



SYSTEMATIC REVIEW: IMPACT OF SCIENTIFIC ATTITUDE, LOCUS OF CONTROL, AND PROBLEM-SOLVING SKILLS ON ACADEMIC ACHIEVEMENT IN SCIENCE OF SECONDARY SCHOOL STUDENTS

Sunita Rani Mahapatro & Dr. Dinesh Kumar Sharma

¹*Research Scholar, Mangalayatan University*

²*Research Guide and Associate Professor, Department of Education, Mangalayatan University*

*Corresponding Author: Sunita Rani Mahapatro Email: suni.nihar@gmail.com

Paper Received On: 21 August 2024

Peer Reviewed On: 25 September 2024

Published On: 01 October 2024

Abstract

This systematic review explores the impact of scientific attitude, locus of control, and problem-solving skills on the academic achievement of secondary school students in science. By synthesizing findings from various studies, this review aims to provide a comprehensive understanding of how these psychological and cognitive factors influence science education outcomes. The review includes an analysis of the methodologies, findings, and implications of the selected studies, offering insights into the complex interplay between students' attitudes, control beliefs, problem-solving abilities, and their academic performance in science.

Key words: *Scientific Attitudes, Locus of Control, Problem-solving skills, Academic achievement and Secondary school student.*

INTRODUCTION

In the ever-evolving field of education, the interaction between a scientific mind-set and academic success in secondary schools carries significant implications for a nation's progress. India, with its deep cultural roots and a growing emphasis on scientific education, provides an intriguing stage for investigating the complex interconnection between these two factors.

A scientific mind-set, marked by curiosity, critical thinking, and a systematic approach to problem-solving, plays a crucial role in shaping the academic journey of students in the realm of science education.

SCIENCE: MEANING AND IMPORTANCE

Science has instigated revolutionary transformations across various spheres of life, leaving an indelible imprint on our vocational, social, economic, political, and cultural realms. Its pervasive influence is evident in domestic amenities, industrial production, communication, agriculture, medicine, transport, defence, and more, making human reliance on science ubiquitous. Presently, science occupies a paramount position in education, both at the compulsory and specialization levels, garnering special attention globally for its developmental significance. Countries that have prioritized science education for adolescents have emerged as modern and advanced societies, exerting a profound impact on the global stage.

The teaching of science in schools has the potential and responsibility to positively impact the lives of children, positioning them on the advantageous side of the educational spectrum. Much emphasis has been placed on the significance of children comprehending nature and the scientific enterprise, and this holds several key reasons. In a society that values freedom, the progress of science relies on the will of the people—both as decision-making citizens supporting it and as individuals aspiring to become scientists.

METHODOLOGY

BEST underscores the essential requirement for related studies and literature, emphasizing that "practically all human knowledge can be found in books and libraries". DEWEY positions the review of related studies as the third step in the scientific method. In the vast library of the world, knowledge waits to be discovered. The literature review is the map that guides the intrepid researcher through the uncharted territories of human understanding.

This systematic review follows a structured approach to identify, select, and synthesize relevant studies. The databases searched include PubMed, ERIC, Google Scholar, and JSTOR. Keywords used were "scientific attitude," "locus of control," "problem-solving skills," "academic achievement," and "secondary school students." Inclusion criteria were peer-reviewed articles, studies conducted between 2000 and 2023, and studies focusing on the impact of the mentioned constructs on academic achievement in science. Exclusion criteria were non-peer-reviewed articles, studies focusing on higher education, and studies not in English. Data extraction involved summarizing study design, sample characteristics, measurement tools, and key findings.

Copyright@2024 Scholarly Research Journal for Humanity Science & English Language

The investigator has meticulously examined numerous references, organizing the reviews of related literature based on the variables of the impact of scientific attitudes, locus of control, and problem-solving skills on academic achievement among senior secondary science students.

NECESSITY OF REVIEW OF LITERATURE

The necessity for a comprehensive review of literature in research stems from several crucial considerations:

1. **Guidance from Previous Studies:** Conducting a thorough review of existing studies within the specific area of interest is a timely and foundational step in any research endeavour. Qualitative and quantitative analyses of these studies serve as a guide, providing valuable insights and indicating the trajectory of the current study.
2. **Access to Updated Information:** Researchers must possess the most recent and relevant information pertaining to the literature related to their research problem.
3. **Preventing Duplication:** A well-structured literature review plays a pivotal role in preventing the duplication of research study findings. Drawing insights from similar or related literature helps researchers avoid redundancy in aspects such as research methodology, data collection techniques, research procedures, and drawn conclusions.
4. **Source of Research Problems:** Literature reviews serve as rich sources for identifying potential research problems. Drawing analogies from existing literature aids researchers in pinpointing and selecting their research problems, contributing to the originality and significance of the study.
5. **Formulating Hypotheses and Objectives:** Through a thorough literature review, researchers can formulate hypotheses and define clear objectives for their studies. The insights gained from previous research endeavours contribute to the development of a robust theoretical framework, providing a rationale for the current study.
6. **Clear Problem Profile:** The review of literature contributes to a clear understanding and profiling of the problem under investigation. This not only enhances the researcher's comprehension of the research landscape but also assists in defining the scope and boundaries of the study.

RESULTS

I. ACADEMIC ACHIEVEMENT

Academic achievement, whether for a student, teacher, or institution, is the measure of the extent to which they have accomplished their short or long-term educational objectives, including milestones like secondary school certificates, diplomas and bachelor's degrees. In

Copyright@2024 Scholarly Research Journal for Humanity Science & English Language

today's competitive world, there is a common aspiration for high achievement, as modern society expects individuals to excel.

The sensitive significance of academic achievement prompts crucial questions for educational researchers, exploring factors that promote student achievement and understanding the diverse contributions of these factors. Factors influencing school achievement encompass study habits, intelligence, attitudes toward school, socio-economic status, and various aspects of learners' personalities. In our society, academic achievement is a fundamental criterion for assessing an individual's overall capabilities and potentialities, holding a vital place in both education and the learning process.

Academic achievement is

1. any identifiable success in the areas of scholarship or disciplined study
2. in educational psychology, a level of proficiency in scholastic work in general or in a specific skill, such as arithmetic or reading. Evidence of future academic achievement is usually based on the results of standardized ability tests and assessment of performance by a teacher or other supervisor. (American Psychology Association).

1. **Bhat. A.M. (2013)** organised a study investigating the Correlation of Academic Achievement in Secondary School Students with Self-Concept and Parental Encouragement. The research aimed to assess the association between academic achievement and self-concept as well as parental encouragement among secondary school students. The study utilized a descriptive survey research method, and the sample comprised 228 students chosen through a stratified random sampling technique. Data were collected using a self-concept scale developed by Dr. Rastogi & Mukta Rani, and a three-dimensional Parental Behavioural Inventory created by Hardeo Ojha in 2009. Academic achievement was assessed based on examination marks obtained by students in the annual examination of the previous class (class 9th and 10th), recorded from school records. The results indicated that: (i) a significant relationship exists between self-concept and academic achievement for both male and female students; (ii) there is no significant relationship between father's encouragement and academic achievement for female students; (iii) a significant relationship exists between father's encouragement and academic achievement for male students; (iv) a significant relationship exists between mother's encouragement and academic achievement for both male and female students.

2. **Chetri. D.S. (2014)** did a study of "the Achievement Motivation of Adolescents and Its Relationship with Academic Achievement" conducted with 480 secondary school students

of different schools of Sikkim by using stratified random sampling techniques from various government and non-government managed schools of the age range of 16-17 years, from urban and rural areas. The finding revealed a non-significant difference in achievement motivation with regard to gender and locale variation but significant differences in relation to management variation. Another finding of the study was the significant difference in the academic achievement of the students with regard to locale and management variation. Drawing the attention of the government to equip the rural schools with all sorts of facilities and fixing accountability of teachers for exhibiting the drive for better achievement by recruiting well and equip and efficient leaders who are resourceful and making all other resources suitable for enhancing the quality of education.

3. **Verma, A (2016)** led a study of Academic Achievement Among High School Students in Relation to Their Study Habits. The study habit has an impact on academic achievement. Various factors such as the method of study, family background, socio-economic status and environment, etc. are the determinants of study habits i.e. these factors affect study habits, but the investigator has kept these variables controlled in the study. It is also found that the Academic Achievement of the students having good and poor Study Habits differ significantly. The result also shows that the academic achievement of the students having good study habits is high as compared to the students having poor study habits.
4. **Kiran, P. R. (2021)** investigates the impact of problem-solving ability and self-esteem on the academic achievement of secondary school students. A sample of 400 secondary school students was randomly selected using a sampling technique. The survey method was employed to gather data. Schools play a crucial role in fostering a scientific attitude among students, enabling them to independently tackle problems for better adjustment in the future complex society. An adolescent lacking appropriate self-esteem for a normal personality may experience insecurity, unable to perceive the necessary qualities for coping with the world's demands and may undervalue their achievements as they surpass their self-image. Recognizing this, the researcher found it essential to explore the interaction between academic achievement, problem-solving ability, and self-esteem. The tools used included a Four-Point Rating Scale on self-esteem, consisting of five components prepared and validated by the researcher, and a Problem-Solving Ability Test with four components. The main findings concluded that self-esteem significantly influences academic achievement. Students with high self-esteem exhibit significantly greater academic achievement compared to those with average and low self-esteem. Additionally, students with average self-esteem achieve significantly higher academic success than those with low self-esteem.

5. Obiorah, J. N., Eneogu, N. D., Nji, I. A., Ezeocha, I. G., Ekwesaranna, F., & Nwabufu, C. (2021) conducted a study sought to determine path analysis of the influence of student variables and school location on senior secondary students' academic achievement in Economics. Two research questions and two hypotheses guided the study. The study adopted a correlational survey design. Sample of the study consist of 377 SS2 Economics students drawn from 82 secondary schools in Ogoja Education Zone of Cross River State. Multi-staged sampling procedure was used to select fifteen schools from the urban and rural stratum. Two instruments were used for data collection namely, Students Variable Questionnaire (SVQ) and Proforma for collecting SS2 Economics Students' Scores for first term 2018/2019 academic session. Face and construct validity were employed in validating the instruments and were also tested for reliability. Using Cronbach Alpha reliability estimate the internal consistency, 0.94 for SVQ. Data collected were analysed using IBM AMOS. Hypotheses were tested using Chi-square Goodness of Fit Index (CGFI), Root Mean Square Error of Approximation (RMSEA) and ANOVA. Result shows there are 7 significant causal paths out of the 9 originally designed. Also, the student variables and school location have combined influence on students' academic achievement in Economics. However, there is no significant model fit for explaining students' academic achievements in Economics.

II. SCIENTIFIC ATTITUDE

According to the English dictionary, attitude is termed as one's thoughts and feelings about something, encompassing manner, disposition, feeling, and position. It reflects a tendency or orientation, particularly of the mind, towards a person or thing. Attitude involves a predisposition to respond positively or negatively to a specific idea. In the context of science, a scientific attitude is characterized by a curiosity to understand the how and why of things with an open mind governed by factors such as intellectual honesty, open-mindedness, and creativity. It is an expression of thought grounded in factual or experimental evidence. Key aspects of a scientific attitude include tolerance for uncertainty, willingness to alter opinions, and open-mindedness. Cultivating a scientific attitude is crucial for success in the field of science and forms an integral aspect of an individual's personality.

IMPORTANCE OF ATTITUDES:

D. Bhaskara Rao emphasizes that the advancement of a scientific attitude stands out as the most crucial outcome of science education. While some individuals perceive the scientific attitude merely as a byproduct of science instruction, a majority recognizes its equal significance alongside the acquisition of knowledge. The cultivation of a scientific attitude

Copyright@2024 Scholarly Research Journal for Humanity Science & English Language

holds considerable importance in the realm of science education. A journal titled 'Rethinking Science Education' outlines the features of a scientific attitude, highlighting traits such as open-mindedness, a pursuit of correct knowledge, confidence in the method of seeking knowledge, and the anticipation that problems can be solved through the application of proved knowledge. To instil these components of a scientific attitude in students' minds, it is essential to engage them in practical experiences and observations of science, providing them with the opportunity to both feel and develop these crucial aspects.

1. **Jebson and Hena (2015)** ran a study examining the Attitudes of Senior Secondary School Students Towards Science Subjects in Adamawa State. The research involved a sample of 250 science students selected through stratified random sampling. Data were collected using the Science Students' Attitude Questionnaire (SSAQ). The findings indicated that students in Adamawa state generally exhibit a positive attitude toward science subjects. Additionally, gender was found to have a significant impact on their attitudes, with boys displaying a more positive outlook compared to their female counterparts. However, age differences among boys and girls in secondary schools in Adamawa state did not influence their attitudes toward the study of science subjects.
2. **Khitab, Zaman, Ghaffar, and Jan (2015)** piloted a study to Examine the Influence of Low-Cost Teaching Materials on Students' Attitudes Toward Science (Chemistry) at The Secondary Level in Khyber Pakhtunkhwa, Pakistan. This experimental study involved two groups, an experimental group and a control group, each consisting of 30 Grade 12 science stream students. The impact of low-cost teaching materials on students' attitudes toward science (Chemistry) was assessed using a modified version of the Test of Science-Related Attitudes (TOSRA) comprising 29 items. The test, constructed on a Likert scale, aimed to measure students' attitudes toward Chemistry, focusing on factors such as behaviour tendencies to learn Chemistry, liking for chemistry laboratory work, liking for Chemistry theory lessons, evaluation beliefs about Chemistry, leisure interest in science, and enjoyment of Chemistry. The primary findings indicated that students in the experimental group, taught through activities with low-cost materials, exhibited significantly greater attitudes toward science (Chemistry) compared to the control group.
3. **Sethi U. (2015)** studied the Attitudes of Students Toward Science in Connection with Specific Non-School Factors. The sample comprised 100 students, and statistical measures such as mean, standard deviation, and t-test were employed to assess the significance of differences in means concerning the gender, locality, and socio-economic status of students. The findings revealed a significant difference between urban and rural students,

although no significant differences were observed based on gender and socio-economic status.

4. **Zeidan and Jayosi (2015)** explored the Correlation Between the Knowledge Level of Science Process Skills and Attitudes Toward Science Among Palestinian Secondary School Students. The study also investigated the impact of gender and residence on students' knowledge of science process skills and their attitudes toward science. Utilizing an 18-question science process skills test and a 25-item attitudes toward science questionnaire, the study found a significant association between the knowledge level of science process skills and attitudes toward science, indicated by a correlation coefficient of 0.69. Results revealed notable gender-based differences in science process skills, favouring females, and residence-based differences, favouring students from villages. However, no significant differences were observed in attitudes toward science based on these variables.
5. **Lucas, Paulmathi (2016)** conducted a study on the Scientific Attitude and Academic Achievement in Science Among Secondary School Students in Thane City. The findings revealed that a higher percentage of boys exhibited extremely favourable and just favourable scientific attitudes compared to girls. However, for fairly favourable and just favourable scientific attitudes, the percentage of girls surpassed that of boys. Interestingly, for somewhat favourable and unfavourable scientific attitudes, the percentages of girls and boys were equal.
6. **Marcela and Mala (2016)** carried out a study to reveal Students' Attitudes Toward School play a crucial role in predicting their academic achievement. The study suggests that a positive attitude tends to yield positive outcomes, whereas a negative attitude is associated with negative results. Attitude, in this context, encompasses an individual's predisposition to categorize objects and events, reacting to them with consistent assessments. It involves a combination of one's knowledge, respect, emotions, motivation, and self-esteem, collectively shaping an individual's perspective on a particular subject.
7. **Singh; Singh and Giri (2016)** organised a study to Explore the Relationship between Scientific Attitude and Academic Achievement Among Girls in The Science Stream at Intermediate Colleges in Rural Areas of Varanasi District, Uttar Pradesh. The results indicated a positive and significant correlation between academic achievement and scientific attitude. The study concluded that as academic achievement increases, the scientific attitude of female students also tends to increase. This finding may be attributed

to the development of an overall optimal level of scientific attitude among students at the higher secondary level.

8. **Ahuja. A (2017)** ran a study on Scientific Attitude in Relation to Science Achievement Scores among Secondary School Students. The study found that in science education, teaching strategies that help students cultivate a scientific mind-set help them achieve high academic standing; as a result, scientific mind-set may function as a predictor of students' academic achievement. A descriptive survey was conducted on 208 students of secondary school students in Delhi. The data analysis showed that there was a gender difference, in favour of girl students, with respect to scientific attitude and science achievement scores. A significantly positive correlation between scientific attitude and science achievement scores of students was found. Interaction effects also supported these findings.
9. **Suryawati, E. and Kamisah. O. (2017)** set up a study on “Contextual Learning: Innovative Approach toward the Development of Students’ Scientific Attitude and Natural Science Performance”. This study is specifically designed to measure the effectiveness of Contextual Teaching and Learning (CTL) on the students’ scientific attitude and achievement in Natural Science among Junior school students in Pekanbaru, Indonesia. This quasi-experiment involved some 215 Form VII students from three public schools, segregated based on their existing cognitive abilities. The CTL materials were developed by applying the RANGKA strategy. Overall, the findings revealed that there is a significant difference exists across experimental groups in terms of students’ achievement. However, there is no significant difference in terms of scientific attitude. These findings contribute significant implications for the enhancement of scientific thinking skills among various students’ capabilities and different categories of school. The contextual teaching strategy is found appropriate in achieving the above dimensions in heterogeneous schools. This is due to the fact that the RANGKA contextual learning strategy as developed in this study focuses on the right way for students to learn.
10. **Abdulaziz Aboud Mohamed Asiri (2018)** conducted a study to Explore the Perspectives of Saudi Arabian Secondary School Students Regarding Science. A 24-item questionnaire, encompassing various aspects of views on science, was devised and administered to a group of 150 secondary school pupils, comprising 78 males and 72 females. The results indicated a positive disposition of Saudi Arabian secondary school students towards science. The findings further revealed that there was no significant difference in student attitudes toward science concerning family and student-related factors, including book ownership, parent education, student gender, and attitudes toward school.

11. **Hu, Leung, and Chen (2018)** examined a Cohort of 3600 fourth-grade students across 132 schools in Hong Kong. Their analysis revealed significant correlations between family- and student-related factors, including book ownership, parent education, student gender, and attitudes toward school, with students' attitudes toward science. However, factors related to the school environment and teacher characteristics did not exhibit a significant impact on students' attitudes toward science.
12. **Jamhari and Sipahutar (2018)** conducted a study to Explore the Impacts of Science-Related Attitudes on Students' Problem-Solving Skills and The Interactions Between Visual Mapping and Science-Related Attitudes in Shaping Students' Problem-Solving Skills. The research was carried out at MAN TanjungPura, involving a sample of 141 students from the XI-Science Program. The findings revealed significant effects of visual mapping on students' problem-solving skills ($F=94.214$; $P=0.000$), indicating that students taught through concept mapping demonstrated significantly higher problem-solving skills scores (87.74 ± 2.586) compared to those taught through direct instruction (78.84 ± 2.689). Moreover, there were notable effects of science-related attitudes on students' problem-solving skills ($F=3.397$; $P=0.031$), with higher science-related attitudes correlating to elevated problem-solving skills scores. Specifically, students with high science-related attitudes taught through visual mapping (85.68 ± 4.312) outperformed those with low science-related attitudes taught through visual mapping (77.26 ± 3.614). Additionally, the study identified interactions between visual mapping and science-related attitudes on students' problem-solving skills ($F=2.195$; $P=0.000$), highlighting significant differences in problem-solving skills scores between argument mapping with high science-related attitudes and direct instruction with high science-related attitudes.
13. **Veliappan and Nambikkai (2018)** organised a study on the Attitude Toward Science Among Higher Secondary Students in The Puducherry Region. The study revealed the following findings: i) There is a significant difference in the attitude toward science among government, aided, and un-aided higher secondary school students. ii) There is a significant difference in the attitude toward science among students in the pure science, mathematics, and computer science groups. iii) There is a significant difference in the attitude toward science among students from rural, semi-urban, and urban areas at the higher secondary level.
14. **Ananda, Suhandi, and Rahman (2019)** ran an experiment to Enhance Students' Attitudes Toward Science in a Junior High School in Bandung City by Incorporating Science Magic into The ILD Model During Science Learning. A pre-post-test approach was employed,

and a random cluster sample of 70 students participated. The attitude toward science scale, comprising 30 items across four dimensions (interest in science, importance of science in life, interest in advanced study in science, and interest in a future career in science), was utilized. The results indicated that the implementation of the ILD model assisted by science magic effectively improved students' attitudes toward science in the junior high school setting.

15. **Toma, Greca, and Gómez (2019)** undertook a study examining the Attitudes of Spanish Secondary School Students toward Science and Their Perspectives on The Nature of Science. The study emphasized the importance of reversing the consistent decline in positive attitudes toward science and enhancing students' perspectives on science through the implementation of science teaching strategies that are inclusive of gender and culture.
16. **Binwal (2020)** investigated Challenges in Studying Science and The Attitudes Toward Science Among 9th-Grade Adolescent Students. The study included 100 students from various government schools in Almora and its vicinity in Uttarakhand. Data were collected using the Scientific Attitude Scale (SAS). The findings indicated that urban adolescent students exhibited a more positive attitude toward science compared to their rural counterparts. Additionally, the study concluded that attitude toward science correlated with the students' achievement in the previous class, with those who achieved first division showing a more favourable attitude than those who scored second or third division.
17. **Bajaj. M and Devi. S (2021)** ran a study on the “Attitude of Secondary School Students Toward Science in Relation to Academic Achievement, Gender, And Type of School”. This study revealed that secondary school students’ attitudes towards science differ significantly regarding their academic achievement. Female students were found to have a favourable attitude towards science as compared to their male counterparts. Results also showed that private school students have a positive attitude towards science compared to students in government schools. They enjoy science and are ready to pursue their career in science. The students in both government and private schools have a positive attitude towards science.
18. **Chikendu, Rebecca E., and Obikezie, Maxwell C. (2021)** conducted a study to Explore the Attitude of Secondary School Students Toward Science Education in Onitsha South Local Government Area of Anambra State, Nigeria. The research design adopted for this study was descriptive survey. The population included all senior secondary school students in the eight secondary schools in Onitsha South of Anambra State. Simple random sampling was employed to select 15 students from each senior secondary school, totalling

90 students across the sampled schools. Data were collected through questionnaires distributed to senior secondary school students, and the hypothesis was tested using a one-sample t-test with SPSS version 20. The findings indicated a significant impact of students' attitude on their science education in Onitsha South Local Government Area of Anambra State. The study recommends that teachers employ learning methods capable of capturing students' interest in science to enhance their attitude. Additionally, concerted efforts from parents, teachers, and governments are suggested to foster and amplify positive attitudes toward science among secondary school students.

III. LOCUS OF CONTROL

Julian Rotter (1962), a clinical psychologist defined the locus of control construct as a distribution of Individuals on a continuum according to the degree to which they accept personal accountability for what happens to them. Locus of control refers to the expectancies about causations of actions and outcomes.

The concept of locus of control holds significance in the realm of education. Locus of control, in essence, pertains to an individual's perception of the primary causes underlying events in their life. It is also defined as the degree to which individuals believe they can exert control over events that impact them. Amidst changes in one's environment, attributing success and failure can be directed either towards factors within one's control or external forces beyond influence. It can be categorized on a spectrum ranging from internal to external. An internal locus of control attributes outcomes to personal skills or efforts, while an external locus of control attributes outcomes to external circumstances. Those with a high internal locus of control typically experience successful lives.

1. **Abid.M.A, Kanwal. S and Nasir. M.A.T(2016)** handled a study on the Effect of Locus of Control on the Academic Performance of Students at The Tertiary Level. This study aims to investigate the impact of locus of control on students' learning performance. The theoretical framework incorporates locus of control (internal-external) within the context of organizational behaviour and learning performance. Utilizing a quantitative research method, the study focuses on all students continuing to higher education. The population size is sufficient, eliminating the need for additional sampling. Data for the research is gathered through a standardized survey technique. The subjects' locus of control levels are measured using Rotter's (1966) Scale of Internal-External Locus of Control and Gungor's (2006) Learning Scale. Descriptive statistical techniques and multiple regression analysis are employed to analyse the data with the SPSS program. The research concludes that students with an internal locus of control exhibit higher learning performances,

demonstrating greater proactivity and effectiveness. Conversely, those with an external locus of control tend to be more passive and reactive. Additionally, variations among students' demographic groups and their learning factors are identified.

2. **Akintunde, D.O. and Olujide, F.O. (2018)** performed a study on the Influence of Emotional Intelligence and Locus of Control on Academic Achievement of Underachieving High-Ability Students. This study is therefore motivated to investigate the influence of emotional intelligence (EI) and locus of control (LC) on academic achievement of underachieving high-ability students in Ibadan, Nigeria. The sample for the study consists of 72 underachieving high-ability students purposively selected from 12 schools in Ibadan, Nigeria. Cognitive Ability Test modified Schutte's (1998) Emotional Intelligence Scale (SEIS) and Rotter's (2001) Locus of Control Scale (RLCS), and the school academic record were used for the data collection. Data collected were analyzed using, a t-test and multiple regression analysis. Results showed that the LC and EI of the respondents are significantly low. Again, there is a very strong influence of EI and LC on academic achievement of the participants. A significant difference also exists between male and female students in their locus of control ($t=2.15$, $p<.05$) with female participants showing better locus of internal control. The study also revealed that LC ($\beta = .52$) has more influence than emotional intelligence ($\beta = .46$) in predicting academic achievement and that the two variables have high positive correlation ($R = .636$) and very strong significant composite effect ($F(2,70) = 6.53$ and $p<.05$) on academic achievement. Again, LC and EI account for 40.4% (Multiple $R^2 = .404$) of the total variance of the academic achievement. Therefore, it is recommended that educators and parents should develop the emotional intelligence and internal locus of control strongly and not only the cognition domain for optimum achievement of high ability students.
3. **Korkmaz, O, Ilhan,T and Bardakci. S (2018)** carried out a study on the Investigation of Self-Efficacy, Locus of Control, and Academic Procrastination as Predictors of Academic Achievement in Students Diagnosed as Gifted and Non-Gifted. The overall objective of this study was to investigate self-efficacy, locus of control, and academic procrastination as predictors of academic achievement in students identified as gifted or non-gifted. Another purpose of the study was to analyse whether there was a difference between the self-efficacy, locus of control, and academic procrastination scores of the students in both groups. The study group consisted of 6th, 7th, and 8th-grade students, some of whom were Science and Art Centres students who were diagnosed as gifted, while others were public school students who were not diagnosed as gifted. The data of the study were collected

using the Self-Efficacy Questionnaire for Children, the Internal-External Locus of Control Scale, and the Academic Procrastination Scale. The Pearson Product-Moment Correlation Coefficient, the Independent Samples t-Test, and simple and multiple linear regression were employed to analyse the data. According to the results, it can be said that academic adjournment has an important role in the academic achievement of gifted students, whereas self-efficacy, locus of control, and academic adjournment have a significant part to play in the academic achievement of non-gifted students. The comparison of self-efficacy, locus of control, and academic procrastination scores of gifted and non-gifted students indicated that the self-efficacy scores of gifted students were significantly higher than those of the non-gifted.

4. **Bang. H, Chang. M, Lee. C and S Kim. S (2019)** administered a study on Sport Participation, Locus of Control, and Academic Performance among Early Adolescents: Racial and Linguistic Status Differences. The purpose of this study was to examine the effects of sport participation on the locus of control and academic performance among eighth-grade students. In the analysis, particular attention was placed on the differential effects of sport participation on racial and linguistic minority groups who oftentimes lag behind. Participants were eighth graders from the Early Childhood Longitudinal Study–Kindergarten Cohort (2006). Data were analysed by employing path analysis with partial least square estimation and group analyses. Results showed the positive effects of sport participation on locus of control and reading and math performance among white and Hispanic groups while the effect was not significant for black and non-English-speaking students.
5. **Alipio. M.M. (2020)** aimed a study on Academic Success as Estimated by Locus of Control and Motivation. According to this study the influence of locus of control and motivation on academic success, as measured by dropout intention and academic performance, of the first batch of freshmen under the K to 12 curriculums in the Philippines. A descriptive-correlational study using online survey questionnaires was employed for 21,012 respondents who were chosen through simple random sampling and Slovin's formula. Standard questionnaires were used to gather data on locus of control, motivation, and dropout intention, while academic performance was measured using the Weighted Point Average (WPA) of the students. The majority of the respondents had a very strong external locus of control but had a low level of motivation. The results also showed that the majority of the respondents had very high levels of dropout intention and WPA. correlation revealed a weak positive association between locus of control and WPA. multiple regression

analysis revealed that locus of control significantly influenced WPA while locus of control and motivation did not influence dropout intention.

6. **Bahçekapili. E, and Karaman. S (2020)** carried out a study on “A Path Analysis of Five-Factor Personality Traits, Self-Efficacy, Academic Locus of Control, and Academic Achievement among Online Students”. This study examines the direct and indirect effects of online learners' personality traits, self-efficacy, and academic locus of control variables on grade point average (GPA) via path analysis. The participants of the study are 525 online learners from two different universities in Turkey. Relationships in the research model show that self-efficacy has a positive direct effect and external academic locus of control has a negative direct effect on academic achievement. Meticulousness, openness, and neuroticism have an indirect effect on the GPA, mediated by self-efficacy and external academic locus of control. Results are compiled with the intent of providing an enhanced understanding of the importance of personality in students' success in online learning experiences.
7. **Tiara Prawitasari, Sugiyo Sugiyo, and Sinta Saraswati (2023)** organised a study titled "The Moderating Role of Locus of Control in the Effect of Self-Efficacy on Academic Resilience" to analyse the role of locus of control in moderating the impact of self-efficacy on the academic resilience of eighth graders across Kendal Regency. This quantitative research surveyed 202 students as respondents, utilizing an instrument developed based on Cassidy's academic resilience scale (2016), Bandura's self-efficacy (1997), and Levenson's locus of control scale (1981). The collected data were subjected to the Hayes model 1 moderation test. The findings revealed that self-efficacy alone did not significantly impact academic resilience. However, locus of control, specifically internality scores, played a moderating role, strengthening the effect of self-efficacy on academic resilience. Conversely, locus of control on powerful others and chance scores showed no moderating effect. Consequently, further studies are recommended to delve deeper into the examination of the impact of internal locus of control on academic resilience.

IV. PROBLEM-SOLVING SKILLS

Problem-solving and critical thinking involve utilizing knowledge, facts, and data to effectively navigate challenges. It doesn't necessitate an immediate response but demands the capacity to think on one's feet, evaluate problems, and devise solutions. Employers highly value the skill of crafting well-thought-out solutions within a satisfactory timeframe.

Problem-solving is characterized as a process employed to derive the optimal solution to an unknown or a decision subjected to specific constraints. It's important to note that problem-

Copyright@2024 Scholarly Research Journal for Humanity Science & English Language

solving differs from routine textbook exercise solving, a common aspect of any curriculum. This definition lays the groundwork for identifying the skills students need to acquire and the attributes essential for them to be deemed proficient problem solvers.

1. **C Kalaivani and N Pugalenthly (2015)** undertook a study to Explore the Correlation Between Problem-Solving Ability and the Attitude Toward Science Among Higher Secondary School Students, Considering Various Background Variables. The survey method was employed, utilizing two tools: “the Problem Solving Ability Test”, prepared and standardized by Dr. L.N. Dubey, a Professor in the Department of Psychology at the University of Agra, and “The Science Attitude Scale”, constructed and standardized by Mrs. Avinash Grewal of Bhopal (published by National Psychological Corporation, Agra), was employed in the study. Statistical analyses, including Standard Deviation, 't' test, ANOVA, and Pearson's Coefficient Correlation, were applied to compute significant differences between the means of each group. The findings, established and tabulated from the analysed data, revealed no significant difference between the problem-solving ability and attitude towards science among higher secondary school students. Finally, the investigator provided interpretations and recommendations based on the findings.
2. **Gupta, Madhu; Pasrija, Pooja; & Kavita (2015)** conducted a study to Explore the Impact of Problem-Solving Ability on the Academic Achievement of High School Students. The descriptive method was employed in this research. A sample of 250 students (165 male, 85 female) enrolled in the 10th class of high schools affiliated with CBSE in Rohtak district was randomly selected. The Problem-Solving Ability Test (PSAT) (2006), developed by Dr. L. N. Dubey, was utilized to assess problem-solving ability. Academic achievement was determined by the students' marks obtained in the 9th class (previous class). Data analysis involved the application of ANOVA supplemented by t-test. The study findings indicated a significant impact of problem-solving ability on the academic achievement of high school students. Moreover, it was revealed that female students outperformed their male counterparts. However, no interaction effect between problem-solving ability and gender was identified concerning the academic achievement of high school students.
3. **Rani, K. V. (2017)** conducted a study on Reasoning Ability, Also Referred to as 'Problem-Solving Skills,' 'Analytical Ability,' or 'Deductive and Inductive Reasoning'. Academic achievement encompasses the overall score obtained in educational settings, including classrooms, laboratories, libraries, or fieldwork at school, college, or university. The study aimed to investigate the relationship between reasoning ability and academic achievement among secondary school students in Trivandrum district. It also aimed to assess the

differences in mean scores of reasoning ability and academic achievement based on background variables such as gender, age, and type of school. The study population included all students enrolled in secondary schools in Trivandrum district, with a sample of 225 secondary school students. The researcher employed the Reasoning Ability of Secondary School Students Scale, developed by herself, and assessed academic achievement using term tests conducted by the state government. Statistical analyses included t-tests and Pearson's Product Moment coefficient of correlation. The study results indicated a significant and strong positive correlation between reasoning ability and academic achievement among secondary school students. Male students demonstrated higher reasoning ability and academic achievement compared to female students. Additionally, significant differences were observed in reasoning ability and academic achievement concerning age and type of school. The findings underscore the impact of age and school type on students' reasoning ability and academic performance. Educators should acknowledge these influences and provide students with access to contemporary facilities at no cost. It is essential to organize various competitive programs, scientific exhibitions, quizzes, talent tests, puzzles, and other initiatives to enhance reasoning ability. The society's support for low-cost access to science and technology museums, along with encouraging clubs and NGOs to arrange seminars and symposiums, can further contribute to nurturing students' reasoning ability.

4. **Bara, G. & Xhomara, N. (2020)** in their study “The Effect of Student-centred Teaching and Problem-Based Learning on Academic Achievement in Science”, sought to examine the relationships among the student-centred teaching approach, problem-based learning, and academic achievement in science teaching. The study employed a quantitative quasi-experimental research approach, collecting data through a structured questionnaire. The sample included an experimental group of students (N=215) and a control group of students (N=204) selected through cluster random sampling. The results revealed a significant difference in the scores for the student-centred teaching approach, problem-based learning, and academic achievement between the experimental and control groups. Although a low positive correlation was identified between the student-centred teaching approach and academic achievement, significant differences were noted between the two groups. Additionally, the study unveiled a medium positive correlation between problem-based learning and academic achievement, accompanied by significant differences between the experimental and control groups. Simultaneously, it was found that the total variance of

academic achievement levels explained by the student-centred teaching approach and problem-based learning is relatively high.

5. **Fitriani, A., Zubaidah, S., Susilo, H., Al Muhdhar, M. H. I. (2020)** conducted a study titled "The Effects of Integrated Problem-Based Learning, Predict, Observe, Explain on Problem-Solving Skills and Self-Efficacy" with the aim of exploring the potential impact of problem-based learning (PBL), predict observe explain (POE), and PBLPOE on students' problem-solving skills and self-efficacy in Biology. The research was motivated by the observation that problem-solving skills and self-efficacy among Indonesian students in biology subjects are currently at a low level. Research Methods: This quasi-experimental study employed a pre-test post-test non-equivalent control group design, involving 132 tenth-grade students (aged 15 to 17) from Bengkulu, Indonesia. The participants were selected to be homogeneous in terms of academic abilities. Data collection utilized an essay test to assess problem-solving skills and observation sheets to evaluate students' self-efficacy. The data were analysed using ANCOVA and the Least Significant Different (LSD) test. Findings from the study suggest that PBLPOE has a more significant impact on students' problem-solving skills and self-efficacy compared to PBL, POE, and conventional learning. The highest scores in problem-solving skills and self-efficacy were observed in the PBLPOE class, followed by the PBL, POE, and conventional groups.
6. **Ocak, G., Doğruel, A. B., & Tepe, M. E. (2021)** carried out a study to Explore the Connection Between Problem-Solving Skills and Scientific Attitudes Among Secondary School Students, Considering Factors Such as Gender, Class Level, and Parents' Education. The study employed a correlational research model within the general survey framework. The sample included 560 students selected from secondary schools in Afyonkarahisar Province, Turkey, using the convenience sampling method. Problem Solving Inventory for Children (PSIC) and Scientific Attitude Scale (SAC) were utilized for data collection. Analytical methods such as Pearson correlation analysis, one-way variance analysis, and two-way variance analysis were employed. The results indicated a negative and low-level correlation between problem-solving skills and scientific attitudes in secondary school students. This negative correlation was not significant for male students, but it was significant for female students. No significant relationship was observed when analysing class level and maternal education level. The study concluded that problem-solving skills and gender did not have a significant and shared impact on students' scientific attitudes. Similarly, problem-solving skills and class level were not found to have a significant and shared effect on students' scientific attitudes. There was no significant difference in the

scientific attitudes of middle school students based on their problem-solving skill levels. Furthermore, students' problem-solving skills were not identified as a significant predictor of their scientific attitudes.

7. **R. Periasamy (2021)** employed a descriptive survey method of research and utilized a simple random sampling technique to select the sample. The study's population comprises 350 (2018-2019) class nine students attending secondary classes in Salem district, Tamil Nadu. For this research, The Problem-Solving Skills Inventory, consisting of 20 items in the form of statements with a five-point Likert scale, was utilized. The findings of the study indicate a significant difference in the mean scores of problem-solving skills among groups of secondary school students based on the locality of schools, the residence of the students, and the type of schools. Additionally, the study reveals a significant positive correlation between problem-solving skills and academic achievement in secondary school students. In conclusion, the study suggests that fostering or enhancing problem-solving skills and academic achievement is crucial for the success of ninth-standard students in both academic endeavours and life.
8. **Tóthová, M., & Rusek, M. (2021)** in their study titled "Developing Students' Problem-Solving Skills Using Learning Tasks: An Action Research Project in Secondary School," aimed to enhance the problem-solving skills of upper-secondary school students in chemistry lessons. Students initially underwent a pre-test that focused on their conceptual knowledge of the periodic table, their ability to apply knowledge regarding factors affecting chemistry reaction rates, and properties of compounds. The majority of students (72 out of 112) struggled to solve the tasks. Consequently, an intervention was crafted based on a study utilizing eye-tracking combined with think-aloud protocols. This intervention involved students working on context-based chemistry problem tasks, resembling PISA assessments, with specific scaffolding. Formative assessment by the teacher encouraged students to employ expansive strategies. The effectiveness of the intervention was subsequently evaluated through problem tasks in two post-tests. The results demonstrated the success of the action plan in enabling the majority of students to achieve above-average test scores. The ratio of successful problem solvers increased, while the number of unsuccessful students significantly decreased.
9. **Ananda, P.D. and Atmojo, S.E., (2022)** conducted a study on The Impact of the Discovery Learning Model on Problem-Solving Ability and Scientific Attitude of Elementary School Teacher Education Students. This study aims to analyse the effect of the application of the Discovery Learning model on the problem-solving abilities and

scientific attitudes of elementary school teacher education students in science learning. This type of research is quasi-experimental with a non-equivalent control group design. The population used in this study were students of the even semester Elementary School Teacher Education Study Program, totalling 78 students and collecting data using the test method, with instruments in the form of test questions in the form of essay tests to test problem-solving skills and observation sheets to determine scientific attitudes. The data analysis technique used descriptive, normality, homogeneity, hypothesis, and Manova tests. The results showed that the average score for the scientific attitude of the experimental class students was higher than the average score for problem-solving skills and the average score of the control class. Thus, it can be concluded that the Discovery Learning model influences the problem-solving abilities and scientific attitudes of elementary school teacher education students in science learning.

10. Hamutoğlu, N. B., Başarmak, U., Çam, E., & Salar, H. C. (2022) conducted a study to examine middle school students' computational thinking, problem solving skills and their attitudes towards research inquiry of the information technologies course, which is taught with the method of constructivist approach. The study was carried out in accordance with the pre-posttest experimental design. 14 girls and 8 boys in a middle school 5th grade were included to the study. The data was collected in Kırşehir in the second semester of 2018-2019. Within the scope of the study, "Problem Solving Inventory", "Computational Thinking Skill Scale" and "Attitude Scale Towards Research-Inquiry" was used at the beginning and end of the application. As a result of the study, it was observed that there was a significant difference in the post-test scores between the "avoidance" subdimension of the problem solving skills of middle school students and the total score obtained from the problem solving skill scale. In addition, the significant difference obtained between the total score the students got from the inquiry-oriented attitude scale and the sub-dimensions of curiosity, value. Finally, avoidance is in the direction of the posttest score.
11. **Suharyat, Y., Winiasri, L., Santosa, T. A., Rahman, A., & Marzuki, K. (2023)** Meta-Analysis Study: The Impact of the Problem-Solving Learning Model on Problem-Solving Ability in Students' Science Learning at the SMP-SMA Level. This study aims to assess the influence of the problem-solving learning model on students' problem-solving abilities in science learning. The data for this research were sourced from the analysis of 30 national or international journals published from 2010 to 2022. Data sources were retrieved from databases such as Google Scholar, Science Direct, Emerald, Eric, Springer, Hindawi, ProQuest, Sage Journal, Wiley, and Taylor & Francis. Purposive sampling was employed

in this study, focusing on data relevant to the research variables. The keywords used for data retrieval were problem-solving learning models, problem-solving skills, and science learning. Descriptive quantitative analysis techniques were applied using the OpenMEE application. The study's results concluded that the problem-solving learning model significantly influenced students' problem-solving abilities in science learning, with an effect size of 1.808, an average value of 83, and a standard deviation of 0.45.

2.0. SUMMARY OF THE REVIEW OF LITERATURE

From the above, the summary of the review is.

- **Scientific Attitude:** Students in both government and private schools show a positive attitude toward science, with private school students exhibiting slightly stronger attitudes and a greater inclination to pursue science careers.
- **Gender and Attitude:** There is no significant difference in scientific attitude and educational aspirations based on gender. However, a higher percentage of boys demonstrate extremely favourable scientific attitudes compared to girls, while girls surpass boys in fairly favourable attitudes.
- **Study Habits:** Students with good study habits achieve higher academic performance compared to those with poor study habits.
- **Self-Efficacy and Academic Performance:** Self-efficacy significantly predicts academic performance, though locus of control alone is not a strong predictor. Collectively, academic self-efficacy and locus of control play a significant role in academic success.
- **Scientific Attitude and Achievement:** There is a significantly positive correlation between scientific attitude and science achievement scores, indicating that a positive attitude towards science enhances academic performance in this subject.
- **Locus of Control:** Most students exhibit an internal locus of control, which correlates with higher learning performance and a more proactive approach during the learning process, whereas students with an external locus of control tend to be more passive and reactive.
- **Gifted vs. Non-Gifted Students:** Academic adjournment plays a significant role in the academic achievement of gifted students. In contrast, for non-gifted students, self-efficacy, locus of control, and academic adjournment are key factors influencing their academic success.

- **Socio-Economic and Educational Stream Differences:** Significant differences in attitudes towards science are observed due to variations in students' educational streams, type of school management, and socio-economic status.
- **Urban vs. Rural Attitudes:** Urban students generally have a more positive attitude towards science compared to rural students, with urban students' previous academic achievements also correlating positively with their science attitudes.
- **Problem-Solving Skills:** A strong correlation exists between problem-solving skills and academic achievement, with students who possess better problem-solving abilities performing better academically.
- **Influence of Educational Environment:** The school environment and teacher characteristics do not significantly impact students' attitudes toward science, but the use of interactive learning methods and low-cost materials can enhance students' attitudes towards subjects like Chemistry.
- **Impact of Participation and Personality:** Participation in sports positively affects locus of control and academic performance in certain groups, and personality factors such as emotional intelligence and internal locus of control play important roles in students' success in online learning and overall academic achievement.
- **Differences in Attitude Towards Science:** No significant differences in student attitudes towards science are noted concerning family-related factors, such as book ownership, parental education, and gender.
- **Correlation with Problem-Solving Skills:** There is a low-level negative correlation between problem-solving skills and scientific attitudes among secondary school students, particularly significant among female students.
- **Fostering Positive Attitudes:** Teachers should employ methods that capture students' interest in science, while parents, teachers, and governments should work together to foster and amplify positive attitudes toward science among students.

DISCUSSION

Based on the findings presented above, the researcher identified certain gaps in existing research. Primarily, an exploration into the state of Sikkim revealed a scarcity of studies addressing the influence of scientific attitude on academic achievement among higher secondary school students. While some studies exist individually on scientific attitude or academic achievement, none have comprehensively examined all three variables—scientific

attitude, locus of control, and problem-solving skills—simultaneously and investigated their correlations.

Furthermore, there is a notable absence of research focusing specifically on the academic achievement of higher secondary science students in the region.

Consequently, this study is deemed relevant and valuable in bridging these research gaps, offering a comprehensive understanding of the interplay among these variables and contributing to the existing knowledge base.

INTEGRATION OF FINDINGS:

- Scientific Attitude: Fosters curiosity and engagement, leading to better understanding and retention of scientific concepts.
- Locus of Control: Students with an internal locus of control are more proactive, enhancing their learning experiences and outcomes.
- Problem-Solving Skills: Enable students to tackle scientific problems effectively, leading to higher achievement.

IMPLICATIONS FOR EDUCATION:

- Curriculum Design: Incorporating activities that foster a positive scientific attitude and develop problem-solving skills can enhance science education.
- Teacher Training: Educators should be trained to support students in developing an internal locus of control and effective problem-solving strategies.
- Policy Development: Educational policies should emphasize the development of these psychological and cognitive factors to improve science achievement.

CONCLUSION

This systematic review highlights the significant impact of scientific attitude, locus of control, and problem-solving skills on the academic achievement of secondary school students in science. By understanding and enhancing these factors, educators and policymakers can improve science education outcomes, fostering a generation of critical thinkers and problem solvers.

FUTURE RESEARCH DIRECTIONS:

- Longitudinal Studies: To examine the long-term effects of these factors on academic achievement.
- Intervention Studies: To develop and test specific interventions aimed at improving scientific attitude, locus of control, and problem-solving skills
- Cross-Cultural Studies: To explore how these factors influence science achievement in different educational and cultural contexts.

REFERENCES

- Abid, M. A., Kanwal, S., Nasir, M. A. T., & Iqbal, S. (2016). *The effect of locus of control on academic performance of the students at tertiary level. International Review of Management and Business Research*, 5(3), 860.
- Ahuja, A. (2017). *Study of scientific attitude in relation to science achievement scores among secondary school students. Educational Quest-An International Journal of Education and Applied Social Sciences*, 8(1), 9-16.
- Akintunde, D. O., & Olujide, F. O. (2018). *Influence of emotional intelligence and locus of control on academic achievement of underachieving high ability students. Journal for the Education of Gifted Young Scientists*, 6(2), 14-22.
- Alipio, M. (2020). *Academic success as estimated by locus of control and motivation.*
- Ananda, P. D., & Atmojo, S. E. (2022). *The impact of the discovery learning model on problem-solving ability and scientific attitude of elementary school teacher education students. International Journal of Elementary Education*, 6(2), 259-267.
- Ananda, S. R., Suhandi, A., & Rahman, T. (2019, February). *Students' attitude toward science in junior high school after follow science learning used ILD model assisted science magic. In Journal of Physics: Conference Series (Vol. 1157, No. 2, p. 022060). IOP Publishing.*
- Asiri, A. A. M. (2018). *Attitudes of secondary school students in saudi arabia towards science . International Journal of Education, Learning and Development , Vol.6, No.3, pp.30-36, March 2018*
- Bahçekapili, E., & Karaman, S. (2020). *A path analysis of five-factor personality traits, self-efficacy, academic locus of control and academic achievement among online students. Knowledge Management & E-Learning*, 12(2), 191-208.
- Bajaj, M., & Devi, S. (2021). *Attitude of secondary school students towards science in relation to academic achievement, gender and type of school. MIER Journal of Educational Studies Trends and Practices*, 82-92.
- Bang, H., Chang, M., Lee, C., Kim, S., & Taliaferro, A. (2019). *Sport participation, locus of control, and academic performance among early adolescents: Racial and linguistic status differences. Sociological Spectrum*, 39(1), 20-39.
- Bhat, M. A. (2013). *Academic achievement of secondary school students in relation to self-concept and parental encouragement. International Journal of Recent Scientific Research*, 4(6), 738-741.
- Binwal, H. K. (2020). *Attitude towards science: A study of 9th grade adolescent students. The International Journal of Indian Psychology*, 8(1), 609-615.
- Chetri, S. (2014). *Achievement motivation of adolescents and its relationship with academic achievement. International Journal of Humanities and Social Science Invention*, 3(6), 8-15.
- Chikendu, R. E., Obikezie, M. C., & Eke, J. A. (2021). *Co-operative group learning strategy on secondary school students achivevement and retention in chemistry. GIS Business Journal* 16 (2) 127, 138.
- Dr. Vinod Kumar Singh, Dr. Ajay Kumar Singh, Anita Giri. *A study of the relationship between scientific attitude and academic achievement of rural area's intermediate college girls (science stream only). Int J Appl Res* 2016;2(4):46-49.
- Fitriani, A., Zubaidah, S., Susilo, H., & Al Muhdhar, M. H. I. (2020). *The effects of integrated problem-based learning, predict, observe, explain on problem-solving skills and self-efficacy. Eurasian Journal of Educational Research*, 20(85), 45-64.
- Gezim, B. A. R. A., & Xhomara, N. (2020). *The effect of student-centered teaching and problem-based learning on academic achievement in science. Journal of Turkish Science Education*, 17(2), 180-199.

- Gupta, M., & Pasrija, P. (2016). Problem solving ability & locality as the influential factors of academic achievement among high school students. *Issues and Ideas in Education*, 4(1), 37-50.
- Hamutoğlu, N. B., Başarmak, U., Çam, E., & Salar, H. C. (2022). Investigation of Secondary School Students' Attitudes Towards Computational Thinking, Problem-Solving Skills and Research-Inquiry. *Türk Akademik Yayınlar Dergisi (TAY Journal)*, 6(2), 429-461.
- Hu, X., Leung, F. K., & Chen, G. (2018). School, family, and student factors behind student attitudes towards science: The case of Hong Kong fourth-graders. *International Journal of Educational Research*, 92, 135-144.
- Jamhari, M., & Sipahutar, H. (2018). The effects of visual mapping and science-related attitudes on students' problem solving skills. In *3rd Annual International Seminar on Transformative Education And Educational Leadership (AISTEEL 2018)* (pp. 40-47). Atlantis Press.
- Jebson, S. R., & Hena, A. Z. (2015). Students' attitude towards science subjects in senior secondary schools in Adamawa State, Nigeria. *IMPACT: International Journal of Research in Applied, Natural and Social Sciences*, 3(3), 117-124.
- Kalaivani, C. & Pugalenth, N. (2015). Problem solving ability and scientific attitude of higher secondary school students. *Shanlax International Journal of Arts, Science & Humanities*, 2(3).
- Khitab, U., Zaman, A., Ghaffar, A., & Jan, Q. (2015). Impact of low cost teaching material on students' attitude towards science at secondary level in Khyber Pakhtunkhwa Pakistan. *International Journal of Innovation in Teaching and Learning (IJITL)*, 1(2).
- Kiran, P. R. (2021). *Impact of Problem Solving Ability and Self-esteem on Academic Achievement of Secondary School Students*.
- Korkmaz, O., İlhan, T., & Bardakci, S. (2018). An Investigation of Self-Efficacy, Locus of Control, and Academic Procrastination as Predictors of Academic Achievement in Students Diagnosed as Gifted and Non-Gifted. *Online Submission*, 4(7), 173-192.
- Lucas, Paulmathi (2016), A Study of Scientific Attitude and Academic Achievement in Science of Secondary School Students in Thane City. *Anveshana's International Journal of Research in Education, Literature, Psychology and Library Sciences*, 1(1), 68-74.
- Verešová, M., & Mala, D. (2016). Attitude toward school and learning and academic achievement of adolescents. In *7th International Conference on Education and Educational Psychology*, Published by Future Academy.
- Obiorah, J. N., Eneogu, N. D., Nji, I. A., Ezeocha, I. G., Ekwesaranna, F., & Nwabufu, C. (2021). Path analysis of the influence of students' variables and school location on students' academic achievement in economics. *International Journal of Psychosocial Rehabilitation*, 25(02).
- Ocak, G., Doğruel, A. B., & Tepe, M. E. (2021). An analysis of the relationship between problem solving skills and scientific attitudes of secondary school students. *International Journal of Contemporary Educational Research*, 8(1), 72-83. DOI: <https://doi.org/10.33200/ijcer.780710>
- Periasamy, R. (2021), Critical thinking among secondary school students in relation to their academic achievement, *International Research Journal of Modernization in Engineering Technology and Science*, 03(03), 994-999.
- Prawitasari, T., Sugiyo, S., & Saraswati, S. (2023). The Moderating Role of Locus of Control in the Effect of Self-Efficacy on Academic Resilience. *Jurnal Bimbingan Konseling*, 12(2), 139-145
- Rani, K. V. (2017). Reasoning Ability and Academic Achievement among Secondary School Students in Trivandrum. *Journal on School Educational Technology*, 13(2), 20-30.
- Rao, D. B. (2010). *Scientific attitude, scientific aptitude and achievement*. Discovery Publishing House.
- Rotter, J. B. (1962). An analysis of Adlerian psychology from a research orientation. *Journal of Individual Psychology*, 18(1), 3.

- Sethi, U. (2015). Study of attitude of the students towards science in relation to certain non-school factors. *International Journal of Education and Information Studies*, 75-80.
- Suharyat, Y., Winiasri, L., Santosa, T. A., Rahman, A., & Marzuki, K. (2023). Meta-analysis Study: Effect of Problem Solving Learning Model on Problem Solving Ability in Students' Science Learning SMP-SMA. *Jurnal Penelitian Pendidikan IPA*, 9(9), 721-728.
- Suryawati, E., & Osman, K. (2017). Contextual learning: Innovative approach towards the development of students' scientific attitude and natural science performance. *Eurasia Journal of mathematics, science and technology education*, 14(1), 61-76.
- Toma, R. B., Greca, I. M., & Orozco Gómez, M. L. (2019). Attitudes towards science and views of nature of science among elementary school students in terms of gender, cultural background and grade level variables. *Research in Science & Technological Education*, 37(4), 492-515.
- Tóthová, M., & Rusek, M. (2021). Developing students' problem-solving skills using learning tasks: An action research project in secondary school. *Acta Chimica Slovenica*, 68(4), 1016-1026.
- Veliappan and Daisy Nambikkai, (2018), Attitude towards science, A study among higher secondary students in Puducherry region, *Research and reflections in Education*, 16(2), 21-27.
- Verma, A. N. J. U. (2016). A study of academic achievement among high school students in relation to their study habits. *International journal of research in Humanities, Arts and literature*, 4(3), 75-88.
- Zeidan, A. H., & Jayosi, M. R. (2015). Science Process Skills and Attitudes toward Science among Palestinian Secondary School Students. *World journal of Education*, 5(1), 13-24.