A Scoping Review of Sense of Belonging in Engineering and Computing Education: Research Landscape, Conceptualization, and Operationalization

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A Scoping Review of Sense of Belonging in Engineering and Computing Education: Research Landscape Over the Past Decade

Introduction

The construct of sense of belonging (SB) has garnered significant scholarly attention in the fields of engineering and computing education in recent years, reflecting a growing awareness of its pivotal role in shaping student success and well-being. This surge of interest aligns with broader trends observed in STEM education, where SB has emerged as a crucial factor in fostering inclusive learning environments and promoting academic persistence [1]. However, the rapid proliferation of research in this domain has revealed several areas in need of further exploration and synthesis, particularly in generating knowledge on the current state of SB research and in conceptualizing and operationalizing SB within engineering and computing education. Inconsistencies in the use of related terminology, such as the interchangeable application of "connectedness" and "sense of community," as well as ongoing debates about whether SB should be considered a unidimensional or multidimensional construct, highlight the necessity for a systematic examination of the field [2]-[4]. Given these challenges, mapping the existing literature is crucial to clarifying the scope and trends in SB research. Without a comprehensive understanding of the research landscape, researchers risk duplicating studies, misinterpreting findings, and ultimately hindering the advancement of effective SB interventions in educational settings.

This scoping review seeks to address these gaps by systematically mapping the landscape of SB research in the context of engineering and computing education while considering the lack of consensus on conceptual attributes (i.e., terminologies, definitions, defining components) in these fields. In particular, the current review explores the SB literature on students in engineering and computing education published over the past decade. The data collection and analysis focus on synthesizing information on the research scope and trends (e.g., research objectives, types and methods, study population's educational levels and groups, research settings, SB reference groups) as well as bibliographic information (e.g., publication title, year of publication, source title, and author) A brief background on sense of belonging and the scoping review methodology is provided prior to discussing the review design, search strategy, and future directions. By providing a holistic understanding of SB across diverse contexts and populations, this review aims to support the development of more inclusive and effective educational practices in engineering and computing.

Background

Sense of belonging Sense of belonging (SB) is a fundamental human need for social bonds and connections [5],[6] and has been extensively studied in social psychology. In education, SB plays a critical role in fostering inclusive learning environments, enhancing students' social and psychological well-being, and supporting academic achievement, retention, and persistence [7],[8]. For engineering and computing students, especially those from historically underrepresented groups, SB is vital in mitigating feelings of isolation and improving their educational and professional outcomes [9]. Recently, there has been a surge of research on SB in engineering and computing education, with much of the literature emerging in the past five years [10]. The rapid growth in research on SB in engineering and computing education has led to a proliferation of studies but also introduced challenges similar to those faced by more established fields, including conceptual ambiguity, inconsistent measurement approaches, and a lack of efforts to consolidate the field. This is problematic as they hinder cross-study comparisons and increase the risk of

redundant or fragmented research, ultimately slowing progress in synthesizing knowledge and advancing the field of research on SB [11],[12].

In higher education contexts where SB research is more established compared to engineering and computing education, synthesis studies have contributed to consolidating the field by generating knowledge on the research scope, conceptualization, and operationalization [1],[13],[14]. However, in the context of engineering and computing education, only a few synthesis studies on SB were published before 2021 [1],[4], prior to the steep increase in SB literature [10]. Furthermore, these synthesis studies primarily focused on specific populations (e.g., women in engineering) or contexts (e.g., undergraduate online education), underscoring the need for a more comprehensive understanding of the research landscape and conceptual issues, particularly in light of more recent evidence on SB in engineering and computing education.

Scoping review A scoping review is a research methodology designed to systematically map the existing body of literature within a specific field [15],[16]. It is particularly useful for exploring emerging topics where specific questions for a more focused systematic review have not yet been established. The purpose of a scoping review is to identify available evidence in a field, clarify key terms and concepts, highlight research gaps, and lay the groundwork for a future systematic review [17], objectives that align well with our project. Given the relatively underexplored nature of the sense of belonging in engineering and computing education, we considered a scoping review to be the most appropriate methodology to develop a deeper and more comprehensive understanding of this concept. In terms of methods, a scoping review shares similar procedures with other systematic reviews in that both employ structured, transparent, and reproducible methods to select relevant studies, answer review questions, and extract the necessary information from the evidence [18],[19].

Research Objectives and Questions

Research Objectives To address conceptual issues and to consolidate the field of SB research in engineering and computing education, our research team has undertaken a multi-method synthesis research project that comprises a scoping review focused on the research landscape and use of conceptual attributes and systematic reviews addressing the conceptualization and operationalization of SB within the field. This paper presents preliminary findings from a scoping review aimed at identifying and synthesizing the existing evidence on SB in engineering and computing education over the past decade. The review seeks to generate knowledge on the landscape of SB research, with a particular focus on key trends, research methods, study populations, and the scope of existing studies. The synthesis is guided by the research questions below:

Research Questions What is the landscape of sense of belonging research in engineering and computing education?
a) What is the paper counts by year? What are the publication venues?
b) Who is writing articles about sense of belonging?
c) What themes and categories emerge from research on sense of belonging published between 2015 and 2024?
d) What are the research methods used? Who are the studied populations? What are the reference groups of sense of belonging? What are the contexts of study?

The following sections will outline the search strategies for the project, including search strings, databases, and inclusion criteria (visit *Research Methods*), present the preliminary results (visit *Results and Discussio*ns), and discuss the future directions of the study (visit *Future Works*).

Research Methods

The review follows the guidelines outlined in the JBI Manual for Evidence Synthesis, developed by the Joanna Briggs Institute (Munn et al., 2018), which is widely recognized in the field of systematic synthesis research. This approach aligns with the PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) checklist [20]. The review process adhered to the six stages detailed in the JBI Manual: 1) Defining objectives and research questions, 2) Identifying information sources and establishing a search strategy, 3) Setting inclusion criteria, 4) Managing and selecting data, 5) Collecting and synthesizing data, and 6) Determining outcomes. The research team also conducted pilot reviews to scope the project and develop search strategies, such as refining search strings and inclusion criteria [10], which enabled us to develop a more effective and targeted search approach to answer the research questions. The research team consists of a professor, a postdoctoral researcher, and a PhD student, all in engineering education department, along with an engineering librarian who refined search strategies and managed information sources.

Literature Identification and Database The current scoping review focuses on peer-reviewed literature on SB within engineering and computing education, including journal articles and conference papers published between 2015 and 2024. A comprehensive search was conducted across selected databases that index empirical and conceptual research in engineering and computing education on the phenomenon of SB or its relevant concepts (e.g., belonging, belongingness, connectedness, relatedness, etc.). Leveraging the research team's experience from pilot reviews [4], we selected six databases, including Engineering Village (Compendex, INSPEC, and GeoRef databases), American Psychological Association (APA) PsycINFO, Web of Science, Education Resources Information Center (ERIC), and Association for Computing Machinery (ACM) Digital Library. The search was conducted using filters applied to the title, abstract, and keywords to ensure the identification of relevant studies.

Search String Development To ensure the "sensitivity" of the search strings, the research team first identified terms referring to SB in engineering and computing education from the pilot review [10]. Then, we developed four (n=4) Boolean-based search strings by combining the identified key terms related to SB (e.g., "belonging," "connectedness," etc.), subject areas (e.g., "engineer*," "comput*," etc.), and research contexts (e.g., "undergraduate," "graduate," etc.), as presented in Table 1.

Table 1. Boolean Search Strings

Search String	Terms		
	Sense of Belonging		**Subject Areas and Research Contexts**
1	(belonging OR belongingness OR "sense of belonging" OR "university belonging" OR "social belonging" OR "academic belonging")	AND	("engineer* educat*" OR "computing educat*" OR "computer science educat*" OR "engineering student*" OR "computing student*" OR "computer science student*" OR "engineering undergraduate stud*" OR "computing undergraduate student*" OR "computer science undergraduate stud*" OR "engineering graduate
2	(connectedness OR "student connectedness" OR "campus connectedness")		

3	(relatedness OR "student relatedness" OR "academic relatedness" OR "social relatedness")	stud*" OR "computing graduate student*" OR "computer science graduate stud*" OR "engineering facult*" OR "computing facult*" OR "computer science facult*" OR "engineering communit*" OR "computer science communit*")
4	("sense of inclusion" OR "social fit" OR membership)	

Search Results and Data Management Following data retrieval in September 2024, a total of 5,291 articles were searched. The research team conducted the duplicate removal and abstract review using Covidence [21], a collaborative literature review software designed for systematically organizing, sharing, managing, and preserving records and data. A total of 2,624 articles remained for abstract review after removing duplicates. Figure 1 presents detailed search results, such as the number of articles identified from each database, removed as duplicates, and abstract reviewed, etc.
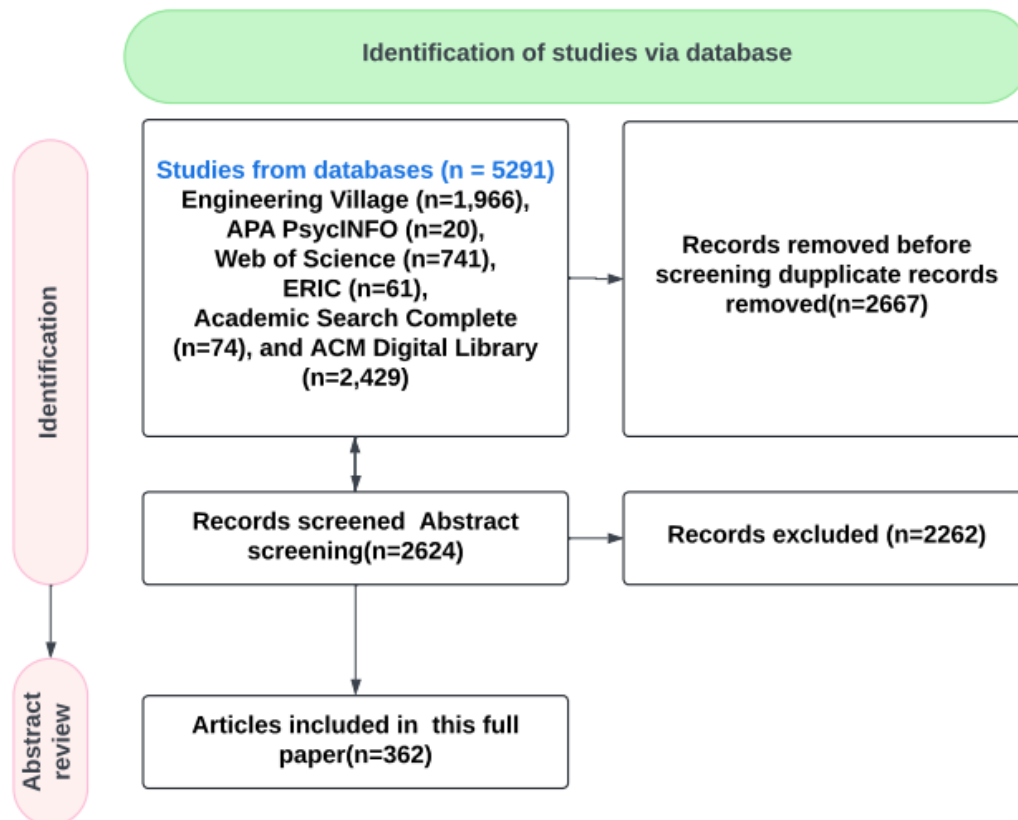

Fig. 1. PRISMA diagram of the scoping review

Abstract Review and Inclusion Criteria The abstract review process was conducted from September 2024 to January 2025, using the following inclusion criteria. The literature must:

- Focus on SB or related constructs
- Published between 2015 and 2024 and be in English
- Be peer-reviewed literature, including journals, conference proceedings; posters, book chapters, and opinion pieces excluded

- The study sample (e.g., or an arbitrary majority, e.g., ≥ 50%) should represent the population of interest
- The educational level of students in the literature must be undergraduate or graduate.

As a result, a total 362 articles remained for the data extraction.

Data Extraction and Analysis Following the abstract review, the research team extracted data from the 362 articles between December 2024 and January 2025. To answer the research questions, the data extraction focused on bibliographic information and research scope and trends. Table 2 presents the specific data components (i.e., items) extracted from each article, with their definitions. The extracted data were summarized and mapped for each item using descriptive summaries and statistics.

Table 2. Data Extraction Items and Working Definitions

	Items	Working Definitions
Bibliographic Data	Publication title	Full title of paper
	Publication year	Year of published work
	Source type	Journal article, work-in-progress conference paper, or full conference paper
	Source title	Title of where paper was published (journal or conference name)
	Author names	List of all author names
	Discipline of first author	Discipline of first author based on departmental affiliation or education (in the case of graduate students)
Research Scope and Trends	Research questions	Include publications with the peer-review process
	Level of focus on SB	Include publications available in English regardless of their contexts (e.g., non-/US contexts)
	Student populations: educational level	A multi-select list of: graduate (general); graduate (program/course participant); undergraduate (general); undergraduate (program/course participant); undergraduate (first-year); unspecified; others (please specify)
	Student populations: disciplines	A list of: engineering; computer science; engineering and computer science; STEM; students/participants taking an EC/STEM course/program; unspecified; other (please specify)
	Student populations: student groups	A multi-select list of: All, regardless of majority and URM; All, comparisons between majority and URM; majority; URM (race/ethnicity); URM (gender); URM (first-generation); URM (socioeconomic status); unspecified; others (please specify)
	Research types	A multi-select list of: empirical; conceptual/theory; experimental: intervention; experimental: assessment; synthesis; unspecified; other (please specify)
	Research methods	A multi-select list of: quantitative: survey and correlational research; quantitative: instrument development research; qualitative; mixed methods; multi methods; not applicable (synthesis, conceptual/theory); unspecified; other (please specify)

	SB reference group	A multi-select list of: class; department/school; discipline; institution; online contexts (e.g., classroom); peer/other small groups; research lab; unspecified; other (please specify)
	Geographic location of the study	Area(s) where study took place, if applicable

Results and Discussions

This section presents the results from the scoping review of the identified ## empirical and conceptual studies on students' sense of belonging within engineering and computing education, focused on *Bibliographic Data* and *Research Scope*. The bibliographic data subsection maps out data on publication trends, venues, the disciplines of first authors, and geographic location, and the research scope subsection presents the student populations, research questions, and contextual focus of studies. Each subsection discusses key takeaways and insights from the analysis.

1. Bibliographic Data

Publication year Analysis results on the year of publications provides clear evidence that sense of belonging research in engineering and computing education is a rapidly growing and expanding field.
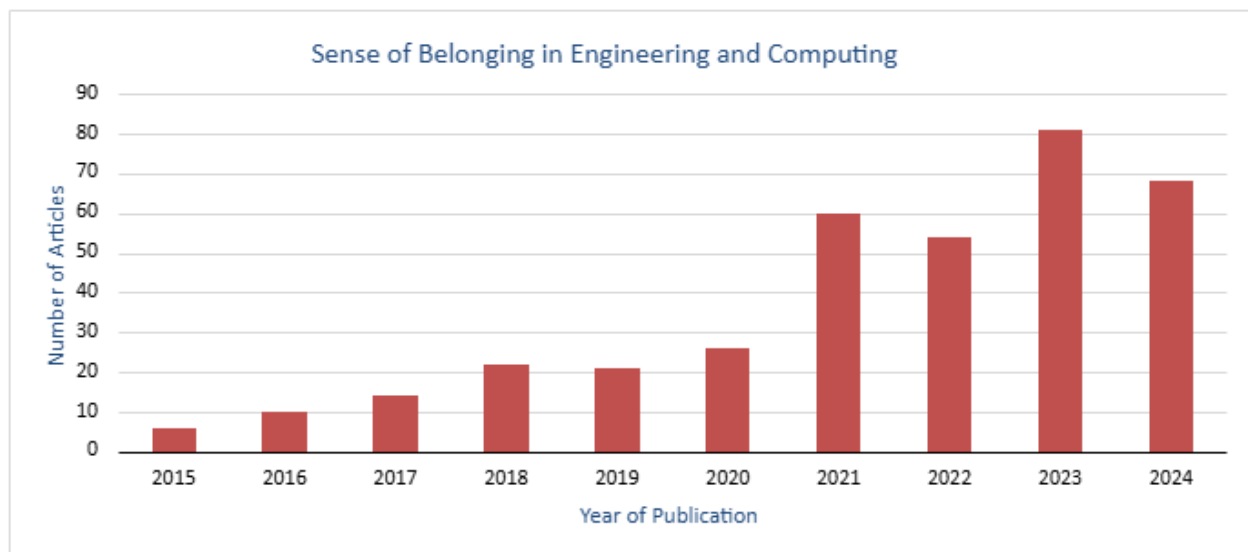

Figure 1. Publication year

First, despite the current scoping review focusing on peer-reviewed articles on student populations in the context of higher education, the remaining number of publications for the full text review was large (*n*=362), with a significant surge occurring from 2020 which coincides with the global pandemic. A total of 263 articles (72.7%) of all the included articles were published since 2021. This rise likely reflects heightened attention to student well-being and the importance of sense of belonging, particularly in remote learning settings and social distancing during the pandemic, which are strongly associated with one of essential factors in developing sense of belonging, *interpersonal interactions* [5]. Second, analysis results indicate an even faster growth rate after 2020. Considering that the data retrieval for the current review was conducted in September 2024, the total number of articles published in 2024 may exceed that of 2023 (n=81), representing not only growing but sustained focus on and interest in sense of belonging as an emerging field of research in engineering and computing education.

Publication venue Although the number of publications is growing fast, the majority of current research on sense of belonging in engineering and computing education has been published through conference proceedings (*n*=265; 73.2%), rather than journal articles (*n*=82; 26.8%) as presented in Table 3. This result reflects the currently emerging and establishing field of research on sense of belonging, as conference proceedings typically serving as preliminary works for journal articles, while also indicating sustained interest in the topic. Particularly, the majority of articles were published as conference proceedings at the American Society for Engineering Education (ASEE) (*n*=186; 51.38%), followed by the Association for Computing Machinery (ACM) (*n*=55; 15.2%) and IEEE Frontiers in Education (FIE) (*n*=24; 6.62%). Recent publications as journal articles appeared in IEEE Transactions on Education (*n*=11; 3.04%), International Journal of Engineering Education (IJEE) (*n*=9; 2.49%), and Journal of Engineering Education (*n*=9; 2.49%). Additionally, conferences and journals in higher education, science education, traditional engineering, and other related fields were identified as publication venues (n=53; 14.64%).

Table 3. Publication Venues

Publication Venues	Number of Articles
American Society for Engineering Education (ASEE)	186
Association for Computing Machinery (ACM)	55
IEEE Frontiers in Engineering (FIE)	24
IEEE Transactions on Education	11
International Journal of Engineering Education (IJEE)	9
Journal of Engineering Education (JEE)	9
CoNECD Conference	4
European Journal of Engineering Education (EJEE)	4
European Society for Engineering Education (SEFI)	3
International Journal on STEM Education	2
Journal of STEM Education	2
Others (e.g., Science Education, Internet and Higher Education, etc.)	53
Total	362

Discipline of first author Authors who have contributed to the reviewed papers are affiliated with disciplines within and outside of engineering education (*n*=65, 18.2%) and computing science education, including traditional engineering (*n*=122; 34.2%) and computer science (*n*=75; 21.0%) disciplines, higher education (*n*=22, 6.2%), psychology (*n*=21; 5.9%), STEM education (*n*=6, 1.7%), and others (e.g., computer and information technology, social science, and curriculum and instruction). Considering that engineering and computing science education researchers are often affiliated with traditional engineering and computer science discipline, further analysis on the individual authors with higher contributions needs to be conducted as a next step.

Geographic location of study The geographic distribution of studies indicates a strong dominance of research conducted in the United States (*n*=272; 76.4%), followed by European countries (*n*=19; 5.3%) and diverse countries in Central America and India (Others, *n*=12; 3.4%), as presented in Table 5. The analysis results indicate that sense of belonging research remains a field with limited international representation, highlighting the need for a more globally inclusive perspective in its development as a field of research.

Table 4. Discipline of first author		Table 5 Geographic location of study	
Disciplines of First Author	**Number of Articles**	**Geographic Locations**	**Number of Articles**
Traditional Engineering	122	USA	272
Computer Science	75	Europe	23
Engineering Edu.	65	Australia	3
Higher Edu.	22	Canada	2
Psychology	21	Asia	2
Computer Science Edu.	9	Africa	1
STEM Edu.	6	Unspecified	4
Others	36	Others	12

2. Research Scope

Participants As shown in the Table 6, the majority of articles focused on undergraduate students with varied sub-groups, including students participating in a specific program or course ($n=152$; 46.77%), general undergraduate students ($n= 71$; 21.85%), and first-year students ($n=50$;14.2%). Relatively fewer studies were situated in graduate education, focusing on general graduate students ($n=9$; 2.77%) and program/course participants ($n=8$; 2.46%). These findings highlight the current emphasis on undergraduate participants in sense of belonging research, suggesting graduate education in engineering and computing education as an under-explored context.

Table 6. Participants' Educational Level

Educational Levels	Number of Articles
Undergraduate (Program/course/etc. participant)	152
Undergraduate (General)	71
Undergraduate (First-year)	50
Graduate (General)	9
Graduate (Program/course/etc. participant)	8
Mixed (e.g., Undergraduate, Graduate, etc.)	15
Unspecified	12
Others	8

Research Context The analysis on the research context shows that research has explored students' sense of belonging in diverse educational contexts, focused on their sense of belonging to/within the contexts (Table 7). The majority of articles focused on sense of belonging within disciplines such as engineering or computer science being most common (n=164; 52.6%), followed by class (n=20; 6.41%), institution (n=12; 3.85%), peer/other small groups (n=11; 3.53%), and research lab (n=6; 1.92%). Some articles investigated sense of belonging to multiple settings (n=51; 16.35%), while the contextual focus was unspecified in other articles (n=31; 9.94%). Although this breakdown highlights the diverse settings of sense of belonging studied with a clear preference for disciplinary context (e.g., sense of belonging in engineering/computer science), a more systematic analysis that considers the study participants' data will be conducted. This is important due to the potentially different reference groups of sense of belonging that matter more for the experiences and decisions of students at different educational levels or in varied student groups.

Table 7. Reference Groups of Sense of Belonging

Reference Groups	Number of articles
Discipline	164
Institution	12
Class	20
Research lab	6
Peer/other small groups	11
Mixed contextual research	51
Unspecified	31
Others	17

Level of Focus on Sense of Belonging We also analyzed items on the level of focus on sense of belonging within each article (Table 8). A majority of the articles (n=228; 65.1%), had sense of belonging as the primary focus, with sense of belonging clearly included in the research objectives or questions. Another 49 articles (14%) measured SB as part of their data collection although it was not a central focus, whereas sense of belonging emerged from the findings but not considered as a primary focus in other 36 articles (10.3%). Contrarily, 28 articles (8%) mentioned sense of belonging in relation to a broader initiative or program without making it part of the research objectives, questions, or findings. The analysis result suggests that the majority of the current research have their primary interest in generating knowledge on sense of belonging, supporting the claim that it is an emerging research field.

Table 8. Level of Focus on Sense of Belonging

Level of Focus	Number of Articles
Primary focus	228
Secondary focus 1 (Measured SB in the data collection)	49
Secondary focus 2 (SB emerged from the findings)	36
Tertiary focus	28
Others	9

Conclusion and Future Work

The growing body of research on sense of belonging in engineering and computing education reflects the increasing recognition of its importance for student success. Publications have surged, especially in response to the challenges posed by the pandemic, highlighting the need to consolidate the field through synthesizing the current evidence, as addressed by this scoping review. The preliminary findings indicate interdisciplinary contributions to the establishment of the field, while suggesting to expanding the scope of research to include graduate students and diverse global contexts.

Our next step will include analyses of additional items not yet presented in the current paper (e.g., research type, methods, etc.), with a more systematic approach to synthesizing the data that considers the potential impact of participant data, such as students' educational level and groups, on the analysis results. In addition to data collection and analysis focused on the landscape of research on sense of belonging, our team has been gathering data on the conceptual attributes (e.g., definition, dimension, etc.), which will be presented in future works.

References

[1]   J. P. Allen et al., "Sense of belonging in higher education: A systematic review," J.   Educ.   Psychol., vol. 116, no. 3, pp. 423–437, 2024.

[2]   G. Wilson and J. VanAntwerp, "Revisiting the sense of belonging in STEM education: A conceptual framework for future research," Int. J. STEM Educ., vol. 8, no. 25, pp. 145–162, 2021.

[3]   St Amand et al., "Sense of community and connectedness in higher education," Educ. Psychol., vol. 27, no. 4, pp. 100–112, 2017.

[4]   D. Lawrence and A. Lee, "Sense of belonging in engineering and computing education: Research landscape over the past decade," Int. J. Eng. Educ., vol. 40, no. 3, pp. 1045–1059, 2024.

[5]   R. F. Baumeister and M. R. Leary, "The need to belong: Desire for interpersonal attachments as a fundamental human motivation," Psychol. Bull., vol. 117, no. 3, pp. 497–529, 1995.

[6]   A. H. Maslow, Motivation and Personality. Harper & Row, 1954.

[7]   M. Gopalan and S. Brady, "The role of sense of belonging in STEM education: Implications for underrepresented students," J. STEM Educ., vol. 20, no. 4, pp. 15–21, 2019.

[8]   B. Buckley et al., "Sense of belonging in engineering education: A review of the literature," J. Eng. Educ., vol. 112, no. 2, pp. 184–201, 2023.

[9]   P. Stayhorn, "The importance of sense of belonging in the transition to engineering careers," J. Career Dev., vol. 47, no. 4, pp. 250–265, 2023.

[10]   Lawrence, C. U., & Lee, E. (2024, June), [Work-in-Progress] Sense of Belonging in STEM Higher Education: Developing a Scoping Review Protocol and Strategy Paper presented at 2024 ASEE Annual Conference & Exposition, Portland, Oregon. 10.18260/1-2--46414

[11]   K. M. Power, "Conceptualizing sense of belonging in higher education: Current issues and future directions," Higher Educ. Q., vol. 75, no. 2, pp. 88–102, 2021.

[12]   R. Tennant et al., "The role of sense of belonging in improving student retention: A review of literature," Educ. Res. Rev., vol. 24, pp. 88–104, 2018.

[13]   K. Dost and L. M. Smith, "Sense of belonging in higher education: A scoping review," Higher Educ. Rev., vol. 56, no. 2, pp. 128–144, 2023.

[14]   S. Taff and J. Clifton, "Sense of belonging and student success in STEM: A comprehensive review," J. STEM Educ., vol. 31, no. 1, pp. 12–23, 2022.

[15]   D. Levac, H. Colquhoun, and K. K. O'Brien, "Scoping studies: Advancing the methodology," Implement. Sci., vol. 5, no. 69, pp. 1–9, 2010.

[16]   H. M. L. Daudt, C. van Mossel, and S. D. Scott, "Enhancing the scoping study methodology: A case study," BMC Med. Res. Methodology., vol.

[17]   Z. Munn, M. D. Peters, C. Stern, C. Tufanaru, A. McArthur, and K. Lisy, "Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach," BMC Medical Research Methodology, vol. 18, no. 143, 2018.

[18]   M. Borrego, M. J. Foster, and J. E. Froyd, "Systematic review of research methods in engineering education: 2000–2012," Journal of Engineering Education, vol. 103, no. 1, pp. 27–45, 2014.

[19]   M. T. Pham, A. Rajić, J. D. Greig, J. M. Sargeant, and A. Papadopoulou, "A scoping review of scoping reviews: Advancing the approach and enhancing the consistency," Research Synthesis Methods, vol. 5, no. 4, pp. 371–385, 2014.

[20]   A. C. Tricco, E. Lillie, W. Zarin, K. K. O'Brien, H. Colquhoun, D. Levac, and S. Hempel, "PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation," Annals of Internal Medicine, vol. 169, no. 7, pp. 467–473, 2018.

[21]   Covidence, "Covidence: Collaborative literature review software," accessed [Online]. Available: https://app.covidence.org/reviews.