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The College Experiences of Undergraduate Students with ADHD: A Scoping Literature Review

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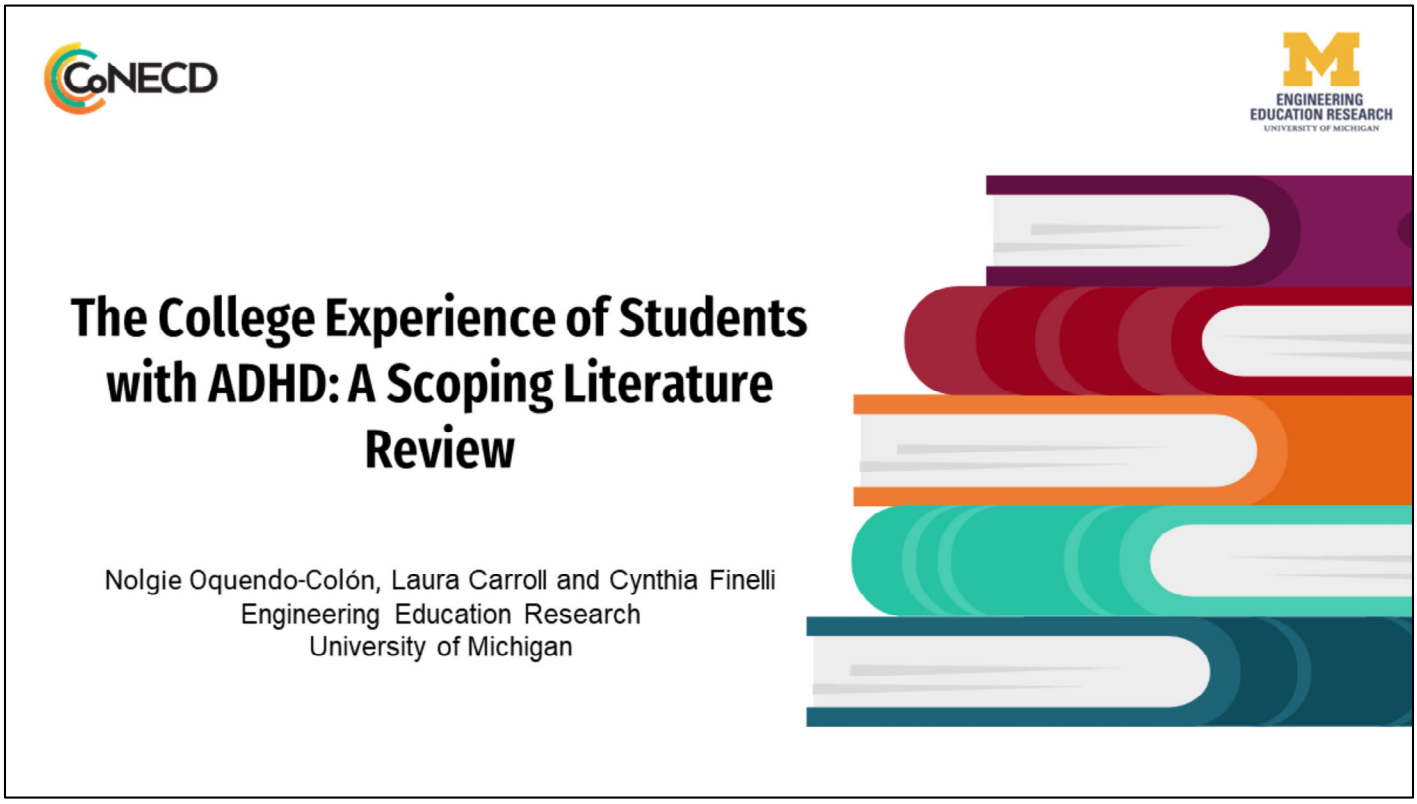

- My name is Nolgie Oquendo-Colón, and I'm a first-year Ph.D. student in Engineering Education Research at the University of Michigan alongside my peer Laura Carroll and our advisor Dr. Cynthia Finelli; we have been working on this project that I will be presenting today entitled; The College Experiences of College Students with ADHD: A Scoping Literature Review.

Agenda

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- Introduction
- Background Literature
- Purpose
- Methods
- Results
- Future Work

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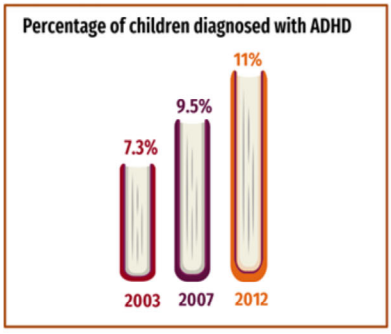
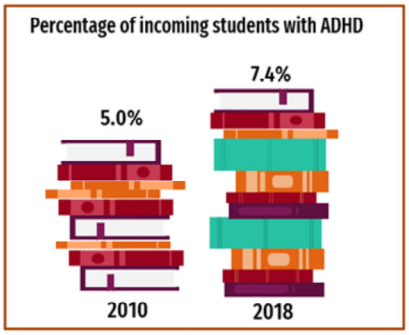
- I will start by giving an introduction to the topic, followed by a discussion of the literature on the college experiences of these students. Followed by the purpose of our work, the methods, the results, and our future work.

Introduction

- **Neurodiversity -** describes the idea that people experience and interact with the world around them in many different ways; there is no one "right" way of thinking, learning, and behaving.
    - Attention deficit and hyperactivity disorder (ADHD), autism, dyslexia, obsessive-compulsive disorder



National Survey of Children's Health indicates that the percentage of children diagnosed with ADHD [4]



Higher Education Research Institute [5]

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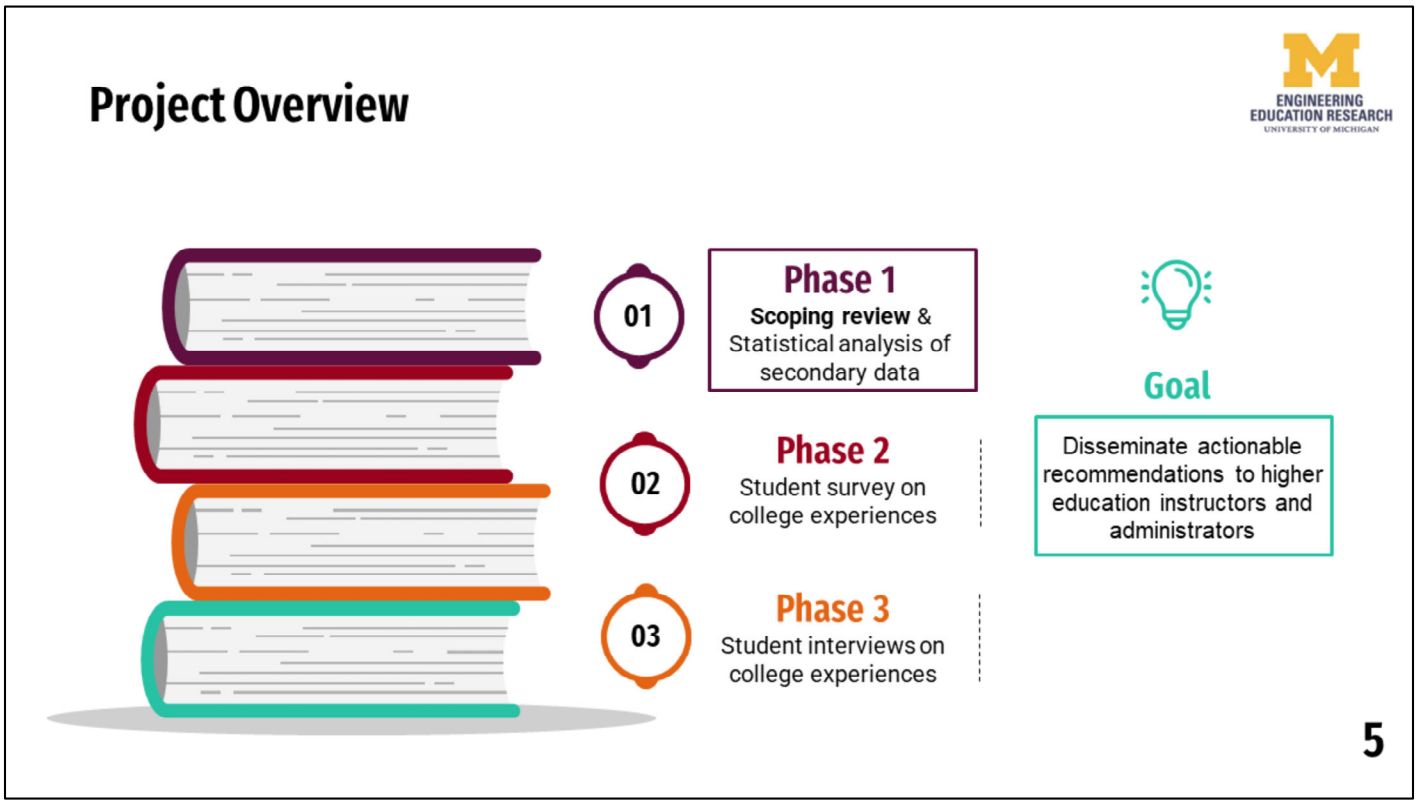
- Neurodiversity describes the idea that people experience and interact with the world around them in many different ways; there is no one "right" way of thinking, learning, and behaving [1]. Students with ADHD or other neurodiversity such as autism, dyslexia, or obsessive-compulsive disorder are an invisible minority [2], and there is a need for the study of the challenges that these students face in higher education. The population of students with neurodiversities comprised 11% of college undergraduates in the U.S. [3], and higher education institutions are beginning to consider a diverse group of learners. One sector of this population that has shown significant growth in the past few years is

students with ADHD. Data from the National Survey of Children's Health indicates that the percentage of children diagnosed with ADHD has increased from 7.3% in 2003 to 9.5% in 2007 and 11% in 2012 [4]. Similarly, the percentage of incoming college students with ADHD has increased from 5.0% in 2010 to 7.4% in 2018 [5]. Even though higher education institutions are beginning to recognize the need to provide inclusive support, these students' college experiences are still under-researched. However, in spite of their growing presence in college, little is known about the academic success of college students with ADHD, and even less is known about students with ADHD in science, technology, engineering, and math (STEM). Some researchers have suggested that classroom teaching practices may play a critical role in promoting the academic success of college students with ADHD. There is ample evidence that demonstrates the positive effects of student-centered teaching practices for undergraduates in general. However, their impact on the learning, retention, and engagement of students with ADHD has received little consideration. This project aims to fill this gap by studying the role of college experiences on the academic success of STEM students with ADHD.



- This project is a two-part study whose main goals are (1) to investigate the relationships between pre-college factors, classroom teaching, and academic success of STEM college students with ADHD, (2) to compare those to relationships for STEM college students without ADHD, and (3) to identify evidence-based teaching practices that may improve the college experience for these students. To accomplish our goals, we divided our tasks into three main phases. In phase one, we will conduct a large-scale study of secondary data (comprising records of approximately 40,000 first-year students, including approximately over 2,000 with ADHD) and conduct a scoping literature review. In phase two, we will

design, administer and analyze a student survey, and finally, in phase three, we will conduct in-depth interviews of 30 STEM college students with ADHD to better understand survey results. As a result, we will have empirical evidence about teaching practices that may improve the college experience for STEM college students with ADHD, and our goal will be to disseminate actionable recommendations to higher education instructors and administrators. The scoping literature review falls into the first phase, and this presentation will provide details on it.

Background Literature

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- **Attention deficit hyperactivity disorder (ADHD)** is a neuropsychological condition characterized by a persistent pattern of inattention, hyperactivity, and/or impulsivity [6].
- **Strengths of individuals with ADHD**
  - Greater resiliency [7]
  - Creative and innovation [8]
  - Divergent thinking [9]
  - Hyper-focus [10]
  - High energy levels and courage [11]
- **Challenges they face**
  - Executive function [12]
  - Time management [12]
  - Organization [13]
  - Study skills [13]

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- ADHD is a neuropsychological condition characterized by a persistent pattern of inattention, hyperactivity, and/or impulsivity [6].
- Previous studies have shown the importance of increasing diversity in different settings and its impact on cognitive development [7]. Seeking to increase and improve diversity at the college level, we must pay attention to what students with ADHD can contribute. Individuals with ADHD often have greater resiliency ,(i.e. adaptability in difficult circumstances) than people without ADHD [8] , they tend to be more creative and innovative [9], and they exhibit divergent thinking [10]. Additionally, some people with ADHD are capable of achieving intense

focus (hyper-focus) when engaging in high-interest activities and tasks [11] . And they commonly identify strengths such as high energy levels and courage [12]. However, like all people, they also face challenges, especially with executive functioning [13].

Background Literature

- We know about pre-college factors and their association with academic success [12], but little is known about factors at the college level.
  - Studies have primarily focused on academic success, grades, and retention and lesser on their relationship to the college experience [14, 15].
  - We are unaware of a literature review of the college experience of students with ADHD.

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- We then must explore the college experience of these students to understand the factors that hinder or enhance their academic success. As I mentioned earlier, there is considerable research showing the association between pre-college factors and academic success, but little is known about college factors. Although there have been some recent studies about college students with ADHD, their focus is not on the college experience is more on academic success, grades, and retention. In addition, we are unaware of a literature review of the college experience of students with ADHD.

Theoretical Framework – Social Model of Disability [15]

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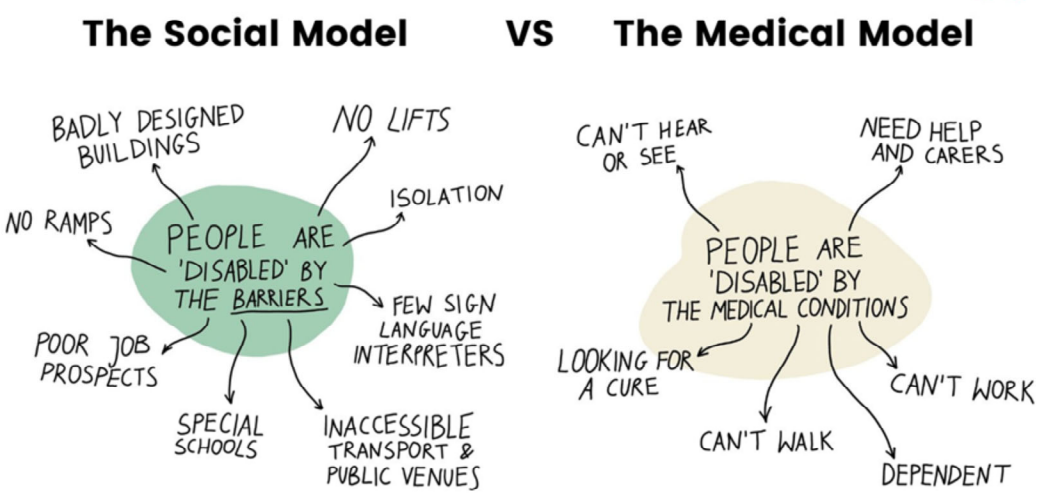


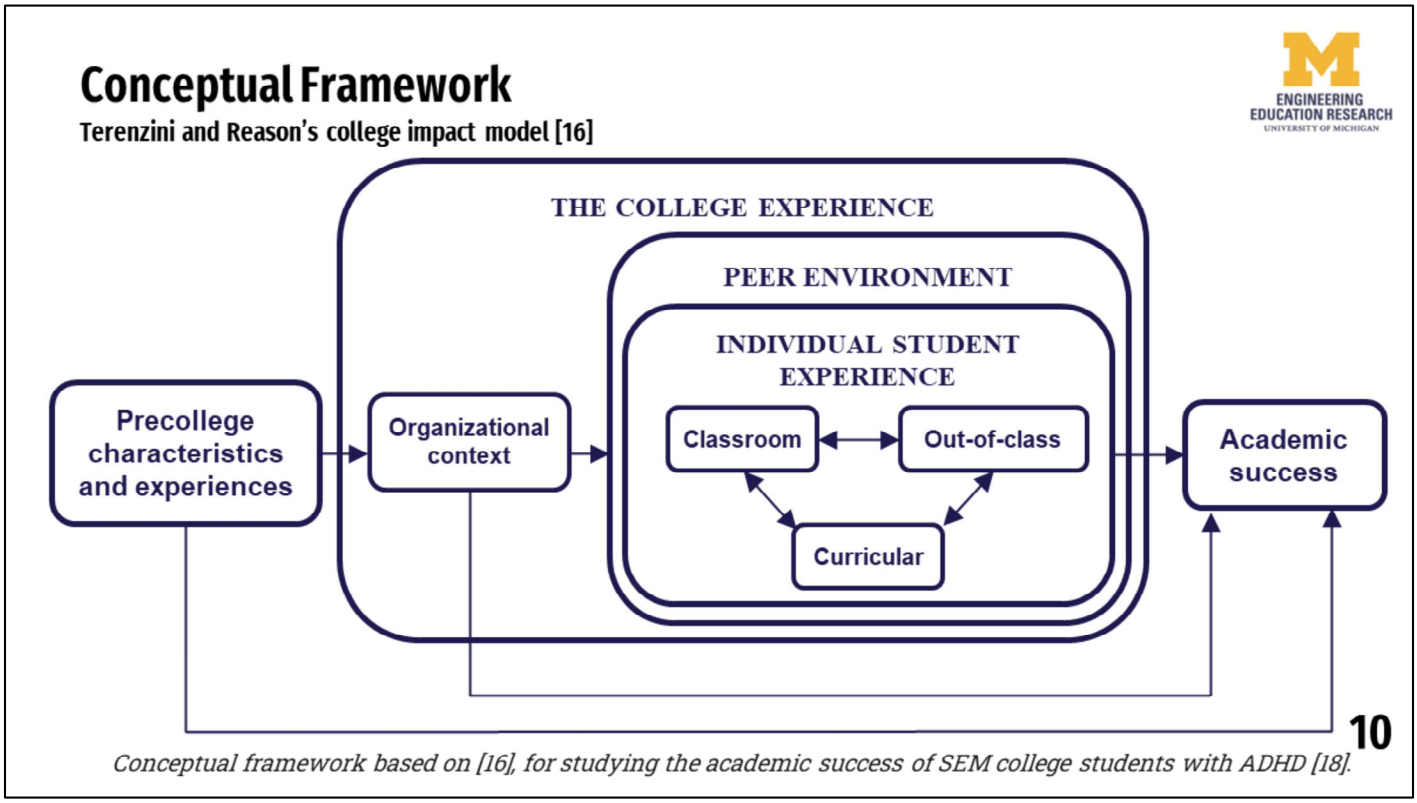
- Our work is based on two important frameworks, one of them the Social Model of Disability (SMD). The SMD was created by people with disabilities. It states that people have impairments but that the oppression, exclusion, and discrimination they face are not an inevitable consequence of having an impairment. It is instead caused by the way society is run and organized. Other models, such as the medical and charity model of disabilities, rest on the assumption of what a person with disabilities can't do because of their impairment [15]. The medical model focuses on "helping or fixing" the individual through medical procedures, and the charity model concludes that a person with disabilities needs special charitable

services [15].

- The SMD argues that people with impairments are “disabled” by the barriers operating in the society that excludes and discriminates against them [15].

- This model can help us answer the question of why it is so important to understand the college experiences of neurodivergent students, particularly students with ADHD. One reason is to create more inclusive classrooms, classrooms that can help these students to engage, participate and learn without having to think about the limitations they might find that hinder their academic success. For example, there have been some works on the periods of lectures on learning. If we have long periods of lecture (2 to 3 hours), students (with ADHD) don't learn as well as other students (without ADHD). Thus, shorter periods of lecture might be beneficial for these students. This way, we are taking down a barrier and building a

bridge for them to be supported. And another reason is to increase diversity. Previous studies have shown the benefits of having people from different backgrounds and life experiences in different settings, particularly academic and research settings. Students with ADHD tend to be more creative and innovative [7], and they exhibit divergent thinking [7].

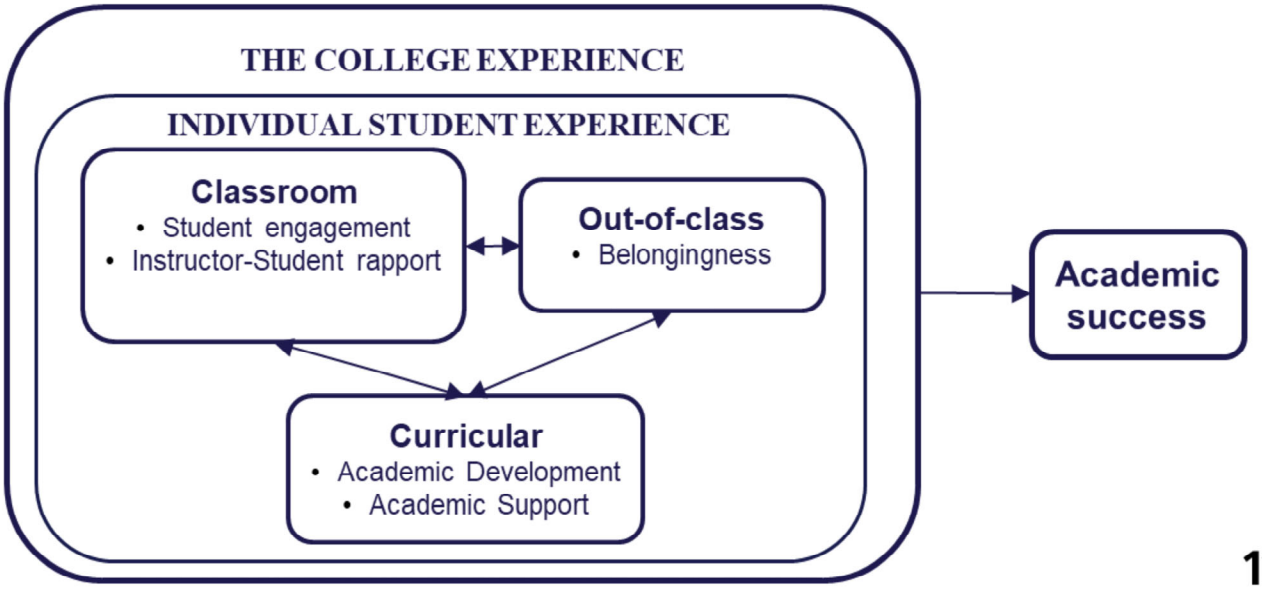


- In order to explore those experiential elements and their association with the academic success of these students, we developed a conceptual framework based on Terenzini and Reason's Input-Environment-Output (I-E-O) model [16]; our previous work described this in detail. This college impact model posits that students' educational outcomes are influenced by pre-college characteristics and experiences as well as the college experience (organizational context and individual student experience). We tailor this college impact model to our study of academic success by including neurodiversity [17] in pre-college characteristics and experiences and defining elements of the model.

Basically, the model is composed of pre-college characteristics and experiences, which include neurodiversity, sociodemographic traits, prior academic preparation and performance and student dispositions, the college experience that captures both the organizational and individual student experience, and by the academic success, which encompasses more traditional college outcomes.

Conceptual Framework

Terenzini and Reason's college impact model [16]



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Conceptual framework based on [16], for studying the academic success of SEM college students with ADHD [18].

- Our work is focused n the individual college experience, which is comprised of the classroom (student engagement, instructor-student rapport), curricular (academic development and academic support), and out-of-class (belongingness) experiences. Finally, we have academic success, which encompasses more traditional college outcomes [18].

- To meet our first goal (phase 1) of understanding the relationship between pre-college factors, college teaching experiences, and academic success of students with ADHD, we decided to conduct a Scoping Literature Review focusing on the college experiences of these students based on our framework.

Methods

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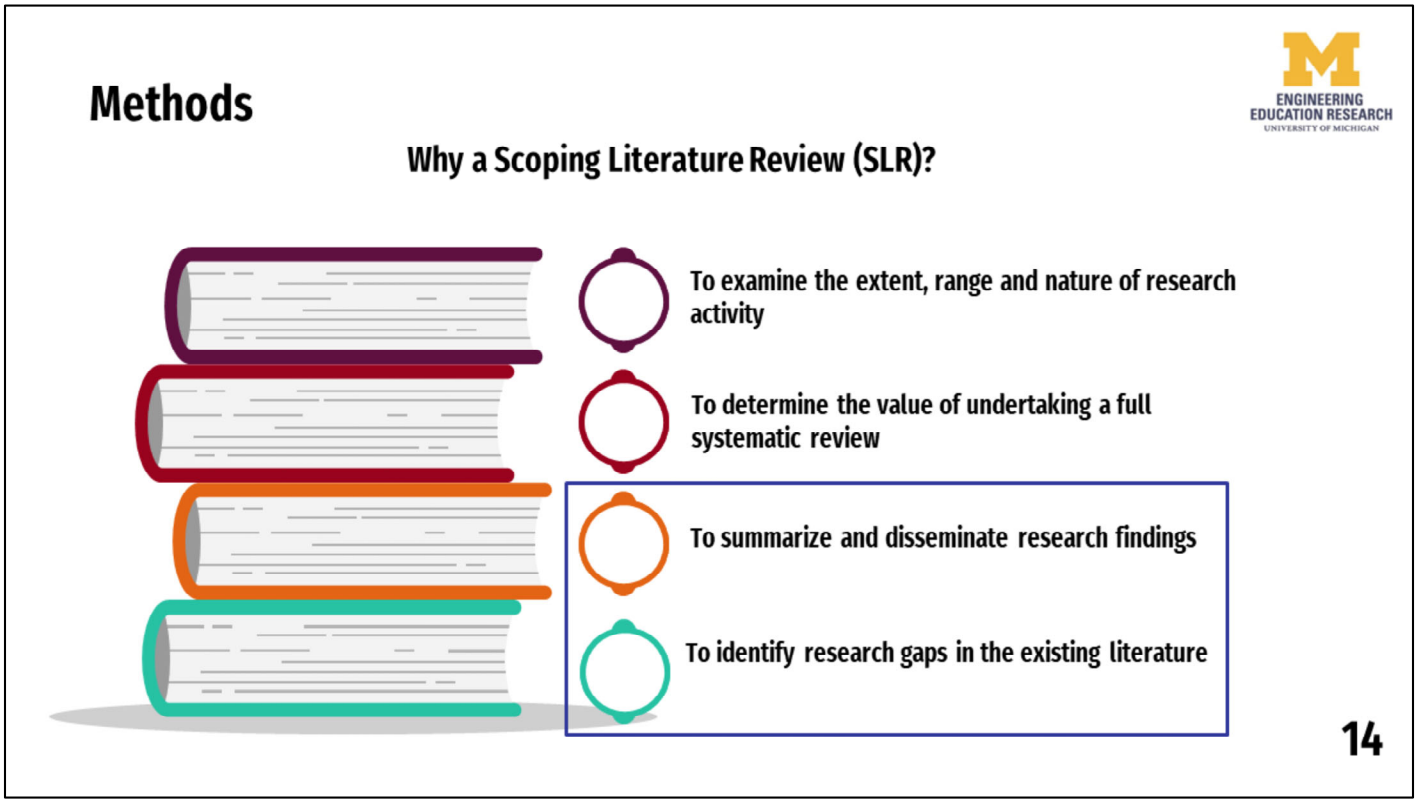
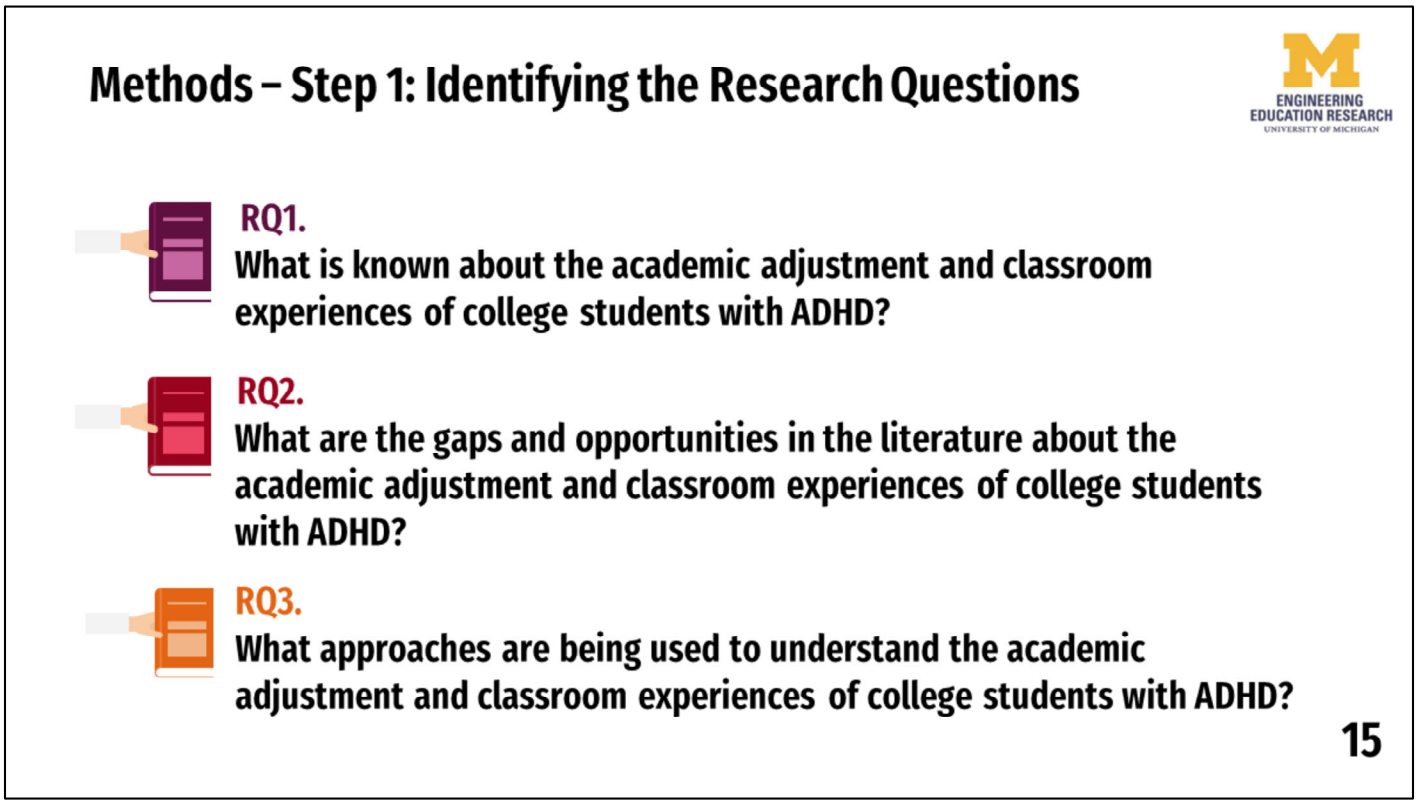
Scoping Review Frameworks [21]

	Arksey & O'Malley framework (p. 22-23)	Enhancements proposed by Levac, Colquhoun, & O'Brien (p. 4-8)
Step 1	Identifying the research question	Clarifying and linking the purpose and research question
Step 2	Identifying relevant studies	Balancing feasibility with breadth and comprehensiveness of scoping process
Step 3	Study selection	Using an iterative team approach to selecting studies and extracting data
Step 4	Charting the data	Incorporating a numerical summary and qualitative thematic analysis
Step 5	Collating, summarizing, and reporting the results	Identifying implications of the study findings for policy, practice, or research
Step 6	Consultation (optional)	Adopting consultation as a required component of scoping study methodology

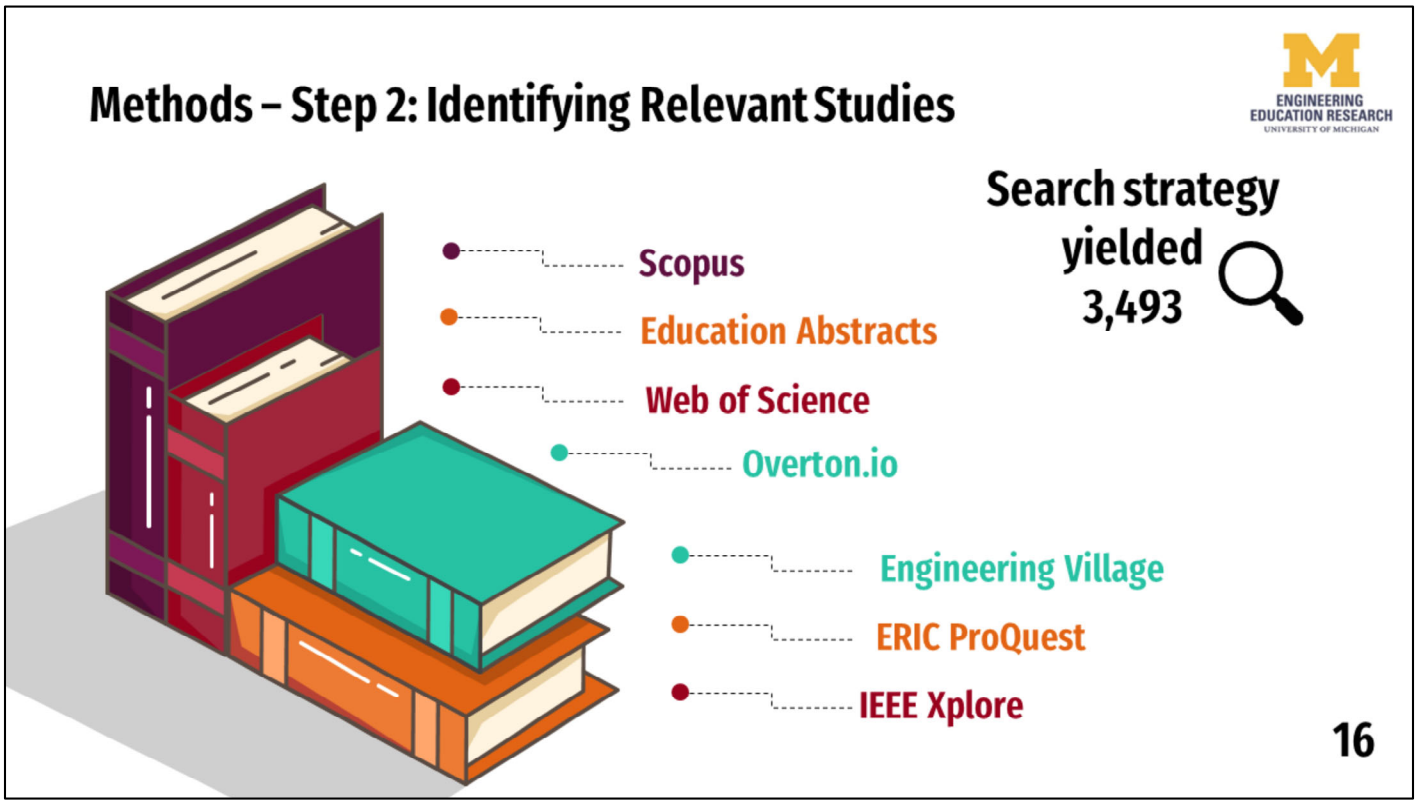
- We conducted a Scoping Literature Review of the college experiences of students with ADHD. A SLR aims to identify the nature and extent of research evidence [19]. SLR "tend to be completed in an iterative process, involving frequent adjustments during the literature search and selection [20] We used Arksey and O'Malley's framework as a guide following the five stages of conducting a scoping review: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results [21].



- Arksey and O'Malley said that there are four reasons to conduct a SLR: (1) to examine the extent, range and nature of research activity, (2) to determine the value of undertaking a full systematic review, (3) to summarize and disseminate research findings, and (4) to identify research gaps in the existing literature.
- Our work aligns with two of their four reasons to conduct a SLR, "to summarize and disseminate research findings, and to identify research gaps in the existing literature."
- In this section, I discuss in detail the first three steps of this framework which is the work we have completed or are currently working on.

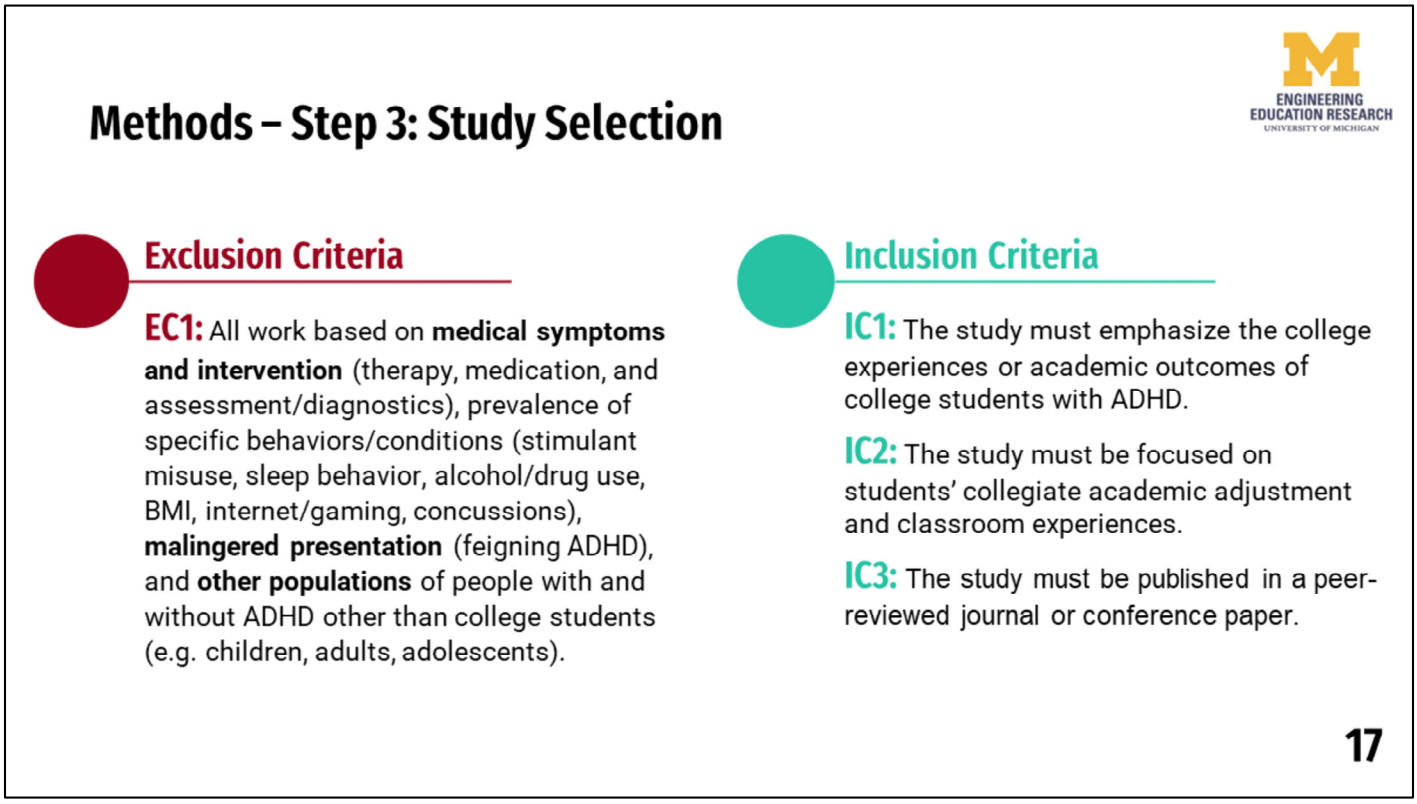


- The first step is to identify the research questions. This scoping review aims to answer the following questions. Our Scoping Literature Review aims to answer the following research questions: (1) What is known about the academic adjustment and classroom experiences of college students with ADHD? (2) What are the gaps and opportunities in the literature about the academic adjustment and classroom experiences of college students with ADHD? and (3) What approaches are being used to understand the academic adjustment and classroom experiences of college students with ADHD?



- The second step in the framework is identifying relevant studies, and to achieve that, two important elements must be defined. One is the search strategy, and the other one is the inclusion criteria. During our search, we primarily used the Engineering Education Research database at the University of Michigan's Library, which includes Scopus, Education Abstracts, Web of Science, Overton, Engineering Village, ERIC ProQuest and IEE Xplore. Using our framework, we created a list of the keywords used for the search to be consistent when looking for qualifying studies in all the databases. Within each database, we used the different keywords as an initial text string, and then we added ADHD to all of them. (e.g. student

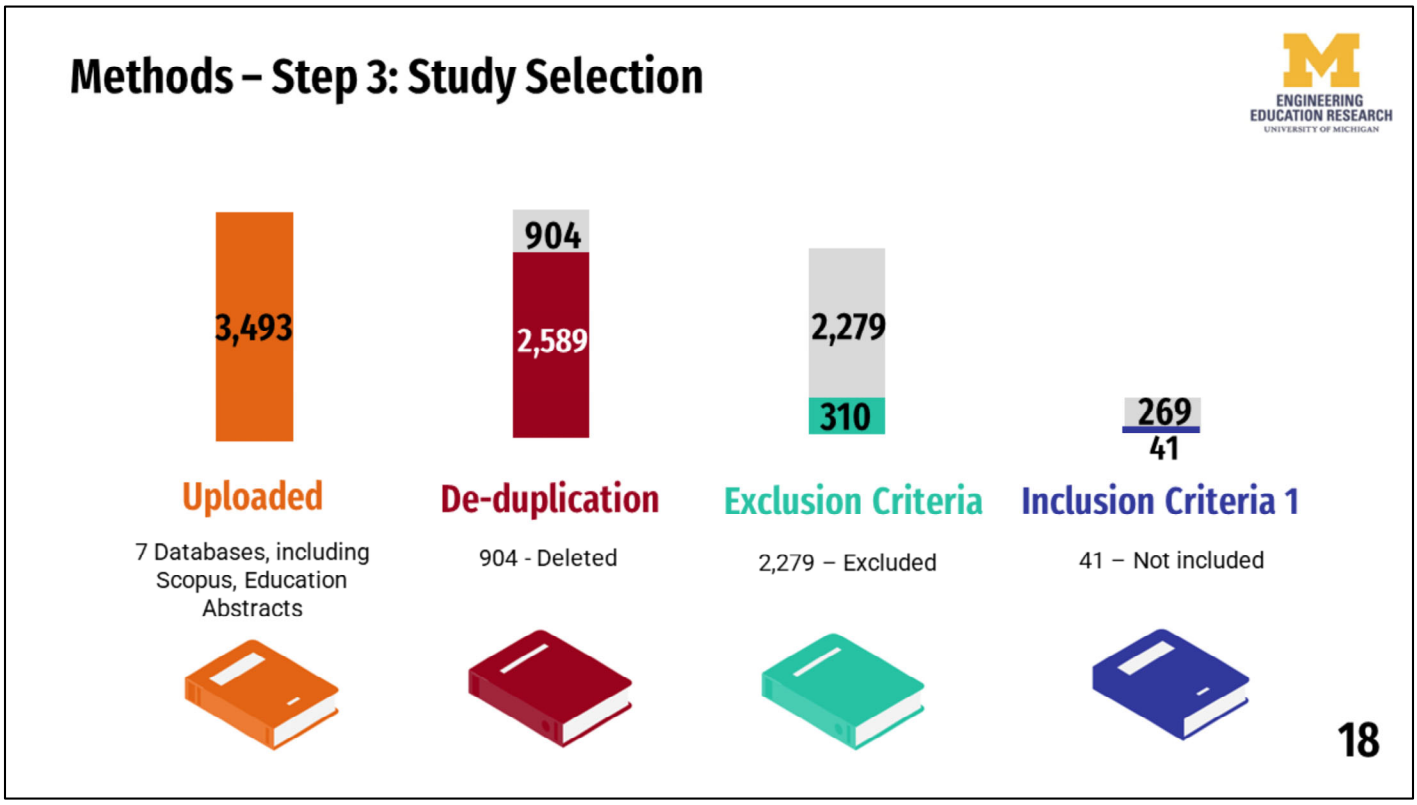
engagement and then student engagement AND ADHD). All studies gathered from the initial search process were stored on Rayyan, a systematic literature review software. A total of 3,493 studies were found.



- We established the initial inclusion and exclusion criteria based on our research questions and adjusted the criteria during the search and selection processes as our understanding of the literature and scope evolved [19]. The final inclusion and exclusion criteria are as follows:
- EC1: All work based on **medical intervention** (therapy, medication, assessment/diagnostics), symptoms, and relationships with specific behaviors/conditions (stimulant misuse, sleep behavior, alcohol/drug use, BMI, internet/gaming, concussions) **Malingered presentation** (feigning ADHD) and on **other**

populations of people with ADHD other than college students (children, adults, adolescents).

- IC1: The literature/study must emphasize the college experiences or academic outcomes of college students with ADHD.
- IC2: The study must be focused on academic adjustment and classroom experiences.
- IC3: The study must be published in a peer-reviewed journal or conference paper.



- A total of 3,493 studies were uploaded to the review software Rayyan. The first that we did after we uploaded all the studies to the software was to carry out the de-duplication process. This process consisted of identifying potential duplicates of each study in order to get rid of copies of the same study. The results from this process resulted in getting rid of 904 copies leaving us with a total of 2,589 studies. Followed by that, we began the selection process by applying our exclusion criteria which established that any work that focuses on medical intervention, malingered presentation and focuses on other populations other than

college students would be excluded. The results, a total of 2,279 were excluded and 310 studies remained. We then proceed to apply our first inclusion criteria, which allow us to include 269 studies and exclude 41. Currently, we are assessing those 269 studies based on our second inclusion criteria.

Results – STEM Students

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Initial Inclusion Criteria

The studies must emphasize college students with ADHD

21 studies that focus on STEM students

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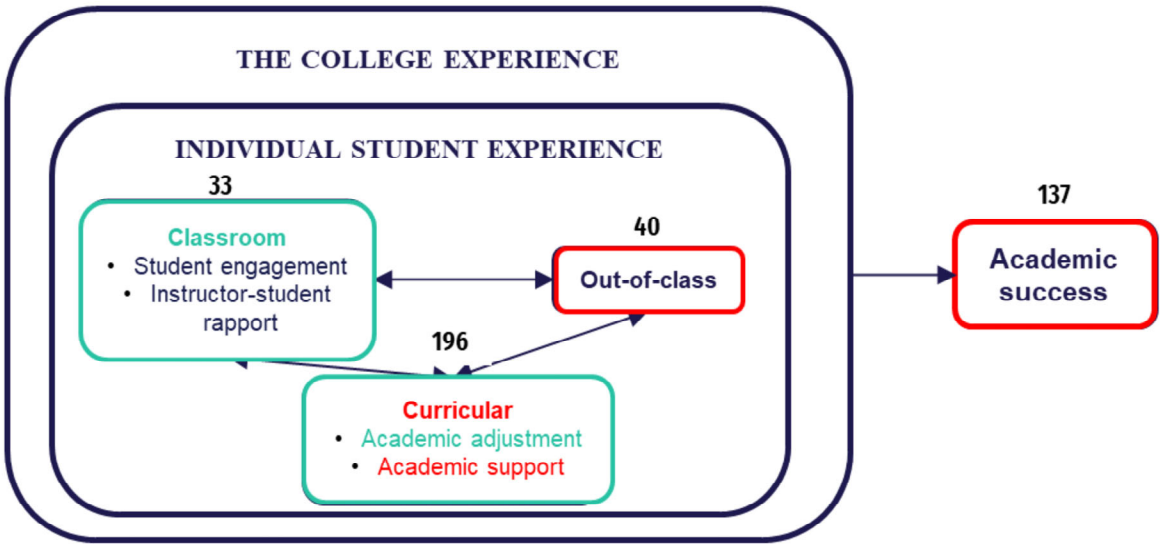
- This is a work in progress, and once the study selection is completed, we will focus on the last steps of the framework. Nonetheless, as I said earlier, the SLR is an iterative process, and adjustments are made as our understanding of the literature and scope evolves, I want to discuss the most significant adjustments we did based on the latter elements.
- The overarching goal of this work is to understand and explore the college experiences of STEM students with ADHD; however, in order to provide a complete analysis of these students' experiences, it is important first to assess, explore, and understand this population as a whole, and then investigate the STEM population. Thus, we decided to change our

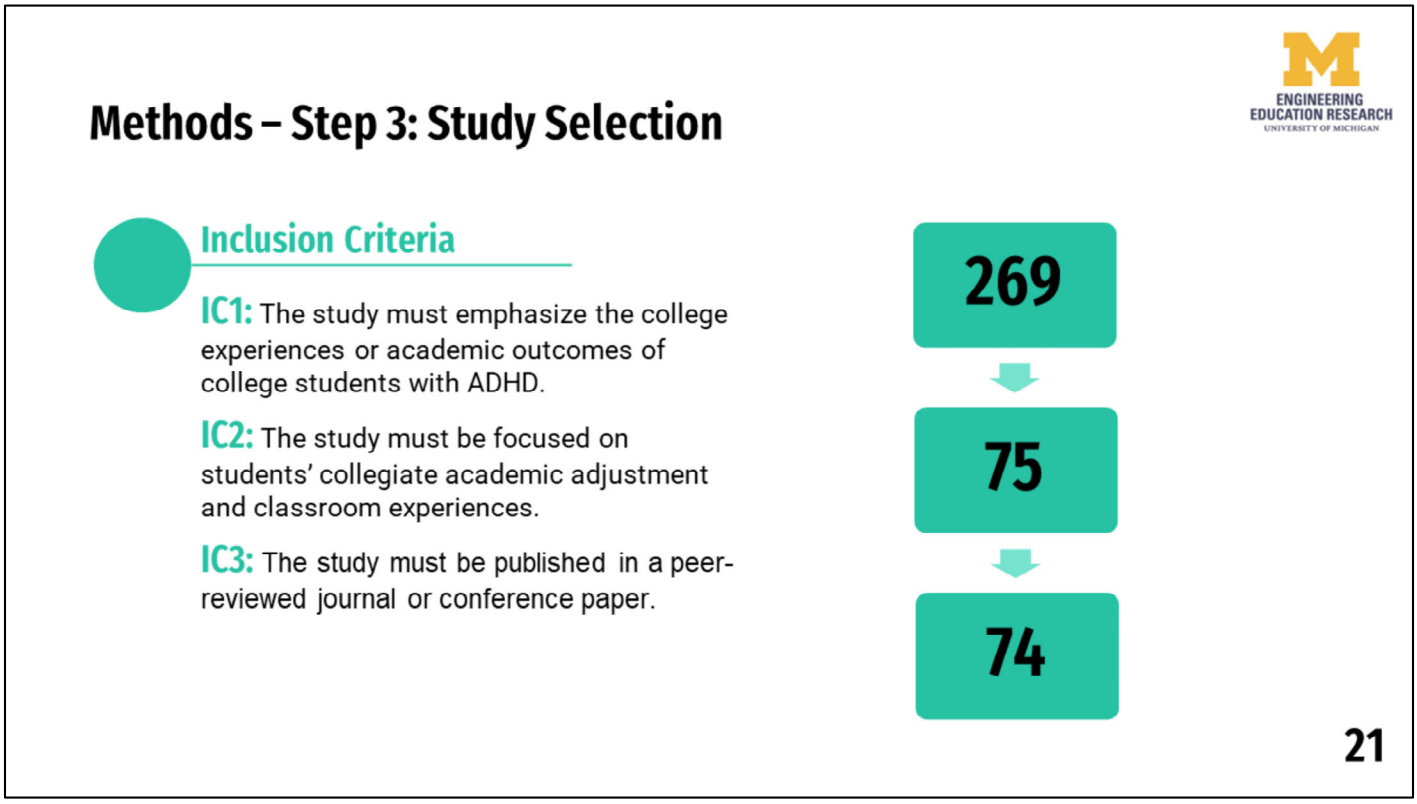
initial inclusion criteria that established that we only included studies that emphasize STEM college students with ADHD and take into consideration the whole population since we found a significant amount of work in this area and only a total of 21 studies that focus on STEM students.

Results – Individual College Experience



Conceptual framework based on [15], for studying the academic success of SEM college students with ADHD [17].

- We also decided to change the scope of the experiential elements by only focusing on the classroom and, within the curricular category, the academic adjustment. We made this decision based on our Structural Equation Modeling, (SEM), which showed that the classroom and the academic adjustment variable were the most significant of all. Note that the out-of-class variable now falls into the academic adjustment variable.
- The 269 studies were classified into these 4 categories: classrooms, out-of-class, curricular and academic success. Some studies address multiple factors, so that is why there is some double counting.



- Focused on the new categories for classroom and academic adjustment, we then applied the second inclusion criteria that established that the study must focus on students' collegiate academic adjustment and classroom experiences. From the 269 studies, a total of 194 studies were excluded.
- We then applied the third inclusion criteria which established that the studies must be published in a peer-reviewed journal or conference paper. Only 1 study was excluded leaving a total of 74 studies, which will pass on to the next phase of the study selection process.

Results – Individual College Experience

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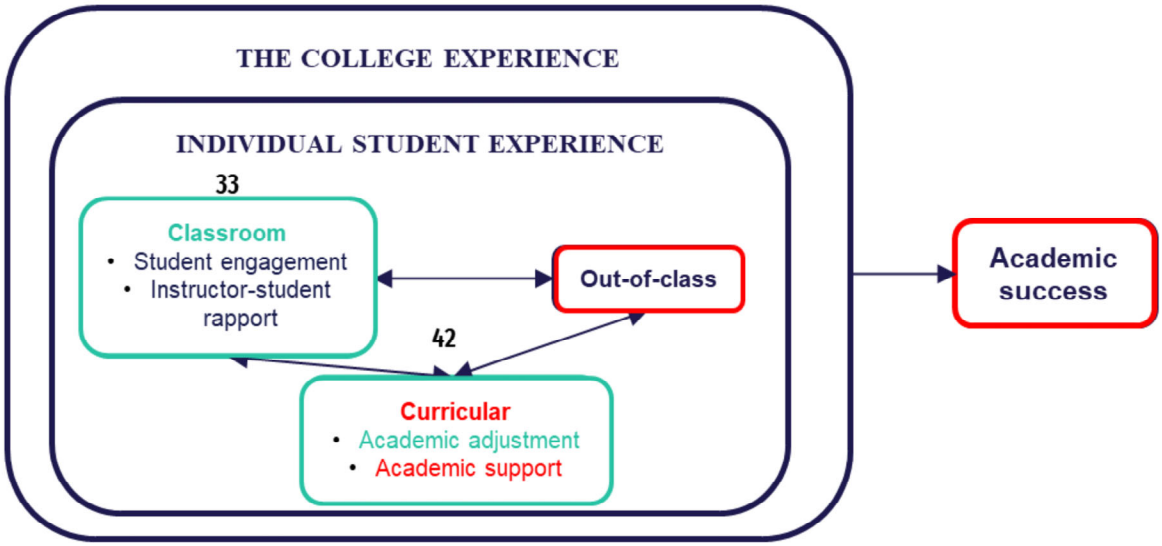

Conceptual framework based on [15], for studying the academic success of SEM college students with ADHD [17].

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- The final number of studies on each category.

Results – What have we found?

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- Papers cover topics such as:
  - **Academic Success (137)** – Academic achievement, college grades, major grades, persistence, creativity, self-confidence, post-graduation plan.
  - **Academic Support (116)** – Disability services, academic support programs

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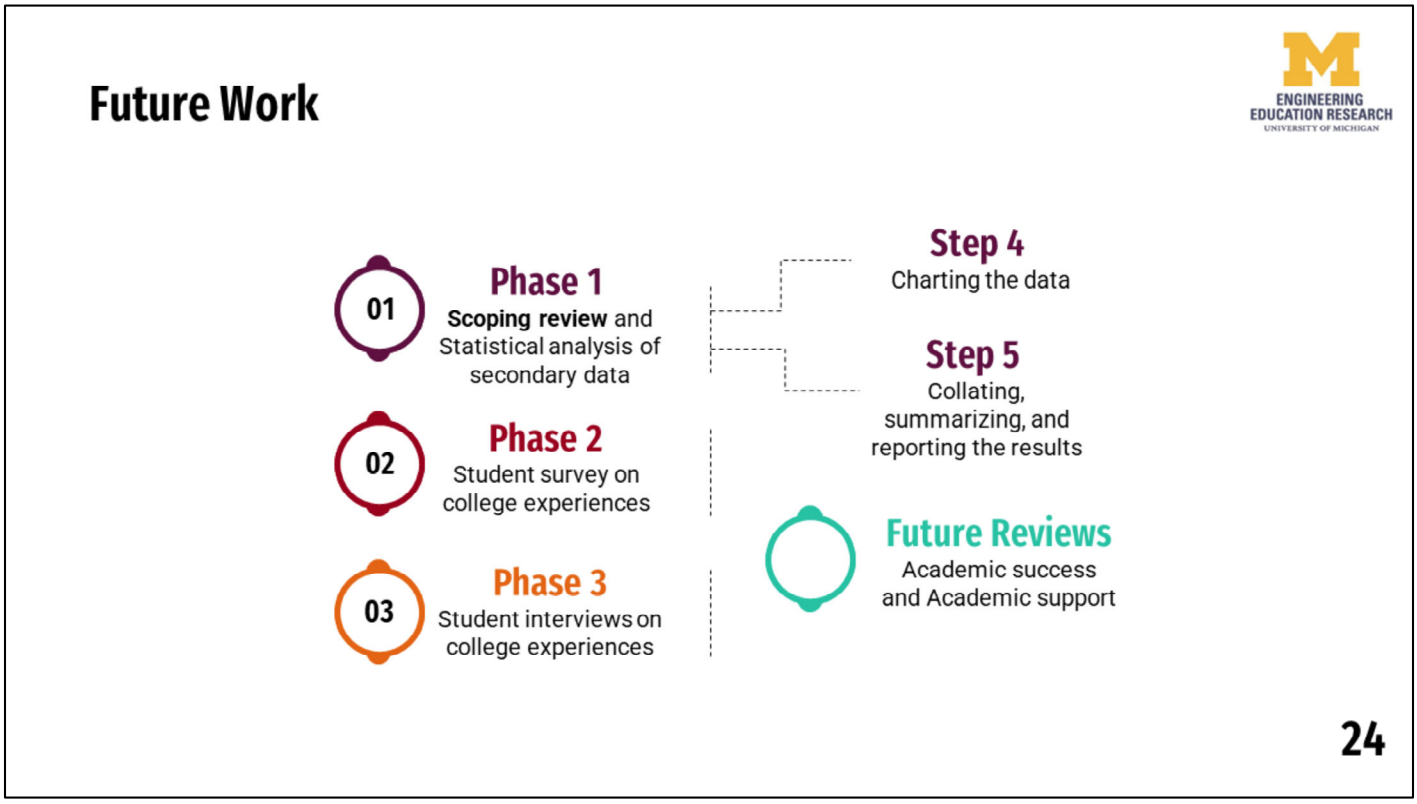
- All the studies that were found based on the initial scope of our project include a total of 253 studies, 137 related to academic success, which includes topics such as academic achievement, college grades, major grades, persistence, creativity, self-confidence and post-graduation plan and 116 to academic support. The vast majority of the studies in this category were focused on disability services and academic support programs. These are now excluded but now become part of our future work.



- Our future work will consist of finishing the study selection process and proceeding with the last steps of the framework, which include charting the data (incorporating a numerical summary and a qualitative thematic analysis) , and collating, summarizing, and reporting the results (identifying the implications of the study findings for policy, practice or research). Once we finish this work, we will move on to phases 2 and 3, which consist of developing and administering surveys on college experiences and conducting interviews with college students to better understand those survey results.
- Finally, the studies from the academic success and academic support categories will be further analyze

by conducting separate literature reviews since these two categories were broad and have a significant number of studies with a myriad of topics were found.

References

1. Baumer, N., Frueh, J., (2021). "What Is Neurodiversity?". *Harvard Health.* https://www.health.harvard.edu/blog/what-is-neurodiversity-202111232645.
2. Comberousse, S. (2019). A beginner's guide to neurodiversity. *Learning Disability Today*. https://www.learningdabilitytoday.co.uk/abeginners-guide-o-diversity
3. Cole, E., & Cawthon, S.W., (2015). Self-disclosure decisions of university students with learning disabilities. *Journal of Postsecondary Education and Disability, 28(2), 163-179.*
4. Visser, S.N., Danielson, M.L., Bitsko, R.H. Holbrook, J.R., Kogan, M.D., Ghandour, R.M., Oreou, R., & S.J. (2014). Trends in the parent-report of healthcare provider-diagnosed and medicated Attention-Deficit/Hyperactivity Disorder: United States, 2003-2011. *Journal of the American Academy of Child & Adolescent Psychiatry, 53(1), 34-46.e2.*
5. Higher Education Research Institute. (2011, April). *College students with hidden disabilities: The freshman survey Fall 2010*. https://www.heri.ucla.edu/PDFs/pubs/briefs/HERI_ResearchBrief_Disabilities_2011_April_25v2.pdf
6. Taylor, C. L., Esmaili Zaghi, A., Kaufman, J. C., Reis, S. M., & Renzulli, J. S. (2020). Divergent thinking and academic performance of students with attention deficit hyperactivity disorder characteristics in engineering. *Journal of Engineering Education*, *109*(2), 213-229.
7. Rowley, S. J., & Camacho, T. C. (2015). Increasing diversity in cognitive developmental research: Issues and solutions. *Journal of Cognition and Development*, *16*(5), 683-692.
8. Wilmshurst, L., Peele, M. & Myette, P. (1995) Devising a supportive climate based on clinical vignettes of college students with attention deficit disorder. *Journal on Postsecondary Education and Disability, 11*(2-3), 31-43.
9. White, H.A., & Shah, P. (2011). Creative style and achievement in adults with attention-deficit/hyperactivity disorder. *Personality and Individual Differences*, 50(5), 673-677.
10. Delisle, J., & Braun, C. M.J. (2011). A context for normalizing impulsiveness at work for adults with Attention Deficit/Hyperactivity Disorder (combined type). *Archives of Clinical Neuropsychology*, 26(7), 602-613.

References

11. Mahdi, S., Viljoen, M., Massuti, R., Selb, M., Almodayfer, O., Karande, S., de Vries, P.J., Rhode, L., & Bolte, S. (2017). An international qualitative study of ability and disability in ADHD using the WHO-ICF framework. *European Child and Adolescent Psychiatry, 26(10, 1219-1231.*
12. Fleming, A., & McMahon, R.J. (2012). Developmental context and treatment principles for ADHD among college students. Clinical Child and Family Psychology Review, 15(4), 303-329.
13. Resnick, R.J. (2005). Attention deficit hyperactivity disorder in teens and adults: They don't all outgrow it. *Journal of Clinical Psychology, 61*(5), 529-533.
14. Weyandt, L., DuPaul, G. J., Verdi, G., Rossi, J. S., Swentosky, A. J., Vilardo, B. S., ... & Carson, K. S. (2013). The performance of college students with and without ADHD: Neuropsychological, academic, and psychosocial functioning. *Journal of psychopathology and behavioral assessment*, *35*(4), 421-435.
15. McCourt, D. (2022). The Social Model of Disability. Inclusion London 2022 · Promoting equality for London's Deaf and Disabled people. Website.
16. P. T. Terenzini and R. D. Reason, (2019) "Parsing the first year of college: A conceptual framework for studying college impact," presented at the Proceedings of the Annual Meeting of the Association for the Study of Higher Education, Philadelphia, PA, U.S.,
17. T. Armstrong, (2015) "The myth of the normal brain: Embracing neurodiversity," *American Medical Association Journal of Ethics*, *17*(4). 4, pp. 348-352, doi: 10.1001/journalofethics.2015.17.4.msoc1-1504.
18. Carroll, L., Finelli, C. J., & DesJardins, S. (2022). Academic Success of College Students with ADHD: The First Year of College. 2022 Collaborative Network for Engineering and Computing Diversity Annual Conference
19. Grant, M. J., & Booth, A. (2009). A typology of reviews: an analysis of 14 review types and associated methodologies. *Health information & libraries journal, 26*(2), 91-108.
20. Denton, M., & Borrego, M. (2021). Funds of knowledge in STEM education: a scoping review. *Studies in engineering education, 1*(2).
21. Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. International journal of social research methodology, 8(1), 19-32.

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Questions?

Thank you