CHAPTER- II

REVIEW OF LITERATURE

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This chapter offers an overview of academic literature on the topics related to this research. The various studies conducted over the past years till today (2011-2024) in India and other countries are all described in this chapter. The research gaps emerging from the previous literature reviewed are also presented in this chapter. Further, the objectives and hypotheses of the present study also form important constituents of this chapter.

At both international and national levels, a comprehensive literature review was conducted to assess existing trends in the literature and identify potential research gaps with the aim of providing a research-based framework direction for this current study.

The existing literature reviews are divided into the following types:

Section 2.1 Review of related literature on school climate and academic achievement

Section 2.2 Review of related literature on scientific reasoning and academic achievement

Section 2.3 Review of related literature on procrastination tendency and academic achievement

Section 2.4 Review of related literature on parent autonomy support and academic achievement

Section 2.5 Review of related literature on academic achievement in physics

Section 2.6 Research gaps emerging from review of literature

2.1 Review of related literature on school climate and academic achievement

2.1.1 Studies conducted at the international level

Zhao et al. (2023): Investigate the effect of school climate on achievement motivation among left-behind children as an unexplored group. This study investigates the mediating role of learning adaptability and the moderating role of teacher support in this relationship. Survey results in 1,417 left-behind children indicated that Asian

children demonstrated a positive effect of school climate on achievement motivation ($c'=0.177$, $p<0.001$) in which another mediator variable learning adaptability is also shown ($a1=0.338$, $p<0.001$; $b=0.341$, $p<0.001$) via school climate and achievement motivation. Moreover, the indirect effect of school climate on educational outcomes is significantly powerful for high level of perceived teacher support ($a2=0.153$, $p<0.001$). The present study highlights the importance of school climate and teacher support in facilitating achievement motivation of left-behind children and implications for intervention strategies.

Karaki, Mirza & Siahaan (2023) with 275 students (obtained by simple random sampling, taken from the population SMK Negeri 1 Salatiga also using Hierarchical multiple linear regression analysis to see how motivation achievement affect the score expectancy and out come expectations in facing mathematics exercises. Student report cards from Winkel (2007) The development of tools compounded by Sagone and Caroli (2014), Gauge et al. and McClelland (1987), respectively. Achievement motivation was not significant as a predictor of mathematics success ($t = -0.454$) when analysed using AMOS for the structural equation modelling and LISREL 8.7 for implementing constructs validity test. Academic self-efficacy ($t = 6.411$) and school climate ($t = 3.234$), however, were positively significant. Academic self-efficacy and school climate positively impact mathematics achievement, while motivation is not a mediator.

Seva & Demiroz (2020) examined relationships in their study between secondary school students' perception of school climate, their sense of belonging, and academic performance. The correlational survey model was employed as the method in this descriptive study which included 340 sixth and seventh grade students, who responded to School Climate Scale and School Belonging Scale, while academic achievement was calculated with first-term grade averages. No significant differences were found between genders and grad level of students perception toward school climate and belonging. Yet schools felt to be positive environments by students are strongly associated with their sense of belonging to and success in their academic environment.

Camilleri (2019) assessed the relationships between certain dimensions of school climate and elementary students' reading and mathematics achievement. The research

showed four broad areas: relations of teachers, parents based in school, expectations of the parents from academics and at home. Together with the ten dimensions assigned to each of these factors. Descriptive statistic along with bivariate and multiple regression analysis indicated that each of the variables studied significantly affected the scores respectively in achievement of two subjects. The relationship between school climate and academic performance held across gender, grade level, and previous achievement level.

Elena Cocoradă, Ana-Maria Cazan, and Ioana Emanuela Orzea (2018). A Romania-specific scale for student perspective on their school climate was developed by Their study using principal components analysis followed by confirmatory factor analyses, with a sample of 605 urban secondary and high school students, resulted in the seven-factor structure. The elements were student-instructor connections, headmaster association, student-student connections, school fulfilment, accomplishment inspiration, student-outline teacher connections, and recognized security. These results highlight the strong influence of gender, residential type and parents education on academic performance.

Linda D. Ruiz, Susan D. McMahon, and Leonard A. Jason (2018) examining whether positive school climate contributes to reduce the negative effect of community violence exposure on academic achievement of African American adolescence living in low-income urban neighbourhoods. Using data from 297 Chicago public elementary schools and geographic information systems (GIS) maps, poor academic outcomes were positively associated with lower SES, an association which was accounted for in part by violent underreporting crime. A more prominently SES-academic performance association was moderated by students' security associated with a positive school climate. These findings highlight an important need to integrate community, school, and safety elements into prevention models.

Abdulraheem, Kumar, Moza, and Al Nahyan in (2017) created a framework to examine the perceived impact of five quality factors on student academic achievement. It crystallizes years and hundreds of studies’ worth of work into a coherent framework that’s useful for the other stakeholders. In their review of the relevant literature, the authors concluded that the effects of leadership and climate on academic achievement were mediated by parental engagement. NA Although the

proposed linkages are yet to be empirically tested, this study offers fresh prospects for educational leadership and policy-makers that champion student-wellbeing. The study is a novel initiative in recognizing considerations that influence academic performance but are less investigated and unaddressed.

Geleta, K.(2017), investigated the relationship between school climate and student achievement in secondary schools of Ethiopia. The study was done in Ethiopia, and the data comprise a combination of the School Climate Index (SCI), and performance in an SAT-like exam — the Ethiopian General Education Leaving Certificate Examination (GELCE). The authors found that school climate was positively associated with student performance. This work was carried out using statistical methods of non-experiment correlation study: Pearson's product-moment coefficient of correlation and multiple regression analysis.

Greenway (2017) examined the relationship between school climate and student achievement using school climate data from 31 Georgia middle schools. The study found that school climate had a significant, direct impact on student success as measured by the College and Career Ready Performance Index (CCRPI). The CCRPI, or College and Career Ready Performance Index, is a way to gauge how schools are performing in improving and offering college and career prep resources and also highlights the role school climate plays in students' academic success.

Shullai (2017) study the impact of school organisational climate on academic achievement in higher secondary schools of Meghalaya. 162 teachers and 1,389 students included in the study, none of the three types of school climate (open, closed, parental) was significantly related to student academic achievement. That said, the study did highlight an inverse negative correlation between a well-structured school climate and student success, i.e. that rather than being beneficial, a more controlled environment could negatively influence academic performance.

Sophie et al. (2017) performed an association between school climate, teacher working conditions, and teaching and learning and achievement in a sample of 17 secondary schools from Madrid. Using data points of 760 staff members and 2,257 students, the study discovered that student perception was drawing such a parameter to their numeric abilities in addition to their writing performance. A student's attachment to his or her school further mediated this effect. This means that school

climate viewed from a staff lens could have an impact on student achievement, which could therefore have implications for organisation studies concerned with education.

Shindler, Jones, Williams, Taylor, & Cardenas (2016) examined the relationship between school climate and student achievement in (U.S. urban) school districts from five states (N = 230). With their research, they argue that school climate and student achievement are not so much two sides of the same educational coin, or two separate sides of the same coin, but two parts of the same side. The overall quality of the school climate was a much better predictor of student achievement than any of the other big ticket items from federal policy that were introduced education, and that's really crazy extreme. Those practices that fostered a "psychology of success" helped students achieve more, and also contributed to a better school climate, while those that supported a "psychology of failure" led to underachievement:

Ahmed A. Osman Khaemba Ongeti (2013) Cheng'oli Calistus Kisumo in his research Established school climates rank a high on academic literature as one of the most crucial factors in eroding discipline and the learning culture in schools as otherwise exemplified by known cases of violence routinely reported by students therein. Employing a causal-comparative research design, they analyzed 103 teacher school climate ratings from 4 high-performing (HPS) and 4 low-performing developer-built secondary schools. Conclusion: Schools with better academic performance had a more positive school environment and culture. The study has referred to school climate as a factor of success, recommending, among other proposals, the promotion of more environment, social and culturally healthy space in schools to enhance students' results.

2.1.2 Studies conducted at the National Level

Muhammad, I. M., Akram, M., & Qamar, A. H. (2023) investigated the role of school climate and school performance: Constructs of internal dynamics management, external dynamics management, conflict management, and shared decision-making in this sample of 740 secondary school teachers from District Sahiwal, using a multistage sampling technique and employing the Head Teacher Effectiveness Questionnaire to determine head teacher effectiveness. A positive relationship (+0.57) was found between the head teachers who compose school climate and boundaries to

the good schools in Ofsted rating data. School climate accounted for close to a third — or 32% — of the variation in school performance, a powerful indication of how critical strong and positive leadership is to a successful learning environment.

Burma, Priti Bora, P. (2022) found in the research the moderate, positive and statistically significant relationship between school climate and academic performance in school climate. The study adopted descriptive survey method and employed stratified random sampling among 200 students from urban/rural slum population. The paper highlighted the importance of a robust school climate policy in the pursuit of academic performance, stating that because climate plays an important role in directing that trajectory of academic outputs, it is a compass for students studying in either urban or rural schools.

Indumathy, N., & Annadurai S. (2022) as an organised learning place the resources are well used and monitored to nurture academic intelligence and emotional management of the students to make students shine like the top-rankers. So, the authors said, perceptions of staff and students affect academic performance through the establishment of an academic context. This highlights the need to understand the mediating psychological processes informing the relationships among school climate, achievement, and student success. In conjunction with others, their research reinforces the premise that school climate is the apogee for educational outcomes and that collegial, supportive, organisational environments, improve both school and student outcomes.

Mittu and Zhimomi (2019) studied the school climate and academic motivation of higher secondary students. To accommodate the differences of individuals about achievement motivation and school climate, the current study aims to explore the association between achievement motivation and school climate as well as the effect of school climate over the development of achievement motivation. Sample: 250 convenience sampling method students from five higher secondary schools of Dimapur District, Nagaland Method: Data were collected using The Comprehensive School Climate Inventory (CSEE, 2008) and The Achievement Motivation Inventory (Muthee & Immanuel, 2009). Data were analysed using Pearson's Product Moment Coefficient of Correlation and Regression Analysis. The findings of this study showed that there was a significant positive correlation between school climate and

achievement motivation, which indicated that a more positive school climate improved on students' confidence.

Ahmad (2018) examined the factors of school climate, emotional intelligence, and learning style and which significantly forecast academic performance among secondary school students in Kashmir, India. The study was based on 600 students from both government and private schools. Ahmad described school climate using a self-made School Climate Scale (SCS), emotional intelligence using the Emotional Intelligence Scale (EIS) of Arun Kumar and Shruti Narain (2014), and learning styles using the Style of Learning &Thinking (SOLAT) (Venkataraman, 1994). Statistical methods of relevant statistics, % statistics, mean SD T-tests and correlation coefficient were used to analyse data collected. Results: There was a significant relationship between school climate, emotional intelligence, and learning styles with academic achievement. There was female perception, more preferable to male of school climate and private school students perceived the school climate more favourably compared to government schools.

Balu and Samrat (2015) investigated the association of classroom climate and students' academic performance. Classroom climate refers to the intellectual, social, emotional, and physical environmental factors that influence the learning. Method: Survey-type study conducted with 400 higher secondary students selected from different schools in Pudukottai District, Tamil Nadu It also suggested, classroom climate influenced students' academic performance at school. The crying for both individual as well as group involvement is essential in building a climate where students are academically engaged with one another, he further expanded in a statement.

Deepa (2015) study absenteeism, as school climate, was used when concerning high school students and the various changing factors like gender, locality of residence, education level, and income status vis a vis the parents. In this study, sampling method was employed to study and 300 IX standard students were randomly selected using sampling method. Instruments: The participants' semi-structured personal data sheets and the School Refusal Assessment Scale (25 items) were completed by children and their parents. The findings showed that school climate had a significant effect on absenteeism, and there were significant differences with respect to gender

and parental qualification, while there were no significant differences with respect to the economic situation.

Mary, M., Manjula, Rose, & Porgio, G. (2015) study the academic performance and the climate of physical education schools among high school students using stratified random sampling. The study population consists of 1000 students (3 districts-Kanyakumari, Tirunelveli and Tuticorin). The means scores for the Teacher Effectiveness Scale and Academic Achievement Scale employed in this study. Self-financed high schools had statistically significantly better the physical climate than government and aid high schools. They also called for increased government funding to provide better infrastructure for schools to realize holistic academic outcomes.

Nikhat et al (2015) made a comparative study on family climate and academic achievement among the secondary school students of Aligarh. The present study includes 300 (150 boys and 150 girls) students from eight local schools. The study results indicated there was no relationship between social background and scholarly achievements. However, the study also found how students in private schools had far superior academic achievement compared to the ones in government schools.

Jayalekshmi (2012) explored the family and school climate as possible predictors of behavioural disorders in early adolescents. The study on students from IX-grade from Tirunelveli, Tuticorin and Kanyakumari districts and tools like JaWi's Scale on Family Climate and School Climate Behavioural Disorders were used. Results: Family and school climates were both positively associated with the behavioural problems, while home discipline was irrelevant. Conclusions: In summary, family climate and school climate were significantly identified as correlates to development of behavioural disorders among adolescents.

Kaur (2011) examined the impact of gender and school climate on psychological hardiness on 1011 adolescents in India (448 men, 563 women, M age = 18.35). The instruments used for the study included the Psychological Hardiness Scale instrument and the School Organisational Climate Description Questionnaire. The results indicated a distinctly higher level of trait curiosity among males than females, to the degree that the gender-comparing scores of GCQ and PHCC were statistically adjusted. In addition, direct effects of school climate on psychological hardiness were substantial and gender moderated school climate.

2.2 Review of related literature on Scientific Reasoning and Academic achievement

2.2.1 Studies conducted at the International Level

De Ryer et al. (2023) employed a cross-sectional study that examined STEM accomplishment patterns and drivers using inductive reasoning, scientific reasoning, science interest, and parental effects of 726 students from grades 6, 8, 10, and 11 across 6 secondary schools. Results showed that training in everyday reasoning skills was effective for higher-achieving students in grades 4–9, although their intrinsic motivation to pursue science dropped slightly. Furthermore, inductive and scientific reasoning were identified as strong predictors of STEM achievement, including selected majors, with students achieving the highest scores in the inductive test. The educational level of the parents was negatively associated with the grades of STEM subjects, and positively associated with STEM perseverance and enrolment of study participants from all stages of the education system. In contrast, the effect of parental engagement as well as scientific motivational orientation on STEM359 accomplishment was weaker and varied by year. The results highlight potential pathways to boost STEM success with cognitive and parental support interventions tailored to specific children.

Ma, Luo, Daner, Sun Liying, Zhu, and Yuqin (2021) found the differences of SRA between gender and the results of SRA vary with grade and science academic achievement; using data from 2,261 seventh- to ninth-grade students in Mainland China. A validated 23-item SRA questionnaire based on a six-stage scientific reasoning development framework was undertaken by participants, and Rasch modelling was subsequently applied to the data to explore SRA levels and ability ranges. • These results suggest SRA increases stepwise across developmental stage (AAL) and socioeconomic hardship (SPL) and is significantly higher in males compared with females, with significant interactions observed between these factors (i.e., between AAL and gender and AAL and grade). The here-presented research adds to overall body of studies which strengthen the call for instructional practices that are increasingly focused as students advance through academic stages of development, supporting scientific reasoning.

Ahmad, Malik and Raheem (2020) studied the relationship between academic achievement and the ability of scientific reasoning of the science graduates of SSC level in Punjab. The sampling technique was convenience sampling, hence 1620 first-year intermediate students from both public and private institutions across four different districts were selected. A pilot test of a multilingual test (L1 and L2) demonstrated excellent reliability (Cronbach's alpha = 0.914), and the preliminary data showed a successful 93.7% response rate for the final survey. Results: The obtained descriptive statistics and Pearson correlation analysis of overall test data (Table XX below) showed no significant correlation between SSC score and reasoning ability as a measure of IQ. They emphasized that assessment agencies, such as BISE, should revise their evaluations by incorporating higher-order thinking items into the exams to improve students' logical reasoning abilities, etc.

Nurul, U., Sri E, I., Sulisetijon, and Atan N, A. (2020) stated that scientific reasoning is an important concept to develop in biology learning. The study conducted by a descriptive quantitative design to analyze 37 Biology students from Universitas Negeri Malang in the 2018 study program, where the scientific reasoning was assayed via problem essays covering five variables. Results showed below-average scores across the board: argument topic selection (21.62), topic knowledge (20.27), methodology (13.3), analysis (5.4) and drawing conclusions (11.0). Findings expose qualitative deficiencies in general thinking and call for as well the development of techniques and future endeavours focused on enhancing scientific reasoning as a critical component of general biology instruction.

Zulkipli (2020) used a modified version of Lawson's (1978) instrument to measure the scientific reasoning ability of 82 pre-service science educators, which were sampled from the Faculty of Education, Universiti Teknologi MARA (UiTM), Malaysia. The results show that the vast majority of participants (whether their discipline is physics, chemistry or biology) and on average exhibit deficient reasoning skills in science. However, across all four reasoning patterns, students who studied physics outperformed students who studied biology, displaying control variable and probabilistic thinking beyond their respective disciplines. Chemistry students demonstrated the expectation of causality and reciprocal reasoning similarly to their selection level, however, their level of control variable was less than would be predicted based on selection.

Khoirina et al. (2018) assessed the scientific reasoning of 88 class XI students at SMAN 3 Surakarta using descriptive methods and a written test based on the Lawson Classroom Test of Scientific Reasoning (LCTSR). Results Based on Perry's model, 51.14% were in the concrete reasoning stage, 42.05% were in the transitional stage, and only 6.81% exhibited formal reasoning patterns. The statistics show a strong correlation between quality and scientific reasoning development in students. Teachers select models and methods for teaching physics, and appropriate educational resources.

Jensen et al. (2017) demonstrated that strong reasoning ability was strongly predictive of the likelihood of achieving better grades in courses by students in STEM disciplines. The difference between STEM and non-STEM majors was significant ($p < 0.001$); the results suggest that if given the opportunity to use their science knowledge, STEM students have better reasoning scores; this was especially true for students after their first year of study—often considered the point of no return in the college-level science pipeline connecting a portion of the persistence effect to college-level science education to improved reasoning ability.

Opitz, A., et al. (2017) conducted a holistic analysis of 38 assessments of scientific reasoning while Nehm et al. (2017) conducted a systematic review of available tests entitled “Measuring Scientific Reasoning—A Review of Test Instruments”. The first tests were purely multiple-choice but have gradually made space for various methodologies including computerised assessments of virtual experiments. The paper highlighted a transition between understanding science as the intersection of domain-specific skills—generating hypotheses, evaluating evidence and reaching conclusions—and considering these skills their own situational dependencies (Brainard et al, 2014). Methodological deficits highlighted in this evaluation led to recommendations for further research specifically regarding theoretical propositions, operational comparisons of instruments, and the relationship between test scores and academic performance.

Remellind K. (2017) used the Scientific Reasoning Ability Test (SRAT) to study the scientific reasoning ability of Class X students from various regions of Meghalaya. The aim of this research was to evaluate capacity of scientific reasoning, to analyze differences by sex and to appraise its relation with academic achievement in sciences.

A positive connection was found between the ability of pupils to engage in scientific reasoning and their success in academic work wherein the pupils who scored high on reasoning, excelled in their studies. History of Science and Technology Science has always historically faced skepticism and challenges, which has also made it easier to dismiss claims of scientific thinking, as they were often seen as a gender difference.

Helena Thuneberg, Jarkko Hautamäki, and Risto Hotulainen (2015) study conducted looked at reasoning and performance. This study included 769 (395 males, mean age 15 years) students from 51 classes of seven different schools in metropolitan and eastern Finland. Results were analysed using MLwiN 2.10 for multilevel modelling.Using a novel low inference embedded assessment methodology, science reasoning was assessed via modified ScienceReasoning Task items. Outcomes First article The school ICC for science thinking was 7%, and the class ICC was 10%. Notably, the findings provided comparisons of results at the school and class level, which were aligned with earlier PISA results but also provided unique insights into disparities between schools (i.e. schools that could see the average lower if they increase the variation of entering characteristics of their classes) and classes within the same school (i.e. classes that could see the average lower if they increase the variation of entering characteristics of students) leading to some recommendations for authors on how even such a diversity might be achievable.

Ömer Acar (2014) investigated data related to the detection of true and misplaced beliefs in students undergoing argumentation-based guided inquiry in the context of physics (focusing on scientific reasoning, conceptual knowledge, and achievement that can essentially only be acquired by well-qualified prospective science teachers). Although the departments began with different levels of reasoning, knowledge, and accomplishment, both departments improved similarly in knowledge and achievement after instruction. But the logic gap remained. Gradually, the two camps came together in the pursuit of reasoning, declarative, and situational knowledge. Acar further suggested that students' misconceptions or correct conceptions be classified so that they can be further researched and added argumentation based guided discovery in primary science education.

Nor’ain Mohd Tajudin et al. (2012) conducted a quantitative survey to evaluate the scientific reasoning (SR) competencies among undergraduates in the science,

mathematics, and engineering (SME) fields at Malaysian Institutes of Higher Learning (IHLs). The Lawson Scientific Reasoning Skills Test and the Lecturers' Teaching Style Survey were used on 975 students in six universities and were analysed with descriptive and inferential statistics. Four out of five pupils displayed concrete self-regulation skills, and the main teaching approaches used were the expert and delegator roles. However, no significant relationship was established that link teaching approaches with SR proficiency; whereas the pedagogical paradigms used in most Malaysian IHLs did not seem to yield any fruitful results towards SR competencies.

Zeynep Demirtaş (2011) conducted study on High school students' chemistry types on conceptual and scientific reasoning were explored by and how they related to their academic performances in science, language, social studies and skill development-related disciplines. Among seven high schools in the Sakarya region of Turkey, a significant correlation was determined between the science reasoning skills and GPA (N = 408) of freshman students. It also found differences between women and men. They found that the development of scientific reasoning skills was a strong predictor of students' performance on different subjects and most of the times more important than their cognitive talents.

2.2.2 Studies conducted at the National Level

Iyappan (2021) also a research study elaborated the learning difficulties of the high school students in their learning in the perspective of reasoning ability, scientific creativity and the learning style. Several other variables were considered, including gender, locality, school management type, and medium of instruction, and in some cases, parental background. on reasoning ability resulted with concluding that there was a difference in reasoning ability of the respondents based on gender whereas it proved that there were no significant differences in reasoning ability based on the locality and type of schools The study was a reminder that there are many factors that could be spurring learning challenges for teenagers.

Ranjusha A. (2021) Personality traits and attribution styles as predictors of scientific reasoning. This study aimed to evaluate the levels of personality traits, attributional styles, and scientific reasoning of these students and to verify differences in four variables according to sex, locality, and type of school. Indeed, the results imply that

rural youth's belief that less will change in future is, in fact, rational—the social and environmental climate in localization context provides evidence that legitimatize this statement. Aspects were found to differ significantly between government and aided schools. Second, scientific reasoning had a big gender gap (just 74% with good skills).

Babu, U. M, and Kalaiyarasan (2019) explored the effectiveness of visual-spatial intelligence-based instructional material in scientific reasoning at the secondary level. The study evaluated the effectiveness of these resources with tools such as scientific reasoning skills tests. All the results were positive in both cases, fostering students' scientific reasoning skills and demonstrating that use of visual-spatial intelligence is a resource that adds value to instruction.

Jaleel, S., Premachandran, P. (2017). The relationship between scientific reasoning and the achievement in chemistry of secondary school students. This research highlighted the importance of being purposeful and transparent in what kind of inquiry is framed as a process of reasoning to constitute knowledge (p. 4). Results showed a significant correlation between scientific reasoning and achievement in chemistry, Gender differences were apparent on the outcomes.

According to Premachandran, P. (2017), the study was based on an Interactive Compensatory Learning Model based on Constructivism to enhance scientific reasoning, interest, and achievement in chemistry. The aim of this study was to design this model and to investigate its effects on the students' scientific skills, students' performance, and chemistry achievement. It was found that students taught through this activity-orientated way of teaching actually performed significantly worse than students taught using this constructivist-based model when assessing their scientific reasoning, interest and achievement.

Kanimozhi, G., & Ganesan, M. (2017) have proven by conducting a study whether a certain group of higher secondary school students of the selected Madurai District have reasoning ability or not. The authors designed a 50-item multiple-choice instrument to measure reasoning ability and randomly assigned 303 students to take part. Of these, results 61.38% students suffering, with an average grade point average of 21.45%, 16.5%, by the very poor, and only 0.66% classified as excellent; The

results indicate that performance in mathematical reasoning, and no difference, that is, between male and female students can be said to be an equal to each other.

Rani (2017) examined students in the Trivandrum District who have high academic achievement and reasoning ability through their own external background variables such as gender, age, and type of school. For this purpose, the Reasoning Ability Scale prepared by the researcher was applied to measure the reasoning ability of the sample selected, with 225 students participating in the study as participants. Their academic performance was indexed using term tests of state government. The statistical analyses which performed t-tests, Pearson's correlation, etc. suggested significant positive correlations between reasoning ability and academic achievement. The results of the questionnaire, which was applied to male-female pairs of students selected by randomly picking 170 students from 807 first-year students in 5 schools covering 11 departments, revealed the superiority of male students over female students and a significant difference according age and types of schools in the reasoning ability other than academic achievement.

2.3 Review of related literature on Procrastination Tendency and Academic Achievement

2.3.1 Studies conducted at the International Level

Jörn R. Sparfeldt and Sarah Schwabe (2024) explored the relationship between academic procrastination, conscientiousness and academic achievement in university students. They reported a large negative correlation between procrastination and conscientiousness (r = –. 67) and between avoidance and achievement (r = –. 29). Conscientiousness showed a positive relation to academic achievement (r =. 22). The results revealed that procrastination mediated the relationship between conscientiousness and academic performance, underscoring how procrastination is an important factor in the association between conscientiousness and academic achievement. Procrastination has both psychological and educational consequences on a student’s academic life.

Widia S. R., Era L. S., and Dyah L. P. (2024) have studied the effect of avoidant procrastination on academic achievement in Indonesian college students. Findings from a survey of the 2014-2017 cohort of 400 individuals indicate that avoidant

procrastination significantly precedes worse academic achievement as evidenced by GMPA readings. And inverse correlation appears to be quite strong with regression coefficient of −0.81 and a low p-value ($p < 0.05$). These results illustrate the negative consequence of avoidance procrastination on students' academic performance which indicates the need of preventative treatments to reduce procrastinatory behaviour.

Yashmin G., Vidhi M and Prisha K. (2024) conducted a study on academic procrastination with 50 sources, using Procrastination Assessment Scale (PASS). Other strong relations were found between procrastination and its predictors and consequences, finding that high self-efficacy ameliorated the negative effect of the procrastination on the academic performance of students. The results showed gender differences regarding procrastination tendencies, suggesting that interventions for reducing procrastination must take these differences into account. The authors highlighted the importance of self-regulated learning and proposed that their results had far-reaching potential for reducing procrastination in educational and professional domains. They say more research is needed on how procrastination affects each individual's longer-term career path, and that businesses need to try to tackle the issue.

Morales (2021) the effect of accomplishment objectives on procrastination and academics. All 1,153 junior and senior undergraduates completed the Academic Procrastination Scale (Morales, 2010) and the Achievement Goal Questionnaire (Elliot & Harackiewicz, 1996), and grades were used to measure students' academic success. It was concluded that positive procrastination and no-procrastination correlated positively with academic success and negative procrastination negatively influenced the academic performance of students.

Brilliant, Sanny, Anoita, Sri, Tiatri, Meylisa, Permata, and Sari (2020) studied the effect of fear of failure towards students success and included procrastination as a mediating variable. The study included 52 respondents (37 females and 15 males) and aimed to explore the mediating role of procrastination in the relation between fear of failure and academic performance. Procrastination did not mediate that association, suggesting that different mechanisms may help explain the relationship between fear of failure and academic performance, the data showed.

Naki and Erdemir (2019) investigated the impact of decreasing procrastination habits in pre-service science teachers taking a course in physics on their academic performance. The study was conducted using a quasi-experimental design with an experimental group and a control group in which 35 members participated in both groups in the experimental group were provided commitments to reduce procrastination. The experimental group outperformed the control group in academic performance by a significant amount, serving as evidence that procrastination-reduction tactics led to positive effects on learning outcomes in physics courses.

Kurtovic et al. (2019) conducted study on "Predicting Procrastination: The Role of Academic Achievement, Self-efficacy, and Perfectionism," and it looked at the mediating effects of self-efficacy and perfectionism in the relationship between academic achievement and procrastination of university students. They wanted to see if the three predictors could predict procrastination. The fact of the study included 227 college students whose maladaptive procrastination was measured using Tuckman's Procrastination Scale, the Almost Perfect Scale—Revised (APS-R), and the General Self-Efficacy Scale (GSE). Data on academic achievement were also collected for the prior school year. As for the results, they were negative correlated with students' academic performance, self-efficacy and adaptive perfectionism; but positive correlated with students' maladaptive perfectionism.

Erdinc and Balkis (2014) explored the mediating role of academic procrastination in the relationship between self-doubt and self-esteem with the academic performance of university students. Methods: The study population consisted of 261 students from various continents, 56 males 205 females, ages 18–30. Data were collected by means of the Aitken Procrastination Inventory, the Rosenberg Self-Esteem Inventory, and the Self-Doubt Subscale of the Subjective Overachievement Scale. It was found that academic procrastination acted as a partial mediator between self-doubt and self-esteem, and as a full mediator between self-doubt and academic performance. In addition, academic achievement partially mediated the relationship between academic procrastination and self-esteem.

Aponte and Pujol (2013) conducted study on secondary level students sample of 72 students aged 15-17 (35 females and 37 males). They were creating a system to measure the performance of pupils based on what they were able to accomplish. The

General Achievement Motivation Scale (GAMS) was developed for the sample, which was shown to be a valid and reliable measure of correlates of general performance for students' causal attributions. In the next part of their study, they used academic procrastination as a measure of performance. A total of 677 students (476 boys and 201 girls) aged between 14 and 19 provided data on a combined measure that indicated a negative correlation between procrastination and attributions for interest, ability, task features, and teacher rating but weak positive correlation with gender.

Filiz, Bezci, Semra, Sungur, and Vural (2013) conducted a study on the sample consisted of 4,725 elementary students (2,335 females, 2,379 males, and 11 unspecified genders), for which studied the associations between academic procrastination, gender, and science achievement of elementary children. They included the Tuckman Procrastination Scale and a test of science achievement. Results of multiple regression analyses showed that both types of academic procrastination and gender were significant predictors of students' scientific performance. The results revealed an inverse relationship between procrastination and attainment rates, with girls showing superior academic performance in terms of career achievement within the sciences than boys.

2.3.2 Studies conducted at the National Level

Shilpi, Saxena, Satish, and Chandra (2024). Conducted study on understanding academic procrastination, an important aspect that negatively influences college students' anxiety, stress, academic performance, and well-being. They worked to more or less quantify the levels of procrastination, as well as the statistically significant differences by gender, type of course, geography, and family structure. Research that involved studying 100 undergraduate and postgraduate students from Bareilly discovered that a wide section of students showed moderate up to below average procrastination with a major disparity of sex. But there were no notable differences by type of course, location or family structure. The researchers suggested strategies like motivation, breaking down tasks, setting deadlines and reducing distractions to alleviate procrastination and its negative impacts.

Harpreet & Kaur (2023) studied the relationship of procrastination and academic performance difference in 282 college students from 12 colleges in Punjab. Using

two-way analysis of variance, the results showed no statistically significant difference between the procrastination rating levels (excellent, average and bad) on academic level. Among the three main areas of study—science, humanities and commerce—a huge differentiation existed, however. Academic Achievement and Field of StudyThe interaction between academic achievement and field of study was found to be significant ($p = 0.045$), while the correlation of procrastination with academic achievement was negative but not significant ($p = 0.794$).

Similar to Kaur (2022) study, Arvinder, Jena and Kaur also explored academic procrastination at educational institutions, stating the diverse nature and negative impacts of academic procrastination, which can lead to increased academic anxiety and academic failure. To understand the relationship between gender and academic procrastination, this study was conducted with 400 senior secondary students (200 males and 200 females) across different private and government institutions in Delhi. The authors stressed the prevalence of student procrastination and the need to address it at its roots to ease its negative effect on academic success

Sushila, S. and Seema, M. (2022) determined learnt helplessness, achievement motivation and procrastination of 600 teenagers (300 males and 300 females) government and private senior secondary schools. Data were collected with the Academic Procrastination Scale (APS–KAYM, 2013), Helplessness Scale (HS-MGBR, 2012), and Achievement Motivation Scale (N-Ache, 2011). Results showed that learned helplessness had a strong positive and achievement motivation had a significant negative relationship with procrastination.

Babu, Chandra, Vanishree, and Amritha (2019) studied this power face and the academic procrastination among dental students from Bangalore. In this quantitative study, data were obtained through the Tuckman Academic Procrastination Scale and the Rosenberg Self-Esteem Scale in a total of 255 students. Results from data analysis using t-tests, ANOVA and Pearson's correlation, shows a small positive correlation between procrastination and self-esteem ($r=0.25$, $p<0.001$), suggesting that students with higher self-esteem exhibited lower levels of procrastination. The findings showed male students procrastinated significantly less than female pupils. This study found that successful treatments will improve students' time management skills and study methods.

Anjali, S. (2018) found whether there is a correlation between procrastination, stress and academic performance among B.Ed. students at GGSIP University. The study used a self-developed Procrastination and Stress Scale by the researchers, and a sample of 100 students, it was found that procrastination and stress had a negative impact. Results indicated significant positive relationships between procrastination and stress, and procrastination and academic achievement explaining that procrastination, distraction, and worry negatively affect students from reaching their potential. However, these challenges require a team-based counseling approach and an efficacious preventive education.

Smitha and Dev (2018) studied the determinants of high school students' academic performance using a sample of 210 students from Abu Dhabi and Thiruvananthapuram. They used a variety of tools including the Procrastination Behaviour Inventory, Behavioural Stress Tolerance Index and Study Habits Scales. Using data analytic methods including the product-moment correlation coefficient and factor analysis, the research showed that students' academic success is influenced by different factors. Additionally, it highlighted the important role a healthy level of support and encouragement of the educator and parents can play in helping children stay on track with their academic goals.

Das (2016) discussed relationship between academic procrastination and academic performance of higher secondary school students of rural Kamrup. Seventy students from 6 schools and junior colleges were included as follows; first year high-school performance was used to assess academic achievement, and the revised Tuckman Procrastination Scale (1991) was used to study academic procrastination. Similarly, a subsequent investigation carried out by Lee and Gibbons (2022) discovered that there exists no relevant association between academic procrastination and academic achievement. Procrastination did not significantly vary with respect to gender or academic stream (arts or science).

2.4 Review of related literature on Parent Autonomy Support and Academic Achievement

2.4.1 Studies conducted at the International Level

Wang et al. (2023) investigated the relationship between parental autonomy support and academic performance of adolescents using the theories of ecosystems of human

development and self-determination. The study surveyed 1,372 seventh to tenth graders from schools in Chengdu, Xi'an, and Hangzhou and found that parental autonomy support was one of the most powerful determinants of academic performance. Metacognition was the strongest mediator of the relation between parental support and academic achievement, whereas grade level moderated the relation between parental support and metacognition. The environmental (parental support) and individual (metacognition) variables explored with this study illustrates their impact on academic outcomes while offering suggestions on how to enhance adolescents' academic performance.

Sakhavat, M. and Kayla, S. (2023) conducted a meta-analysis of the effects of both teacher- and parent-related autonomy support on six educational outcomes of interest (namely, autonomous motivation; student engagement; mastery goals; self-regulated learning; self-beliefs; and academic performance). They examined 378 effect sizes from 179 independent samples drawn from 153 studies and found that autonomy support was associated with positive outcomes overall, and that it was significantly more strongly related to outcomes such as motivation, engagement and self-beliefs than with other more distal outcomes. The association between autonomy support and the autotelic experience was moderated, with gender differences. Academic performance, though weakly related to autonomy support, was also partially mediated by other outcomes. Results additionally showed the quality of knows had a high effect on students well-being since autonomy-supportive teaching behaviour induced constructive educational outcomes.

Shi and Tan (2020) used latent profile analysis to identify groups of parents with high or low autonomy support and also control, and examined the effects of parenting types and family brokering on students' mathematics achievement. In three separate components of parents analysis, three subtypes were identified: ruling, democratic, and governing. Parents in positions of ruling (and, to a lesser extent, governing) were probably of a higher socioeconomic rank. Authoritative parent better math scores than democratic/governing parent.

Gutierrez and Tomas (2019) centred his study on the autonomy support provided by teachers vis a vis academic achievement in a model with self-efficacy and school engagement as mediators. Their results showed that greater autonomy-supportive

teaching was positively linked to engagement, self-efficacy, and well-being. In addition, the findings exhibited that self-efficacy and engagement-related predicted subjective well-being, which then had direct effect on academic achievement; as the result self-efficacy and engagement were mediator variables which mediated the impact of teacher autonomy support on students' academic performance. These findings demonstrate a positive association between teachers' support for them and both important psychological and academic student outcomes.

Froiland (2017) used self-determination theory to explore the relationships among parental autonomy support, students' intrinsic life goals, and educational expectations and academic achievement. The results indicated that parent autonomy support was indirectly related to academic achievement through intrinsic life goals. The study also found intrinsic life goals to be positively related to student expectations and both values to be positive predictors of academic performance. The important lesson here is that the several contacts imparting autonomy-supportive feedback make schools more conducive to intrinsic aspirations, optimised learning.

Vasquez, A. et al. (2016) performed a systematic review with meta-analysis of 36 studies exploring AS in parent-child and peer relationships and its association with child outcomes. Conversely, PAS is negatively correlated with academic burnout, anxiety, and depression. However, higher PAS correlated with poorer psychological health. In order for PAS to work, both parents must support it, not one or the other. Results from this study suggested that PAS was differentially effective across congruent outcomes via language and grade levels. These results have important implications for theory development and future research.

Jungert and Koestner (2015) examined the effects of teacher support, parent support, and self-efficacy on high school students motivation and academic goals in science. Data On the basis of previous studies, we analysed data of students who completed self-report questionnaires (surveys) over multiple time points, and whose academic records were later also examined to obtain effects on academic performance (Study 1), including our self-selection-based screening of subgroups (Studies 2 and 3). Teacher autonomy support predicted motivation, self-efficacy, and academic performance positively while parental autonomy support was not associated with such outcomes. Thus, the results show that teacher autonomy support is by far the more

effective element in improving the science class experience for students that have intrinsic motivation.

Diesel and Samdal (2014) investigated teachers' autonomy support with these outcomes in students by examining students' achievement goals, academic performance, and deviations of life satisfaction. Results showed that teacher autonomy support positively predicted all types of achievement goals: mastery, performance approach, and performance avoidance. A relationship was also found between teachers' autonomy support and their achievement goals, academic achievement and life satisfaction, with variations in grades and gender. The findings emphasize the significant role of teacher autonomy support in enhancing both academic achievement, as well as life satisfaction, two important dimensions of life adjustment.

Lucas, Jeno, and Diseth (2014) student motivation is explored through the lens of self-determination theory, explaining how the perception of autonomy, need satisfaction, self-regulation, and competence plays a role in student motivation. In their study, which included 316 upper secondary school students, they found that the degree to which teachers were perceived as being autonomy-supportive predicted need satisfaction that led to autonomous self-regulation, perceived competence, and school performance. In turn, the relationship between basic need satisfaction and school performance was fully mediated by means of autonomous self-regulation. Additionally, this study found that student perceptions of autonomy support by the teacher were class-shared, highlighting the role of group experiences on students' academic motivation. These results align with a motivational model based on self-determination theory.

Olusola (2013) studied 250 senior secondary school students across Nigeria found that both parent and teacher autonomy support predicted academic achievement. The findings indicated that both teachers' support for autonomy and parents' attachment were significant positive predictors of students' academic success, highlighting the importance of supportive relationships in promoting the learning outcomes of students.

Jiang et al. (2011) examined the relationship between the degree to which parents support students' autonomy and control in scheduling their academic work and

students' academic performance and motivation for a sample of 271 Asian American and 218 Latino American high school students. For Asian Americans, autonomy support from parents was positively associated with academic achievement directly, and positively associated with motivation indirectly via self-esteem. For Latino Americans, there was a positive relationship between autonomy support and self-esteem, which predicted academic achievement. Conversely, parental control of academic planning had a negative effect on academic achievement. For Latino American students, autonomy support had positive indirect effects but control of academic planning had negative direct effects on motivation.

2.4.2 Studies conducted at the National Level

Jitendra K. P., Antima D., Swarnaprava M., and Sarojini Mishra (2024) examine the significant role of parental encouragement in academic achievement through a comprehensive literature review. Their research reveals the many aspects of positive parental involvement, including effective communication, continuous motivation, and active participation that make up a supportive educational environment. The study also examines the diversity in experiences and impacts across demographic groups, highlighting the nuanced nature of the relationship between parental support and academic achievement. Now, one thing that stands out is that more support from parents is related to better academic performance of secondary school students, while less support from parents is associated with worse academic outcomes.

Najia, Z., Muhammad, T. S., and Rimsha, A. (2023) explored the mediating role of perceived parental involvement, autonomy support, and academic motivation on academic achievement by utilizing data from 427 students, and an approach based on structural regression, the authors discovered that parental involvement and autonomy support did predict academic motivation, which in turn had a positive predictive value on academic achievement. Extrinsic motivation predicted academic achievement better than intrinsic motivation and amotivation. Family structure and SES significantly influenced all other variables except for academic achievement, and no differences were found between the genders. SES did not significantly moderate how maternal autonomy support was perceived. Such findings might offer educators and parents with useful information that the academic success of first-generation university students can be strengthened with the help of extracurricular activities.

Banerjee R. and Halder S. (2021) conducted a correlation-type of research based on Self-Determination Theory (SDT) where they aimed to study impact of teacher and parent autonomy support on academic motivation in middle school students. They concluded that autonomy support from teachers and parents uniquely and additively predicted motivation. In this study, similar to motivation results, teacher control had a negative association with motivation. The finding underscores the need for training for the familiarity- and experienced-teachers who may be resistant to using autonomy support and also for parents who should be providing support when schools don't, the researchers said.

Shama P. and Renu D. (2017) investigated whether parenting style and ethnicity influence the academic achievement motivation and mental health among female adolescent students. Data were collected using the three-dimensional parental behaviour inventory, academic achievement motivation test, and the mental health inventory. The study participants included tribal and non-tribal adolescent students from intermediate colleges and +2 schools, which were selected using stratified random sampling, in Ranchi. Results showed that a rejecting parenting style was negatively related to academic motivation and mental health, and the loving parenting style was positively related to academic motivation and mental health. Mental health also differed based on ethnicity: non-tribal students had better mental health while tribal students had higher academic achievement motivation. A positive correlation was also discovered to exist between students' academic motivation and their mental well-being.

2.5 Review of related literature on Academic Achievement in Physics

2.5.1 Studies conducted at the International Level

Assem, Nartey, Appiah, and Aidoo (2023) identified student disposition, teaching strategies, misconceptions, and teacher qualification as factors that can lead to low levels of performance in physics. As physics is a significant subject that assists students comprehend universal laws and physical phenomena, it is significantly positive but has also been tended to by teacher and student attitudes which also have an influence on the performance of subjects. In their work, Naki (2018) indicated that negative attitudes, procrastination in some cases, have a large role regarding ineffectiveness in the Student learning. Effective teaching methods and quality of the

teacher, when properly established, can effectively dispel misconceptions and improve outcomes.

Boabeng et al. (2014) argue that even schools with plentiful resources will generate poor outcomes if instruction is of poor quality. Based on a sample of 857 senior secondary students in Kwara State, Nigeria, the study showed that spatial visualisation ability has a significant positive correlation with performance in physics, and that gender and type of school moderate that relationship. To that end, the team suggests introducing spatial visualisation tests into physics education to enhance student performance in physics as well as the wider STEM sector.

Abaniel (2021) focuses on the impact of the open inquiry learning model in the field of physics education in Southeast Asia grade 12 students in a state university in the Philippines. Through pre-test/post-testexperimental design and quantitative analysis, the research results show that the open inquiry model can effectively enhance students' conceptual knowledge, learning attitudes and 21st century skills, with high Hake gain (0.82). These results indicate an improved trend in students' learning attitudes, and the difference between the pre-test and post-testresults is significant. The conclusion further argues the need to conduct additional comparative studies involving the open inquiry model to determine its effectiveness in a local context as well as for the development of a professional development plan for teachers and pre-service teachers in the Philippines in order for the positive effects that the test results reflect to become sustainable, with the conclusion of the study as stated; "The results of the study the open inquiry model supports holistic learning which is essential to concept understanding and the attainment of 21st century skills.

Taslidere (2020) investigated predictors of 12th-grade students' physics achievement in Turkey. The predictor variables were cognitive, personal, socioeconomic, and physics-related predictor variables. It found that cognitive factors — including course grades and science achievement — accounted for the largest share of the variance in physics performance, at 60.6 percent of the variance. Other predictors included all but one of interest in physics, motivation and gender and teacher-directed activities. None of the socioeconomic variables were significant predictors of physics achievement, but the model explained a total of 64% of the variance.

Wang, X. and Liou, S.Y. (2017) expectancy-value theory and science learning and performance (in Taiwan). It examined three core beliefs: self-concept, intrinsic worth and utility value, and determined they were all significant predictors of achievement in science. Such initiatives raise science achievement through self-concept enhancement, mainly where the school environment is favourable (Al Naimi et al., 2019) In contrast, school-mean utility value negatively moderated the relationship between utility value and science achievement. The current study came to show the role of school context as a key influence on between-person variation in motivational ideas and science learning domains among Taiwanese adolescents.

Sun et al. (2012) used a multilevel modelling approach to explore the determinants of science achievement for Hong Kong secondary students. Male gender, high SES, high motivation and high self-efficacy were all significantly associated with higher science performance. Additionally, the parents of students who had high scores on science achievement were more likely to prioritize science in their lives. At the school level, the predictors of differences in science achievement were the number of students at the school, the socio-economic make-up of the student body, and the amount of weekly science instruction time.

Manjula, D., Sharma, and James, B. (2011) describe metacognition as a superior type and high-level supervisory activity, applying such high-level supervision to control the chain of high-order thoughts leading to the development of thoughts and new ways of understanding the text, as well as ways to organize the information from the text (Manjula, D., Sharma, & James, 2011). Thus, their study centered on self-monitoring behaviours among physics students, including the exploration of gender differences in self-monitoring skills. By analysing the performance of 490 university first-year physics students attempting online mechanics quizzes, it was found that students from higher-achieving classes are indeed capable of higher self-monitoring. The ability to self-monitor was not markedly different, however, there was a significant difference across the genders when it came to confidence levels.

2.5.2 Studies conducted at the National Level

Mohd, A. S., & Moheeta, K. (2016) conducted research on the senior secondary students of India, the students of some core subjects such as physics face many hurdles in their studies. There are several factors responsible for these problems

including institutional, psychological, personal, familial, environmental, teacher-related etc. The only other group of factors - personal ones like study habits and self-concept - are even more important than physical factors in relative terms. The first is how a student organises his/her learning, their study habits, and; the self-concept is how do students see themselves. And both are strong predictors of success. Such analysing tools and techniques are used to study the relationship of personal factors and achievement in physics by Siddiqui and Khan (2016) on a sample of 204 senior secondary students by using standardised tools to compute ANOVA and correlational analysis data.

Sujathamalini, J. and Kesavan, R. (2014) study on the Relationship between Learning Style and Academic Performance in Physics of Higher Secondary School Students, Education and Information Technologies. I conducted a study investigating whether the college physics students' learning styles make a difference in how well they perform in school. An achievement test and a learning style inventory were the instruments employed to collect data from 250 students randomly selected using a simple random sampling technique. The study showed a significant positive relationship of achievement in physics with learning style. "It's clear-cut that teachers are a big part of student success, and we want school leadership to continue to lead on professional development and transform the way teachers teach." A study of 300 teachers suggested that the sex of students in the survey would affect results (QQ tests among the non-working level factors, covering qualifications, experience and individual student needs – usually again posing as sex). Many schools lack modern instructional materials that are required for teaching and learning, the study added. Lastly, the authors noted the importance of improving teacher quality, bridging gaps in teacher training, and improving instructional materials.

2.6 Research Gaps Emerging from Review of Literature

Notable research gaps have been identified in literature review on the varied aspects of school climate and the effect of these conditions on academic performance. A perspective was shared by Kaur (2011) around the environmental factors and psychological resilience, while Jayalekshmi (2012) analysed the effect of family and school climates on behavioural disorders. Nikhat et al. (2022) also noted the relation of classroom climate with absenteeism and academic performance. Private school

students' academic performance varies with family environment (Cha, 2015). It was argued by Mary & Porgio (2015) that government need to help the schools to improve overall school environment, and Ahmad (2018) explored the link between school climate and emotional intelligence among female students. In addition, Indumathy and Annadurai (2022) found a significant relationship between school climate and achievement motivation and revealed that the best predictor of achievements is school climate. Parna (2022); Muhammad et al. (2023) discovered Keyun et al. (2023) exploring teacher support for left-behind children. A positive association was also demonstrated in Nigeria (Aldas, 2022) and Indonesia (Siti, 2022). Demiroz (2020) who affirmed relationships among school climate, belonging and motivation. But, on the other hand, Camilleri (2019) and Cocoradă et al. (2018) no significant differences by demographic correlate were found in terms of student performance related to dimensions of school climate. Linda et al. (2018) through the mediating role of community violence: Abdulraheem et al. As previously discussed, however, the model proposed by Bouchamma et al. The same good relations were shared by Geleta (2017) in Ethiopia and by Greenway (2017) in Georgia. Shullai (2017) found organisation climate to have varied effects on outcomes, while Shindler et al. The potential improvements needed for the climate found reaffirmation in (2016). If taken together, these studies highlight a need for more nuanced research in specific school climate dimensions, how they interact, and their impact on different student populations.

Across contexts, Zeynep (2011) showed a relationship between GPA and scientific reasoning and achievement but called for wider studies. Helena et al. (2015), different reasoning according to class sectors remains, suggesting class composition may play a role. Jensen et al. (2017) observed that reasoning levels improved after the freshman year for STEM majors, but Opitz et al. stated (2017, p. 15) in reviewing testing instruments, that studies of their validity are needed. Mushtaq et al. There was no relation between reasoning and their performance in terms of grades (2020), which was another demand for higher domain evaluation in assessments. Nurul et al. Insufficient strategies of proper teaching were needed to apply to acquisitions of reasoning ability in biology students (2020). According to Zulkipli (2020), pre-service teachers showed particularly poor reasoning and to quote De et al. (2023), calling for the examination of parental influences in the performance of STEM. Ma et al.

emphasized gender and Iyappan (2021) necessitating specificity. Only 26% of students reached higher levels of reasoning (Ranjusha, 2021) and Babu and Kalaiyarasan (2019) unintentionally proved that visual-spatial intelligence was helpful without procedural or academic change. A positive relationship between reasoning ability and achievement was found (Kanimozhi and Ganesan, 2017). In literature discussion, for example, the connection between reasoning and chemistry achievement has been studied by Jaleel and Premachandran (2017), whereas Premachandran's (2017) work is suggested as a pure constructivist model without cross-subject studies. Although Rani (2017) does discuss differences in reasoning and success among genders and age categories, there is not enough attention given to socio-economic status. Overall these findings point to the need for targeted interventions and novel teaching strategies that recognise the diversity of scientific reasoning ability across demographic groups.

Widia et al. (2024), Morales (2021) did describe forms of procrastination, but not their long-term effects on academic learning outcomes. Brilliant et al. (2020) found procrastination to not be a mediating factor for the relationships between fear of failure and achievement and called for a more nuanced approach to investigating the role of these feelings on such relationships. Conversely, international studies using interventions as the dependent variable (Naki, 2019; Kurtovic et al., 2019) have largely neglected to explore the potential levels of adaptation (i.e., acceptability) based on different contextual systems (e.g., education systems). With both gender (Filiz et al., 2013) and motivational attributions (Luis et al., 2020) features individual differences relevant to academic procrastination, the available literature has explored both features on procrastination to some extent, though neither remains well-validated in relation to procrastination in secondary education and beyond. Though various factors (gender, school environment, self-esteem, and academic achievement) have shown a significant correlation when assessed through national studies exploring procrastination (Babu et al., 2019; Anjali, 2018; Das, 2016), there are no explorations whether these relations are similar or different across different academic streams and family structures. Some studies (Sharma & Mehrotra, 2022; Smitha, 2018) propose high correlation between procrastination and stress, while others reflect weak associations with academic performance in higher secondary environment (Das, 2016). Further, there is a dearth of research documenting the longitudinal impact of

procrastination on mental health and academic achievement on adult adjustment in the long run, and very little examination of the specific challenges experienced by rural or tribal students as a whole.

While parental autonomy support has been well studied regarding academic achievement, there is a gap internationally regarding the relationship between parental autonomy support in high school and academic performance in all other forms of existing academic contexts. Jichen et al. (2023) validated the significant contribution of metacognition in the relationship between parental autonomy support and academic performance, suggesting that more ultimate mediators at the levels of individual or environment explore. This led them to a review of moderating factors such as gender role orientation, discovering that a low correlation exists between academic performance and autonomy support (Sakhavat & Schroeder, 2023). Shi and Tan (2020) found heterogeneous typologies of parenting, but the interaction between diverse parenting styles and academic achievement remains underexplored. Reflections on Teacher Autonomy: The Mediation Role of Self-efficacy and Engagement Gutierrez and Tomas (2019), saw a call for more examination to be conducted for these two domains in conjunction with parental influence to student self-determination development, confirming the mediating role of self-efficacy and engagement. Intrinsic life goals fostered through parenting support without consideration of contextual factors were however identified (Froiland, 2017). Turning to the longitudinal studies, e.g., Lu et al. 4. But we have not done sufficient longitudinal research on the effect of sustained deep parental support on students' academic performance. Vasquez et al. (2016) did note a stronger association with parental autonomy support when both parents were involved, necessitating the study of mothers' versus fathers' support. The strong link between teacher support and student outcomes (Jungert & Koestner, 2015), now separated in any way from parental support suggests the need to investigate whether the two now interact. Similarly, studies of how teachers' autonomy support is influenced by both gender and school grade (Disel & Samdal, 2014) would benefit from analogous analyses for parental support. Lucas et al. (2014) proposed and model of perceived autonomy support and self-regulation, but the question of how parental support is involved in this process remains unanswered. Sets like Olusola (2013) and Jiang et al. — in their analysis of how strong parental predictors are for academic achievement and less

clear what has accounted for these relationships (2011). Recent investigations draw attention to these gaps: Jitendra et al. (2024) also identified a significant correlation between parental encouragement and academic performance among secondary students, while Najia et al. However, (2023) investigated the interaction of parental involvement, autonomy support, and academic motivation and reported that maternal support had the greatest influence. Banerjee and Halder (2021) investigated the additive, unique roles of parent and teacher autonomy support and advocated for on-the-ground interventions aimed at enhancing both. Perween & Dewan (2017) examined how ethnicity affected performance in the context of investigating the impact of parenting styles on tribal and non-tribal females' academic motivation and mental health. While such studies shed light on the constructs of parental involvement and autonomy support per se, much is still unknown about how certain moderating variables — for example, the parents' expectations of these behaviors from their children and the cultural and social context — affect the academic outcome, hence necessitating more detailed exploration on the subject matter.

The final point raised in the summary of physics education research was that very little work has been done on identifying factors that influence student performance. Studies by Assem et al. (2023) demonstrate that performance could be affected by student attitudes, teaching methods, misconceptions, and a teacher's qualifications. Badmus and Jita (2022) identify spatial visualisation as an important predictor of performance, while Abaniel (2021) suggests that inquiry models of learning can play a key role in allowing students to develop their conceptual knowledge of physics. Other studies address motivational beliefs and cognitive factors associated with accomplishments (e.g., Taslidere, 2020; Wang & Liou, 2017), and they call for further investigation of three-dimensional analyses that embrace socio-cultural settings and stakeholder needs (Li, 2018). Though on a national level, personal factors like study habits and learning styles have been a recurring theme (Siddiqui & Khan, 2016; Sujathamalini & Kesavan, 2014), other aspects of the educational ecosystem like teacher quality and leadership dynamics seem to have been excluded from considerations (Mohd Shamim et al., 2013). Hence, there is an urgent need to study those combined factors and how they affect the physics achievement among the students, specifically in the Indian context.

The review of literature across themes of school climate, scientific reasoning, procrastination tendencies, parental autonomy support, and academic achievement reveals significant research gaps that necessitate further exploration. There are many research gaps in all the themes of school climate, reasoning in the field of science, procrastination tendencies, autonomy support by parents, and achieving the educational goal during schoollife as is evident from their literature-review. As noted, school climate is relevant to academic success in multiple ways, but scholars are calling for nuanced investigations of specific dimensions of school climate (such as interactions between environmental factors and student demographic characteristics) to advance understanding of school climate and academic success relationships. Likewise, although links with academic success are established, evidence is sparse to guide effective practice across contexts and learner demographics, especially with respect to gender differences and effective teaching practice. This finding has been described as a negative correlation between academic achievement and procrastination. While the procrastination literature recognises this correlation, there is insufficient exploration of individual mediating factors or long-term impacts of different types of procrastination. As for parental autonomy support, previous studies have suggested its potential effect on academic achievements, but the underlying mechanisms, especially the influence of participants' gender and cultural background, were not sufficiently examined previously. Finally, many of the studies addressed to academic engagement and performance in physics call for more holistic approaches that need to contemplate a broader range of factors influencing students' learning processes—personal, instructional, and socio-cultural. Together, these gaps highlight the need for focused investigations that consider the complex interactions of factors related to academic success over different types of educational contexts.