

Enabling Successful Transitions to Higher Education for Students with Disabilities

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Background – The transition into higher education from high school presents numerous challenges for students with disabilities. In the United States, regulatory support changes dramatically in this transitional period; students who could previously rely on accommodations guaranteed under the Individuals with Disabilities Education Act (IDEA) now must rely solely on the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act, which guarantee fewer educational accommodations.

Purpose/Hypothesis - Unique challenges with accessibility in STEM disciplines contribute to a disparity in persistence between students with disabilities and their peers. Libraries are uniquely positioned to provide resources and foster inclusive learning that supports academic success for students with disabilities through their cross-disciplinary involvement in information, technology, and student support. This paper critically examines the literature around the transition to college for students with disabilities to extract meaningful ways libraries can contribute to academic success for students with disabilities entering higher education.

Method/Design/Scope – We used advanced search techniques to identify candidate articles related to the transition to higher education for students with disabilities in Web of Science (n=1152). We then used Biblioshiny (an R package) to conduct bibliometric analysis and visualize trends in the literature. Finally, using the most influential of the results, we identified themes that libraries can use to contribute to the academic success of students with disabilities.

Results – We evaluated the composition of the dataset, determining the most highly cited authors and publications related to this topic. We also used theme analyses to identify terms that have increased or decreased in usage over time. The results can also provide insights into future research directions related to the transition to higher education for students with disabilities.

Conclusions – Our analysis yielded several insights for librarians in higher education, including focus on universal design in both instruction planning and space allocation, opportunities for outreach and engagement with campus entities supporting students with disabilities, and critical evaluation of the terminology used in resource description and access.

Introduction

To begin, it is important to contextualize the education transition literature within the history of United States federal legislation. In the US, the first notable piece of federal legislation addressing disabilities was the Smith-Sears Act or, as it is better known, the “Veterans Rehabilitation Act” of 1918 [1], [2]. The purpose of this legislation was to rehabilitate and

reintegrate veterans with permanent disabilities¹ returning from World War I [1]. This was followed two years later by the Smith-Fess Act or the “National Civilian Vocational Rehabilitation Act” [2], [4]. These early acts of legislation largely focused on physical disabilities [2]. Legislation was revised and expanded to include a more nuanced understanding of disabilities between the early 1920’s and the passage of the Rehabilitation Act of 1973. This landmark legislation combined and expanded upon all prior acts of rehabilitative legislation and forms the foundation of the current legal framework [5]. Notably, the Rehabilitation Act of 1973 enshrined protection for those with disabilities seeking educational opportunities, guaranteeing otherwise qualified individuals are not excluded from educational opportunities at publicly funded institutions [5]. The Individuals with Disabilities Education Act (IDEA) was first passed two years later in 1975 as the Education for All Handicapped Children Act (EHA) [6]. It was reauthorized and revised to its current name in 1990 and further improved and reauthorized in 2004 to align with the “No Child Left Behind Act” of 2001 [2], [7], [8], [9]. IDEA guarantees Free and Appropriate Public Education (FAPE) for students with disabilities and mandates that qualified children receive an Individualized Education Program (IEP) through primary and secondary education [8]. Finally, the Americans with Disabilities Act (ADA) of 1990 guarantees protections against discrimination for people with disabilities. The Rehabilitation Act, IDEA, and ADA guarantee certain civil rights to people with disabilities but also create the challenge we are investigating in this study.

While ADA and the Rehabilitation Act apply to all individuals in the United States, the educational guarantees under IDEA cease after secondary education, creating a substantial hurdle for students with disabilities entering college. Much literature focuses on the differences in guaranteed services and increased student independence which necessitates greater student self-advocacy [10], [11], [12], [13]. These challenges have negative impacts on student outcomes; a 2020 study conducted by the Office of Special Education Programs found only 23 percent of disabled students planned enrollment in higher education [14] compared to a 2021 study by the National Center for Education Statistics which found that across all populations 38 percent of 18-to-24 year-olds were enrolled in higher education [15]. Furthermore, students with disabilities complete their degree programs at lower rates than their peers [16], [17]. This presents in the workforce as well; only 3 percent of those working in STEM disciplines report having a disability while 13.5 percent of the general population reports having a disability [18], [19].

While factors prior to entering higher education may contribute to gaps in enrollment, institutions of higher education have a significant role to play in increasing persistence. As crucial campus partners in information dissemination and research support, libraries must do their part to ensure the diverse needs of the institution are met, including supporting more successful and less burdensome transitions into higher education. Substantial research has been conducted on accessibility and Universal Design in libraries [20], [21]. Although numerous prior reviews have been conducted on the transition to higher education, these have largely focused on

¹ In this paper we have chosen to use person-first language (ex. students with disabilities) to center people, namely our students in higher education, as our focus [3]. We acknowledge that some individuals prefer to use identity-first language (ex. Autistic student) to describe themselves and any quotations we use maintain the original identifying terminology from the referenced article.

specific interventions [22], [23] and/or disabilities [24], [25], [26]. In this review, we seek to systematically identify relevant literature that librarians may consider using to support a campus in better enabling successful transitions. We also utilize key findings to identify specific strategies libraries might deploy to cultivate a welcoming and supportive environment for students with disabilities.

Methodology

We selected the Web of Science (WOS) Core Collection for our analysis as we wanted robust metadata, interoperability with the Biblioshiny analysis tool, and to search across disciplinary bounds [27]. We recognize that WOS may not have the most inclusive coverage; however, limitations with regards to interoperability of exports with Biblioshiny precluded the inclusion of additional databases. Further, we do not have access to Scopus, the other primary abstracting and indexing database which can also export interoperable data. After trying numerous search combinations, we used the following search to gather candidate articles for our dataset: (transition OR success) (All fields) AND disab* (All fields) AND student (All fields) AND (“higher education” OR college OR university) (all fields), which resulted in 3,585 items.

Those items went through three rounds of refinement to establish our final dataset (see Figure 1). First, filters for Countries/Regions “USA” and Language “English” were applied to the search results, refining the list to 2,394 items. We are primarily interested in students’ transition under US legal frameworks, not other national contexts. Also, none of the authors have the ability to read scholarly literature in other languages. No temporal limits were placed on the dataset to gain a better understanding of changes in the literature over time. Also, no limits were placed on the type of disability to gain the broadest possible understanding of the experiences of students with disabilities.

Once filters were used on the search results, all remaining items were included in a WOS Marked List (their version of a folder). Once in the list, we noticed that some articles from beyond the US were still in the search results, so our filters of Countries/Regions “USA” and Language “English” were applied a second time to ensure that only articles with a US context in English were included in the dataset. This process resulted in 2,224 items for potential inclusion in the final dataset. This second application of the filters should not have been necessary, but the filters did not eliminate all irrelevant items when first applied.

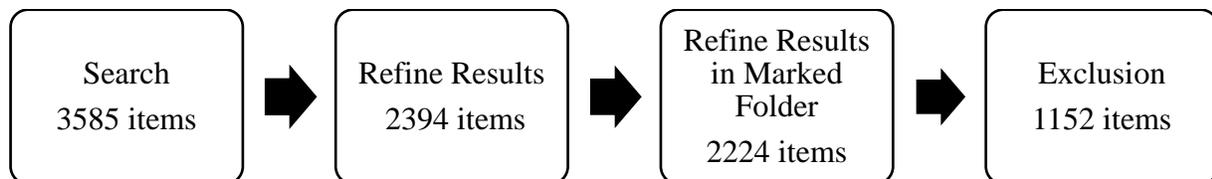


Figure 1. Number of candidate items after each stage of the data collection process

Finally, a second author reviewed each candidate article more thoroughly for scope and relevance to establish a final dataset of 1,152 items. The final dataset included items published between 1984 and 2024. Titles, abstracts, and subject terms were reviewed for relation to the transition to higher education and/or adulthood and for a focus on students with disabilities.

Most retained items discussed transition planning, setting and achieving post-secondary goals, or experiences of students pre- and post-transition. Additionally, to gain a fuller understanding of the post-secondary transition as well as the skills and supports necessary to help students with disabilities succeed in higher education, included items covered the following:

1. Broad exploration of students with disabilities setting and achieving post-secondary goals and ambitions, such as careers and higher education.
2. Examinations of adult skill development as students in higher education often must live independently and develop skills such as navigating transportation, cooking, and navigating social relationships.
3. Studies on the experiences of students with disabilities in higher education.

Several types of articles were removed from the final dataset as off-scope for this particular study. Removed articles were retained in a second Marked List should data sharing or further analysis be necessary. Excluded articles fell into the following categories:

1. Elementary and/or high school focused – these items tended to focus on teaching a specific subject or the experiences of students with disabilities without mention of the transition to adulthood or higher education. This category also included camps held at universities for elementary school students with disabilities.
2. IEP processes in high school – these items looked at specific aspects of the IEP planning process, such as student participation in meetings while in high school without discussion of the larger transition process, skills needed, and/or barriers to transition.
3. K-12 teacher preparation and professional development – these items included articles focused on training special education teachers, professional development for paraprofessionals, and other aspects of the work experience of special education teachers without mention of students in transition.
4. Tangential higher education topics – these items included articles about student veterans that did not mention veterans with disabilities or engineering design course projects to design assistive devices.
5. Juvenile disciplinary services – which focused on rehabilitation of students with disabilities in juvenile detention as well as disrupting the school to prison pipeline.
6. Analysis of broader infrastructure, policy, and laws that did not contain any discussion of students in transition to adulthood and/or higher education.

Once the final dataset was compiled, it was imported into Biblioshiny for analysis. Biblioshiny provides a web interface for Bibliometrix, which uses a science mapping workflow to provide a suite of instruments for bibliometric analysis [28]. Biblioshiny is an interface friendly to non-coders and supports analysis from data upload through creation of visualizations. It runs on R, an open-source programming language for statistical computing. R Studio contains an integrated

development environment for R and Python [29]. As the members of the research team do not have extensive coding or R experience, Biblioshiny and R Studio (instead of Bibliometrix and R) were used for this analysis.

Results

Several analyses were conducted in Biblioshiny to gain insights into the composition of the final dataset and trends in the literature. The first analysis run after importing the dataset was to check the completeness of metadata which happens automatically (see Table 1). The percentage of complete metadata corresponds to different statuses: “Excellent” is defined as 0% of the records missing data in that field, “Good” (.01% to 10% missing), “Acceptable” (10.01% to 20% missing), “Poor” (20.01% to 50% missing), “Critical” (50.01% to 99.99% missing), and “Completely missing” (100% missing) [28]. Eight metadata fields were rated “Excellent,” including author, journal, publication, publication year, and total citations. Another four fields were rated “Good,” including abstract and affiliation. Two more fields, Keywords Plus and DOI, were “Acceptable.” Only Keywords were rated “Poor” with 32% of items missing that metadata. No fields were rated as “Critical” or “Completely Missing.” Overall, the metadata was largely complete and useable for analysis.

Metadata	Description	Missing Counts	Missing %	Status
AU	Author	0	0	Excellent
DT	Document Type	0	0	Excellent
SO	Journal	0	0	Excellent
LA	Language	0	0	Excellent
PY	Publication Year	0	0	Excellent
WC	Science Categories	0	0	Excellent
TI	Title	0	0	Excellent
TC	Total Citation	0	0	Excellent
CR	Cited References	14	1.22	Good
RP	Corresponding Author	37	3.21	Good
C1	Affiliation	39	3.39	Good
AB	Abstract	65	5.64	Good
ID	Keywords Plus	125	10.85	Acceptable
DI	DOI	208	18.06	Acceptable
DE	Keywords	371	32.20	Poor

Table 1. Metadata completeness results after uploading into Biblioshiny

Dataset Composition

We used the “Annual Scientific Production” analysis to examine publication trends throughout the 1984-2024 period included in the dataset (Figure 2). As expected, there has been a general increase in the number of articles published over time on the transition to adulthood for students with disabilities. In 2023 and 2024, the number of items in the dataset surpassed 100 each year. We were also interested in how publication trends related to the passage of laws regarding students and disabilities. Using a timeline of IDEA published by the US Department of Education [7], we overlaid key milestones onto the Biblioshiny visualization. Two key pieces of

legislation were enacted prior to the timeframe of our dataset, Section 504 of the Rehabilitation Act and EHA, the first iteration of IDEA. The National Longitudinal Transition Studies (NLTS [30], NLTS 2 [31] and NLTS 2012 [32]), a series of significant studies sponsored by the US Department of Education were also conducted during our time frame. A search of our dataset in WOS revealed 77 of the items contain within their metadata mention of this nationally conducted survey that examined students with disabilities while in high school and after exiting, for examples see [33], [34], [35]. Students, parents, and special education professionals were all participants in the study.

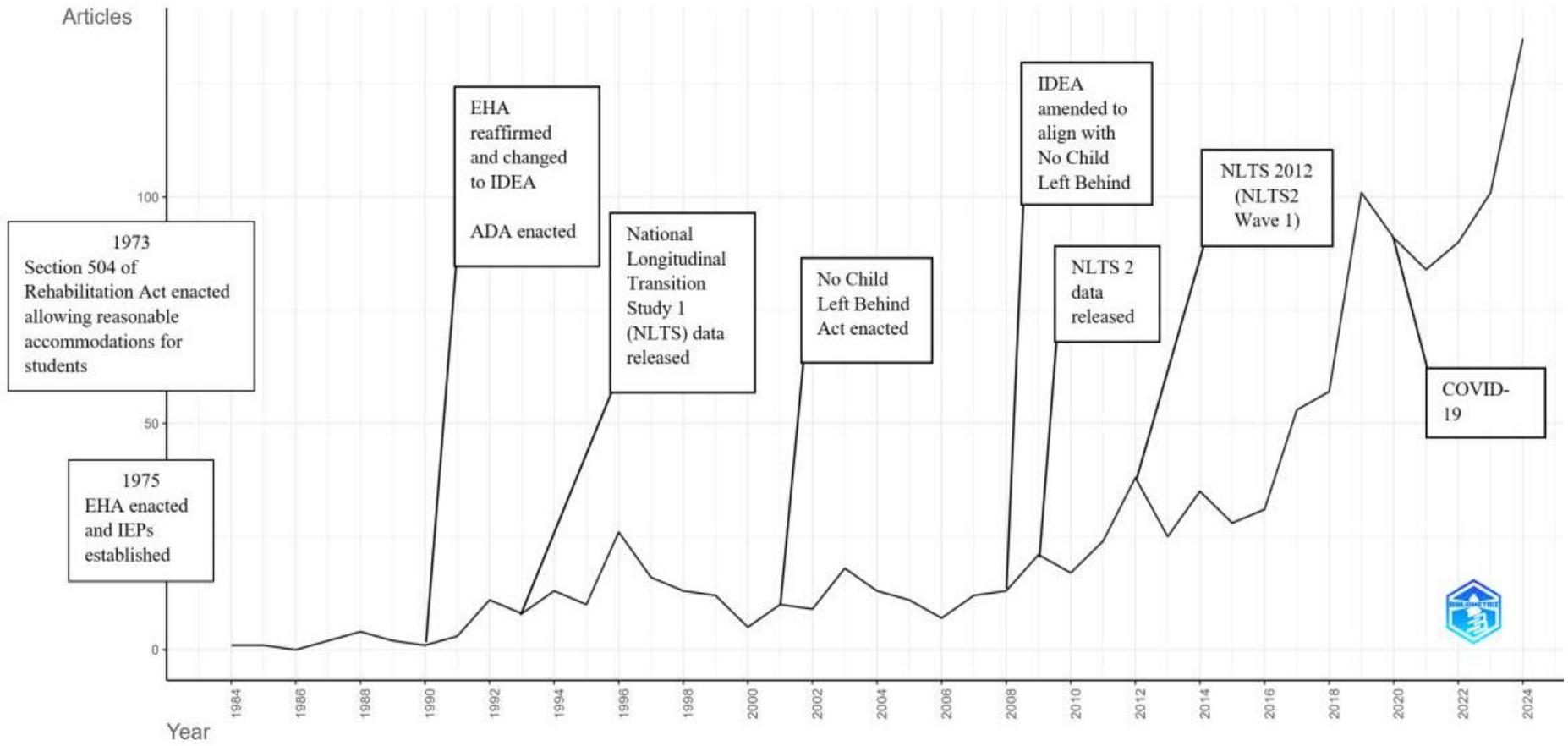


Figure 2. Publication totals in the dataset over time, aligned to IDEA milestones and relevant legislation

To better understand the sources of the articles in the dataset, we compared the top journal titles with the most local cited sources. The “Most Relevant Sources” analysis was used to identify the top 10 publication venues. The “Most Local Cited Sources” analysis was used to identify the top 10 publications cited most by other items in our dataset. To view potential overlap between these two lists, they were compiled side-by-side in Table 2. Seven publications were on both lists. The three publications on the most relevant sources list but not on the most cited list were *Journal of Learning Disabilities* (11th in most cited list), *Education and Training in Autism and Developmental Disabilities* (13th), and *Intervention in School and Clinic* (25th). The three publications on the most locally cited list but not on the most relevant sources list were *Journal of Special Education* (12th on most relevant list), *Focus on Autism and Other Developmental Disabilities* (14th), and *Research and Practice for Persons with Severe Disabilities* (17th).

Most Relevant Sources	Articles	Most Local Cited Sources	No. of Citations
Career Development and Transition for Exceptional Individuals	103	Career Development and Transition for Exceptional Individuals	2016
Journal of Postsecondary Education and Disability	55	Exceptional Children	1688
Journal of Vocational Rehabilitation	43	Journal of Autism and Developmental Disorders	1155
Remedial and Special Education	39	Journal of Vocational Rehabilitation	782
Journal of Disability Policy Studies	35	Journal of Postsecondary Education and Disability	678
Journal of Learning Disabilities	34	Remedial and Special Education	658
Exceptional Children	32	Journal of Special Education	503
Education and Training in Autism and Developmental Disabilities	31	Focus on Autism and Other Developmental Disabilities	391
Intervention in School and Clinic	27	Research and Practice for Persons with Severe Disabilities	389
Journal of Autism and Developmental Disorders	24	Journal of Disability Policy Studies	383

Table 2. Comparison of top publication venues and top citation sources with unique titles in bold

We also compared the most frequent authors in our dataset with the most locally cited authors. To generate the two lists for comparison, we used the “Most Relevant Authors” analysis and the “Most Local Cited Authors” analysis and created a table combining the top 10 from each list (Table 3). As with the publications list above, there was a significant overlap. Six authors appear on both lists. Four authors who were on the most relevant list, but not the locally cited list were Karrie Shogren (31st on the locally cited list), Emily Bouck (22nd), Allison Lombardi (19th), and Anthony Plotner (77th). The four authors who were on the most locally cited list but not on

the most relevant list were: Bonnie Doren (11th on the most relevant list), Michael Benz (23rd), Catherine Fowler (30th), and Paul Yavanoff (not included in our dataset).

Most Relevant Authors	Articles	Most Local Cited Authors	No. of Citations
Carter, Erik W.	39	Carter, Erik W.	344
Mazzotti, Valerie L.	22	Trainor, Audrey A.	278
Test, David W.	22	Test, David W.	222
Trainor, Audrey A.	19	Mazzotti, Valerie L.	179
Morningstar, Mary E.	18	Doren, Bonnie	164
Shogren, Karrie A.	17	Benz, Michael R.	151
Rowe, Dawn A.	15	Rowe, Dawn A.	150
Bouck, Emily C.	14	Morningstar, Mary E.	135
Lombardi, Allison R.	14	Fowler, Catherine H.	133
Plotner, Anthony J.	13	Yavanoff, Paul	121

Table 3. Comparison of most frequent authors and most locally cited authors with unique authors in bold

Trends in the Literature

To explore the top words used to describe the items in our dataset, we created a word cloud (Figure 3). We used the Keywords Plus data field and set the number of words to include in the cloud to 30. We did not load a list of synonyms or a list of terms to remove. These are potentially relevant search terms and could provide avenues for further expansion of our search criteria.



Figure 3. Word cloud of most used keywords in the Keywords Plus field

The types of words used in the literature regarding the transition to adulthood for students with disabilities can have implications for librarians when describing materials or searching for relevant content. We used the “Trend Topic” analysis to explore the words most used in the Abstract field of documents in our dataset (see Figure 4). We chose to use the Abstract field to get the greatest variety of words, selected bigram (two-word phrase, such as autism spectrum) instead of unigram (one word) or trigram (three-word phrase). Although we tried unigrams and

trigrams in this analysis, we found unigrams lacked sufficient context and trigrams too narrow to provide sufficient data on trends. Specifically, unigrams returned numerous terms that were decontextualized such as “study,” “adult,” and “missing;” with terms like “students” appearing over 3000 times in the abstract field of the dataset. Conversely, trigrams returned phrases such as “transition age youth,” “requiring transition services,” and “receiving transition services” with the highest frequency term, “autism spectrum disorder,” only appearing 110 times in the dataset. We also set word stemming to “no,” word minimum frequency to 15, and words per year to 3.

We used the text editing features to edit terms to remove irrelevant terms and group similar terms. Seven phrases were placed on a “terms to remove” list: education teachers, future research, study examined, school students, article describes, education students, and current status. Additionally, several phrases were grouped as synonyms with the first word for each list acting as parent term:

- Autism spectrum, autistic students, autistic youth, spectrum disorder, autistic individuals, spectrum disorders, autistic college
- Longitudinal transition, national longitudinal, transition study-
- Transition services, transition planning, transition plans, students transition
- Adult outcomes, adult life
- Education act, act idea, disabilities education
- Intellectual disability, intellectual disabilities
- Postsecondary education, inclusive postsecondary, postsecondary settings
- Learning disabilities, disabilities ld

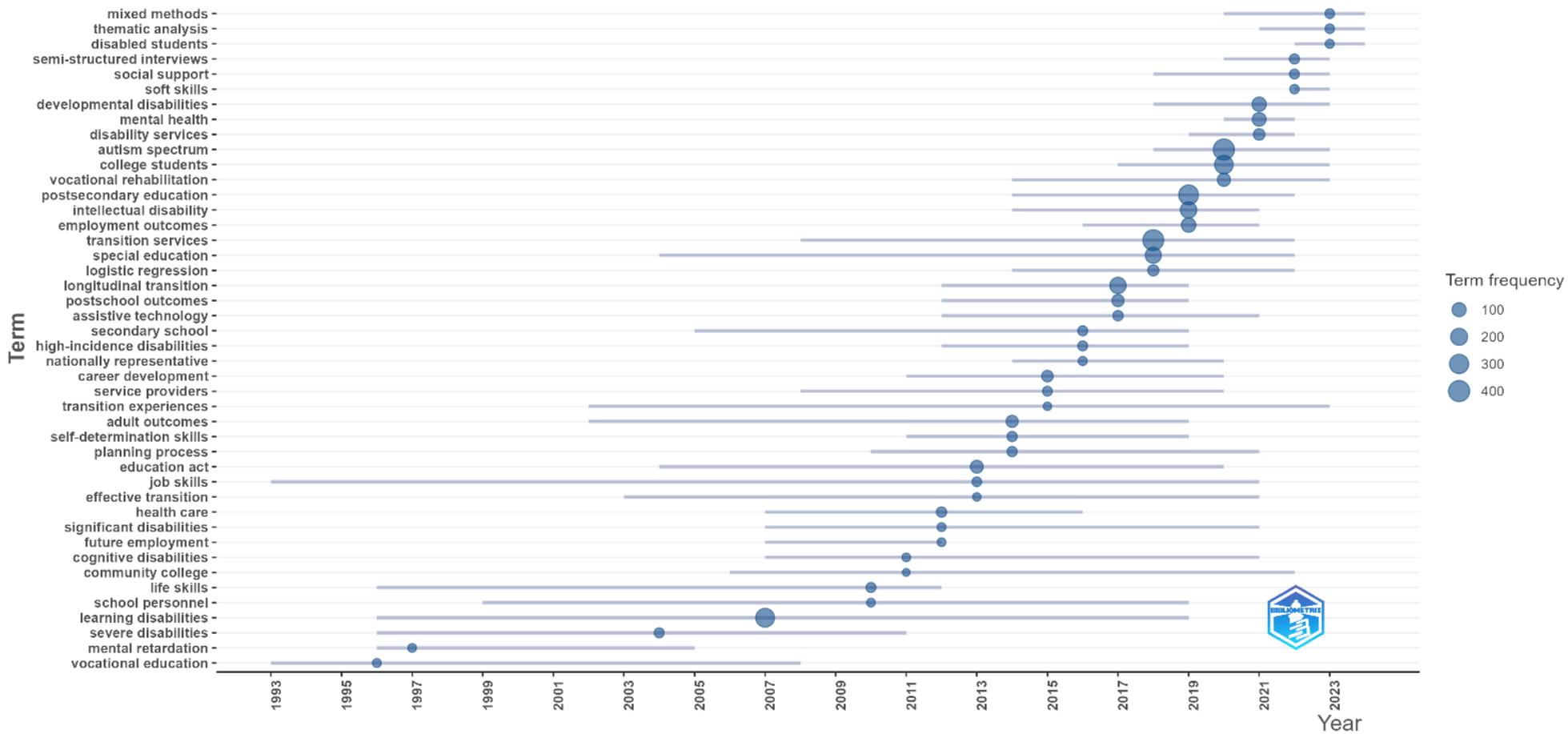


Figure 4. Visualization of trending topics in abstracts across the timespan of the dataset.

Figure 4 contains the 44 top trending topics from the Abstract field, showing the time span for each topic with the circle indicating the median year of usage. Some phrases have fallen out of usage, such as “vocational education”, and others have come into use in recent years, such as “mental health” and “social support.” The trending topics visualization also reflects a change in the way that disabilities are described and understood medically. Phrases we now consider to be pejorative, such as mental retardation, have fallen out of use, while terms that encompass a more nuanced understanding of disability, such as autism spectrum and intellectual disability, have become more highly used.

As not all articles in the dataset had abstracts, we also used the “Thematic Evolution” analysis to examine themes in the article titles (see Figure 5). This analysis uses co-word analysis, where different themes appear together in titles in the dataset during each time slice. Every article in the dataset had a title. We used bigrams, the same list of removals and synonyms as the trend topic analysis above, and established three cut points at 2000, 2011, and 2019. These years were selected to group research around, 1) the passage of the No Child Left Behind Act in 2001, 2) the compilation of the National Longitudinal Transition Study in 2012, and 3) the COVID-19 pandemic. The size of each bar indicates prevalence of that term and the line between bars indicates the two words connected in titles during that time slice. The direction of the line curve describes trends in word usage. For example, “Asperger Syndrome” is a prevalent term in the 2012 to 2019 time slice. It is connected to “learning disabilities” in the previous time slice. The term falls out of usage after 2019, giving way to “autism spectrum” as the more prevalent term.

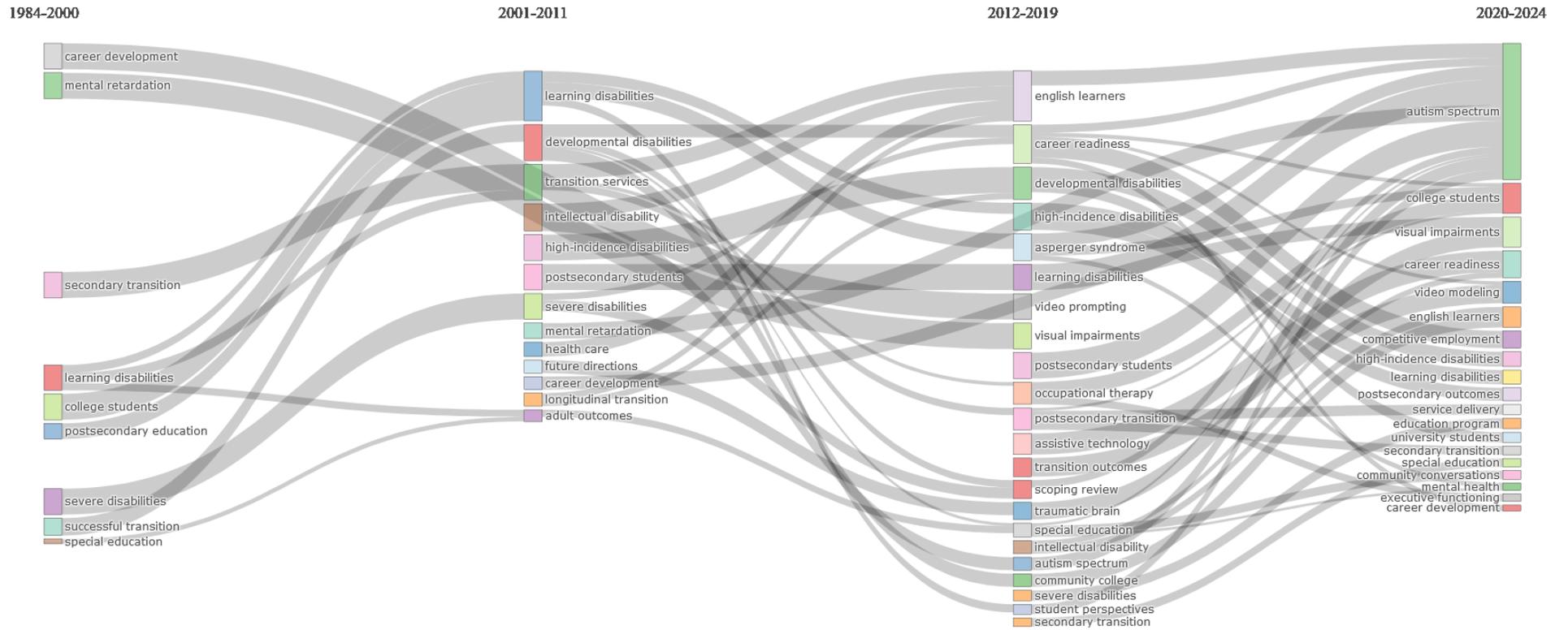


Figure 5. Visualization of thematic evolution in titles across the timespan of the dataset

Finally, we identified a selection of the most influential articles for more in-depth reading and analysis. We used three analyses to generate a table for comparison, 1) “Most Global Cited Documents” which contains the items from our dataset with the highest citation counts in WOS as of the date of data collection, 2) “Most Local Cited Documents” which contains items from our dataset most highly cited by others in the dataset, and 3) “Most Local Cited References” which contains the items that appear most often in the bibliography of items in this dataset (Table 4).

Most Global Cited Documents	Total Citations	Most Local Cited Documents	Local Citations	Most Local Cited References	Citations
Carter EW, 2012, Journal of Disability Policy Studies [36]	360	Carter EW, 2012, Journal of Disability Policy Studies [36]	88	Test DW, 2009, Career Development for Exceptional Individuals [37]	184
DuPaul GJ, 2009, Journal of Attention Disorders [38]	259	Mazzotti VL, 2021, Career Development for Exceptional Individuals [39]	71	Newman L., 2011, The Post-High School Outcomes...[Report] [35]	125
Benz MR, 2000, Exceptional Children [40]	232	Benz MR, 2000, Exceptional Children [40]	65	Blackorby J, 1996, Exceptional Children [41]	99
Parsons HM, 2012, Journal of Clinical Oncology [42]	202	Doren B, 2012, Exceptional Children [34]	49	Carter EW, 2012, Journal of Disability Policy Studies [36]	88
Kohler PA, 2003, Journal of Special Education [43]	178	Wehman P, 2015, Journal of Occupational Rehabilitation [33]	38	Mazzotti VL, 2016, Career Development for Exceptional Individuals [44]	84
Gelbar NW, 2014, Journal of Autism and Developmental Disorders [45]	173	Benz MR, 1997, Exceptional Children [46]	37	Mazzotti VL, 2021, Career Development for Exceptional Individuals [39]	71
Mazzotti VL, 2021, Career Development for Exceptional Individuals [39]	158	Kohler PA, 2003, Journal of Special Education [43]	36	Shattuck PT, 2012, Pediatrics [47]	68
Wei X, 2013, Journal of Autism and Developmental Disorders [48]	152	Trainor AA, 2020, Career Development for Exceptional Individuals [49]	34	Benz MR, 2000, Exceptional Children [40]	65
Sinclair MF, 2005, Exceptional Children [50]	151	Wehman P, 2014, Journal of Disability Policy Studies [51]	31	US. Gov, 2004, IDEA Reauthorization [9]	64
Denhart H, 2008, Journal of Learning Disabilities [52]	148	Rowe DA, 2021, Career Development for Exceptional Individuals [53]	29	Hasazi SB, 1985, Exceptional Children [54]	55

Table 4. Comparison of global citations, local citations, and cited references with common items in bold

Three articles appeared on all three lists [36], [39], [40] and one additional item appeared on the first two lists [43]. The 2004 reauthorization of IDEA was 9th on the most local cited references list [9]. After removing IDEA, the three lists produced a combined total of 22 items for consideration for more in-depth analysis. We also searched the dataset for any articles specifically about academic libraries or access to information and found three items [55], [56], [57].

Discussion and Implications for Libraries

The Biblioshiny Data

The analysis of our dataset in Biblioshiny yielded interesting implications for librarians in terms of collections, research support, and resource description. The lists of most relevant sources and locally cited sources in Table 2 can provide a starting point for collection analysis and development. As librarians at the Colorado School of Mines, a smaller STEM-focused university, we compared the lists to our institution's holdings and found that we have access to 9 of the 13 titles listed. This was surprisingly good coverage given the size of our collections budget and institutional focus. One author is a current graduate student at another institution, the University at Buffalo, which is a larger, more comprehensive university that includes a school of education. We found that the larger university provides access to 11 of the 13 journals, missing only *Career Development and Transition for Exceptional Individuals* and *Focus on Autism and Other Developmental Disabilities*. The list can be used to evaluate current holdings related to disabilities and students in transition or to identify possible publications for addition to the collection. Similarly, the lists of significant authors in the dataset and highly cited authors in the dataset can be used to explore collections holdings and potential sources for acquisition.

The trends analyses conducted on the Keywords Plus, Abstract, and Titles fields can have implications for our use of terminology in information literacy instruction, research support, and resource description. All three analyses demonstrated a move towards a more nuanced understanding of disability, as deprecated terms such as "Aspergers Syndrome" and "mental retardation" have given way to terms like "autism spectrum" and "intellectual disability." Librarians working in resource description and access can compare the terminology found in these analyses with terminology used in their own collections to ensure that researchers using current terminology can find relevant research materials. The findings also have implications for information literacy instruction. These analyses can be used as an example of the evolution of terminology and the need to search using temporally relevant terminology. Finally, the thematic evolution in particular can be a starting point for librarians interested in conducting research in this topic area. The far-right column in Figure 5 contains the terms currently most used in the dataset. Some, like "English learners," "community conversations," "universal design," "career readiness," and "executive functioning" could be intersections that librarians can consider when exploring the needs of students with disabilities in their local context. Biblioshiny was used to identify the most influential articles in the dataset for more in-depth analysis. We reviewed the top 22 globally and locally cited articles in the dataset as well as three related specifically to libraries and/or access to information. Within the 22 most highly cited articles, several focus on

recommendations for future research into the efficacy of specific interventions, which is beyond the scope of this study [37], [49], [51], [53]. Additionally, several of these articles explore the results of NLTS or NLTS2 [41], [44], [48]. Finally, there was a notable focus on Autism Spectrum Disorder (ASD) within these highly cited articles. Four of the most highly cited articles focused on ASD [45], [47], [48], [51]. Wei et al. explores the prevalence of students with ASD in STEM disciplines. In their investigation of the NLTS2 data, they found that although students with ASD were less likely to enroll in higher education than all other disability types, except for those with intellectual disabilities or multiple disabilities, they were significantly more likely to major in sciences than their peers across disability types [48]. Perhaps then, for STEM librarians, it may be worth concentrating additional effort into those policies and changes that support students with ASD.

The Highly Influential Articles

Although some of the highly influential articles were ultimately not directly relevant to the work of STEM librarians, others provided useful insights that can be applied to our work with students with disabilities. Aligning with Wei et al.'s findings regarding the prevalence of students with ASD in STEM, all three articles focused on libraries and/or access to information were also focused on ASD [55], [56], [57]. Beyond our review, significant literature focuses on Universal Design in library spaces [20], [21]. Space is an area in which librarians can meaningfully work with students with disabilities to evaluate the library. The library can be both a sanctuary and a source of anxiety for students with and without disabilities. Quiet, yet not fully isolated, spaces in libraries can be valued by students with disabilities who wish to be around others without experiencing sensory overload [56]. Offering a variety of types of spaces in a library, with clear signage regarding expected use, can help all students identify the proper study space for their needs. The library can be a source of anxiety for students trying to navigate new physical spaces or for students trying to find help for the first time. Universal design should be considered when designing or retrofitting library spaces [57]. Librarians can ask themselves how students with disabilities would enter the space, access and use important services, access restrooms, or find a suitable place to study. While a major retrofit is beyond the budget of most libraries, small changes like ensuring clear paths to vital service points, updated signage with appropriate color contrast, and flexible seating in instruction spaces to accommodate crutches or wheelchairs, can be very impactful.

Additionally, librarians can implement changes to teaching and social interactions that will better support students with disabilities. This is perhaps the least difficult yet most impactful area that librarians can address, especially in working with students with ASD. First, we can evaluate the way our information literacy instruction is presented. In their study, Stockwell et al. explored access to information across campus (including financial aid, office hours, library services, etc.) [55]. They found that students with ASD may not process as rapidly as other students, which can impact their ability to contribute to discussions in class or respond when called upon in a lesson. They can also experience frustration when it is assumed that all students share the same foundational knowledge. The changes don't need to be seismic, small changes can improve teaching practice [58]. Librarians should ensure that lessons are paced slowly enough to allow

all students to process the information they are receiving [52]. Providing some information ahead of time, such as a video or slide deck, can be helpful in establishing foundational knowledge. Also, allowing students time to think individually before beginning a class discussion or group activity can help students who process slower than their peers. Finally, using explicit instructions and clear language can help to ensure all students understand activities as well as jargon used [55].

We can explore areas of hidden curriculum in library use and access to information. For example, the expectation that students will know how to make use of office hours has been shown to negatively impact historically disadvantaged students [55]. Do your students with ADS know when they would benefit from visiting the reference desk? As one participant in Anderson's 2021 study described, "kids on the spectrum, they're more likely to ask for help when they come into the library or talk to the librarian if they know, individually, if they have a face, if they know a name, if they have a relationship with someone" [56]. Other questions you can explore include, can students with disabilities access the space you use for research consultations? Can they use a screen reader to navigate through your booking page or research guides? Personal librarian programs or a dedicated library liaison to the disability services office can provide a specific point of contact for both students with disabilities and support staff. Additionally, multiple means of engagement, interaction, and expression are core tenants of Universal Design for Learning and explored in prominent library literature on the subject [20], [59], [60]. Likewise, Stockwell et al. found students with disabilities may not be able to attend or may be overwhelmed by large scale orientation events, so librarians should use multiple means to engage with new students regarding services [55].

Several of the studies would be of value for librarians interested in pursuing research into the transition or experiences of students with disabilities in higher education. Some of the articles provide areas for future research such as taking a strengths-based approach to research on transition [49] or engaging with students with disabilities as study participants instead of relying on support staff as participants [56]. Trainor et al. identified a significant research gap related to disabilities and intersectionality, "Overall, much less is known about effective services and supports for individuals with disabilities of color, who experience poverty, who live in rural communities, and/or who have complex support needs" [49]. Others can provide insights into the methodologies of research in this space, such conducting systematic literature reviews [44], [45], [53], conducting analyses across libraries [56], utilizing the NLTS study data [33] or centering disabled voices in empirical research design [55].

Limitations of Biblioshiny

There were also several limitations to the analysis of the data using Biblioshiny. First, some of our analyses made use of data fields that were rated less than "Excellent," which may have impacted the results. The word cloud made use of the Keywords Plus field which was rated "Acceptable" and missing data for 125 records (10.85%). The trending topics analysis made use of the Abstract field, which was rated "Good," missing data from 65 documents (5.64%). These two thematic analyses were combined with the theme evolution analysis of titles to produce a fuller picture of themes in the dataset. Additionally, other analyses would require cleaning of the

raw data prior to importing to be truly useful. We attempted an analysis of Affiliations to explore the institutions affiliated with the most authors, but some were coded to a university system, such as State University System of Florida, and others were coded to individual institutions, such as University of Oregon. Although Biblioshiny offers an option for “Affiliation Name Disambiguation,” we were unable to determine how items are tagged either by institution or system. We would need to manually check and disambiguate the entire list of affiliations to ensure consistency.

Furthermore, Biblioshiny is not an accessible product, ultimately making it a complicated choice for a study on disability research. When analyzed with the Wave tool, a web content accessibility tool that checks for compliance with web content accessibility guidelines, multiple analyses had more than 100 errors identified. It would be difficult to use a screen reader to navigate the visualizations created within the tool. There is no way to manipulate the colors, contrast or spacing on visualizations to improve their accessibility as can be seen in the included figures. Also, substantial work was necessary to create alt-text for the visualizations before including them in this work. While Biblioshiny is a powerful research tool, its accessibility limitations should be considered based on the needs of the research team and potential audiences.

Conclusion

In this study, we combined an analysis of the literature using Biblioshiny with a more in-depth exploration of the 25 most influential and relevant studies within our dataset to identify areas in which librarians can positively impact the academic experience for students with disabilities. Bibliometric analysis helped us identify influential publications, authors, and articles from the dataset. It also helped to map the evolution of themes in the research between 1984 and 2024. The deprecation of some terms and the rise of others in recent years demonstrates a more nuanced understanding of disability as well as avenues for potential research for librarians. By combining an in-depth analysis of influential articles with the bibliometric analysis, we were able to identify implications for library practice. Librarians can have the most impact by evaluating spaces and social interactions. Using universal design in space design, as well as clear signage, and dedicated quiet spaces can help students with disabilities feel welcome in the library. Using clear language, teaching at a slower pace, and developing a personal connection can help students with disabilities to succeed in information literacy classes and research consultations.

One substantial limitation with this study, beyond issues with Biblioshiny discussed above, was the use of WOS as the only database from which records were collected. The WOS Social Science Citation Index includes works dating back to 1977 and, although significant legislation was enacted in the 1970s regarding students and individuals with disabilities, our dataset only begins in 1984. While some gaps in coverage are attributable to limitations of the holdings in the WOS Core Collection, it cannot explain the complete absence of publications between 1977 and 1984. For example, using Google Scholar, we identified one on-scope publication from 1978 which appears in WOS [61], upon examining the metadata for this publication in WOS, it *should* have appeared in our search and subsequently made its way into our dataset, but did not. The proprietary nature of the WOS search algorithm precludes our ability to explain all of its

behaviors. Future research could identify earlier research in this topic area, examine how one might be able to include these items, and if inclusion of earlier items would impact the resulting analyses.

This study presents several avenues for future research and engagement for librarians working with students with disabilities. As Trainor et al. identified, there has been little work on disability and intersectionality, identifying where students with disabilities might face additional barriers to success in higher education [49]. Librarians can also use the thematic evolution analysis in Figure 5 to explore new avenues such as the needs of students with disabilities who are also English language learners, or ways the library can support students who struggle with executive functioning. Beyond research, there are many avenues for librarians to engage in impactful outreach. As Anderson's study indicated, many autism support entities on campus are not working with their library, providing an opportunity for outreach and collaboration [56]. As not all campuses have dedicated autism support programs, librarians can engage with student groups or the campus disability services office. Finally, several articles mentioned a need for greater education and training for library staff and student workers [55], [56], [57]. Libraries and professional organizations, like the American Society for Engineering Education: Engineering Libraries Division, can host training that helps librarians identify and support the needs of students with disabilities.

Data Availability

Exports of our datasets are available on OSF [62].

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Appendix A - Table of Term Frequency in Figure 4 to Enable Content Accessibility

Term (Bigram)	Start Year	Median Year	End Year	Term Frequency
mixed methods	2020	2023	2024	23
thematic analysis	2021	2023	2024	22
disabled students	2022	2023	2024	19
semi-structured interviews	2020	2022	2023	27
social support	2018	2022	2023	25
soft skills	2022	2022	2023	21
developmental disabilities	2018	2021	2023	108
mental health	2020	2021	2022	94
disability services	2019	2021	2022	45
autism spectrum	2018	2020	2023	401
college students	2017	2020	2023	268
vocational rehabilitation	2014	2020	2023	78
postsecondary education	2014	2019	2022	332
intellectual disability	2014	2019	2021	178
employment outcomes	2016	2019	2021	112
transition services	2010	2018	2022	386
special education	2004	2018	2022	163
logistic regression	2014	2018	2022	40
longitudinal transition	2012	2017	2019	176
postschool outcomes	2012	2017	2019	58
assistive technology	2012	2017	2021	30
secondary school	2005	2016	2019	26
high-incidence disabilities	2012	2016	2019	25
nationally representative	2014	2016	2020	19
career development	2011	2015	2020	46
service providers	2008	2015	2020	24
transition experiences	2002	2015	2023	16
adult outcomes	2002	2014	2019	56
self-determination skills	2011	2014	2019	28
planning process	2010	2014	2021	28
education act	2004	2013	2020	71
job skills	1993	2013	2021	23
effective transition	2003	2013	2021	16
health care	2007	2012	2016	30
significant disabilities	2007	2012	2021	18
future employment	2007	2012	2012	17
cognitive disabilities	2007	2011	2021	17
community college	2006	2011	2022	15
life skills	1996	2010	2012	26
school personnel	1999	2010	2019	17
learning disabilities	1996	2007	2019	278
severe disabilities	1996	2004	2011	26
mental retardation	1996	1997	2005	17
vocational education	1993	1996	2008	18

Table 5. Term frequency from Figure 4.