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SOCIOECONOMIC STATUS AND PHYSICS ACADEMIC ACHIEVEMENT AMONG FILIPINO STUDENTS: AN EMPTY SYSTEMATIC REVIEW

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Abstract

The paper presents an empty systematic review examining empirical literature on the relationship between socioeconomic status (SES) and Physics academic achievement among Filipino students. Studies published from 2000 to 2025 were systematically searched in Google Scholar, Semantic Scholar, ERIC, and ProQuest following PRISMA 2020 guidelines. Of 364 identified records, 338 were screened, with 327 excluded primarily because they focused on other disciplines ($n = 142$) or did not examine SES as the relevant construct ($n = 123$). Eight records underwent full-text assessment; however, none met all eligibility criteria because five used inappropriate outcome measures and three were unavailable in full text. Consequently, no eligible empirical studies specifically examining the relationship between SES and Physics achievement among Filipino students were identified. This finding should not be interpreted as evidence that SES has no effect on Physics achievement; rather, it indicates an absence of eligible Philippine evidence addressing this relationship. Existing literature has examined SES in relation to mathematics, reading, general academic achievement, and science literacy, often using large-scale assessment data, but has not reported Physics-specific achievement. The review identifies major gaps, including the lack of Physics-specific empirical investigations, reliance on general science measures and large-scale assessments, limited Philippine evidence, scarcity of discipline-specific educational research, and insufficient evidence to guide targeted interventions. Future research should employ curriculum-aligned Physics achievement measures, multidimensional SES indicators, and rigorous quantitative, qualitative, mixed-methods, multilevel, and longitudinal designs to examine socioeconomic disparities and inform evidence-based interventions in Philippine Physics education.

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Introduction

It is well known that socioeconomic status (SES) is one of the primary determinants of educational outcomes and a main indicator of educational equity. SES is a multi-dimensional concept that captures the social and material environment in which students live and study and not an individual characteristic. There are several ways through which SES can be measured, including income, parents' education levels, their occupation, and educational opportunities among others (Sirin, 2005; Liu et al., 2022). International studies suggest that students coming from more affluent socioeconomic background tend to perform better academically. In an earlier meta-analysis, Sirin (2005) revealed a moderate stable relationship between SES and academic performance. Later, Liu et al. (2022) with use of data from almost one million students in 47 countries and international assessments with participation of more than five million students in 105 countries and regions found positive correlations ranging from $r = 0.22$ to 0.28 . Inequalities remain persistent, and in some cases, gaps in academic achievement in relation to SES have widened despite higher educational participation rates (Chmielewski, 2019). The association between socioeconomic status and academic performance may be influenced by several interrelated factors such as access to education, motivation, self-efficacy, home-based learning, parental features, and the nature of SES at the school level (Tan, 2022; Tan et al., 2023; Eriksson et al., 2021; Yiğiter, 2025). Hence, SES inequality is not only a reflection of inequality in family resources but also inequality in the educational experiences.

In case of science education, learning may depend on access to books, technological devices, laboratories, enrichment activities, and favorable learning environments. Positive relations between SES and science performance at various educational levels and in developing countries have been shown in international studies (Kim et al., 2019; Liu et al., 2022; Barnes et al., 2024; Zhao et al., 2022). However, science consists of different disciplines, and evidence related to general science performance cannot be simply extrapolated to particular sciences. Studying physics involves applying the concepts and knowledge, engaging in abstract and quantitative thinking, performing calculations, conducting investigations, and carrying out experiments. Therefore, the mechanisms by which the influence of SES on physics achievement may operate might differ from those influencing the general science performance. At the same time, evidence related to the specific fields of sciences is still lacking, and existing international

evidence is sometimes inconclusive. For instance, Adeyemo and Babajide (2012) found no correlation between SES and physics performance among Nigerian secondary school students. The importance of examining the issue of the role of SES in physics achievement is also highlighted in the Philippine context, as the country has witnessed the growth in education participation but educational inequities still exist there. Yee (2023) proved that the growth of education from 1950 to 2015 failed to solve inequalities in secondary education and higher education participation, while Castillo et al. (2025) explained the differences in the student performance in part by the unequal access to digital technologies and other educational resources. Evidence collected in the Philippines within PISA 2018 suggests that SES accounts for considerable variance in mathematics and science performance (Bernardo, 2020). Moreover, according to Cabural (2024), the poor science performance of Filipino students is caused by such interacting factors as poverty, inequality in educational resources, school quality, and teacher performance.

While there are increasing amounts of evidence about SES inequalities in general education and sciences, it is still unclear whether empirical studies have examined the association between SES on physics academic performance among Filipinos. The majority of Philippine studies have investigated overall academic performance, mathematics, reading, science literacy, educational inequality, or institutional outcomes, but not the physics achievement as a separate discipline. The distinction is important since evidence obtained from general science tests cannot reveal the unique features of knowledge and skills necessary for physics learning. Consequently, lack or shortage of discipline-specific evidence makes it difficult to understand whether the SES gradient in academic achievement described by international research is typical for Filipino students' physics performance. In order to examine the question, the current research conducts systematic review of the Philippine literature using the PRISMA 2020 framework (Page et al., 2021). Specifically, the study investigates whether empirical studies satisfying the predefined eligibility criteria have examined the relationship between SES and Physics academic achievement among Filipino students, finds out the most common reasons why potentially eligible studies are excluded, identifies major gaps in evidence, and provides recommendations for further research. As a systematic search may lead to finding no studies meeting all pre-defined inclusion criteria, the empty systematic review approach is applied to the analysis (Slyer, 2016; Fitzgerald, 2018).

Theoretical Framework

This study conceptualizes socioeconomic status (SES) as a multidimensional phenomenon, which involves several dimensions (such as material conditions, family, individual, and school) and influences learning through connected pathways, but not through a direct causal process (Sirin, 2005; Liu et al., 2022; Tan et al., 2023). This model is particularly important for Physics, as high requirements for quantitative skills, abstract thinking, and experiments make the availability of special materials and technology especially vital (Yiğiter, 2025). While the possible moderating effects of other variables on the relationships between the hypothesized pathways should be considered (Chmielewski, 2019), the model itself does not imply any causal relationship and does not involve any empirically validated connections between multidimensional SES and academic achievement among Filipinos. The model provides an analytical tool for linking multidimensional SES indicators through possible learning pathways to Physics achievement to critically analyze existing literature. In case of an empty systematic review, a lack of studies is a clear gap in the existing evidence, but not evidence that there is no relationship between SES and Physics achievement.

Literature Review

Socioeconomic Status and Academic Achievement

Socioeconomic status (SES) is a multidimensional concept that includes the social and economic factors that characterize the families and education settings of students. Thus, it should not be confused with the SES indicators, which are individual variables used to operationalize a dimension of the larger concept. Indicators of SES include household income, parents' education, parents' occupation, and availability of educational resources (Sirin, 2005; Liu et al., 2022). Extensive international literature has demonstrated that SES has an important association on academic achievement of the students. Sirin (2005) has found a moderate relationship between SES and student achievement at different levels of education. Recently, Liu et al. (2022) reported positive associations between SES and academic performance of the students based on large international databases with the correlation coefficient varying from $r = 0.22$ to 0.28 . It was shown that relatively small socioeconomic inequalities still have educational consequences. According to Chmielewski (2019), achievement gaps associated with SES became more pronounced in numerous educational systems that means that increased participation in education does not necessarily lead to reduced inequalities in learning outcomes.

Pathways Connecting SES and Learning Outcomes

However, the relationship between SES and academic achievement is not determined by the family income alone. Contemporary research shows that the advantages of socioeconomic status work through interlinked pathways including material resources, educational opportunities, motivation, self-efficacy, parents' characteristics, and school environments. Thus, Tan (2022) found that the relationship between family SES and science achievement becomes stronger when indirect pathways including educational resources and motivation of the students were taken into consideration. At the same time, Tan et al. (2023) showed that students with more socioeconomic advantages tend to have greater self-efficacy for science learning in comparison with those coming from less privileged families. Additionally, Eriksson et al. (2021) and Yiğiter (2025) found that such variables as parental education and occupation, home and school SES, and availability of educational resources were associated with academic achievement of the students. This is consistent with a theoretical model in which SES is viewed as a multifaceted socioeconomic situation, but income, parents' education, occupation, and educational assets are separate dimensions or indicators of that socioeconomic situation. Thus, it can be concluded that the influence of socioeconomic inequalities works through different dimensions including not only family but also individual and school contexts.

Socioeconomic Status in Science Education

The role of SES is especially important in science education because effective learning of science requires learning materials, computer technologies, laboratories, extra-curricular activities, and appropriate educational environment. International studies have demonstrated that there are positive associations between the socioeconomic conditions and science achievement at different levels of education (Kim et al., 2019; Liu et al., 2022). For example, students from more privileged families could have better access to books, technologies, additional classes, and other sources that would promote learning out of school (Barnes et al., 2024; Zhao et al., 2022). It is important to note that Kim et al. (2019) found that socioeconomic disparities exist even in developing-country contexts although their intensity may vary in different national settings. Thus, it can be seen that socioeconomic inequalities are a universal characteristic of science education rather than something unique to well-developed educational systems.

Need for Physics-Specific Evidence

However, although science education literature provides robust evidence of the existence of socioeconomic inequalities, different branches of science impose different learning demands and require different conditions. General measures of science achievement usually include competencies in Biology, Chemistry, Earth Science, and Physics, but may not reflect the characteristics of Physics learning. Learning Physics requires the use of conceptual knowledge, mathematical abilities, abstract thinking, quantitative problem-solving skills, scientific inquiry, and laboratory experiments. Access to specialized equipment, calculators, laboratory classes, additional materials, and learning supports related to Physics may therefore contribute to differences associated with SES in Physics learning that are not captured by measures of general science achievement. Nevertheless, the discipline-specific evidence is not abundant. For instance, Adeyemo and Babajide (2012) found that there is no relationship between SES and Physics achievement among secondary school students in Nigeria. This discovery further clarifies the reasons why connections that have been made in general education and science cannot automatically be applied to Physics.

Socioeconomic Inequality in the Philippine Educational Context

The particularities of Philippine educational context provide strong justification for analysis of the SES–achievement relationship within specific subject areas. Despite considerable expansion of the access to education, the inequalities in educational opportunities and learning outcomes are still pronounced. Thus, Yee (2023) found that the process of educational expansion from 1950 to 2015 did not eliminate disparities in completion of secondary education and participation in higher education. Additionally, Castillo et al. (2025) discovered associations between socioeconomic inequalities and student performance, partly related to the uneven distribution of digital technologies and other learning resources. Thus, it becomes clear that the socio-economic disadvantage remains a factor that influences educational attainment and learning conditions.

SES and Philippine Science Achievement

The available evidence from Philippine science education also shows that there are socioeconomic factors associated with learning outcomes. Based on Philippine PISA 2018 data, Bernardo (2020) found that SES was a powerful predictor of mathematics and science achievement and explained more variance than

psychological factors such as growth mindset. Cabural (2024) found that poverty, unequal distribution of educational resources, schools' quality, and teachers' performance were interacting factors that contributed to the persistently low science performance of Filipino students. Nevertheless, this evidence is not relevant to achievement in a particular Physics course or Physics-specific assessment. Therefore, it can be concluded that this literature provides valuable background information about socioeconomic inequalities but does not establish whether SES is associated with Physics achievement among Filipino students.

Evidence Gap in Philippine Physics Education

The difference between general science achievement and Physics achievement is a crucial point of the present study. As it has been mentioned above, the existing Philippine literature proves that there are socio-economic factors that influence achievement but it does not contain evidence about the particular association between SES and Physics achievement. The lack of such evidence is important because Physics requires particular learning conditions that may have specific interaction with socioeconomic status. Considering the definition provided above, this connection can involve a number of aspects, such as resource access, learning possibilities, motivation, self-efficacy, home support, and the school environment. The identification of the particular relationship requires the study that would explicitly measure SES or its relevant dimensions and Physics achievement using appropriate discipline-specific outcomes. This evidence gap serves as a basis for the systematic analysis of the literature and determination of the presence of the relevant evidence.

Rationale for an Empty Systematic Review

Systematic review represents a methodology for locating, evaluating, and synthesis of evidence; however, in some fields of research, the results of the systematic search might show that there are no studies that meet all predetermined criteria. Such systematic reviews are correctly described as empty systematic reviews and are important for documenting an absence of eligible evidence rather than evidence of the absence of an association or effect (Slyer, 2016; Fitzgerald, 2018). The PRISMA 2020 statement provides a framework for transparent description of identification, screening, eligibility assessment, and inclusion of studies in systematic reviews (Page et al., 2021). In case of Philippine Physics education, the empty systematic review becomes important because it allows to define whether the evidence gap that has been detected is real, to describe the reasons of exclusion of

the potentially relevant studies, and to identify priorities for further empirical research.

Research Questions

The research aims to systematically identify and evaluate empirical literature concerning the relationship between socioeconomic status and Physics academic achievement among Filipino students and determine whether sufficient evidence meeting predefined eligibility criteria exists for a systematic review.

1. What empirical studies meeting the predefined eligibility criteria have examined the relationship between socioeconomic status and Physics academic achievement among Filipino students?
2. What are the primary reasons for the exclusion of identified studies during the screening and eligibility assessment?
3. What evidence gaps exist regarding the relationship between socioeconomic status and academic achievement in Physics among Filipino students?
4. What recommendations can be made to guide future research on the relationship between socioeconomic status and academic achievement in Physics among Filipino students?

Methodology

Research Design

In order to evaluate the existence of empirical research in relation to the influence of socioeconomic status (SES) on the academic performance in Physics of Filipino students, an empty systematic review was used as the research design. Empty systematic review involves a process of synthesis of scientific evidence, when there is a comprehensive and systematic search based on predefined inclusion criteria, but there are no articles matching all inclusion criteria. Thus, the goal of such an approach is to document the absence of evidence, identify research gaps and provide recommendations for future research in the field.

The review was performed according to the methodology of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 (PRISMA 2020; Page et al., 2021). The review protocol covered the research questions, inclusion criteria, sources of information, search strategy, methods of selecting studies, as well as methodology to be used in the assessment of evidence before the final analysis of the collected studies. Although the current systematic

review is not registered in a systematic review register, its inclusion/exclusion criteria, search methods, and search strategy have been clearly defined before the start of the searches. Since the review does not address any health outcome, registration with PROSPERO was not done. The systematic review was not registered on any other database since there is no requirement for doing so.

Eligibility Criteria

For the inclusion in the review, articles had to comply with specific criteria.

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
1. Investigated the relationship or effects of socioeconomic status on academic achievement in Physics;	1. Investigated academic achievement in subjects other than Physics without reporting Physics-specific outcomes;
2. Conducted within the Philippine educational context;	2. Were conducted outside the Philippines;
3. Published between January 2000 and December 2025;	3. Were published before 2000 or after 2025;
4. Included Filipino students from elementary, secondary, tertiary, or teacher education levels;	4. Were editorials, opinion papers, conceptual papers, literature reviews, or theoretical articles;
5. Employed quantitative, qualitative, mixed methods, or action research designs;	5. Did not explicitly examine socioeconomic status or related socioeconomic indicators as an explanatory variable;
6. Published as peer-reviewed journal articles, conference proceedings, master's theses, doctoral dissertations, or institutional research reports;	6. Did not provide sufficient methodological information;
7. Available in full text; and	7. Were unavailable in full text; or
8. Written in English.	8. Were written in languages other than English.

In particular, in this case, socioeconomic status could be indicated by means of family income, household economic status, parental education, parental occupation or any other measures of socioeconomic status. Articles analyzing broader notions such as social support or family environment without SES indicator were excluded. Publication bias was taken into account: both peer-reviewed and grey literature were included in the review.

Information Sources and Search Strategy

The literature search was performed in four electronic databases: Google Scholar, Semantic Scholar, ERIC and ProQuest. Only literature published between January 2000 and December 2025 was included in the review. The searches were conducted by means of key words related to the research topic – socioeconomic status, Physics achievement and Philippines.

The first search string was: (“socioeconomic factors” OR “socioeconomic status” OR SES OR “family income” OR “household income” OR “parental

education” OR “parental occupation”) AND (physics) AND (“academic achievement” OR performance OR grades OR score* OR assessment) AND (student* OR learner*) AND (Philippines OR Filipino*)

Table 2. Syntax for Each Database Used

Database	Search Fields	Search Syntax	Filters Applied
Google Scholar	Title	(“socioeconomic factors” OR “socioeconomic status” OR SES OR “family income” OR “household income” OR “parental education” OR “parental occupation”) AND (physics) AND (“academic achievement” OR performance OR grades OR score* OR assessment) AND (student* OR learner*) AND (Philippines OR Filipino*)	With all of the words: “Philippines” With the exact phrase: “academic achievement” With at least one of the words: “socioeconomic”, “status”, “family income”, “household income”, “parental education”, “parental occupation”, “academic achievement” Where my words occur: in the title of the article Return articles dated between: 2000-2025
Semantic Scholar	Title, abstract	(“socioeconomic status” OR SES OR “family income” OR “household income” OR “parental education” OR “parental occupation”) AND (physics) AND (“academic achievement” OR performance OR grades OR score* OR assessment) AND (student* OR learner*) AND (Philippines OR Filipino*)	Fields of Study: Education, Chemistry Date Range: 2000-2025
ERIC	Title, abstract	(“socioeconomic status” OR SES OR “family income” OR “household income” OR “parental education” OR “parental occupation”) AND (physics) AND (“academic achievement” OR performance OR grades OR score* OR assessment) AND (student* OR learner*) AND (Philippines OR Filipino*)	None
ProQuest	Title, abstract, subject terms	(“socioeconomic status” OR SES OR “family income” OR “household income” OR “parental education” OR “parental occupation”) AND (physics) AND (“academic achievement” OR performance OR grades OR score* OR assessment) AND (student* OR learner*) AND (Philippines OR Filipino*)	Applied Filters: 2000-01-01 – 2025-12-31 Subject: students, education, learning, academic achievement, science education, physics, socioeconomic factors, teaching, science instruction Limit to: Full text, peer reviewed

The searches began on June 29, 2026, and used the same start date across all four databases. In total, 364 entries were identified, namely ProQuest (n = 65), ERIC (n = 27), Google Scholar (n = 21), and Semantic Scholar (n = 251). Such databases were chosen to ensure the coverage of peer-reviewed journals related to sociology, theses and dissertations, and other scholarly entries regarding socioeconomic status, Physics achievement, and education in the Philippines.

The date of the search is provided because the contents of the databases are constantly updated and indexed. Backward and forward citations searches were performed to find additional literature that could be omitted during electronic database searching. Pilot searches were performed to improve the literature retrieval.

Study Selection Process

Selection process involved identification, de-duplication, title-screening, abstract screening and full-text eligibility screening. All the records obtained in the literature searches were imported into Zotero for reference management and de-duplication purposes and thereafter uploaded into Rayyan to perform the systematic screening process. There were 364 records initially identified. Using Zotero and Rayyan for de-duplication process led to 26 duplicate records (7.14%) elimination. Hence, 338 unique records (92.86%) proceeded to title screening.

The two authors performed as independent reviewers during the screening process. They independently assessed records based on pre-defined inclusion/exclusion criteria. At each level of screening, the reviewers independently made decisions on whether or not to include a record, providing a justification for exclusion where applicable. In case of discrepancy between the reviewers’ assessments at each level of screening, the problem was solved by direct consultation in an attempt to achieve consensus. In the event consensus could not be reached, the disagreement was referred to an independent third reviewer. Inter-rater agreement was measured using Percent Agreement, which is obtained from reviewers’ screening decisions. It was used descriptively to indicate level of agreement between reviewers, and not as replacement to the reviewers’ consensus-based inclusion/ exclusion decisions. Inter-rater agreement was assessed using Percent Agreement at each screening stage, yielding 99.70% for title screening, 90.90% for abstract screening, and 100.00% for full-text assessment.

There was a steady reduction in the number of potentially relevant records through the process of

screening. Out of 364 records that were retrieved, 26 (7.14%) were duplicate records that were eliminated, thus remaining with 338 (92.86%) non-duplicate records for the screening of titles. Of the total 364 records retrieved, 11 (3.25%) went through abstract screening out of which 8 (72.73% of the 11 records undergoing abstract screening) were taken for full-text screening. All eight records that underwent full-text screening were later eliminated thus having zero (0%) records that met the eligibility criteria out of the eight full-text screened records. This implies that of the 364 retrieved records only 8 (2.20%) got to the full-text stage.

Out of the 327 articles excluded in the primary screening stage, the most common reason for exclusion was that of inappropriate discipline ($n = 142$; 43.43%) while inappropriate socioeconomic status construct/concept was the second most common reason ($n = 123$; 37.61%). Other reasons for exclusion were inappropriate setting ($n = 25$; 7.65%), inappropriate population ($n = 24$; 7.34%), inappropriate research design ($n = 12$; 3.67%) and inappropriate language ($n = 1$; 0.31%). This indicates that most articles which would have been potentially relevant were those of inappropriate disciplines other than Physics or of inappropriate socioeconomic status constructs.

Table 3. Screening Records and Percentage

Stage	Records	Percentage
Records identified	364	100%
Duplicates removed	26	7.14% of identified
Records after duplicates	338	92.86% of identified
Records progressing to abstract assessment	11	3.02% of identified / 3.25% of post-duplicate records
Full texts assessed	8	72.73% of abstract-stage records / 2.20% of identified
Included studies	0	0% of full texts assessed

Eleven records went to abstract-level assessment out of which three records were excluded since their outcomes related to general science achievement and not specific Physics achievement. This left eight records for full-text assessment. These eight full texts were independently assessed against all pre-defined inclusion criteria. Five records were excluded due to inappropriate outcome measures that did not reflect Physics academic achievement. Three full texts could not be accessed for assessment against inclusion criteria. Therefore, no study met all the pre-defined inclusion criteria and was included in the final review.

Though none of the studies met all the inclusion criteria, a total of eight studies that had advanced into full-text review were evaluated descriptively based on their methodologies and substantive contents before exclusion. The evaluation considered the match between the study population, SES construct/ indicator used, study context, research design, and more

importantly the outcome measure with the preset inclusion criteria. Much importance was given to whether the outcome measure was a Physics-specific achievement outcome or one that covered a wider academic domain like science, math, reading, or general academic achievement. Five studies were excluded based on the fact that their outcome measures failed to meet the preset criterion of having a Physics-specific achievement outcome, and three studies were excluded because their full texts were not accessible. Because no study met the inclusion criteria, no formal quality assessment of the studies was done.

Data Extraction

Prior to the review, a data extraction form was prepared. If eligible articles had been found, then the following information would have been extracted: author(s), year of publication, level of education, geographical location, school type, research design, participants' characteristics, sample size, measures of socioeconomic status, measures of Physics academic achievement, statistics, main results, study limitations and recommendations. As no articles met all inclusion criteria, no data extraction was performed.

Quality Assessment

The assessment of the quality of the study was not performed as there were no eligible articles. If needed, the evaluation of the quality would have been performed using the Mixed Methods Appraisal Tool (MMAT) 2018. During the evaluation, the appropriateness of the research design, sampling, data collection and analysis and conclusions would have been assessed.

Data Analysis

As there were no eligible articles, neither quantitative nor qualitative synthesis of the obtained literature was performed. However, the analysis was focused on the documentation of the review process and characterization of the evidence gap. Specifically, the following issues were analyzed: (1) number of records retrieved from all information sources; (2) reasons for exclusion at the stages of title/abstract/full-text screening; (3) amount of existing literature on the issue of socioeconomic status and Physics academic achievement among Filipino students; and (4) implications of the identified evidence gap for future educational research, policy and practice. The findings were described descriptively with the help of the PRISMA flow diagram and corresponding tables.

Moreover, a gap analysis was performed to identify those areas of scholarly literature that require further attention. Possible explanations for the lack of

literature can be the focus of disciplines, terminology differences, publication pattern, and methodological limitation of the existing literature. Recommendations for further research were proposed taking into account the identified gap and based on international scholarly works in the field of the research problem.

Ethical Considerations

As this study includes the review of publicly available literature, no human participants are involved, and their informed consent is not required. However, the principles of ethics in research were applied to this study through the documentation of the process of the review, the accurate report of the findings, proper referencing of all sources, the avoidance of plagiarism and truthful description of the existing evidence. The review protocol was developed before the literature search in order to enhance the methodological transparency of the research and minimize the risk of reporting bias.

Results and Discussion

An “empty” systematic review is regarded as a legitimate result of research activity and occurs when a comprehensive search leads to no relevant studies to address a certain research question (Fitzgerald, 2018; Slyer, 2016). Though this outcome might seem rather rare, it is rather common; for example, 8.7% of Cochrane systematic reviews are empty (Slyer, 2016; Yaffe et al., 2012). Usually, there are two main reasons for systematic reviews to be empty (Moreal et al., 2026; Slyer, 2016; Yaffe et al., 2012): (1) the lack of research on the topic, i.e., the topic is rather new or is not of great scholarly interest; and (2) the excessive strictness of the inclusion/exclusion criteria when searching. The current review meets both of these conditions to be classified as an empty systematic review: first, there is scarce literature on the topic of effects of socioeconomic status on the academic achievement in Physics among Filipino students; and second, inclusion criteria require a number of strict conditions.

None of the potential eligible empirical studies emerged after the full-text eligibility assessment. As such, the synthesis of empirical data was impossible since none of the studies met the criteria for inclusion. No eligible effect sizes, statistics, or any other empirical information can be synthesized. Therefore, the Results and Discussion sections of this review do not include a meta-analytic comparison of empirical data or thematic analysis of qualitative results. In contrast, the results of this empty review focus more on the findings of the conducted systematic search and reasons for exclusion of potentially eligible records, along with evidence gaps uncovered during this

process. This difference is critical because one cannot consider the lack of eligible studies as a proof of the absence of connection between SES and Physics academic performance. It means that the conducted systematic search did not reveal the empirical evidence required to establish or analyze the connection between SES and Physics performance among Filipino students.

RQ1. What empirical studies have investigated the effects of socioeconomic status on the academic achievement in Physics of Filipino students?

Figure 1 depicts the PRISMA flow diagram for the study identification, screening, eligibility assessment, and inclusion. The key result is that there are no empirical studies that have investigated the effects of socioeconomic status on Physics academic achievement among Filipino students according to the predetermined eligibility criteria. Though the systematic search across four major databases has produced 364 records, none of these articles satisfies the review criteria including: (1) the use of Filipino participants, (2) the analysis of socioeconomic status as the predictor, and (3) the use of Physics academic achievement as the outcome measure. Thus, the present systematic review is classified as an empty one since there is no eligible evidence on the relationship between socioeconomic status and Physics academic achievement among Filipino students.

This result contradicts the international educational literature on this topic. The evidence consistently demonstrates that socioeconomic status is one of the main predictors of academic achievement in educational context across educational levels (Liu et al., 2022; Sirin, 2005). A similar pattern is observed in science education research when socioeconomic advantage leads to better science achievement due to greater access to learning resources and opportunities, greater science self-efficacy, and better school environment (Barnes et al., 2024; Tan, 2022; Tan et al., 2023; Zhao et al., 2022). Even in the case of developing countries, socioeconomic status remains to be a key predictor of educational outcomes, however, with a smaller effect size (Kim et al., 2019). Similarly, prior Philippine literature demonstrates the presence of the same inequalities in relation to participation in the educational process, institutional outcomes, and science academic achievement (Bernardo, 2020; Cabural, 2024; Castillo et al., 2025; Yee, 2023). Thus, the theoretical and empirical literature allows to conclude that socioeconomic status impacts on Physics academic achievement as well.

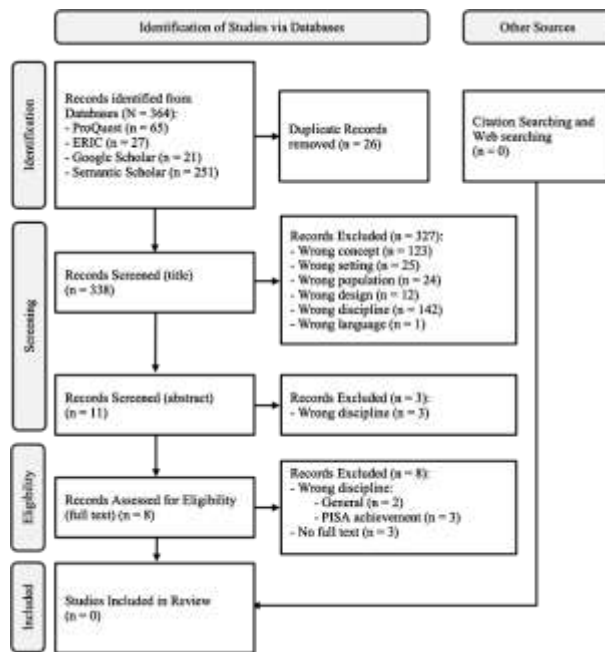


Figure 1. PRISMA flow diagram

However, the current systematic review shows that this assumption has not been examined by the empirical literature dedicated to this issue specifically. It should be noted that the lack of empirical evidence in empty systematic reviews does not mean that there is no effect of socioeconomic status on Physics achievement but indicates that there is no eligible evidence of this effect. Empty systematic reviews play a very important role in evidence synthesis by distinguishing between a true absence of effect and absence of research in order to prevent unsupported conclusions based only on the lack of the evidence (Page et al., 2021).

Thus, this result demonstrates the existence of the discipline gap in Philippine educational research. Although socioeconomic inequalities have been extensively investigated in terms of academic achievement or science education, evidence in relation to Physics is currently not available. Thus, the current systematic review provides an important benchmark by demonstrating the absence of empirical evidence on the issue and pointing to the necessity of future studies.

RQ2. What are the primary reasons for the exclusion of identified studies during the screening and eligibility assessment?

The screening and eligibility assessment has provided the following information concerning the main characteristics of the retrieved literature (see Figure 1). Among 338 unique records which were screened by titles, 327 (96.75%) were excluded as being inconsistent with the pre-established criteria. The most common reasons were wrong discipline (n = 142) and wrong concept (n = 123). Other reasons were wrong setting (n = 25), wrong population (n = 24), wrong

research design (n = 12), and wrong language (n = 1). Also, during the abstract screening, three additional studies were excluded because these studies focused on science education in general, rather than on Physics specifically. Among eight full text-reviewed articles, five were excluded due to the wrong outcome measure, and three were excluded due to lack of availability of the full texts.

The predominance of exclusions according to the discipline indicates that the existing literature deals with the broader educational outcomes rather than specific achievement in Physics. Most of the retrieved studies investigate mathematics, reading, English, science literacy, or overall academic achievement. This indicates that the researchers have mainly investigated socioeconomic status as a factor determining general educational achievement but have not extended their studies to the discipline-specific achievement that requires additional research.

Table 4. Most Relevant Studies Considered during Eligibility Assessment but Excluded from the Review

Study	Why it was Initially Relevant	Reason for Exclusion
Haw & King (2023)	The current study examined the correlates of academic performance among Filipino students using the Philippine PISA 2018 dataset. In particular, it studied the role of socioeconomic status (SES) together with personal, school, and contextual factors and their influence on student performance, making the paper quite relevant during title and abstract screening.	Excluded after the full-text review since the dependent variable was reading achievement, not physics academic achievement. Even though SES was one of the independent variables, no results related to physics learning or physics achievement were provided in the paper.
Cabural (2024)	The article focused on the factors that cause poor performance among Filipino students in PISA Science and identified socioeconomic status as one of the significant contributors. In light of the topic, it looked like an appropriate choice for the paper.	Excluded due to its nature of a diagnostic literature review synthesizing previous evidence, rather than providing original empirical findings. Besides, the examined outcome was general science literacy/performance in PISA, not physics academic achievement in a physics course.
Orbeta et al. (2020)	The study conducted quantitative analysis of associations between individual, family, and school socioeconomic factors and academic performance of Filipino students in 2018 PISA assessment. The fact that family SES variables and science achievement are investigated means that it passes some initial screening criteria.	Excluded due to the fact that the outcome variable is PISA science literacy, alongside with mathematics and reading achievement. No physics achievement was considered separately.
Bacolod & King (2003)	The authors examined the impact of family background and school quality on academic performance of Filipino students by looking at socioeconomic and school-	Excluded due to the fact that mathematics and English achievements are academic outcomes, but not physics. Besides, the focus of the paper is on educational production functions in

	based factors in Philippines. It seemed quite relevant due to the consideration of socioeconomic effects on student performance.	general.
Huang (2010)	The study explored the association between SES, school quality and academic performance of Filipino students applying the method of multilevel modeling. It seemed quite relevant due to the emphasis on SES and Philippines' education system.	Excluded due to the use of mathematics and reading achievement as the outcomes, not physics. Even though SES and school quality were considered, physics was not discussed in this study.

The studies which progressed to full-text review also illustrate this trend (see Table 4). The studies conducted by Haw and King (2023), Huang (2010), and Bacolod and King (2003) have investigated the impact of socioeconomic factors on educational achievement, however, they were focused on reading, mathematics, English or general academic achievement and did not address Physics. Similarly, Orbeta et al. (2020) have analyzed the relationship between the family socioeconomic characteristics and students' performance using Philippine PISA 2018 dataset, and Cabural (2024) have reviewed the evidence on determinants of Filipino students' science performance. Although these studies have used the socioeconomic status and Filipino learners, none of them used Physics academic achievement as the dependent variable. Thus, the exclusion of these studies is explained by the difference in disciplines rather than methodology.

It should be also noted that the most common way to measure science academic achievement is the use of international large-scale assessments, especially PISA test. Although this method allows to obtain valuable evidence on the scientific literacy, it evaluates the integrated science competencies rather than Physics achievement. Scientific literacy includes biological, chemical, earth and physical sciences. Therefore, this measure cannot be used in order to assess the achievement in Physics. Thus, studies which were based only on the evidence of PISA science achievement could not satisfy the review criteria even though they were relevant in the context of science education.

This pattern of exclusions also demonstrates a more general trend in the Philippine educational research. Investigations of socioeconomic status have paid much attention to the broader educational indicators such as overall academic achievement, science literacy, or institutional performance. Probably, this trend is conditioned by the wide availability of the national and international assessment data that allow to analyze educational inequality on the national level, but do not

provide the opportunity to examine the way the socioeconomic status impacts learning in particular discipline.

Thus, the evidence gap identified in this systematic review can be explained by the scope of existing research rather than by the lack of scholarly interest to the issue. The existing literature extensively examines the influence of socioeconomic status on education in the Philippines; however, this literature mainly focuses on broader measures of achievement. The studies which are most closely associated with the research question indicate that the elements of the research problem (Filipino students, socioeconomic status, and academic achievement) have already been examined, although usually separately or in combination rather than specifically in the context of Physics education.

RQ3. What evidence gaps exist regarding the relationship between socioeconomic status and academic achievement in Physics among Filipino students?

The empty systematic review does not only demonstrate the lack of eligible studies but also indicates the particular topics where the evidence is lacking. According to the screening and eligibility assessment, the existing research mainly addresses the broader educational outcomes such as overall academic achievement, science literacy, mathematics, reading, institutional performance, etc. The empirical investigations which focus specifically on the academic achievement in Physics among Filipino students are absent. Thus, the following evidence gaps were identified which explain why no eligible studies were found.

Table 5. Evidence gaps identified from the systematic review

<i>Evidence Gap</i>	<i>Evidence from the Review</i>	<i>Implications</i>
Lack of Physics-specific empirical studies	There has been no study that analyzes the correlation between SES and academic achievement in Physics among Filipino students. Previous literature about SES focused on reading, mathematics, science literacy, or academic achievement rather than Physics.	Thus, the relationship between SES and Physics achievement in the Philippine setting remains unknown due to the lack of evidence for making evidence-based decisions for Physics education.
Reliance on general science rather than Physics outcomes	A number of studies measured science achievement through PISA test scores or some other science scores, yet none used Physics as an independent variable.	Findings from science education should not be generalized for Physics, considering that Physics involves different skills and knowledge.
Dependence on international large-scale assessments	In fact, Philippine studies used PISA data sets measuring scientific literacy rather than Physics performance in the classroom.	Thus, there is a lack of information about actual student achievements in Physics classes, schools, or national curricula.

Limited Philippine evidence despite extensive international literature	International literature proves a positive correlation between SES and academic achievement; however, Philippine evidence in terms of Physics is missing.	There are no reasons to believe that international findings are applicable to the Philippine context because of the unique conditions in the country.
Scarcity of discipline-specific educational research	Most of the retrieved studies discuss the topic of educational inequality in general and not subject-specific outcomes.	Future studies should account for differences in the nature of disciplines rather than treat all academic disciplines as the same.
Insufficient evidence for intervention development	There are no empirical studies that could be considered as eligible, so there is a lack of evidence for developing interventions aimed at SES-related inequalities in Physics achievement.	Policymakers and educators have no empirical basis for overcoming socioeconomic inequalities in Physics education.

First of all, these gaps are not associated only with the lack of the research on this issue but demonstrate the focus of Philippine educational research on broader perspectives. Many studies have examined the impact of socioeconomic factors on the reading, mathematics, science literacy or overall academic achievement, and some other studies have relied on international large-scale assessments such as PISA. Although these studies significantly contribute to understanding of the educational inequalities, they do not provide the direct evidence on academic achievement in Physics as a particular academic discipline.

This point is quite important since Physics is different from general science in both content and learning requirements. Whereas the measures of scientific literacy include a number of various sciences, Physics achievement requires from students integration of mathematical reasoning, conceptual understanding, quantitative problem solving, and laboratory-based inquiry. Thus, these learning requirements can interact with the socioeconomic factors in a different way than the science achievement. For example, access to laboratory equipment, calculators, supplementary materials, private tutoring and Physics teachers can be considered as the examples of socioeconomic advantages which are more characteristic of Physics learning than other sciences. Consequently, the evidence obtained from the science assessments cannot be used in order to investigate the Physics learning.

Second, the review has demonstrated the lack of correspondence between the maturity of the international scholarship on the topic and the Philippine evidence base. The international meta-analyses and cross-national studies have consistently indicated that socioeconomic status is one of the main determinants of academic achievement and science achievement (Liu et al., 2022; Sirin, 2005; Tan, 2022). However, this

well-known finding has not been supported by the Philippine studies on academic achievement in Physics. In contrast, the Philippine literature has concentrated on the broader educational inequalities, institutional performance, and science literacy using the national or international assessment datasets (Bernardo, 2020; Cabural, 2024; Castillo et al., 2025; Yee, 2023). Thus, whether the internationally observed socioeconomic gradient characterizes Physics learning among Filipino students remains an unresolved empirical question.

Third, another evidence gap concerns the type of the evidence. Most of the potentially relevant studies have relied on secondary analyses of the large-scale assessment datasets, especially PISA. Though these datasets provide the valuable information on the scientific literacy and educational inequalities, they are not designed for measuring the achievement in Physics. Thus, there is a lack of evidence which is obtained through the classroom-based, curriculum-aligned or institution-specific studies examining the influence of socioeconomic factors on the Physics achievement among Filipino students at different educational levels. Therefore, the existing evidence cannot be applied for curriculum development and instructional planning.

These evidence gaps have several implications for the educational research and practice. Due to the fact that there are no eligible empirical studies, there is currently no evidence base from which the educators and policymakers can understand whether the socioeconomic gradient observed in the general science also characterizes the Physics learning among Filipino students or special interventions are required. The lack of discipline-specific evidence therefore can be considered as an important research gap rather than an absence of the relationship. This research gap can be addressed by the empirical studies which explicitly examine Filipino students, operationalize socioeconomic status with the appropriate indicators, and measure achievement in Physics using Physics-specific assessments.

RQ4. What recommendations can be made to guide future research on the relationship between socioeconomic status and academic achievement in Physics among Filipino students?

As it was discussed above, there were no eligible empirical studies which could be synthesized. This means that the recommendations are drawn directly from the identified evidence gaps rather than from the results of the analysis of the eligible studies. Therefore, Table 6 summarizes the recommendations that follow from the current empty systematic review.

Table 6. Research agenda for future studies on socioeconomic status and physics academic achievement among Filipino students

Research Priority	Evidence from the Present Review	Recommended Future Research	Expected Contribution to the Field				
Develop Physics-specific empirical studies	There are no eligible studies which specifically investigated the impact of socioeconomic status on Physics academic performance of Filipino students.	Conduct empirical studies using quantitative, qualitative, or mixed methods with the outcome measure of Physics grades, standardized Physics achievement test score, or Physics concepts inventory.	This will form the first body of evidence about the socioeconomic disparities in Philippine Physics education and provide a basis for systematic reviews and meta-analysis.	Conduct multilevel and longitudinal investigations	There is no existing study of the interaction of student-, school-, and community-level variables and changes over time in the area of interest.	Conduct multilevel and longitudinal research in order to examine the influence of the above variables on Physics achievement.	Increase the explanatory and causal power of the evidence produced for the purpose of designing of interventions and understanding the dynamics of the disparities.
Move beyond general science literacy	Most of the studies that could be relevant for the problem use the assessment of science literacy with PISA or general science achievement, rather than Physics-specific one.	Investigate Physics as an independent academic subject, rather than just the part of the general science achievement.	The latter will lead to the production of discipline-specific evidence that reflects better the particularities of Physics learning.	Develop and evaluate interventions	There are no eligible intervention- or program evaluation- studies in the area under investigation.	Design and evaluate interventions such as increasing laboratory resources, tutoring programs, interventions with digital learning, teachers' professional development programs, financial assistance to the disadvantaged students.	Create evidence-based interventions that will help reduce the gaps in Physics achievement related to socioeconomic disparities.
Expand educational levels and contexts	The majority of the studies conducted in the Philippines focused on the PISA or higher education samples.	Investigate the influence of socioeconomic status at junior high school, senior high school, undergraduate Physics courses, teacher education programs, and in various school contexts (public, private, urban, rural).	Achieve the full understanding of the impact of socioeconomic disparities on Physics achievement in different educational contexts and levels.				
Adopt multidimensional measures of socioeconomic status	SES was often measured with the use of composite index in the retrieved literature, without further analysis of the components.	Investigate the effects of each component of SES on Physics achievement, as well as the combined effect of several components.	Understand which dimensions of socioeconomic status have the greatest impact on Physics achievement, so as to develop more effective interventions.				
Examine mediating and moderating variables	There are no eligible Physics-related studies investigating mediators of the impact of SES on Physics achievement.	Examine possible mediators of the SES impact on Physics achievement, such as self-efficacy in Physics, motivation, attitude towards Physics, learning strategies, and lab attendance, as well as	Make the theoretical advance by understanding not only that SES impacts Physics achievement, but also why and under what circumstances this happens.				

First, the key recommendation concerns the shift from broad examination of the academic performance to the discipline-specific research in Physics. Throughout the process of screening, many studies have addressed the issues of the socioeconomic influences on the overall academic achievement, mathematics, reading, or general science literacy, however, none of them have investigated the achievement in Physics among Filipino students. This indicates that the future research should explicitly define Physics as the outcome variable rather than assume that the findings from general science education can adequately describe Physics learning. Given the conceptual complexity of Physics and its special learning requirements (mathematical reasoning, laboratory activities, abstract problem solving), discipline-specific evidence is necessary in order to understand whether the socioeconomic influences are similar in Physics learning.

Another important recommendation concerns the measurement of socioeconomic status itself. As the international studies consistently show, SES is a multidimensional construct including parents' education, occupation, family income, home educational resources and access to learning technologies (Eriksson et al., 2021; Zhao et al., 2022). The future Philippine studies should therefore avoid

using only composite SES indicators and should examine the contribution of each SES component to Physics achievement. Such approach will provide more nuanced evidence concerning which aspect of the socioeconomic disadvantage most strongly influences the Physics learning and will allow to develop the corresponding interventions.

Also, the future investigations should go beyond simple correlations by exploring the mechanisms of the socioeconomic influences on Physics achievement. The international evidence demonstrates that SES impacts the academic performance through science self-efficacy, motivation, educational aspirations, and home learning environment (Tan, 2022; Tan et al., 2023). Whether such mechanisms operate in the context of Physics education among Filipino learners is not known since there were no eligible studies addressing this issue. Thus, exploration of the mediating and moderating variables will help to provide the comprehensive understanding of the mechanism of the socioeconomic influences and to identify factors which can mitigate the educational disadvantages.

Moreover, the current review highlights the need for the multilevel research including the consideration of individual- and school-level socioeconomic characteristics. As the international research has shown, the school socioeconomic composition can produce effects which are equal to or larger than those caused by family SES (Yığiter, 2025; Finch & Finch, 2022). However, there was no Philippine study which has investigated these multilevel effects in the context of Physics achievement. Thus, the future research should use the hierarchical or multilevel modeling techniques in order to disentangle the contributions of the students, classrooms, schools, and communities to the Physics learning outcomes. Such an approach will provide more informative guidance for educational planning and resource allocation than individual-level analyses.

Finally, the absence of eligible studies highlights the need for the research which will directly inform the educational policy and classroom practice. The consistent international finding about the relationship between the socioeconomic disadvantage and academic achievement (Liu et al., 2022; Sirin, 2005) suggests that similar inequalities may exist in the Philippine Physics education, although there is currently no empirical evidence on this issue. Thus, the future research should go beyond the simple documentation of the relationships and evaluation of interventions which can reduce the socioeconomic inequalities in Physics learning. Longitudinal studies,

school-based interventions, curriculum innovations, laboratory resource programs, digital learning initiatives, and teacher professional development will provide the evidence concerning the strategies of improvement of Physics achievement among socioeconomically disadvantaged students.

Thus, the recommendations provided by the current empty systematic review create a forward-looking research agenda rather than the synthesis of the existing evidence. The absence of eligible studies demonstrates that the first and foremost task is the generation of empirical research which examines the relationship between socioeconomic status and Physics academic achievement among Filipino students. Addressing the identified methodological and disciplinary gaps will contribute to the stronger evidence base which will inform the educational policy, instruction, and future systematic reviews in Physics education.

Limitations of the Study

This study has several limitations to take into account when interpreting its findings. First, although a comprehensive and systematic search has been conducted across four major academic databases applying the preestablished strategies, some relevant studies which are indexed in the databases that are not included in this review or found in the unpublished literature, institutional repositories, conference proceedings, dissertations, or other gray literature might have been missed. Second, the review was limited to studies published in English, which may have excluded relevant evidence published in other languages and introduced language-related selection bias. Third, the strict eligibility criteria, requiring the studies to specifically focus on Filipino students, use the socioeconomic status as the primary explanatory variable, and the Physics academic achievement as the outcome, may have excluded studies which examined the closely related concepts such as the general science achievement or scientific literacy. However, the criteria were deliberately defined to ensure the conceptual consistency and to answer the research question. Finally, since there were no studies that met the inclusion criteria, it has not been possible to conduct an integration of primary research evidence and to calculate the strength and direction of the correlation between socioeconomic status (SES) and Physics academic performance. In other words, the results indicate the lack of eligible evidence as opposed to indicating that there is no relationship between SES and Physics academic performance of Filipino students. Lastly, one limitation with this systematic review is the lack of a pre-registered protocol in an open registry like OSF or INPLASY. To avoid any reporting and

selection biases, the inclusion criteria, search strings for the databases, and the screening process were decided upon beforehand.

Conclusion

An empty systematic review was obtained because there were no empirical studies that met the set criteria to assess the correlation between socioeconomic status (SES) and Physics academic performance among Filipinos. This finding does not mean that there is no evidence of the non-existence of such a relationship but rather it is a lack of evidence that fulfills the set criteria. Moreover, from the search results, it can be concluded that Philippine researchers have explored the link between SES and general academic performance, science literacy, math, reading, or overall academic performance but not Physics performance in particular. The most significant conclusion is that there is a need for scientific discipline-specific studies using the proper SES and Physics achievement measures.

Recommendations

Considering the results of the empty systematic review, the future research should focus on generating the empirical evidence which will examine the relationship between socioeconomic status and Physics academic achievement among Filipino students. The future research should include discipline-specific studies which use Physics achievement measures aligned with the curriculum rather than the general science literacy or large-scale international assessment data. Also, the future work should employ multidimensional indicators of socioeconomic status, examine mediating and moderating variables (motivation, self-efficacy, school resources), and implement multilevel and longitudinal designs to capture the mechanism through which socioeconomic status influences Physics learning. Finally, the intervention studies which will evaluate different strategies (laboratory resource enhancement, digital learning support, tutoring programs, and teacher professional development) to reduce the socioeconomic disparities in Physics achievement are needed.

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