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Citation Patterns and Resource Availability in Undergraduate Theses: Insights from a Philippine Academic Library[1]

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Abstract

Statement of the Problem / Objectives. This study examines how undergraduate students in the College of Science at a private higher institution in the Philippines use information sources in their theses. It analyzes the types, age, and availability of cited materials to assess how well the library supports student research and to identify collection and instruction needs.

Methods. Using proportional stratified sampling, 194 theses (2022–2024) were selected from the institutional repository. A total of 15,012 citations were extracted, coded by source type and publication year, and checked for availability via the library discovery system and open access. Descriptive statistics were used to summarize patterns.

Results. Journal articles dominated citations (77.6%), especially in Biology and Chemistry, while Mathematics and Physics showed lower citation volume and more varied formats. 57.76% of sources were published within the past 10 years, indicating a strong preference for current literature, with foundational works retained in some disciplines. Overall, 89.25% of sources were accessible either through the library or open access, yet only 26.02% were available directly through the library's holdings, underscoring reliance on open access to fill gaps.

Conclusion. Library resources support significant portions of undergraduate research, but subscription and monograph gaps remain. Targeted acquisitions, discovery optimization, and discipline-tailored citation instruction are recommended.

Originality. This is among the first large-scale, discipline-specific citation analyses of undergraduate science theses in the Philippines that links use patterns to availability, highlighting open access as a critical complement to local holdings.

Keywords: Citation analysis; Undergraduate theses; Open access; Collection development; Resource availability; Philippines

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Introduction

Academic libraries continually face the challenge of aligning their collections with the evolving research and instructional needs of their institutions (Johnson, 2018). Collection assessment is therefore a critical function, ensuring that investments in acquisitions translate into relevance, accessibility, and actual use (Thomas et al., 2022). As students engage in thesis writing, the references they cite offer valuable insights into their research behavior, source preferences, and the adequacy of existing library collections.

One user-centered approach to collection assessment is citation analysis, which examines the materials students actually reference rather than evaluating holdings in isolation. As White (2019) notes, citation analysis allows libraries to assess their collections against real usage, providing an evidence-based foundation for collection development and instructional planning. It also sheds light on information literacy outcomes, since students' citation behavior reflects how they select, evaluate, and use scholarly resources. With the rapid growth of electronic resources transforming access to scholarly content (Tenopir et al., 2015), questions remain about how effectively these resources meet user demands, particularly in specialized fields such as the sciences.

Globally, studies on collection assessment have demonstrated varied approaches, including usage statistics, citation analysis, user surveys, and overlap studies (Johnson, 2018). Citation analysis has emerged as especially valuable because it not only reveals what resources researchers cite but also whether those sources are available through the library or accessible via open channels (Currie & Monroe-Gulick, 2013; Hoffmann & Doucette, 2012).

International scholarship further shows that citation patterns differ by discipline: laboratory and applied sciences often prioritize recent, peer-reviewed journals, while mathematics and theoretical fields rely more on older, foundational works (Becker & Chiware, 2015; Kelly, 2015). By tracking such patterns, libraries can align acquisitions and instructional strategies with disciplinary needs. Citation analysis has also been applied to test whether holdings meet demand, build discipline-specific core lists, and, when combined with usage data, support evidence-based collection decisions (Currie & Monroe-Gulick, 2013; Martindale, 2020). Despite this robust body of work, much of it remains concentrated in Western contexts, with relatively fewer comparable studies conducted in Southeast Asia.

In the Philippines, only a handful of citation analyses have been undertaken, most of which focus on faculty and graduate-level research in fields such as education (Joson, 2018) and engineering (Eclevia, 2014; Eclevia & Janio, 2016; Peñaflor & Aliwalas, 2022). Collectively, these studies confirm the value of citation analysis for collection development but also highlight that research has focused on faculty and graduate students in professional disciplines, with limited attention to undergraduate science students.

This constitutes a significant gap, as undergraduate theses serve as capstone projects that reflect both student information behavior and the adequacy of library support for

foundational research training. Against this backdrop, the present study analyzes undergraduate theses from the College of Science at a private higher educational institution (HEI) in the Philippines. Using a proportional stratified sample of theses submitted from 2022 to 2024, it investigates citation behavior in terms of source type, recency, and availability. By linking use patterns to access, the study provides evidence for refining collection development, optimizing discovery systems, and tailoring citation instruction to disciplinary needs.

Statement of the Problem/Objectives

This study addresses the lack of research on citation practices of undergraduate science students in the Philippine context. It specifically examines theses submitted by the College of Science at a private university between 2022 and 2024. Specifically, it aims to:

1. Identify the types of sources cited in undergraduate theses across science disciplines.
2. Examine the age distribution of cited sources to determine students' reliance on current versus foundational literature.
3. Assess the extent to which cited sources are available in the university library collection or through open access platforms.

Through these objectives, the study seeks to generate actionable insights into student citation behavior, highlight gaps in resource provision, and inform strategies for both collection development and information literacy instruction tailored to the needs of science students.

Review of Related Literature

Citation analysis is recognized as a user-centered method of collection assessment that evaluates how well library resources support actual research practices. Unlike circulation data or static holdings lists, citation analysis examines what users cite in theses, dissertations, and publications, thereby providing a direct measure of resource relevance and value (Applegate, 2013; Johnson, 2018; Kohn, 2015). Because citations serve as traces of use, they can reveal gaps in coverage, identify core journals, and inform subscription, cancellation, or retention decisions. As Harker et al. (2019) notes, collection evaluation has increasingly shifted from static input measures to dynamic assessments of utility and outcomes, making citation analysis a crucial tool in evidence-based collection management.

International scholarship demonstrates varied applications of this method. Faculty-focused studies show that library collections often provide substantial coverage of cited materials, but gaps persist. Currie & Monroe-Gulick (2013) and Tucker (2013) found that most faculty-cited sources were accessible, yet coverage gaps highlighted opportunities for demand-driven acquisitions. In STEM fields, Kelly (2015) revealed that citation habits vary across subfields such as engineering, statistics, and computer science, underscoring the need for multidimensional assessment strategies. Becker & Chiware (2015) likewise documented that postgraduate students in engineering primarily relied on journals but continued to use books, supporting the case for

sustaining hybrid collections. Beyond STEM, Martindale (2020) identified core journals in business disciplines, while Thomas et al. (2022) highlighted strong e-journal coverage but weaker monograph access in doctoral dissertations, reinforcing the utility of citation analysis across subject domains.

Studies of undergraduate research, while less common, provide equally valuable insights. Wilson (2012) examined 2,301 citations from honors theses and showed how citation patterns reflect both intensity and breadth of resource use. Datig (2015) combined citation analysis with focus groups, finding that advanced undergraduates in the social sciences heavily relied on journals but that faculty mentorship strongly influenced citation choices. Rasaq et al. (2024) analyzing undergraduate research projects in Nigeria, reported that journals comprised more than half of citations but that many sources were dated, pointing to the need for both access to current literature and guidance in evaluating recency. These studies demonstrate that undergraduate citation practices are shaped not only by resource availability but also by disciplinary conventions, pedagogy, and faculty mentoring.

Beyond methodological approaches, recent scholarship highlights broader factors that shape how students and researchers access, discover, and cite scholarly materials. Access and visibility remain central factors shaping what students and researchers can cite. Large-scale analyses show that open access (OA) increases usage and scholarly reach: Piwowar et al. (2018) found that OA articles receive on average 18% more citations, while Klebel et al. (2025) confirmed that OA practices enhance efficiency and inclusivity, though infrastructural and skills gaps remain barriers to equitable use. Yet access does not always translate into prestige or impact. Khan (2023) reported no significant citation advantage for OA health journals in India, and Thakuria et al. (2024) found that subscription-based LIS journals outperformed OA counterparts in citation metrics. At the regional level, Syahid (2020) observed that many ASEAN OA journals remain under-indexed, limiting their visibility, while Fiala (2022) highlighted disparities in Southeast Asia, noting that the Philippines and Vietnam produced relatively higher-impact research despite constrained resources. Together, these studies underscore that both access models and visibility gaps influence which sources undergraduates encounter and integrate into their academic work.

In addition, discoverability through library systems and repositories has emerged as a critical determinant of usage. Macgregor (2020) showed that targeted SEO and metadata strategies increased repository usage by over 60%, while Jantzi et al. (2016) emphasized the need for careful alignment of discovery layers with link resolvers and metadata workflows. Empirical evidence supports these technical interventions: Musser and Coopey (2016) observed a 22% decline in interlibrary loan requests after Summon implementation, suggesting improved retrieval of licensed content, while Szpunar et al. (2025) found that library discovery layers often underperformed compared to Google Scholar and subscription indexes. More recent analyses also highlight proactive strategies: Faniel et al., (2024) documented how Dutch libraries improved OA visibility through coordinated discovery practices, and Marzuki et al. (2025) argued that personalization in digital libraries can enhance satisfaction if designed with transparency and user trust. Walton et al. (2022) further noted that discovery effectiveness depends not only on technical optimization but also on usability testing and integration with information literacy initiatives.

Student citation practices, however, remain uneven. Lynch (2016) found that explicit vocabulary instruction in Thailand produced inconclusive results, underscoring the difficulty of teaching citation style. Pourghasemian et al. (2018) observed that undergraduates relied more heavily on unconventional intertextuality than graduate students, while Suherman et al. (2022) reported that plagiarism in Indonesian theses often stemmed from unintentional citation and paraphrasing errors. Saura and Darya (2023), analyzing ELT theses in Indonesia, noted a roughly equal use of integral and non-integral citation styles, suggesting both author- and research-focused approaches. Collectively, these findings indicate that without sustained, discipline-specific instruction, undergraduates may continue to demonstrate gaps in attribution and citation literacy.

In the regional and Philippine context, user-centered citation studies remain limited. Eclevia (2014) conducted one of the earliest citation-based assessments of science collections at De La Salle University, showing how mismatches between holdings and research needs limited support for faculty scholarship. Extending this work, Eclevia & Janio (2016) analyzed engineering faculty publications across major Philippine universities and found that faculty overwhelmingly relied on recent digital journals, with little demand for backfiles. Joson (2018), studying doctoral dissertations in education, revealed that more than 80% of cited sources were unavailable in the university library, underscoring persistent access gaps and the need for interlibrary and open access support. Peñaflor & Aliwalas (2022) provided a more encouraging perspective from engineering, where over 70% of faculty-cited journals were accessible through local subscriptions, though gaps in specialized titles persisted. Together, these studies affirm the utility of citation analysis for Philippine academic libraries but also highlight that most analyses have concentrated on faculty or graduate-level research in professional disciplines.

What emerges from this body of work is both the promise and the limitation of existing scholarship. While citation analysis has been widely applied to faculty and postgraduate research, there is a dearth of studies focusing on undergraduates, especially in the sciences. Undergraduate theses, as capstone projects, represent an important lens for understanding students' information-seeking behavior and the adequacy of library support for foundational research training. Addressing this gap, the present study applies citation analysis to science undergraduate theses to examine source types, recency, and availability, providing evidence for collection development, discovery optimization, and tailored citation instruction.

Methods

Research Design

This study employed a descriptive research design using citation analysis as a user-centered approach to collection assessment. Citation analysis evaluates a library's alignment with actual user needs by analyzing the materials cited in academic work (Johnson, 2018). The primary objective was to examine the citation behavior of undergraduate science students and to determine the extent to which their cited sources were available in the university library collection.

Scope and Sampling

The scope of the study was limited to undergraduate theses submitted by the College of Science between 2022 and 2024 to the university's institutional repository (Table 1). A proportional stratified random sampling technique was applied to ensure representation across programs. Sample size per program was determined using Cochran's formula with finite population correction, ensuring a 95% confidence level and 5% margin of error. The final sample was rounded using Excel's ROUND() function. Programs with very low thesis output were aggregated as appropriate. The final sample comprised 194 theses across the four science disciplines.

Table 1. Undergraduate Theses Submitted and Sample Size per Program

Dept/Program	No. of UG Theses Submitted	Sample Size
Biology	94	76
Chemistry	55	48
Mathematics and Statistics	44	40
Physics	32	30
Total	**225**	**194**

Data Collection and Processing

Thesis titles were extracted from the institutional repository and organized by program. Records flagged as withdrawn, rejected, initial submissions, revisions, or not yet posted were excluded to ensure only finalized theses were included. Reference lists were downloaded from the full-text files of the selected theses.

Each citation was then copied into a spreadsheet and manually coded by material type:

- Book
- Book chapter
- Journal article
- Website
- Thesis/dissertation
- Other (e.g., reports, conference papers)

Availability Checking

Each cited source was searched using the university library's discovery system. Availability was recorded under three categories:

1. Available in the university library (print or electronic)
2. Not available in the university library
3. Freely available online (open access)

Data Analysis

Descriptive statistics (frequencies and percentages) were applied to analyze:

- The distribution of cited source types
- The age of cited materials (based on publication year)
- The availability of cited sources through the university library and open access platforms

Findings were synthesized to identify trends in student citation behavior, evaluate collection alignment, and highlight areas for acquisition or instructional intervention.

Results and Discussion

This section presents the findings of the citation analysis of 194 undergraduate science theses submitted between 2022 and 2024. Results are organized around three areas aligned with the study's objectives: (1) citation volume and distribution of source types, (2) age of cited references, and (3) availability of cited sources through the university library and open access platforms. The discussion integrates descriptive patterns with disciplinary comparisons and links these to implications for collection development, discovery systems, and instructional practices.

Citation Volume and Source Types

Table 2. Citation Volume Overview

Department/Program	**No. of Sampled Theses**	**Total No. of Cited Sources**	**Average Citations per Thesis**
Biology	76	8,111	107
Chemistry	48	3,875	81
Mathematics and Statistics	40	1,558	39
Physics	30	1,465	49
Total	**194**	**15,009**	**77**

Table 2 shows that the 194 undergraduate theses analyzed contained a total of 15,009 citations, averaging 77 citations per thesis. The volume, however, varied substantially by discipline. Biology theses were the most citation-intensive, averaging 107 references each. This reflects the discipline's dependence on extensive empirical studies, fast-moving research, and the need to ground experiments in current literature. Chemistry followed with 81 citations per thesis, suggesting more focused citation practices anchored in core journals and recent research developments.

By contrast, Mathematics and Statistics (39 citations per thesis) and Physics (49 citations per thesis) displayed lower citation intensity. These results are consistent with disciplinary traditions in the sciences: while the life sciences demand breadth and recency, mathematical and physical sciences often build on a smaller set of enduring

works and formal proofs. Kelly (2015) similarly found that STEM subfields vary in citation intensity, with applied areas citing more extensively than theoretical fields.

Comparing these figures internationally, the overall average of 77 citations per thesis is considerably higher than Wilson's (2012) study of U.S. honors theses, which reported as few as six and an average closer to 26 citations per thesis. It is also consistent with Rasaq (2024), who found Nigerian undergraduates cited between 18 and 77 sources depending on discipline. This suggests that Philippine science undergraduates demonstrate relatively intensive citation practices, particularly in Biology, reflecting both faculty expectations and disciplinary conventions.

From a library perspective, these patterns underscore where collection investment is most critical. High-output fields such as Biology and Chemistry warrant sustained support for journal subscriptions and up-to-date resources, while Mathematics and Physics may benefit more from selective acquisitions of seminal texts and open-access resources that align with foundational research needs.

Table 3. Distribution of Cited Source Types

Source Type	**Frequency**	**Percentage (%)**
Book	476	3.17%
Book Chapter	563	3.75%
Journal Article	11,650	77.60%
Theses and Dissertations	95	0.63%
Website	1,898	12.64%
Other (e.g., reports, conference papers, video/ content, images/illustrations, dataset)	330	2.20%
Total	**15,012**	**100%**

Table 3 presents the overall distribution of cited source types across the 15,012 total citations. Journal articles dominated citations (77.60%), reaffirming their centrality to scientific research. This trend aligns with findings from Becker and Chiware (2015) and Eclevia (2016), both of whom reported postgraduate and faculty reliance on journals as the backbone of scientific work. For undergraduates, this suggests not only access but also instructional emphasis on privileging peer-reviewed literature.

Websites accounted for 12.64% of citations, making them the second-most used source type. While some may represent credible organizational or government publications, the heavy use of web sources also signals ongoing challenges in evaluating quality and stability. Datig (2015) found that undergraduates' source selection was strongly shaped by faculty mentorship, suggesting that higher-than-expected web use may reflect uneven guidance on acceptable source types. This highlights a clear area for information literacy instruction focused on web evaluation.

Books (3.17%) and book chapters (3.75%) were relatively underused, echoing Becker and Chiware's (2015) observation that postgraduate STEM researchers prioritize journals while still turning to books for theoretical grounding. Their low share here may suggest undergraduates are less likely to seek long-form scholarship unless directly recommended. This has implications for collection development: while books remain valuable for conceptual foundations, their low citation presence may reduce their visibility to students unless embedded in instruction or faculty reading lists.

Theses and dissertations (0.63%) and "other" sources (2.20%) were scarcely cited, suggesting undergraduates have limited awareness or exposure to grey literature and alternative formats. This underutilization reflects a missed opportunity to diversify students' engagement with research outputs, particularly in conference-driven fields such as engineering and applied sciences.

Age Distribution of the Cited Source

Table 4 presents the age distribution of the 15,012 cited references. The data shows that a significant proportion of citations (57.76%) are from sources published within the past 10 years, with 33.65% falling within the most recent 0–5 years. This indicates a clear student preference for recent literature, particularly in fast-evolving fields where staying updated with current research is essential.

Table 4. Age of Cited References

Publication Age (Years)	**Frequency**	**Percentage (%)**
0–5 years	5,051	33.65%
6–10 years	3,619	24.11%
11–20 years	1,520	10.13%
21+ years	4,457	29.69%
No Date	365	2.43%
Total	**15,012**	**100.00%**

The emphasis on current sources is consistent with expectations for scientific disciplines such as Biology, Chemistry, and Physics, where new findings and emerging technologies shape the research landscape (Tenopir et al., 2015), and where, as Kelly (2015) notes, laboratory sciences privilege current, peer-reviewed studies. This trend may also reflect the influence of institutional access to up-to-date journal databases and the role of faculty advisers encouraging students to engage with contemporary work.

At the same time, nearly 30% of citations were from works older than 21 years, underscoring the continued importance of foundational texts. This is especially evident in Mathematics and Statistics, where reliance on classic literature aligns with the theoretical nature of the field. This aligns with Pourghasemian et al. (2018), who found that undergraduates often rely on unconventional intertextuality and dated sources unless guided otherwise. Kelly (2015) similarly emphasized that citation half-lives vary

sharply across STEM, with theoretical domains continuing to depend on older works while laboratory sciences privilege recency.

This dual pattern suggests that undergraduate students, even at early stages of research training, are reproducing disciplinary epistemologies: balancing current discoveries with enduring contributions. Libraries must therefore sustain both journal subscriptions and archival access to ensure students can draw on the full spectrum of literature.

Availability of Cited Sources

Table 5 presents the availability of 15,012 cited sources, providing a detailed breakdown between those accessible through the university library, those not available locally, and those obtainable via open access. It shows that 89.25% of all cited sources were accessible either through the university library or open access platforms, indicating a relatively high level of availability. Similar levels of accessibility have been reported in other studies where open access supplements institutional holdings. For example, Abeyrathne (2015), analyzing undergraduate dissertations in Sri Lanka, found that many journals were available only through OA platforms or national consortia, reinforcing the value of open access as a complement to subscriptions. This aligns with Piwowar et al. (2018) and Klebel et al. (2025), who demonstrated that OA increases both usage and scholarly inclusion, though infrastructural gaps remain.

Notably, journal articles (89.73%), and other sources such as reports and datasets (94.55%) demonstrated strong overall accessibility, largely due to the significant presence of open access content. This finding echoes Becker and Chiware's (2015) and Kelly's (2015) observations that STEM disciplines privilege journal literature over other formats. In contrast, traditional materials such as books (61.34%) and book chapters (63.06%) had the lowest availability rates, suggesting gaps in institutional holdings that may affect students in disciplines more reliant on monographs. Similar gaps were observed in Thomas et al.'s (2022) study of doctoral dissertations, which noted weak coverage of monographs compared to e-journals, and in Philippine contexts where Joson (2018) reported that over 80% of cited sources in education dissertations were not held by the university library.

However, excluding websites and open access content, only 26.02% of cited sources were found in the library collection, indicating a substantial gap between what students cite and what is institutionally accessible. For example, journal articles, which comprise the majority of citations had the highest in-library availability (3,394 or 29.13%), yet 1,196 articles were not accessible through the library's subscriptions. This gap is partially offset by the strong presence of open access journal articles (7,060 or 60.60%), suggesting that many students rely on freely available scholarly content to support their work. The significant role of OA in student work reinforces earlier

evidence that visibility, not just access, drives usage patterns (Macgregor, 2020; Faniel et al., 2024).

While this demonstrates the value of open access publishing, it also emphasizes the need to regularly review library subscriptions to ensure alignment with student research needs. Books and book chapters had modest availability rates in the library (144 or 30.25% and 277 or 49.20%, respectively), and a notable number were neither available in the library nor through open access. This shortfall may hinder students working in disciplines that still depend on monographs and edited volumes, such as mathematics, statistics, or humanities-related topics.

From a systems perspective, while the library's discovery tool and link resolver already surface open access, further optimization of discovery service platform harvesting could enhance visibility and reduce reliance on ad hoc searching. Pastva et al. (2018) demonstrated the value of supplementing usage statistics with citation data to reveal hidden demand and improve collection strategies. These findings resonate with international evidence showing that discovery effectiveness depends not only on technical optimization but also on usability testing and integration into instruction (Walton et al., 2022; Marzuki et al., 2025).

Pedagogically, the findings highlight the need to integrate guidance on identifying and evaluating open access sources into information literacy instruction, ensuring students can distinguish between credible OA journals and less reliable web content. This echoes Lynch (2016) and Suherman et al. (2022), who showed that without sustained, explicit instruction, undergraduates continue to struggle with attribution, intertextuality, and evaluating sources. Discipline-sensitive approaches, as recommended by Becker and Chiware (2015) and Kelly (2015), may therefore be necessary to align instruction with the distinct research practices observed across STEM fields.

Table 5. Availability of Cited Sources

Source Type	[A] Available in the library	[B] Not Available in the Library	[C] Open Access	[D] Total Cited Sources	[A+C] Total Available Sources
Book	144 *(30.25%)*	184 *(38.66%)*	148 *(31.09%)*	476 *(100%)*	292 *61.34%*
Book Chapter	277 *(49.20%)*	208 *(36.94%)*	78 *(13.85%)*	563 *(100%)*	*355* *63.06%*
Journal Article	3,394 *(29.13%)*	1,196 (10.27%)	7,060 *(60.60%)*	11,650 *(100%)*	10, 454 *89.73%*
Thesis and Dissertation	49 *(51.58%)*	8 *(8.42%)*	38 *(40.00%)*	95 *(100%)*	*87* *91.58%*

Website	N/A	N/A	1,898 *(100.00%)*	1,898 *(100%)*	1,898 *100.00%*
Other (e.g., reports, conference papers, video/content, images/illustrations , dataset)	43 *(13.03%)*	18 *(5.45%)*	269 *(81.52%)*	330 *(100%)*	*312 94.55%*
Total	**3,907 *(26.02%)***	**1,614 *(10.75%)***	**9,491 *(63.22%)***	**15,012 *(100%)***	***13,398 89.25%***

The findings highlight three major dynamics: (1) science undergraduates at this Philippine university cite intensively, especially in Biology and Chemistry, surpassing international norms; (2) journals dominate citations, while books, grey literature, and theses are underutilized; and (3) while nearly 90% of sources are accessible overall, institutional subscriptions cover less than a third, leaving students heavily reliant on open access.

These patterns reveal both strengths and vulnerabilities. On the one hand, students demonstrate robust engagement with peer-reviewed scholarship, indicating that library-provided journals and open access together sustain their needs. On the other, the gaps in library coverage and the underuse of diverse formats suggest opportunities to rebalance collection priorities and to strengthen faculty-librarian partnerships in guiding students' source evaluation.

Conclusion and Recommendations

This study examined citation practices in undergraduate science theses from a Philippine higher education institution, focusing on source types, recency, and availability. Across 194 theses, students cited an average of 77 references, with Biology and Chemistry showing far higher citation intensities than Mathematics and Physics. Journals dominated citations (77.60%), reflecting the centrality of peer-reviewed literature in the sciences, while books, grey literature, and theses were only marginally used. More than half of citations were drawn from sources published within the last ten years, yet nearly 30% came from works over twenty years old, underscoring the balance between current research and enduring scholarly contributions. While nearly 90% of all cited sources were accessible—largely through open access—fewer than a third were covered directly by library subscriptions, highlighting both the strengths and gaps of institutional holdings.

The findings point to several practical implications for collection development and instructional support. For Biology and Chemistry, sustained investment in journal subscriptions is essential, whereas Mathematics and Physics may benefit more from selective acquisitions of core texts and classic works. Gaps in the availability of books and book chapters suggest opportunities for targeted acquisitions through demand-driven models or consortial agreements. At the same time, the heavy reliance on open

access highlights the need to optimize discovery systems so that credible OA content is seamlessly surfaced alongside subscriptions. Information literacy initiatives should better prepare students to critically evaluate web-based and open-access materials and make fuller use of underutilized resources such as grey literature. Collaboration between librarians and faculty is also crucial to embed citation literacy and resource evaluation within science curricula, ensuring that mentoring and coursework consistently reinforce responsible and diverse citation practices.

Beyond the institutional context, this study contributes to a limited body of work on undergraduate citation behavior in the sciences within the Philippines and Southeast Asia. By analyzing undergraduate theses, libraries gain evidence for program review, accreditation, and long-term planning, while also generating benchmarks for comparing resource alignment across institutions.The reliance on open access materials highlights not only the policy need to strengthen OA infrastructure and regional licensing initiatives, but also the importance of discovery optimization to ensure that available resources are visible and usable. More importantly, the findings affirm that student citation behavior is shaped not only by resource availability but also by pedagogy and mentoring, underscoring the value of sustained faculty-library partnerships. Addressing these dimensions will ensure that students are not only supported in completing their theses but also equipped with the critical skills and research practices necessary for lifelong engagement with scientific information.

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