



Structural Equation Modelling Of Parenting Styles on Achievement of Secondary School Physics Students in Optics Practical Mediated by Interest

Josephine N. Okoli¹; Kingsley T. Onah²

^{1&2}Department of Science Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

ABSTRACT

Secondary school Physics students under achievement in internal and external examination raises concern for inclusion of non-cognitive variables like parenting styles and academic interest in lesson preparation. Therefore, the study investigated the structural equation modelling on parenting styles on the achievement of secondary school Physics students in optics practical mediated by interest. Four null hypotheses guided the study. The study employed an exploratory-correlational survey research design. The study was carried out in Enugu Education Zone of Enugu State, Nigeria with population of 4,578 SS2 Physics students. The multi stage sampling procedure was used to select 916 SS 2 Physics students and parents/ guardians across the schools in Enugu Education Zone with 20% calculation of the entire population. The instrument for data collection was the parenting styles scale (PSS), Optics practical interest scale (OPIS) and Optics practical achievement test (OPAT). The instruments were subjected for face validation, construct validation and content validation by three experts. The internal consistency reliability of the instruments was established using Cronbach alpha for PSS and OPIS. PSS which yielded coefficients .92, .97, .91 and .94 for clusters A, B, C and D respectively for PSS and OPIS yielded a reliability index of .98. The internal consistency reliability for OPAT was done with Kendall's coefficient of concordance. OPAT yielded an index of .90. The indices were adjudged adequate and reliable for data collection. The data collected were analyzed using structural equation model of statistical package for the social sciences Analysis of Moment Structures (SPSS AMOS), The hypotheses were tested using estimates of calculated maximum likelihood with bootstrapping (5000 resampling at 95% bias-corrected confidence intervals (CI95%). The findings showed that Academic interest fully, partially and suppressively mediated the relationship between parenting styles and academic achievement of secondary school Physics students in optics practical. It was recommended that Physics teachers and school counsellors should design a structured parent engagement programmes that educate parents about the characteristics and academic benefits of authoritative parenting practices, particularly as they relate to the cultivation of scientific interest and inquiry habits in the home.

ARTICLE'S INFO

Article No.: 091026161

Type: Research

Full Text: [PDE](#), [PHP](#), [HTML](#), [EPUB](#), [MP3](#)

DOI: [10.15580/gjer.2026.1.091026161](https://doi.org/10.15580/gjer.2026.1.091026161)

Accepted: 13/09/2026

Published: 16/09/2026

Keywords: Structural Equation Modeling, Parenting Styles, academic achievement, academic interest, Students, Physics, Optics Practical

*Corresponding Author

Kingsley T. Onah

E-mail: kingsley.onah@esut.edu.ng

ORCID:

<https://orcid.org/0000-0003-4075-8580>

Article's QR code



INTRODUCTION

Physics is the commonest blueprint, which reveals the complex level of matter and energy that controls everything from the component of quantum particles to the dance of galaxies. Physics is important to the understanding of the universe and influencing technological development therein. According to Onah and Anamezie (2022), Physics is the most basic and the foundation of all other scientific disciplines. Physics, as a foundational science, plays a crucial role in shaping scientific literacy and technological advancement. However, secondary school students often encounter significant challenges in mastering physics concepts, particularly in practical applications like optics. Serway and Jewett (2016), opined that Physics is the most fundamental of the sciences, concerning itself with energy, matter, space and time, and their interactions. As a result, there is a need to explore more effective and engaging non-cognitive techniques like parenting styles and students' academic interest that promote active learning and application of Physics principles in the real-world. It is known that non cognitive techniques contribute to the student's academic achievement in the classroom situation especially during optics practical.

Optics is a branch of Physics that studies the behavior and properties of light, including its interactions with matter. Optics is concerned with the generation, propagation, and detection of electromagnetic radiation, which includes not only visible light but also other forms like infrared, ultraviolet, X-rays, and radio waves. They allow us to observe distant galaxies, stars, and planets, greatly expanding our understanding of the cosmos (Onah, 2025). Despite the relevance of optics to technological development, Secondary school students greatly abscond from optics practical, especially during West African Senior School Certificate Examinations (WASSCE). This is frequently reflected in varying levels of poor academic achievement of the Physics students.

As a result of this, it leads to the poor academic achievement of students in WASSCE Examination. Academic achievement was further defined by Nwankwo and Okoye (2015) as performance results that show how well an individual has achieved particular objectives that were the focus of activities in instructional contexts, specifically in schools, colleges, and universities. In the context of this research, academic achievement is taken as the student's overall performance in the internal and external WASSCE and/or NECO examinations (Onah and Anamezie, 2022). In addition, during the May/June 2025 SSCE. A total of 1,969,313 candidates sat for Physics in the said examination; of this figure 754,545 (39.30%) passed between Alpha and Credit, and 60.70% made D₇ through F₉ grade (WAEC Chief Examiner's report 2025). This grades D₇ through F₉ was not sufficient for a candidate to gain admission into the institution of higher learning. The academic achievement of secondary school students in Physics, particularly in practical-oriented topics such as optics, has always been

very low according to researchers and WAEC examiners; they noted that good number of students usually avoid practical Physics involving optics and those that attempt it fail woefully. This failure maybe influenced by a complex interplay of cognitive, affective, and psychological factors as noted by the researchers. Among these are parenting styles modelled by students' academic interest (Iksan and Saufian 2017).

Parenting style is the behavioral prerogative of the parent on their wards and children. Parenting style could be defined as a decimated influence of parental attitudes and behaviors towards children and an emotional inclination in which the parents' behaviors are expressed (Pamela, 2022). Asanjarani, Aghaei, Fazaeli, Vaezi and Szczygieł (2022), categorized parenting styles into two major dimensions as demandingness and responsiveness styles. According to the researchers, the demandingness as a part of parenting style demonstrates control, demands for maturation, and supervision, and responsiveness as a part of parenting style shows a display of affective warmth, acceptance, and involvement toward their children's academic activities. Demandingness is a parenting style that seeks to engage children on personal oriented acts for good or proud results. Demandingness is the kind of parenting style that demands that the parents should be particularly in touch with their children as every behaviour of these children should be derived from the active involvement of the parents (Asanjarani, et al., 2022). On the other hand, responsiveness is a parenting style that accepts the action of their children's behaviour with or without control about their children's state of well being. Pamela (2022), recategorized these two components of parenting style into four distinct parenting styles which includes Authoritarian, authoritative, Permissive and uninvolved parenting styles. These four types of parenting styles are also known as Disciplinary, Democratic, indulgent and neglectful respectively. Baumrind (1991) posited that a close relationship exists between the type of parenting and children's behaviour, their development and the learning outcomes in school. These four parenting styles could influence secondary school students in their academic achievement. Authoritarian parenting is the kind of parenting that demonstrate high levels of demandingness, along with low levels of responsiveness. These parents are primarily more interested on controlling their children. Authoritarian is strict, demanding, makes decision for the child, apply restrictive punitive style in which parents exhort the child to follow their directives, place firm limits and controls the child with little or no verbal exchange to determine their point. Pinquart (2016) observed that the academic achievement of children from authoritarian homes was high. Authoritative is the kind of parenting that demonstrate high levels of demandingness, along with high levels of responsiveness. Authoritative parenting is also known as democratic parenting. They have rules, use consequences, disciplines their children but they also recognize their children's opinion. Pinquart (2016)

noted that the authoritative parents are more supportive and are involved in their children's performance academically. Children of authoritative parents are so close to their parents that if they face any difficulties with their school work, they will discuss it with their parents who proffer solutions to their problems. It is in the light of the above background that there is need to investigate parenting style in relation to the academic achievement of secondary school students offering Physics on optics practical. Permissive parenting is the kind of parenting style that is characterized by low levels of demandingness and high levels of responsiveness. In this type, parents are lenient; they only step in when there is a severe issue. According to Chen (2015) children raised from permissive parents are likely to become problematic in the society because they completely lack boundaries and they have no consistent routines, no predictability. This is likely to make the child not to adjust well in the school environment. Children of permissive parents may perform poorly academically as their parents rarely monitor them as to the kind of friends they keep and what they spend their day doing. Pinquart (2016) states that children of permissive parents usually have drawn backs, and grow up to be juvenile delinquents. Pinquart further stated that permissive parenting style is usually an overly laid-back approach to parenting. Uninvolved Parenting is the kind of parenting style that shows low levels of both demandingness and responsiveness. A neglectful/uninvolved parenting style does not provide their children with any meaningful support or attention whether academically or otherwise. Here the Parents tend to have little knowledge of what children are doing. Children may not receive much guidance, nurturing, parental attention. They rank low in happiness and exhibit frequent behavior problems.

From the foregoing, it is obvious that a person's upbringing is a factor of how such an individual process information. The process is a factor of the individual's interest in the subject matter. National examination reports indicate a growing decline in students' achievement which engendered poor interest in Physics practical in optics.

Interest, in the educational context, refers to students' intrinsic motivation, curiosity, and psychological investment in a subject. The awareness propensity to learn about the world and gain knowledge of culture and science is called interest. Students who are passionate about a subject may focus more on it, paying close attention, learning it well, and applying their critical thinking skills. Students can only become more enthusiastic about learning Physics, improving their conceptual understanding and procedures, and developing a scientific spirit and attitude if we can pique their interest in the subject. Students who are interested in a subject like Physics are probably more driven to take charge of their education and acquire the necessary abilities to become proficient Physics learners, claims Eze (2016). Interest in Physics is therefore important while thinking about how to create efficient physics learning methods.

However, not much literature is available on the structural equation modelling of parenting style on academic achievement of secondary school Physics students in optics practical mediated by academic interest in Enugu Education Zone. Thus, this work tends to fill the gap using a Structural Equation Modeling (SEM).

Structural Equation Modeling (SEM) is a research technique that permits the test of non-cognitive variables on the tenets of direct and indirect effects in one model with all the latent variables attached to the observed variables. SEM is a multivariate statistical technique that enables researchers to simultaneously examine complex relationships among multiple latent constructs and observed indicator variables, test the fit of theoretically derived models to empirical data, and estimate both direct and indirect (mediated) effects within a single integrated framework (Kline, 2016). In educational research, SEM has been employed extensively to examine the structural relationships amongst non-cognitive variables. These variables stem from parenting styles, students interest student and academic achievement in optics practical. This technique offers a high level of analytical procedure that is particularly well suited to the complexity of the relationships under investigation in the present study (Hair, Black, Babin, and Anderson, 2019).

Statement of the Problem

Physics students' poor academic achievement and learning outcome steaming from very low interest in optics practical constitutes a great source of worry and serious concern amongst parents, school managers, and educational policy makers. Asanjarani, Aghaei, Fazaali, Vaezi and Szczygiel (2022) observed that some parents encourage their wards academically, while others do not. This is arguably as a result of the parents' educational background and socio-economic status that is predominated by their choice of parenting style or worth of parenting. Some parents motivate their wards academically by promptly paying their school fees, providing them with educational materials, and helping them with their assignments, while some do not. In this context, one wonders the role parental style plays on the academic achievement and interest of these Physics students. This worrisome situation has warranted 39.30% achievement in WAEC results and undue drop out of most science students in their respective course of studies; as poor foundation in Physics at the secondary school level are left unchecked. It may also result in the low manpower in the field of science in the country. This is clearly stimulated by students' poor knowledge of Physics from secondary school; forcing them to more of art related courses in the institutions of higher learning. It is against this backdrop therefore, that this study set out to investigate the structural equation modelling of parenting style on academic achievement of secondary school Physics students in optics practical mediated by academic interest. in Enugu Education Zone.

Purpose of the Study

The purpose of this study is to examine the structural equation modelling of parenting style on academic achievement of secondary school Physics students in optics practical mediated by academic interest in Enugu Education Zone of Enugu State, Nigeria. Specifically, the study sought to determine the:

1. Mediating relationship of Academic interest on authoritative parenting style and Academic Achievement of secondary school physics students in optics practical.
2. Mediating relationship of Academic interest on authoritarian parenting style and Academic Achievement of secondary school physics students in optics practical.
3. Mediating relationship of Academic interest on permissive parenting style and Academic Achievement of secondary school physics students in optics practical.
4. Mediating relationship of Academic interest on uninvolved parenting style and Academic
- 5.

Conceptual model

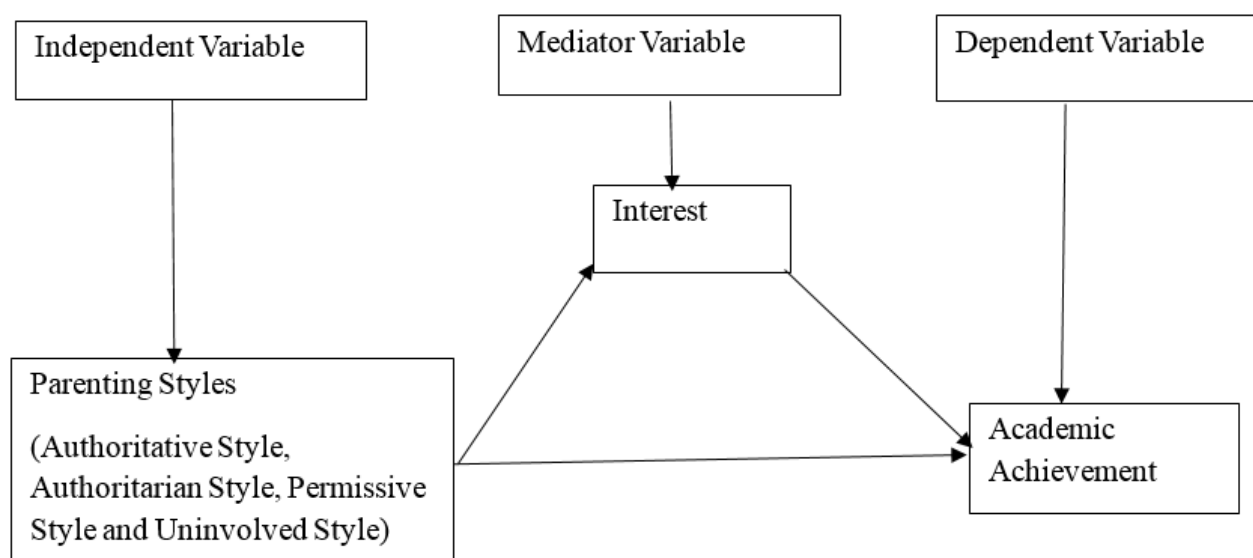


Fig. 1: Schematic Diagram showing the Relationship between the Variables in the Study.

As shown by the arrow connecting the four components of parenting styles: Authoritative parenting style, Authoritarian parenting style, Permissive parenting style and Uninvolved parenting style with interest mediating the relationship with the academic achievement as shown in the fig 1, the components of parenting styles have both direct and reciprocal links with each other. Fig 1 also shows that there is direct relationship between the individual predictor variables and the academic achievement. This therefore signifies that one's parental personality traits contributes to his/her ability to

Achievement of secondary school physics students in optics practical.

Hypotheses

The following null hypotheses were formulated and was tested at 0.05 level of significance to guide the study.

1. Academic interest does not mediate the relationship between authoritative parenting style and Academic Achievement of secondary school physics students in optics practical.
2. Academic interest does not mediate the relationship between authoritarian parenting style and Academic Achievement of secondary school physics students in optics practical.
3. Academic interest does not mediate the relationship between permissive parenting style and Academic Achievement of secondary school physics students in optics practical.
4. Academic interest does not mediate the relationship between uninvolved parenting style and Academic Achievement of secondary school physics students in optics practical.

accomplish tasks successfully and attribute his successes and failure to their parental significant contributions on their academic sojourn in Physics. In classrooms, students' belief in their ability to perform specific classroom activities successfully and attribution of their academic successes and failures has direct impact on their parental involvement in their learning activities and mediated by interest. Academic interest is the student's innate liking for the subject. The independent variables: Authoritative parenting style, Authoritarian parenting style, Permissive parenting style

and Uninvolved parenting style showed direct relationships with the mediator variable: academic interest. Academic interest mediated students' achievement to the parenting styles. This shows indirect relationship of parenting styles to the academic achievement in Physics. This signifies that when a parent shows nonchalant attitude to students well being in school; these students could still do well following their interest in the subject. Academic achievement on the other hand entails the academic outcome that student has done successfully using his own effort and skills in school.

RESEARCH METHOD

The study employed an exploratory-correlational survey research design. This is a form of correlation research design explores the latent variables of the independent variable or a mediator variable to explain or predict one criterion or dependent variable (Nworgu, 2018). This design is preferred as the study seeks to predict academic achievement of Senior Secondary year two (SS2) students in optics practical using structural equation modelling of parenting styles mediated by interest on the achievement of secondary school Physics students in optics practical. Parenting styles: authoritative parenting style, authoritarian parenting style, permissive parenting style and uninvolved parenting style are the independent variable, academic interest is the mediator variable while academic achievement in optics practical is the dependent variable. The study was carried out in Enugu Education Zone, located central of Enugu State, Nigeria. Enugu State has six Education Zones which include; Agbani, Enugu, Udi, Awgu, Obollo Afor and Nsukka. Enugu Education Zone consists of three Local Government Areas namely Enugu North, Enugu East and Isi-uzo. The area is predominantly urban, semi-urban and rural in nature with basic amenities such as good road, hospitals, electricity, schools and markets. Most people living in the Zone are civil servants, students, teachers, lecturers, traders and farmers. There are 34 public and many private secondary schools in the zone. The secondary school types in the Zone are boys' schools, girls' schools and co-educational schools. With a considerable number of secondary schools in the Zone, the people in the area value education. The choice of the area was necessitated due to students' poor achievement in Physics, not minding the number of secondary schools available in the area. The population of the study was 4,578 SS2 students offering Physics in the 30 Public Secondary Schools, made up of single sex and co-educational schools across the three Local Government Areas of the Zone. The population of the parents/Guardians was 4, 548. This is because there were 30 occasions of twins in SS2 classes. The population was retrieved from the Parent Teachers Association (PTA) logbook for SS 2 class. 30 parents and guardians indicated that they are representing twins in the class.

This justifies the reduction of the student's population from the parents/ guardian's population as one parent/ guardian usually represents the number of his/ her children/ wards during PTA meeting. The sample for the study was 916 SS2 physics students and their parents' / guardians' of 2025/2026 academic year. The sample size was obtained from the population of the study using 20% calculation of the population. According to Memon, Ting, Cheah, Thurasamy, Chuah and Cham (2020), when the population for the study is less than 5000, it is appropriate to extract the 20% of the population as the sample size in structural equation modelling. The students were selected using simple random sampling techniques in each of the class from the 20% calculation. The researcher used three instruments for data collection. They are: 1. Parenting Style Scale (PSS), adapted from Shyny (2017) 2. Optics Practical Interest Scale (OPIS), adapted from Okafor (2020). 3. Optics Practical Achievement Test (OPAT), adapted from WAEC past question 2020. Shyny Parenting Style Scale (PSS) is a 32-item developed by (Shyny 2017) to assess the parenting styles of secondary school Physics students. The 32-items, are modified and used for this study to reflect parenting styles in optics practical in Physics. For instance, original construct: "I want my child to follow my instructions because I am the authority to decide what to do or what not to do". Was modified as "I want my child to follow my instructions in reading his optics practical in Physics because I am the authority to decide what to do or what not to do". Optics Practical Interest Scale (OPIS), is a 20-item statements adapted from Okafor (2020) to assess the interest of secondary school Physics students in optics practical. Out of the 20-items, eight were modified to show students interest in optics practical. For instance, the original construct: "I like to answer questions in physics class". This was modified as "I like to solve problems involving optics practical in the class". Optics Practical Achievement Test (OPAT), is an essay type questions adapted from WAEC past questions 2024 with 12-item statements on rectangular block prisms practical. Out of the 15-items, 12 were modified and extracted to show students ability to manipulate optics practical in rectangular block prism. For instance, precautions and sub-theory questions were exempted. PSS and OPIS was measured on four-point rating scale as Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). OPAT was measured as 0, 1, 2, 3 and 4 points in the grading alignment. The instruments were subjected to face validity, construct validity and content validity by three experts. These experts examined the items in terms of contents, relevance and clarity as well as the relatedness of the items to the purpose of the study. The internal consistency reliability of the instruments was determined using Cronbach alpha for PSS and OPIS while OPAT was measured with Kendell coefficient of concordance. PSS yielded an index of .92, .97, .91 and .94 for Cluster A, B, C and D respectively. OPIS yielded an index of .98. OPAT yielded an index of .90. The indices are adjudged to be adequate and reliable; thereby justifying the instruments to be

suitable for data collection. The data was analyzed statistically using structural equation modelling of path analysis of Statistical Package for the Social Sciences Analysis of Moment Structures (SPSS AMOS). The hypotheses were tested using estimates of calculated maximum likelihood with bootstrapping (5000 resampling at 95% bias-corrected confidence intervals (CI95%). The

null hypothesis was rejected when p-value is less than or equal to .05 otherwise do not reject. The analysis was done using SPSS AMOS package version 24.

RESULTS AND ASSUMPTIONS

Table 1 Model Fit Evaluation of structural equation modelling

Index	Value	Recommended Threshold	Interpretation
χ^2/df	2.42	≤ 3.0	Acceptable
CFI	0.96	≥ 0.95	Good Fit
TLI	0.96	≥ 0.95	Good Fit
RMSEA	0.028	≤ 0.06	Good Fit
SRMR	0.033	≤ 0.08	Good Fit

Table 1 shows that the proposed structural equation modelling model demonstrated satisfactory fit to the data across all evaluated indices of the variables. The chi-square test was non-significant ($\chi^2 = 1169.086$, $df = 484$, $p = .000$), and the chi-square/df ratio was within acceptable limits ($\chi^2/df = 2.42$). The CFI (0.96), TLI (0.96), RMSEA (0.028, 95% CI [0.021, 0.059]), and SRMR (0.033) all met or exceeded recommended

thresholds, confirming that the model provided an adequate representation of the empirical data.

Hypothesis 1: Academic interest does not mediate the influence of authoritative parental styles on the Academic Achievement of secondary school physics students in optics practical.

Table 2: Summary of mediation analysis of authoritative parenting style on the academic achievement of secondary school physics students in optics practical

Observable	Standardized Estimation	P-Value	Confidence Interval at 95.0% for β		Decision
			Lower bound	Upper bound	
Total effect	0.246	.005	.346	.864	Significant impact
Direct effect	0.096	.005	.122	.557	Significant impact
Indirect effect	0.096	.004	.136	.412	Significant impact

Table 2 revealed that the total effect of authoritative parenting style on academic achievement was significant ($\beta = .246$, $P < .05$. with the inclusion of mediating variable (Academic interest), the impact of authoritative parenting style and academic achievement became significant ($\beta = .096$, $P < .05$. the indirect effect of authoritative parenting style on academic achievement of secondary school physics students through academic interest was

found significant ($\beta = .096$, $P < .05$. This shows that the relationship between authoritative parenting style and academic achievement is partially mediated by academic interest.

Hypothesis 2: Academic interest does not mediate the relationship between authoritarian parental styles on the Academic Achievement of secondary school physics students in optics practical.

Table 3: Summary of mediation analysis of authoritarian parenting style on the academic achievement of secondary school physics students in optics practical

Observable	Standardized Estimation	P –Value	Confidence Interval at 95.0% for β		Decision
			Lower bound	Upper bound	
Total effect	0.375	.005	.305	.494	Significant impact
Direct effect	0.182	.004	.150	.313	Significant impact
Indirect effect	0.139	.006	.115	.225	Significant impact

Table 3 revealed that the total effect of authoritarian parenting style on academic achievement was significant ($\beta = .375$, $P < .05$. with the inclusion of mediating variable (Academic interest), the impact of authoritarian parenting style and academic achievement became significant ($\beta = .182$, $P < .05$. the indirect effect of authoritarian parenting style on academic achievement of secondary school physics students in optics practical through

academic interest was found significant ($\beta = .139$, $P < .05$. This shows that the relationship between authoritarian parenting style and academic achievement is partially mediated by academic interest.

Hypothesis 3: Academic interest does not mediate the influence of permissive parental styles on the Academic Achievement of secondary school physics students in optics practical.

Table 4: Summary of mediation analysis of permissive parenting style on the academic achievement of secondary school physics students in optics practical

Observable	Standardized Estimation	P –Value	Confidence Interval at 95.0% for β		Decision
			Lower bound	Upper bound	
Total effect	-0.145	.453	-.113	.250	Not Significant impact
Direct effect	-0.578	.036	-.462	-.024	Significant impact
Indirect effect	0.288	.003	.229	.483	Significant impact

Table 4 revealed that the total effect of permissive parenting style on academic achievement was not significant ($\beta = -.145$, $P > .05$. with the inclusion of mediating variable (Academic interest), the impact of permissive parenting style and academic achievement became significant ($\beta = -.578$, $P < .05$. the indirect effect of permissive parenting style on academic achievement of secondary school physics students in optics practical

through academic interest was found significant ($\beta = .288$, $P < .05$. This shows that the relationship between permissive parenting style and academic achievement is suppressively mediated by academic interest.

Hypothesis 4: Academic interest does not mediate the influence of uninvolved parental styles on the Academic Achievement of secondary school physics students in optics practical.

Table 5: Summary of mediation analysis of uninvolved parenting style on the academic achievement of secondary school physics students in optics practical

Observable	Standardized Estimation	P –Value	Confidence Interval at 95.0% for β		Decision
			Lower bound	Upper bound	
Total effect	-0.082	.010	-.103	-.015	Significant impact
Direct effect	-0.072	.079	-.008	.005	Not Significant impact
Indirect effect	-0.024	.008	-.303	-.004	Significant impact

Table 5 revealed that the total effect of uninvolved parenting style on academic achievement was significant ($\beta = -.082$, $P < .05$. with the inclusion of mediating variable (Academic interest), the impact of uninvolved parenting style and academic achievement became not significant ($\beta = -.072$, $P > .05$. the indirect effect of uninvolved parenting style on academic achievement of secondary school physics students in optics practical through academic interest was found significant ($\beta = -.024$, $P < .05$. This shows that the relationship between uninvolved parenting style and academic achievement is totally mediated by academic interest.

DISCUSSION

The finding of this study revealed that academic interest positively, partially and significantly mediated the relationship between authoritative parenting styles and the academic achievement of secondary school physics students in optics practical. Academic interest showed a significant direct and indirect effects with standardized estimates of .096 and .096 respectively at the Confidence Interval of 95% with p-value of .0000 ($p < .05$) level of significance; that led to the rejection of the null hypothesis, confirming that academic interest has a positive and partially mediated the relationship between authoritative parenting styles and the academic achievement of secondary school Physics students in optics practical. The total effect of authoritative and academic interest on the academic achievement of secondary school physics students was positively significant with standardized estimate of .246. This finding indicated that any student who has authoritative parenting support and innate liking for optics practical have the tenacity to achieves higher grades. The finding was consistent with Asanjarani, Aghaei, Fazaeli, Vaezi and Szczygiel (2022), Onah and Anamezie (2022), Okafor (2020), whom in their respective studies, observed that academic interest, personality traits, motivation and self-efficacy partially mediated the relationship between authoritative parenting styles and the achievement of secondary school physics students in optics practical. This shows that approaching academic achievement in optics practical in the presence of authoritative parenting styles have greater constructive engagement when interest interplay between them.

The finding of this study revealed that academic interest positively, partially and significantly mediated the relationship between authoritarian parenting styles and the academic achievement of secondary school physics students in optics practical. Academic interest showed a significant direct and indirect effects with standardized estimates of .182 and .139 respectively at the Confidence Interval of 95% with p-value of .0000 ($p < .05$) level of significance; that led to the rejection of the null hypothesis, confirming that academic interest has a positive and partial mediator of the relationship between

authoritarian parenting styles and the academic achievement of secondary school Physics students in optics practical. The total effect of authoritarian and academic interest on the academic achievement of secondary school physics students was positively significant with standardized estimate of .375. This finding indicated that any student who has authoritarian parenting support and innate liking for optics practical have the tenacity to achieves higher grades. The finding was consistent with Asanjarani, Aghaei, Fazaeli, Vaezi and Szczygiel (2022), Onah and Anamezie (2022), Okafor (2020), whom in their respective studies, observed that academic interest, personality traits, motivation and self-efficacy partially mediated the relationship between authoritarian parenting styles and the achievement of secondary school physics students in optics practical. This shows that approaching academic achievement in optics practical in the presence of authoritarian parenting styles have greater constructive engagement when interest interplay between them.

The finding of this study revealed that academic interest positively, suppressively and significantly mediated the relationship between permissive parenting styles and the academic achievement of secondary school physics students in optics practical. Academic interest showed a significant direct and indirect effects with standardized estimates of -.578 and .288 respectively at the Confidence Interval of 95% with p-value of .0000 ($p < .05$) level of significance; that led to the rejection of the null hypothesis, confirming that academic interest has a positive and suppressive mediator of the relationship between permissive parenting styles and the academic achievement of secondary school Physics students in optics practical. The total effect of permissive parenting style and academic interest on the academic achievement of secondary school physics students was negatively insignificant with standardized estimate of -.145. This finding indicated that any student who has permissive parenting support and innate liking for optics practical have the tenacity to achieves higher grades, but at the combination of direct and indirect effects brings bias and attenuated outcomes. The finding was consistent with Asanjarani, Aghaei, Fazaeli, Vaezi and Szczygiel (2022), Onah and Anamezie (2022), Okafor (2020), whom in their respective studies, observed that academic interest, personality traits, motivation and self-efficacy suppressively mediated the relationship between permissive parenting styles and the achievement of secondary school physics students in optics practical. This shows that approaching academic achievement in optics practical in the presence of permissive parenting styles supresses learning outcomes when interest interplay between them.

The finding of this study revealed that academic interest positively, totally and significantly mediated the relationship between uninvolved parenting styles and the academic achievement of secondary school Physics students in optics practical. Academic interest showed a

insignificant direct effect and significant indirect effect with standardized estimates of $-.072$ at the Confidence Interval of 95% with p -value of $.079$ ($p > .05$) level of significance and $-.024$ at the Confidence Interval of 95% with p -value of $.0000$ ($p < .05$) level of significance respectively; that led to the rejection of the null hypothesis, confirming that academic interest has a positive and total/ full mediation of the relationship between uninvolved parenting styles and the academic achievement of secondary school Physics students in optics practical. The total effect of uninvolved parenting style and academic interest on the academic achievement of secondary school physics students was negatively significant with standardized estimate of $-.082$. This finding indicated that any student who has uninvolved parenting support and innate liking for optics practical have the tenacity to achieve higher grades. The finding was consistent with Asanjarani, Aghaei, Fazaeli, Vaezi and Szczygiel (2022), Onah and Anamezie (2022), Okafor (2020), whom in their respective studies, observed that academic interest, personality traits, motivation and self-efficacy fully/ totally mediated the relationship between uninvolved parenting styles and the achievement of secondary school Physics students in optics practical. This shows that approaching academic achievement in optics practical in the presence of uninvolved parenting styles fully enhance learning outcomes when interest interplay between them.

CONCLUSION

This study has provided robust structural equation modelling evidence that parenting styles and student interest are significant direct and indirect predictors of secondary school students' academic achievement in optics practical. The authoritative parenting style emerges as the most academically facilitative home environment typology, operating through both direct pathways and interest-mediated mechanisms to promote achievement in physics practical work. The authoritarian parenting style also emerged as the good academic facilitators of home environment typology, operating through both direct pathways and interest-mediated mechanisms to promote achievement in physics practical work. Permissive parenting styles showed a suppressive mechanism when mediated by academic interest in optics practical. The uninvolved parenting styles showed retrograding influence in both direct and indirect standardized estimates. Academic interest positively and significantly enhanced the academic achievement of secondary school physics students in optics practical through enhanced curiosity of the students.

Recommendations

From the findings of the study, the following recommendations were made:

1. Physics teachers and school counsellors are recommended to design a structured parent engagement programmes that educate parents about the characteristics and academic benefits of authoritative parenting practices, particularly as they relate to the cultivation of scientific interest and inquiry habits in the home.
2. Curriculum developers are encouraged to integrate interest-activating instructional strategies into the optics practical curriculum, thereby complementing the motivational resources that students bring from home.
3. School administrators are urged to establish mechanisms for identifying students from non-authoritative home environments and providing them with supplementary motivational and academic support within the school setting.

REFERENCES

- Asanjarani, F, Aghaei, K., Fazaeli, T., Vaezi, A. and Szczygiel, M. (2022). A structural equation modelling of the relationship between parenting styles, students' personality traits, and students' achievement goal orientation. *Frontier in Psychology*
- Baumrind D. (1991). Child care practice untecedary three patterns of preschool behaviour. *Genet psycholmonogr*, 75 (1), 43-88.
- Chen, W. W. (2015). The relations between perceived parenting styles and academic achievement in Hong Kong: the mediating role of students' goal orientations. *Learn. Individ. Differ.* 37, 48–54. doi: 10.1016/j.lindif.2014.11.021
- Eze, C. U. (2016). *Relationship between secondary school students' cognitive learning skills and their academic interest in Enugu state*. (Unpublished PGDE project), Enugu State University of Science and Technology, Agbani
- Iksan, Z. H., and Saufian, N. (2017). The roles of parents in cultivating children's interest towards science learning and careers. *International Journal of Science and Mathematics Education*. <https://www.sciencedirect.com/science/article/pii/S2452315116301825>
- Jewett, J. W. And Serway, R. A. (2016). *Physics for scientists and engineers with modern physics*. Brooks/cole: Cengage learning
- Memon, M. A., Ting, H., Cheah, J. H., Thurasamy, R., Chuah, F. and Cham, T. H. (2020). Sample size for survey research: review and recommendations. *Journal of applied structural equation modelling* 4(2), i-xx

- Nwankwo, M. C. and Okoye, K. R. E. (2015). Influence of college clubs in increasing students' interest and achievement in Nigerian post – primary schools as perceived by science students. *Journal of Education and Practice*, 6(18), 184 – 193. www.iiste.org.
- Nworgu, B.G. (2018), *Educational Research. Basic Issues and methodology* (4th ed). By University Trust Publisher Nsukka, Enugu
- Okafor, O. S. (2020). Interest as predictor of academic achievement of secondary school students in Physics. *British Journal of Education, Learning and Development Psychology* 3(3) 2682-6704
- Onah, K. T. (2025). Influence of family background variables on the academic achievement of secondary school physics students. *Journal of Research in Science and Vocational Education (jrsve)*, 5(1): 212-221. DOI: <https://doi.org/10.5281/zenodo.15585109>
- Onah, K. T. and Anamezie, R. C. (2022). Academic interest as predictor of academic achievement of secondary school physics students. *African Journal of Science Technology and Mathematics Education*. 8(4);320-326
- Pamela, L. (2022). 4 types of parenting styles and their effects on the child. Retrieved online on October 12, 2022 from www.parentingforbrain.com
- Pinquart, M. (2016). Associations of parenting styles and dimensions with academic achievement in children and adolescents: a meta-analysis. *Educ. Psychol. Rev.* 28, 475–493. doi: 10.1007/s10648-015-9338-y
- Shyny, T. Y. (2017). Construction and Validation of PS-FFQ (Parenting Styles Four Factor Questionnaire). *International Journal of Engineering Development and Research*. 5(3), 426-437
- West African Examination Council (WAEC). (2020). Chief Examiners Report on Students performance in senior Certificate Physics Examination Lagos: West African Examination Council
- West African Examination Council (WAEC). (2025). Chief Examiners Report on Students performance in senior Certificate Physics Examination Lagos: West African Examination Council

Cite this Article: Okoli, JN; Onah, KT (2026). Structural Equation Modelling Of Parenting Styles on Achievement of Secondary School Physics Students in Optics Practical Mediated by Interest. *Greener Journal of Educational Research*, 16(1): 117-126, <https://doi.org/10.15580/gjer.2026.1.091026161>.