu 0000317.

Anisah, F., Sulastri, S. & Syukri, M. (2020). The Effectiveness of 7E Learning Cycle Model to improve student motivation in work and energy topic. Journal of Physics Conference Series 1460.doi:10.1088/1742-6596/1460/1/012136.

Azida, N.S, Nithya D.S, Lina H, Zuraina A, Norhasyimah H & Shahreen K (2019). Learning Styles and Teaching Styles Determine Students' Academic Performances. International Journal of Evaluation and Research in Education, 8 (4), 610-615.

Bilesanmi – Awoderu, J. B., Afuwape, M. O. & Jolaosho, F. A. (2017a). What happens to Nigerian Arts and Science Students Achievement in Life Science when assisted with Individualized and Demonstration Methods? European Journal of Material Sciences, 4(1), 38-39.

Eisenkraft, A. (2003). Expanding the 5E Model. The Science Teacher, 70(6), 56-59.

Fleming, N.D. & Bonwell, C. (2019). How do I Learn Best? A Learners' Guide to Improve Learning. USA.

Fumei, W, Rong-jou Y, Hann-Jang H & Hui-Mei S (2018). A Tam based study of the attitude towards use of intention of multimedia among school teachers. Journal of Applied System Innovation, 1(3), 36.

Ibrahim, N. & Zulkipli Z.A. (2022). The Diversity of Learning styles and Academic performance of Biology Students. International Journal of Academic Research in Progressive Education and Development, 11 (4),450-464.

Khan, F., Syed, Z & Faisal, I. (2020). An experimental Study Regarding Impact of 7E's Instructional Model Based on Instructions upon Student's Attitude towards Physical Education Subject at Higher Secondary School Level. Global Social Sciences Review, 5(4), 137-151.

Mao, P., Cai, Z., He, J., Chen, X., & Fan, X. (2021) The Relationship Between Attitude Toward Science And Academic Achievement in Science. A three –level Meta- analysis.Frontiers in psychology 12,784068.

Michael, M. C. (2023). Essential Biology for Senior Schools. Tonad Publishers limited Lagos-Ibadan Expressway, Ibafo Ogun State, 41.

Nurgul, I., (2019). Learning Styles of Students and their Attitudes toward Computer Assisted Language. 6th International Conference on Education Social Sciences and Humanities. 14, 819-830.

Saheed, A. A. & William, A.S.(2022). Enhancing Students' Attitudes Toward Biology using Consensus and Cooperative Reflective journal writing educational Strategies problems of education in 21st century 80(2), 242.

Shaheen, M. N. & Kayani, M. M. (2017). Improving Students' Attitude towards Biology as a School Subject: Do the Instructional Models Really Work? Journal of Applied Environmental and Biological Sciences, 7(1), 170-179.

Shih, C. C. & Gamon, J. (2001). Web-Based Learning: Relationships among Student Motivation, Attitudes, Learning Styles and Achievement. Journal of Agricultural Education, 42(4),12-20.

Turgut, U., Colak, A. & Salar, R. (2016).The Effect of 7E Model on Conceptual Success of Students in the Unit of Electromagnetism. European Journal of Physics Education, 7(3),1-37.

Volker, R. P. (1970). Development of a Multimedia System for Teaching High School Biology. Unpublished Ph.D. thesis, Iowa State University, Anneslowa.

Wai, J. (2023) Rethinking science education. International journal of science education, 380(6643), 351.

Yoursuu, S.N.M (2024) Home-economics Students Attitudes Towards Biology And How It Impacts their Academic Performance.European journal of health and Biology Education,11(1),21-27.