



Reading Requirements for Physics Education Journal Articles: A Needs Analysis of Indonesian Undergraduate Physics Education Students

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ABSTRACT

This study examines Indonesian undergraduate Physics Education students' reading requirements and perceived difficulties when engaging with English-language Physics Education journal articles. It addresses two research questions: (RQ1) What reading requirements do students report across eight dimensions of journal reading? and (RQ2) What key challenges do they experience related to article structure, disciplinary vocabulary, comprehension (including multimodal information), and reading strategies? Using a descriptive quantitative needs-analysis survey, data were collected from 52 students using a semi-standardized 40-item Likert-scale questionnaire (1-5) covering reading purposes, IMRaD awareness, vocabulary/technical terms, comprehension skills, reading strategies, reading difficulties, attitudes/motivation, and institutional support. Content validity was established through expert judgment, and the instrument demonstrated excellent reliability (Cronbach's $\alpha = 0.956$). Results show that reading purposes were rated highest ($M = 4.16$) and students strongly requested easier institutional access to international journals ($M = 4.11$). However, lower mean scores were found for vocabulary/technical terms ($M = 3.64$) and reading strategies ($M = 3.62$), alongside difficulties locating Results sections across varying formats ($M = 3.34$), reliance on Indonesian explanations ($M = 4.01$), and low confidence reading without translation tools ($M = 3.23$). The findings indicate a need for integrated support, particularly systematic vocabulary development, guided multimodal-reading practice (tables/graphs), and explicit strategy training. Limitations include self-reported data, a single-institution sample, and a cross-sectional design.

Keywords: needs analysis; research article reading; physics education; reading strategies; disciplinary vocabulary; multimodal literacy

Persyaratan Membaca Artikel Jurnal Pendidikan Fisika: Analisis Kebutuhan Mahasiswa S1 Pendidikan Fisika di Indonesia

ABSTRAK

Penelitian ini mengkaji kebutuhan membaca dan kesulitan yang dipersepsikan oleh mahasiswa S1 Pendidikan Fisika di Indonesia ketika membaca artikel jurnal Pendidikan Fisika berbahasa Inggris. Penelitian ini menjawab dua pertanyaan: (RQ1) kebutuhan membaca apa yang

dilaporkan mahasiswa pada delapan dimensi membaca jurnal? dan (RQ2) tantangan utama apa yang mereka alami terkait struktur artikel, kosakata disipliner, pemahaman (termasuk informasi multimodal), dan strategi membaca? Dengan desain survei kuantitatif deskriptif berbasis analisis kebutuhan, data dikumpulkan dari 52 mahasiswa melalui kuesioner semi-standar 40 item skala Likert (1–5) yang mencakup tujuan membaca, kesadaran IMRaD, kosakata/istilah teknis, keterampilan pemahaman, strategi membaca, kesulitan membaca, sikap/motivasi, dan dukungan institusional. Validitas isi ditetapkan melalui penilaian ahli dan instrumen menunjukkan reliabilitas sangat baik (Cronbach's $\alpha = 0,956$). Hasil menunjukkan tujuan membaca menjadi dimensi tertinggi ($M = 4,16$) dan mahasiswa sangat mengharapkan akses kampus yang lebih mudah ke jurnal internasional ($M = 4,11$). Namun, skor lebih rendah tampak pada kosakata/istilah teknis ($M = 3,64$) dan strategi membaca ($M = 3,62$), disertai kesulitan menemukan bagian Results karena variasi format jurnal ($M = 3,34$), ketergantungan pada penjelasan Bahasa Indonesia ($M = 4,01$), serta rendahnya kepercayaan diri membaca tanpa penerjemah ($M = 3,23$). Temuan ini menegaskan perlunya dukungan terintegrasi: pengembangan kosakata sistematis, latihan membaca multimodal (tabel/grafik) terpandu, dan pelatihan strategi membaca yang eksplisit. Keterbatasan meliputi data self-report, sampel satu institusi, dan desain potong lintang.

Kata kunci: analisis kebutuhan; membaca artikel penelitian; pendidikan fisika; strategi membaca; kosakata disipliner; literasi multimodal

INTRODUCTION

Physics Education undergraduates in Indonesia continue to face significant challenges when engaging with English-language physics education journals, despite these texts playing a central role in lectures, research proposal development, and thesis writing. Previous studies consistently report that students struggle with discipline-specific vocabulary, complex sentence structures, and the abstract nature of physics concepts embedded in scientific texts, often resulting in slow reading speeds, limited comprehension, and reduced self confidence (Handayani et al., 2018). These difficulties can hinder sustained engagement with academic journals and impede students' academic development.

Beyond structural language difficulties, students also experience significant challenges in interpreting the empirical components of physics education research articles, including methodological descriptions, quantitative analyses, and visual representations such as tables, graphs, and diagrams (Kararo & McCartney, 2019). These multimodal elements are crucial for understanding research findings; however, limited experience in visual data interpretation further restricts students' ability to meaningfully engage with journal articles.

Research within Indonesian science education contexts indicates that students' academic literacy and English reading proficiency remain insufficient for processing discipline-specific journal texts (Listiani et al., 2022). Although students typically receive extended exposure to English instruction, courses for non-English majors often do not address the linguistic, rhetorical, and structural demands of scientific literature. As a result, many students demonstrate limited familiarity with the IMRAD structure and the logical organization of research articles, as well as inadequate training in effective academic reading strategies, such as skimming, scanning, and strategic annotation (Di Brico & Zakonova, 2025; Wulff, 2024).

Previous research has highlighted the importance of academic and scientific literacy in enabling students to interpret research texts and engage in evidence-based reasoning (Listiani et al., 2022). Studies in science and physics education have examined several specific aspects of journal reading, including vocabulary difficulty, genre awareness, or reading strategies, often in isolation. However, relatively few studies have systematically examined these dimensions together within a needs analysis framework, particularly in the context of reading physics education journals. Consequently, there remains limited empirical evidence on how various reading demands, such as genre awareness (IMRAD), disciplinary vocabulary, multimodal interpretation, and strategy use, interact to shape students' journal reading experiences.

Reading physics education journals requires an integrated set of academic, disciplinary, and scientific literacy skills. Mastery of discipline-specific vocabulary supports the understanding of technical concepts and methodological descriptions (Webb & Nation, 2017), while awareness of rhetorical and organizational patterns facilitates comprehension of research objectives and argumentation (Green & Lambert, 2018; John M, 2016; Nabilla et al., 2024). Furthermore, effective academic reading strategies, including selective reading and the recognition of argumentative moves, are crucial for efficiently navigating research articles (Lammers, Goedhart, & Lucy, 2019; Macaro & Aizawa, 2024). These findings underscore the multifaceted nature of journal reading in physics education and highlight the need for targeted instructional and institutional support.

Against this background, the present study aims (1) to identify the reading requirements and challenges faced by undergraduate Physics Education students when accessing and reading physics education journals, and (2) to provide evidence-based recommendations for enhancing students' academic reading literacy and institutional support. To achieve these aims, the study addresses the following research questions: (1) What reading requirements do Physics Education undergraduates have when accessing and interpreting physics education journals? and (2) What challenges do they encounter related to journal structure, disciplinary vocabulary, comprehension processes, and academic reading strategies? These research questions are operationalized through a survey instrument that examines eight dimensions of journal reading, thereby providing a comprehensive needs analysis specific to Physics Education programs.

METHOD

This study employed a descriptive quantitative survey design to map the reading needs and challenges of undergraduate Physics Education students when reading English language physics education journals. A survey design is widely used in current ESP/EAP needs analysis research because it captures learners' perceptions in quantifiable form and allows systematic identification of patterns across respondents without applying instructional interventions (Stefanova & Bozeva, 2023). The descriptive orientation was appropriate because the study aimed to portray students' real reading situations as they occur naturally in their academic environment (Macdiarmid & Szilagyi, 2024).

The needs-analysis perspective in this study was primarily guided by (Anthony, 2018) discipline based ESP/EAP model, which emphasizes identifying the specific demands of a field and aligning them with learners' existing abilities. This dominant theoretical lens was then supported by recent academic-literacy and scientific-reading literature used in the Introduction. Genre related indicators such as awareness of IMRAD and rhetorical moves were grounded in contemporary genre studies showing that scientific articles follow predictable organizational structures that students must learn to navigate (John M, 2016). The vocabulary dimension drew on recent lexical research emphasizing the importance of mastering technical and low-frequency disciplinary terminology to understand methodological descriptions and scientific arguments (Webb & Nation, 2017). Indicators for comprehension and strategy use were informed by current academic-reading theory, which highlights selective reading, annotation, rereading, and monitoring understanding as key strategies for processing dense scientific prose and multimodal data (Grabe & Stoller, 2019). These combined frameworks ensured that the questionnaire reflected both the rhetorical expectations of physics education journals and the literacy skills required to engage with them effectively.

The participants consisted of 52 undergraduate students from the Physics Education Study Program at UIN Syarif Hidayatullah Jakarta. Purposive sampling was used to involve students

from the first, third, fifth, and seventh semesters, ensuring that variations in journal-reading exposure across academic levels were represented. Students from the first, third, fifth, and seventh semesters were selected to represent key progression points in the curriculum and to capture variation in journal-reading exposure across early, mid, and advanced stages. Even numbered semesters were not included because the sampling aimed to compare representative academic levels rather than every semester, and to maintain feasibility within the study period. This method is commonly recommended in needs-analysis research when respondents must meet discipline-specific criteria relevant to the study objectives (Anthony, 2018).

The instrument was a researcher-developed, semi-standardized 40-item Likert-scale questionnaire (1 = strongly disagree to 5 = strongly agree) designed to capture undergraduate Physics Education students' journal-reading requirements. The questionnaire measured eight dimensions (five items per dimension): reading purposes, awareness of journal structure, vocabulary and technical terms, comprehension skills, reading strategies, reading difficulties, attitudes and motivation, and institutional support. Item development was informed by recent ESP/EAP needs-analysis research that emphasizes mapping discipline-specific demands and learners' perceived difficulties through structured survey indicators (Stefanova & Bozeva, 2023). The full list of questionnaire items is provided in Appendix A. A separate pilot test was not conducted; instead, content validity was examined through expert judgment and item wording was refined before administration. The final instrument demonstrated excellent internal consistency (Cronbach's $\alpha = 0.956$).

The questionnaire was administered online via Google Forms over a two-week period (7–16 October 2025). Students first read an informed-consent statement explaining the study purpose, voluntary participation, and confidentiality. Only students who agreed to these terms proceeded with the survey. This procedure followed standard ethical practices in educational survey research (Macdiarmid & Szilagyi, 2024).

The collected data were analyzed descriptively using Google Sheets. Total scores and mean values were computed for each item and each dimension to identify the strongest reading abilities, the most prominent needs, and the areas requiring the greatest academic support. To interpret the mean scores, this study applied the following cut-off ranges: High = 4.00–5.00, Moderate = 3.00–3.99, and Low = 1.00–2.99. Dimension-level means were computed by averaging the five items within each dimension. Higher mean scores were interpreted as stronger perceived ability or higher-priority needs, whereas lower means indicated dimensions that students found more challenging or that required additional instructional support. Results were then summarized for each dimension to produce a comprehensive profile of students' journal-reading needs in Physics Education (Stefanova & Bozeva, 2023).

RESULT AND DISCUSSION

Result

This section reports the survey findings in relation to the two guiding research questions: identifying the kinds of reading support students need and the difficulties they face when working with English-language physics education journals. The analysis draws on responses to a 40-item Likert-scale questionnaire that was organized into eight dimensions of journal reading: reading purposes, understanding of journal structure, vocabulary and technical terms, comprehension skills, reading strategies, reading difficulties, attitudes and motivation, and institutional support.

Table 1. Descriptive statistics of students' journal-reading dimensions

Theme	Number of Statements	Mean	Category
Identifying Reading Purposes	5	4.16	High
Suggestions and Support	5	3.91	Moderate
Attitude and Motivation	5	3.85	Moderate
Reading Difficulties	5	3.75	Moderate
Vocabulary and Technical Terms	5	3.64	Moderate
Understanding Journal Structure	5	3.63	Moderate
Reading Comprehension Skills	5	3.63	Moderate
Reading Strategies	5	3.62	Moderate

Table 1 presents an overview of students' perceived reading needs and challenges across eight journal-reading dimensions. The results indicate that reading purposes and institutional support obtained the highest mean scores, reflecting students' strong awareness of the academic importance of journal reading and their expectations for institutional facilitation. In contrast, comparatively lower mean scores appear in vocabulary mastery, reading strategies, and reading comprehension skills, suggesting that students' motivation and awareness are not yet matched by sufficient reading competence. This overall pattern highlights a clear gap between perceived importance and actual reading ability, which frames the interpretation of the more detailed results in Tables 2–9.

Table 2. Students' reading purposes in physics education journals

Category	Identifying Reading Purposes	Mean
Highest	“I understand that reading journals is an essential part of professional development as a future physics teacher.”	4.30
Lowest	“I read the abstract of a journal to understand the main topic without reading the entire article.”	3.96

(Example: “The purpose of this study was to investigate...”)

Table 2 indicates that students primarily engage with physics education journals to support their academic activities and future professional development. The response pattern shows that journal reading is perceived as closely connected to students’ preparation as prospective physics teachers. Nevertheless, responses within this category also suggest that students do not consistently apply effective initial reading strategies, such as consulting abstracts to gain a general understanding of an article. This finding implies that students are aware of the importance of journal reading but have not yet developed efficient methods for navigating journal texts.

Table 3. Students’ understanding of physics journal structure

Category	Understanding Journal Structure	Mean
Highest	“I understand the difference between Abstract, Introduction, Method, Result, and Discussion (IMRAD).”	3.92
Lowest	“I find it difficult to locate the Result section because the format of each journal is different.”	3.34

As presented in **Table 3**, the findings indicate that students have begun to develop an understanding of how physics education journal articles are organized, particularly with respect to the IMRAD framework. This suggests an emerging level of genre awareness. However, the data also reveal that students encounter difficulty when journal formats differ from familiar patterns, indicating that their structural knowledge is not yet adaptable. Rather than identifying sections based on functional cues, students tend to depend on fixed templates, which may disrupt comprehension when they engage with journals that use alternative layouts.

Table 4. Students’ perceived ability in vocabulary and technical terms

Category	Vocabulary and Technical Terms	Mean
Highest	“I usually use specialized dictionaries or online tools to understand physics terms.”	3.75
Lowest	“I understand methodological terms such as ‘quasi-experimental’ or ‘data analysis’.”	3.46

Table 4 reflects students’ perceived competence in dealing with vocabulary and technical expressions commonly found in physics education journals. The response pattern suggests that students frequently depend on supplementary resources, including dictionaries and digital translation tools, to support understanding. Despite this effort, terminology related to research design and data analysis continues to present obstacles. This finding indicates that lexical

challenges are not confined to subject-matter concepts but also affect students’ ability to follow methodological explanations and analytical discussions.

Table 5. Students’ reading comprehension skills

Category	Reading Comprehension Skills	Mean
Highest	“I can distinguish between facts and interpretations in scientific texts.”	3.67
Lowest	“I am able to interpret tables, graphs, or diagrams presented in articles.” Example: “Figure 2 shows the correlation between...”	3.57

The results shown in **Table 5** suggest that students demonstrate a moderate level of confidence in comprehending written scientific text, particularly in recognizing central ideas and evaluative statements. In contrast, responses associated with interpreting graphical and numerical information reveal greater difficulty. This imbalance indicates that students are more comfortable processing linear text than integrating information presented through visual representations, highlighting a need for targeted support in multimodal comprehension.

Table 6. Students’ use of reading strategies

Category	Reading Strategies	Mean
Highest	“I often take notes or highlight important parts while reading journals.”	3.86
Lowest	“I use skimming techniques to find the main idea.”	3.53

According to the patterns observed in **Table 6**, students are more inclined to use close-reading practices, such as marking or annotating text, than strategies aimed at gaining an overview or selectively locating information. This tendency points to a predominantly linear approach to reading, even though academic journal articles often require flexible and goal-oriented navigation. Such an approach may increase cognitive demand and limit reading efficiency, particularly when students are confronted with extensive and information-dense texts..

Table 7. Students’ perceived reading difficulties

Category	Reading Difficulties	Mean
Highest	“I find it easier to understand Physics texts if explained in Bahasa Indonesia.”	4.01
Lowest	“I have difficulty understanding the formal writing style used in journals.” Example: “It is evident that...”	3.34

Table 7 illustrates that students' challenges in reading physics education journals are strongly associated with language-related factors. The data suggest that comprehension improves when explanations are provided in the students' first language, underscoring ongoing difficulties with English academic discourse. In addition, complex sentence structures and formal scientific style continue to impede understanding, indicating that reading problems arise from both linguistic limitations and unfamiliarity with disciplinary conventions.

Table 8. Students' attitudes and motivation toward journal reading

Category	Attitude and Motivation	Mean
Highest	"I feel that reading Physics journals in English is important for my studies."	3.94
Lowest	"I feel confident reading English journals without a translator."	3.23

As summarized in **Table 8**, students generally demonstrate a positive orientation toward reading physics education journals and recognize their importance for academic success. Nevertheless, reduced confidence when reading without translation assistance suggests that positive attitudes do not automatically lead to independent reading ability. This contrast indicates that motivational readiness must be accompanied by sustained development of language skills and reading strategies in order to foster autonomy.

Table 9. Students' expectations of institutional support

Category	Suggestions and Support	Mean
Highest	"I hope the campus provides easy access to international Physics journals."	4.11
Lowest	"I want journal reading learning to be integrated with research practice."	3.86

Table 9 Summarizes the types of support students expect from their institutions. The highest mean indicates a strong demand for better access to international journals ($M = 4.11$). In contrast, the lowest mean relates to the expectation that journal reading activities be integrated with research practice ($M = 3.86$), suggesting that while this need exists, it is less pressing than access-related concerns.

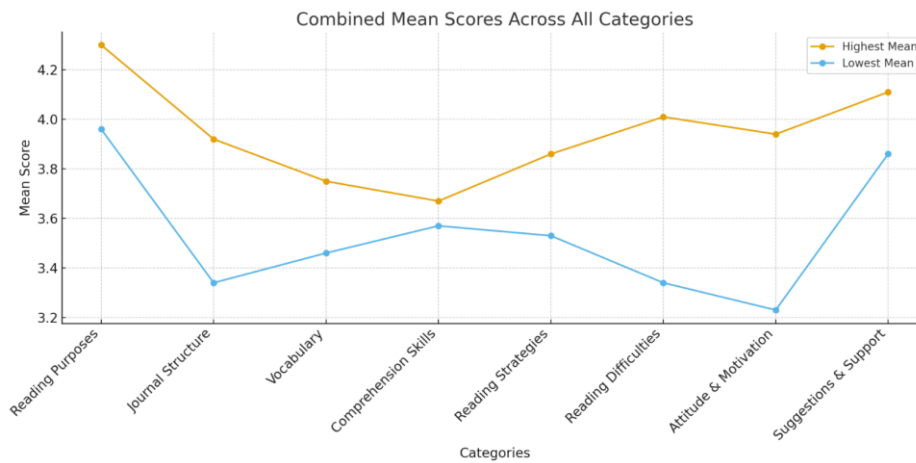


Figure 1. Line chart illustrating patterns in the highest and lowest mean responses across journal-reading dimensions.

Figure 1 illustrates the patterns in students' highest and lowest responses across the eight journal-reading dimensions. The connected data points show that dimensions related to reading purposes and institutional support are associated with higher response levels, whereas lower responses are more evident in areas such as vocabulary, reading strategies, and confidence related aspects. This pattern indicates that students demonstrate stronger awareness of the importance of journal reading than mastery of the skills required to engage with journals effectively.

Discussion

Findings indicate that students' strong orientation toward reading physics education journals reflects an awareness of disciplinary expectations and future professional demands. From a needs analysis perspective, this pattern suggests that students have recognized journal reading as a legitimate academic practice in physics education (Stefanova & Bozeva, 2023). However, inconsistent use of abstracts as an entry point into articles reveals a mismatch between reading goals and strategic text navigation. Because abstracts are designed to provide a concise overview of research objectives, methods, and findings, limited engagement with this section reduces reading efficiency and impedes initial comprehension (Macdiarmid & Szilagy, 2024). This pattern suggests that students' reading goals are conceptually clear but procedurally underdeveloped, highlighting the need for explicit instruction in reading abstracts as a foundational journal-reading strategy.

Students' partial familiarity with the IMRAD structure illustrates the distinction between declarative knowledge and functional genre awareness. While recognizing the general organization of research articles indicates emerging genre knowledge, students' difficulty locating Results sections across different journals suggests that this knowledge remains inflexible. Research on scientific and multimodal texts shows that variations in layout, section labeling, and visual verbal integration can disrupt readers who rely on idealized structural templates rather than functional cues (Jeppsson et al., 2022). Consequently, students who conceptually understand

IMRAD may still experience disorientation when journal formats differ from expectations. This finding highlights the need for genre-based instruction that emphasizes section purposes and rhetorical functions across diverse journal designs rather than fixed structural labels.

Difficulties related to disciplinary vocabulary emerged as a central constraint on students' journal-reading competence. ESP research consistently identifies technical and low-frequency vocabulary as a primary barrier to comprehension in scientific texts, as unfamiliar terms disrupt processing and impede understanding of research procedures and arguments (Stefanova & Bozeva, 2023; Webb & Nation, 2017). The reliance on dictionaries and translation tools observed in this study suggests limited lexical autonomy, which may fragment comprehension and increase cognitive load. These findings indicate that vocabulary instruction should be systematically embedded within journal-reading activities, focusing on recurring disciplinary and methodological terms rather than isolated word memorization.

Although students demonstrated a reasonable ability to identify main ideas in the text, their weaker performance in interpreting tables, graphs, and diagrams points to a gap in multimodal academic literacy. Research on multimodal reading emphasizes that integrating visual and verbal information is a learned academic practice that requires explicit guidance (Crawford Camiciottoli & Fortanet-Gómez, 2022). In physics education journals, key claims and evidence are often conveyed through visual representations, making visual data interpretation essential rather than supplementary. This finding suggests that journal-reading instruction should routinely incorporate guided analysis of figures and tables, enabling students to connect visual data with textual explanations.

Strategy usage patterns further indicate that students tend to rely on surface-level engagement, such as highlighting and note-taking, while underutilizing global strategies such as skimming and scanning. From an ESP/EAP perspective, effective journal reading requires strategic flexibility, allowing readers to adjust their approach based on the goals and demands of the task (Macdiarmid & Szilagy, 2024). The limited use of selective reading strategies aligns with students' inconsistent use of abstracts and reinforces the conclusion that strategic approaches to text are still underdeveloped. Therefore, instructional support should emphasize when and how different strategies are applied, rather than presenting strategies as a uniform or linear process.

The persistence of reading difficulties related to sentence complexity and academic register further reflects the linguistic demands of physics education journals. Scientific prose often compresses information into dense syntactic structures, which can overwhelm readers whose proficiency is still developing (Stefanova & Bozeva, 2023). Students' preference for Indonesian explanations suggests reliance on L1 mediation to manage cognitive load, a common strategy when disciplinary texts exceed current linguistic resources. These findings indicate that scaffolded practice in unpacking complex sentences and paraphrasing scientific claims may help students gradually internalize the conventions of disciplinary discourse.

Despite these challenges, students reported generally positive attitudes toward reading English-language journals, indicating readiness rather than resistance to academic reading demands. However, lower confidence in reading without translation support reveals a gap between motivation and self-efficacy. Previous studies note that motivation sustains engagement, but confidence develops through repeated experiences of successful comprehension supported by

appropriate scaffolding (Stefanova & Bozeva, 2023). Without such support, high motivation may not translate into independent reading competence. This pattern highlights the importance of staged journal-reading tasks that gradually reduce assistance while maintaining achievable levels of challenge.

Surprising and Contrasting Findings

An important and somewhat unexpected pattern in this study is that students reported relatively positive motivation and a strong recognition of the importance of journal reading, while simultaneously reporting low confidence reading without translation tools. This contrasts with reports from some contexts where students are described as having limited motivation to engage with academic journals. In the present context, journal reading appears to be strongly tied to coursework and thesis-related demands, which may increase perceived importance and willingness to read. However, persistent barriers in disciplinary and methodological vocabulary, multimodal interpretation (tables/graphs), and efficient strategy use likely undermine students' confidence and independence. This motivation–confidence gap suggests that instructional support should not only encourage journal reading but also focus on building self-efficacy through scaffolded practice, such as guided abstract-first routines, strategy training, and structured figure-reading activities that gradually reduce reliance on translation tools.

Study Limitations and Future Research

This study has several limitations. First, the findings are based on self-reported perceptions from a Likert-scale questionnaire; therefore, they describe perceived needs and difficulties rather than objectively measured reading performance. Second, the participants were drawn from a single Physics Education program (N = 52), which limits the generalizability of the results to other institutions or regions. Third, this research used a descriptive cross-sectional design and did not include proficiency measures or inferential comparisons across semesters; as a result, it cannot determine which factors most strongly predict students' difficulties. Finally, although content validity was reviewed through expert judgment and internal consistency was excellent (Cronbach's $\alpha = 0.956$), further validation, such as factor analysis and triangulation with qualitative data, is recommended. Future studies could combine survey data with performance-based tasks, for instance journal excerpt comprehension tasks and figure-interpretation tasks, and qualitative methods such as interviews or think-aloud protocols to capture how students actually navigate IMRAD sections and multimodal information. Multi-institution sampling and longitudinal designs would also help explain how journal-reading competence develops over time and which instructional supports are most effective.

Finally, institutional support was rated very highly, showing a clear demand for access and guidance that matches students' difficulty patterns. Higher education ESP research emphasizes that disciplinary reading development depends on both learner effort and institutional ecosystems that provide resources, modeling, and structured practice opportunities (Macdiarmid & Szilagy, 2024). Students' requests for journal-database access, help with statistics and visuals, and integration of journal reading into research courses directly respond to their earlier weaknesses in structure navigation, vocabulary, and multimodal comprehension. This indicates readiness for intervention rather than resistance to it. Therefore, curriculum-level support that embeds journal reading, vocabulary development, and multimodal strategy training is essential for improving independent academic reading in physics education.

CONCLUSION

Undergraduate Physics Education students in this study view reading English-language physics education journals as a central requirement for completing academic tasks and preparing for their future teaching careers. They reported strong purposes for reading (e.g., coursework, thesis writing, and professional growth) and showed generally positive motivation toward engaging with international research. In addition, their responses indicate emerging familiarity with common journal conventions such as the IMRAD organization, suggesting that a basic orientation to academic journal reading is already forming. Together, these findings answer RQ1 by showing that students need journal reading to meet both disciplinary learning demands and professional expectations.

At the same time, students face persistent challenges that prevent them from reading journals independently and efficiently. The most prominent obstacles involve limited control of discipline-specific vocabulary and research-method terminology, which slows comprehension and disrupts understanding of arguments. They also struggled to interpret visual information (tables, graphs, and diagrams) and to navigate Result sections when formats vary across journals, indicating weaknesses in multimodal comprehension and flexible genre navigation. Strategic reading was another gap: students relied more on linear, detail-by-detail reading than on abstract-first, skimming, or scanning, reducing efficiency and confidence. These patterns answer RQ2 by identifying vocabulary load, multimodal interpretation, and strategy use as the core areas of difficulty.

Based on these conclusions, Physics Education programs should embed structured journal-reading support within regular coursework rather than treating it as an optional skill. Priority support should include systematic vocabulary enrichment focused on high-frequency physics terms and methodological language, guided practice for reading statistical and visual data, and explicit strategy training that helps students shift between global, selective, and close reading depending on purpose. At the institutional level, easier access to international journal databases and research-linked reading tasks should be strengthened so students repeatedly practice journal reading in authentic academic contexts. This study has limitations due to its small sample size, limited participation from a single institution, and reliance on self-reported data collected at a single point in time. To address these limitations, future research should employ a mixed-methods design, implement intervention studies, and include larger or multi-institutional samples to validate and expand these findings.

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