WIP: Leveraging AI for Literature Reviews: A Guide for New Researchers

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I teach graduate-level courses in the Department of Educational Leadership. Through my academic scholarship, I center the experiences, voices, and cultural capital of marginalized students, aiming to create more inclusive and equitable educational environments. As a transdisciplinary educational researcher, my work spans three interconnected domains: Amplifying marginalized voices across STEM and other disciplines- I aim to bring attention to their experiences and recommendations, shedding light on the challenges and barriers they face while navigating their academic journey Professional development of educators-equipping them with the knowledge, pedagogies, and skills needed to effectively support and engage multi-marginalized students. And finally, I investigate how teachers can integrate students' identities and cultural capital into classroom lessons, with a special focus on STEM education. My research bridges literacy education and STEM education with an equity lens, and it is deeply rooted in critical theories, aiming for transformational change. I also extensively (formally and informally) mentor students with multi-marginalized identities.

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The importance of conducting a comprehensive literature review cannot be overstated, as it serves multiple purposes: summarizing a field to identify future research directions, finding evidence to support results and discussions, and breaking barriers in interdisciplinary studies [1]. This process is time-consuming and demands significant effort and training to ensure thoroughness and accuracy, which can be challenging for faculty members, especially for the Research in Undergraduate Institutions (RUI) due to limited resources dedicated for training and learning of research for undergraduate students. Meanwhile, faculty face significant constraints on time and resources when training novice researchers in literature review techniques to establish best practices while upholding academic integrity and ethical research standards. AI tools can enhance the traditional manual method by automating labor-intensive tasks such as searching, summarizing, categorizing and organizing information. This allows researchers to focus more on how to critically analyze and synthesize the AI-generated literature review, rather than on tasks such as finding and managing reference lists, tracking citations, formatting documents, and organizing notes. AI-assisted literature review methods can be valuable across all disciplines, particularly in interdisciplinary fields where locating relevant articles is more challenging for new researchers. State-of-the-art AI tools like Elicit, SciSpace, Perplexity, and ChatGPT can help streamline the literature review process, improve work efficiency, and enhance the quality of reviews, offering critical support to both faculty and emerging scholars [2]. This study explores how AI can improve the generation and organization of literature reviews to address these challenges by proposing a framework and a process and the study also highlights the importance of effectively leveraging AI and teaching students to critically evaluate and verify the outputs generated by AI tools. It's not enough for students to simply organize information—they must be able to assess the accuracy, credibility, and relevance of AI-generated conte

In this proposed framework, AI handles tasks that are repetitive and data-intensive, while novice researchers focus on more nuanced activities. This approach minimizes the training and allows faculty to manage the literature review project at a high level. Our framework aims to optimize research workflows by simplifying complex tasks, standardizing processes, and making them repeatable to increase both productivity and the quality of academic output. Ultimately, the integration of AI tools into the literature review process has the potential to transform academic research, particularly at institutions where faculty must balance teaching, mentorship, and research with limited support. Additionally, our findings will help novice researchers to utilize and prompt AI efficiently to populate relevant previous work as AI is going to be the future of education [3]. By adopting a balanced approach, we can make literature reviews more efficient,

reduce the burden of labor-intensive tasks, and enable researchers to focus on generating impactful insights and advancing scholarly discourse. We also recognize the nuances of using AI and will discuss academic integrity, critical thinking, and ethical research standards in the concluding section.

Introduction

The recent progress of perovskite solar cells (PSCs) was used as a topic to construct the framework for the AI-assisted literature review process. The interdisciplinary nature of PSC research demands an integrated approach, combining expertise from chemistry, materials science, engineering, and data science. Our analysis of the literature review steps is based on our existing work on PSCs, which will be submitted to Renewable and Sustainable Energy Reviews for publication.

The goal is to model a literature review process that will systemize the research reviews for novice researchers. It is possible to use literature reviews as a training tool for student researchers, although it presents both challenges and opportunities. Students often have varied research interests and limited experience, making the review process difficult to manage. For instance, in projects involving multiple students, each focusing on different aspects of PSC research—such as manufacturing techniques, space applications, simulation models, or data-driven methods—organizing these inputs into a unified review can be a daunting task. The draft preparation process during the COVID-19 pandemic highlighted these difficulties, with issues like inconsistent quality and high turnover further complicating productivity. Despite these challenges, opportunities abound. For faculty at Research Undergraduate Institutions (RUIs), literature reviews serve as an effective way to engage students in research and provide a tangible product that can be useful for publications. This approach can also add a stimulating element to undergraduate research, helping to retain students by giving meaningful context to their contributions. Undergraduates, typically limited in subject expertise, can start with repetitive tasks like data collection or experiments, which are crucial but often lack context. Literature reviews offer a way to bridge this gap. Tasks such as tracking the evolution of PSC efficiencies over time can be time-consuming but are ideal for undergraduates, especially when AI tools are used. AI not only alleviates the complexity by assisting in information gathering and analysis but also frees students from the burden of deep domain understanding, allowing them to focus on learning and development. Meanwhile, faculty can guide students more effectively, providing explanations and insights that turn seemingly tedious tasks into valuable learning experiences.

In this study, we utilized the AI-assisted process, aiming to propose a framework that could systematically perform multiple subtasks with higher efficiency enabled by AI. The performance of the various AI tools will be evaluated with pros and cons detailed. The goal is to accelerate literature review with a clear understanding of the limits. Although the work is in process, some promising results have suggested a start of paradigm shift in the analysis and synthesis of information.

Methodology

Conducting a literature review involves several key steps, as depicted in Fig. 1 (**adapted from Dundalk Institute of Technology, 2025**), to ensure a comprehensive and high-quality outcome. The first step involves defining the scope and purpose by clearly identifying the research question, focus area, and boundaries, such as time frames and topics. The next step is searching for relevant

literature using academic databases like Google Scholar, Web of Science, or Scopus, employing keywords and Boolean operators to filter results effectively. Once sources are identified, evaluate and select them based on relevance, credibility, and quality, prioritizing peer-reviewed papers and reputable journals. Then, organize and categorize the literature by grouping studies with similar themes, methodologies, or theoretical approaches, using an outline to visualize connections. Next, analyze and synthesize the information by comparing findings, identifying trends, gaps, or inconsistencies, and determining their relevance to the research question. Finally, revise and edit the review for coherence, clarity, and logical flow. Ensure proper citation and formatting and seek feedback from peers or mentors to refine the final product.

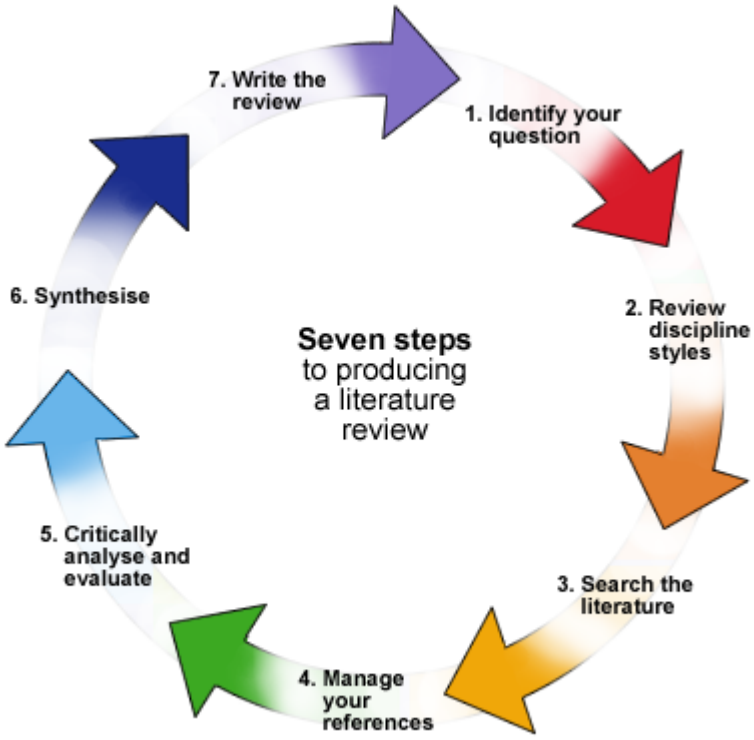

Figure 1: Seven steps of the literature review process: A cyclic process starting with identifying your question, reviewing discipline styles, searching the literature, managing references, critically analyzing and evaluating, synthesizing information, and culminating in writing the review **(Dundalk Institute of Technology, 2025)**.

Identify Review Questions (Define Research Scope):

The questions explored in a literature review depend significantly on its purpose. For a review within a thesis or technical report, the primary focus is on relevance to the specific project. In contrast, a review intended for publication emphasizes making a meaningful contribution to the broader scientific field. These goals often diverge. For example, original research typically highlights claims of novelty, where similar work is limited or insufficient to warrant an independent publication. In such cases, the review mainly serves to justify the research methodology. Conversely, an independent review article aims to balance breadth and depth, offering a comprehensive perspective on the topic. For concept exploration and literature review

development, we focused on the topic of perovskite solar cells (PSCs). Given these complexities, we realized a visual to automate connections within a research area would be helpful for beginners. For example, AI-powered mind mapping tools can help with brainstorming, organizing ideas, and structuring information. These tools use artificial intelligence to automate connections, generate topic suggestions, and enhance visualization. A mind map was created using an AI tool (Map This) to provide a structured visual framework for organizing key topics in perovskite solar cell (PSC) research, including stability, machine learning, space applications, and manufacturing based on our manuscript. As shown in Figure 2, the mind map illustrates how these topics and their subtopics interconnect, such as how stability concerns influence space applications or how machine learning can optimize manufacturing processes to improve both efficiency and stability. The mind map can be created based on one manuscript or multiple manuscripts to explore different concepts related to a topic. The mind map also aids in identifying research gaps, such as the lack of specific machine learning algorithms tailored to PSC design or the unique challenges faced by PSCs in extraterrestrial environments, including radiation and temperature extremes. Additionally, the hierarchical structure of the mind map ensures that the article can be logically divided into sections and subsections. For instance, it allows for a detailed discussion on experimental stability studies, followed by an exploration of predictive machine learning models. This structured approach not only enhances the writing process but also facilitates collaborative work among multiple contributors, ensuring consistency and clarity across sections.

As an alternative approach, a word cloud (Fig. 3) can be generated using Pro Word Cloud to visualize the key topics of the draft paper. For this case, the word cloud accurately highlighted several keywords, such as "PSC," "stability," "PCE," "action," and "challenges" in large fonts. However, other key areas such as "space applications," "manufacturing," and "device modeling" were less prominent. The word cloud included non-technical words such as 'can,' 'one,' and 'type.' Since the word cloud tool allows filtering some words as well before the cloud is generated, researchers can utilize this feature or manually omit non-technical words, focusing only on relevant technical terms. For our study, we decided not to consider non-technical words after the cloud was generated. Therefore, researchers should exercise caution when analyzing the word cloud to ensure that meaningful terms are emphasized while filtering out irrelevant ones. We suggest that researchers be a little mindful of the words and omit the irrelevant words from consideration. While students create the mindmap we suggest they use the key constructs related to the topic to generate one. Since we were already researching the PSC, we already had the manuscript ready and used it as the input to create this map. We also recognize that there is a risk that AI tools can generate inaccurate or non-existent information, often referred to as *hallucination.* AI tools rely on pattern recognition and predictive modeling rather than verified sources, which can lead to the inclusion of misleading concepts and incorrect relationships. To mitigate this risk, undergraduates should cross-check AI-generated content with credible academic sources and domain experts before incorporating it into their research. For this case, the mind map generated via Map this and word cloud were pretty accurate.

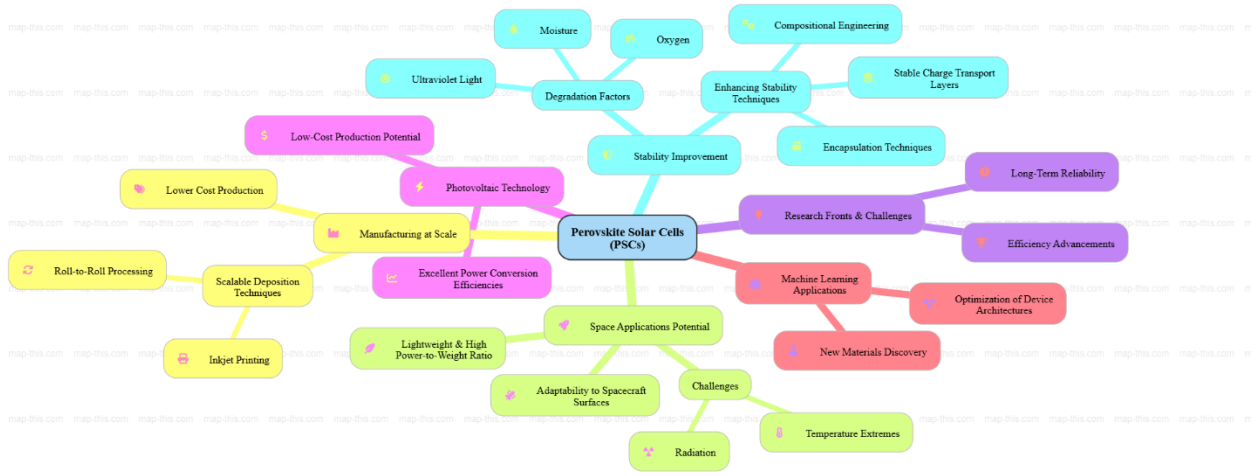

Figure 2. Mind map illustrating key topics and subtopics in perovskite solar cell (PSC) research, focusing on stability, manufacturing at scale, space applications, and machine learning.

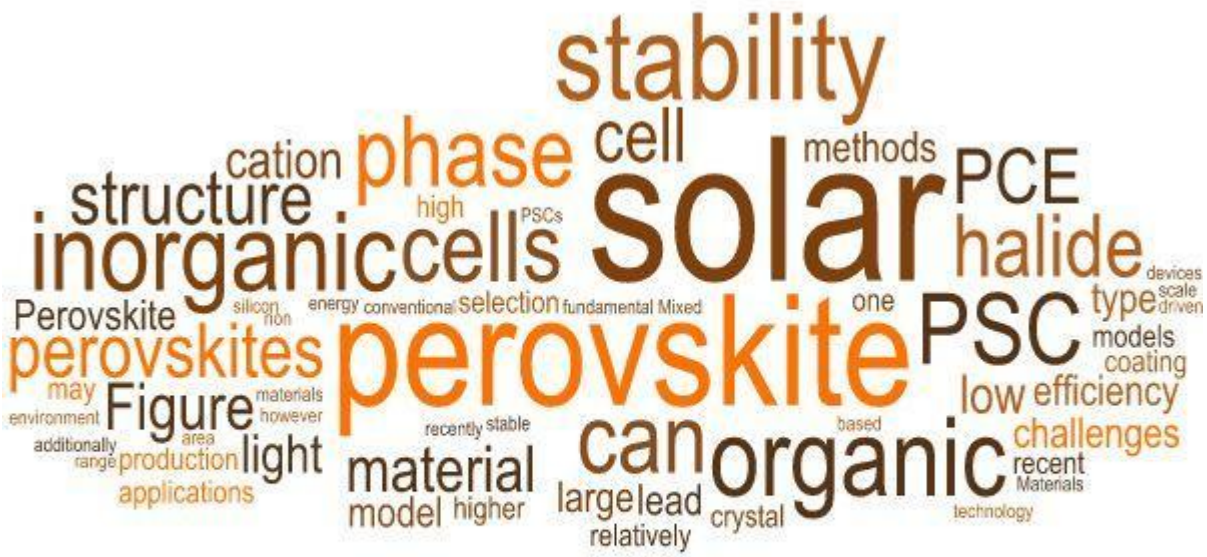

Figure 3. Word cloud generated by Pro Word Cloud.

Guidance on Assessing AI-generated content for Students

Develop a Step-by-Step Cross-Checking Protocol

We suggest students follow a certain protocol, for example-

Source Verification: Identify the primary sources AI references (if available) and compare them with reputable, peer-reviewed academic sources when in doubt.

Triangulation: Compare AI-generated summaries with multiple academic sources to see if there is consistency in claims and findings.

Fact-Checking Tools: Introduce students to fact-checking platforms (e.g., Google Scholar or the original article) to verify the credibility of AI-generated claims.
Expert Consultation: Always check with your major professor/Principal Investigator. They are experts in the field, and they will be able to guide you in case of confusion.

A Critical Evaluation Checklist

A structured checklist can help students assess AI-generated content systematically. For instance, students should consider those following questions while using AI-

1. Does the AI-generated content cite credible, peer-reviewed sources? If not, please follow the steps mentioned above.
2. Are direct citations accurately represented in AI-generated summaries?
3. Does the content contain biases, generalizations, or outdated information? Please check if AI us using latest articles. Also, refer to your mentor and principal investigator. This process will get better for novice researchers with multiple iterations.
4. Are the claims consistent with findings from multiple academic sources? Students should have an idea about this by reading a few articles from the field.

The first step is to make sure the reference is not hallucinated. The second step is to determine whether the reference provides the summary and if there is relationship between the reference and the AI summary. The third step is to determine whether the AI interpretation is accurate. The last step is to verify again, if other papers/sources can be used to confirm the AI-generated content, please utilize them.

At this critical juncture when we can find wealth of information online it's very important to differentiate between facts and opinions (claims, theories, and explanations). Fact checking can be done using above mentioned tools, however, checking on reasoning might not be that easy for the novice researchers and we recommend working closely with your mentors and professors as it's a time taking process master it and needs high level domain knowledge.

We want to emphasize that instead of requiring students to manually repeat the literature review, the process should position AI as a supplementary tool, but the human judgement still remains the primary tool, especially feedback from the PI and other veteran researchers. AI can be used effectively to generate initial research questions or summaries, but in-depth analysis and over-viewing the final products should remain human-led to ensure accuracy, critical evaluation, and academic rigor. Therefore, students must very each information after they are generated which should still save significant time and manual searches.

Review Discipline Style and Search the Literature

Those are step 2 and 3 of the literature review process. The traditional method of literature search and style identification starts with coming up with the keywords for searching research articles in databases like Web of Science (WoS) to perform keyword-driven searches and identify relevant publications. This approach was supplemented by domain expertise, as my prior experience publishing in *Renewable and Sustainable Energy Reviews* (RSER) provided valuable insights into the journal's thematic focus and formatting requirements. By systematically reviewing references, abstracts, and full-text articles, a robust foundation for identifying key works and trends within the field is built. This method, while thorough, is time-intensive and heavily dependent on the researcher's ability to manually synthesize and interpret large volumes of information.

There is no current academic AI search that can locate journals meeting our specific needs. However, the big academic publishers have their own journal finder tools. Links, along with the search results, are presented in Table 1. The top three suggested journals, including their impact factor and count of review articles that have been published based on the manual WoS search. It is speculated that these journal finders implement AI algorithms to match the relevancy between their journals and the scope of our review article. The suggestions were not ranked based on impact factors and several journals such as *Nature Communications*, *Materials Technology*, and *Advances in Materials and Processing* do not accept review articles. Unfortunately, there is no easy way to limit the acceptance of review articles without looking at the journal's aims and scope. RSER is a familiar option, while other reputable journals like Solar RRL and Advanced Functional Materials can be alternatives for further consideration.

Table 1. search results of WoS using key word “perovskite solar cells” and document type: “review” -AI generated table after our manual search.
Elsevier: https://journalfinder.elsevier.com/
Springer: https://journalsuggester.springer.com/
Taylor & Francis: https://authorservices.taylorandfrancis.com/publishing-your-research/choosing-a-journal/journal-suggester/
Wiley: https://journalfinder.wiley.com/search?type=match

Publisher	**Suggested Journals**	**Impact Factor**	**Number of review articles published on PSC**
Elsevier	Renewable and Sustainable Energy Reviews	16.3	32
	Solar Energy Materials and Solar Cells	6.3	8
	Materials Science and Engineering R: Reports	31.6	14
Springer	MRS Bulletin	4.1	5

	Nature Communications	14.7	0
	Emergent Materials	4.8	6
Taylor & Francis	Materials Technology	2.9	0
	Science and Technology of Advanced Materials	7.4	7
	Advances in Materials and Processing Technologies	2.0	0
Wiley	Solar RRL	7.9	123
	Advanced Energy Materials	27.8	149
	Advanced Functional Materials	19	96

We asked the generative AI to generate a list of journals that accept literature review articles focused on PSC along with impact factors and publishing companies. ChatGPT provided the initial list of suggested journals, after which our team of undergraduate researchers manually reviewed each journal. They verified the impact factor, assessed whether the journal falls within the scope of PSC, and checked if it had previously published any work related to PSC and finally created the table based on their manual search. The first column represents the publisher groups. The second column lists the journals suggested by ChatGPT. The third column provides the impact factors for each journal and the final column indicates the number of manuscripts has been published on each journal on PSC We noticed that the ChatGPT was pretty accurate in terms of suggesting the list and the impact factor. We also noticed that ChatGPT suggested journals like *Advances in Materials and Processing Technologies* or *Nature Communications* which have never published work on PSC yet fall within the scope of PSC related work. Finally, this table was created by our students.

Search the Literature via the Literature Map (Litmaps)

Then we search the relevant literature via AI tools. For example, we uploaded the citation of Kanaya [15] to the Litmaps and the AI tool generated the citation map based on the original map. The Litmaps database uses articles with available Open Access metadata to search on and generate suggestions based on the availability, to ensure the best coverage for the search. In Litmap the user can search the citation using DOI or keywords and a map is generated- if the full article is open access probably litemap provides more thorough citation maps. It helped us to understand how one paper is related to the others. The size of the bubble indicated the impact and number of the citation. Also, the map indicates the relevance of all the research articles. Also, it provides students insights into which paper students should read next in order to explore the concept of PSC. This can be replicated with any journal paper/conference paper across disciplines for an efficient literature review.

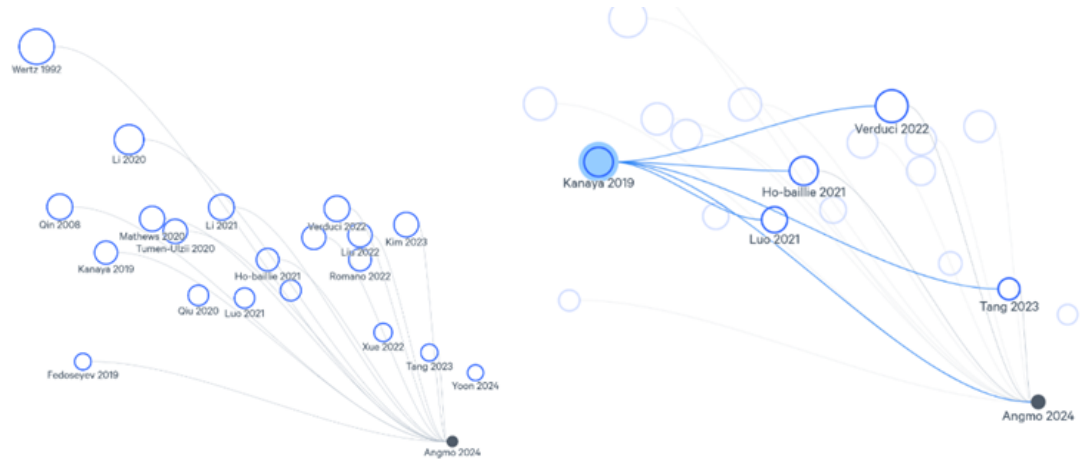

Figure 4. (a) Broad citation network showing connections among key studies on perovskite solar cells in space applications. (b) Focused view highlighting Kanaya (2019) as a central reference influencing subsequent research.

The citation map in Figure 4(a) illustrates the interconnections among key research articles focusing on perovskite solar cell performance in space environments. Notably, Yoon [10] lacks a direct citation connection to Angmo [9], but both share references to foundational works by Kirmani [11], Ho-baillie [12], and Tumen-Ulzii [13]. This indirect linkage emphasizes shared thematic threads related to radiation-hardness experiments, deployment opportunities, and degradation mechanisms of perovskite solar cells in extreme conditions. The most influential work in the map is Kanaya [14], as shown in Fig. 4(b), which serves as a foundational reference for five subsequent studies, including Verduci [15], Ho-baillie [12], Luo [17], Tang [18], and Angmo [9]. These studies build upon Kanaya's investigation into proton irradiation tolerance and the protective measures necessary for perovskite absorbers in space applications. Collectively, these citations underline a consistent focus on enhancing device stability, recoverability, and performance under proton irradiation, demonstrating Kanaya's significant impact on the field.

Manage Your References

We generated some practice guidelines for managing references with AI tools

Stay Current: Regularly check for the latest literature to ensure your research is up to date.

Verify Sources: Always prioritize first-hand literature over second-hand summaries to maintain the integrity of your research.

Review Citations: Double-check automatically generated citations for accuracy before submitting any work.

Many AI tools can be leveraged to manage references. for example, Perplexity and Zeotro/endnote. For Perplexity users may not always provide the latest literature; users should verify publication dates. Perplexity also carries the risk of relying on second-hand sources. For

Zotero, users may neglect to update their libraries regularly, leading to outdated references. Automatic citation generation may sometimes produce errors; manual verification is advised.

Also, ChatGPT can generate a reference list. For example, we used the prompt

"create a reference list in IEEE style with important articles on perovskite solar cell (PSC)"

ChatGPT responded -Here's a reference list in IEEE style featuring some notable articles on perovskite solar cells (PSCs):

Additionally, when AI tools are used to generate or process documents, questions of intellectual property arise—particularly concerning ownership and copyright of AI-generated content which we plan to address during our session.

Reference List in IEEE Style on Perovskite Solar Cells (PSC)

Journal Article:

[19] M. Green, A. Emery, D. H. Lee, and W. Warta, "Solar cell efficiency tables (version 44)," Progress in Photovoltaics: Research and Applications, vol. 24, no. 1, pp. 3-12, Jan. 2016.

Review Article:

[20] H. J. Snaith, "Perovskite solar cells: An emerging technology," Journal of Physical Chemistry Letters, vol. 4, no. 21, pp. 3623-3630, Nov. 2013.

Research Article:

[21] S. K. R. M. K. Choi, A. W. Y. Ho-Baillie, and M. A. Green, "Stability of perovskite solar cells," Nature Energy, vol. 2, pp. 17032, Jan. 2017.

Conference Paper:

[22] S. D. Stranks, G. E. Eperon, J. M. Grätzel, and H. J. Snaith, "Electron-hole diffusion lengths exceeding 1 μm in an organo-lead halide perovskite," in Proc. IEEE 43rd Photovoltaic Specialists Conf. (PVSC), Portland, OR, USA, 2016, pp. 1-5.

Article on Efficiency Improvement:

[23] Y. Yang, C. Y. Wang, H. Z. Zhang, and X. C. Xu, "Recent advances in the efficiency of perovskite solar cells," Advanced Energy Materials, vol. 7, no. 3, pp. 1-12, Dec. 2016.

Review on Stability:

[24] A. M. Alzubaidi, K. M. A. Ibrahim, and A. H. M. Al-Azawi, "Stability of perovskite solar cells: A review," Materials Today: Proceedings, vol. 5, no. 1, pp. 20439-20446, 2018.

Article on Toxicity Concerns:

[25] S. D. Stranks, H. J. Snaith, "Toxicity concerns in perovskite solar cells: The importance of material selection," Energy & Environmental Science, vol. 9, no. 12, pp. 3366-3375, 2016.

By leveraging these AI tools effectively, researchers can enhance their reference management processes, making literature reviews and citation tasks more efficient. Other evolving approaches are being integrated to streamline the literature review process in this research. We will present them at the conference.

Acknowledgments
The authors would like to express their gratitude to Luke Schneider for his valuable assistance in generating the literature map. Additionally, we acknowledge the support of the 2025 Penn State Institute of Energy and the Environment (IEE) Seed Grant Program, and the 2024 Penn State Behrend Research/Creative Activities Seed Grants, both of which provided essential funding for this research.

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