DESIGNING A SEARCH STRATEGY FOR A SYSTEMATIC REVIEW

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INTRODUCTION

Our research, due for completion in December 2019, surveys various research support models to address the following question: What unique research support practices are being successfully used by STEM academic libraries? The results of our investigation will help inform future programming and services in STEM libraries serving academic institutions.

The first phase of this research includes a comprehensive search of the literature in order to capture all relevant studies. Below we describe the development of our final search string, based on the guidelines published by Bramer et al. (2018). This string is a combination of key words and phrases used to search databases, grey literature, and STEM library websites.

THE PROCESS

1. Environmental Scan

We started identifying potential search terms with an exploratory Google search and an evaluation of the controlled vocabulary and thesauri offered across EBSCOhost. An exploration of print dictionaries (Keenan & Johnston, 2000; Levine-Clark & Carter, 2013; Reitz, 2004), online thesauri, and Library of Congress Classification headings provided additional synonyms and subject headings. Searches run with these initial terms revealed that the majority of relevant papers were indexed under EBSCO's "Science & Technology Libraries" subject heading. Because of this, we retrieved bibliographic information for the 2,992 results indexed under this topic for further exploration.
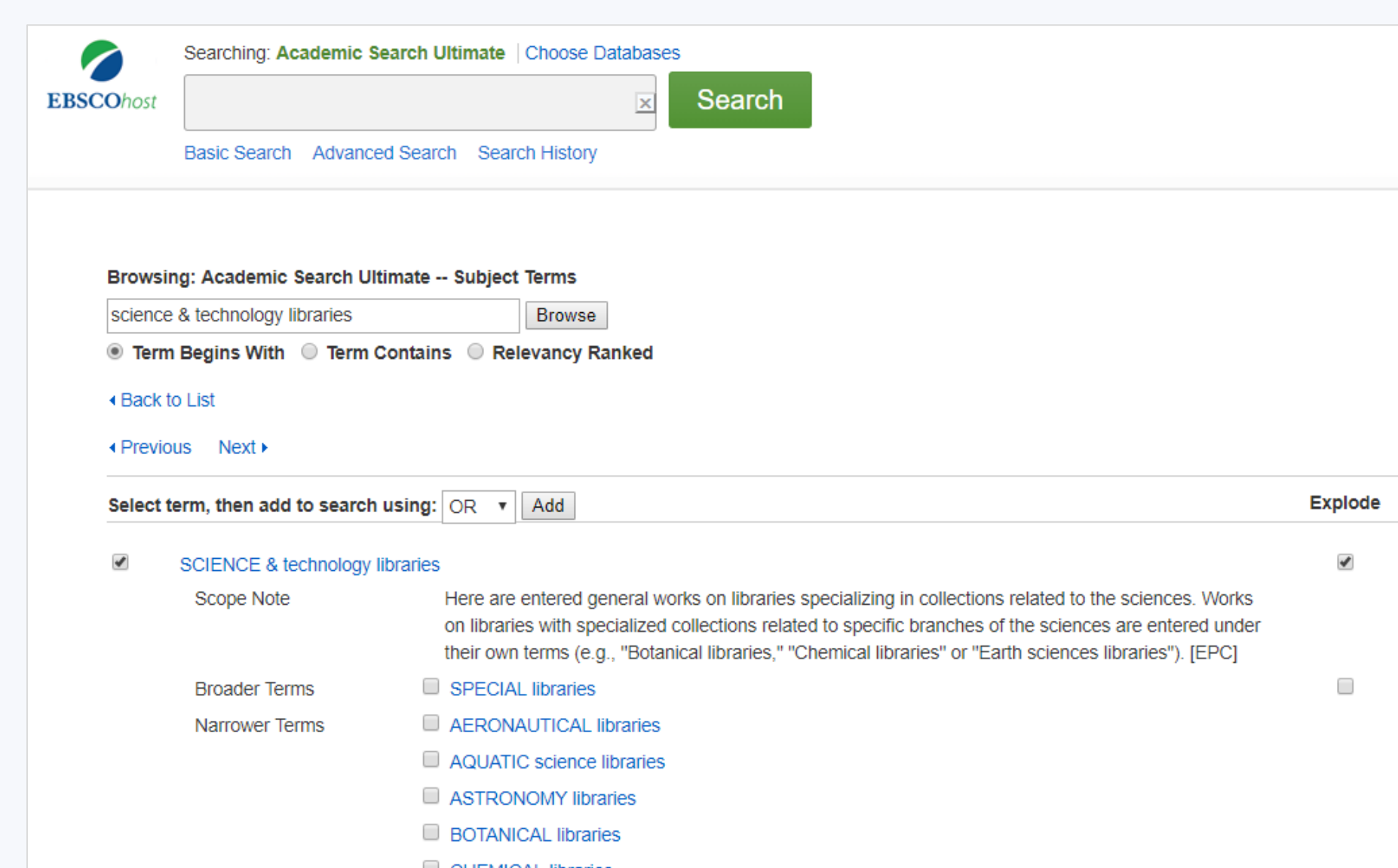
A screen capture from EBSCOhost showing the broader and narrower terms of the "Science & Technology Libraries" subject term.
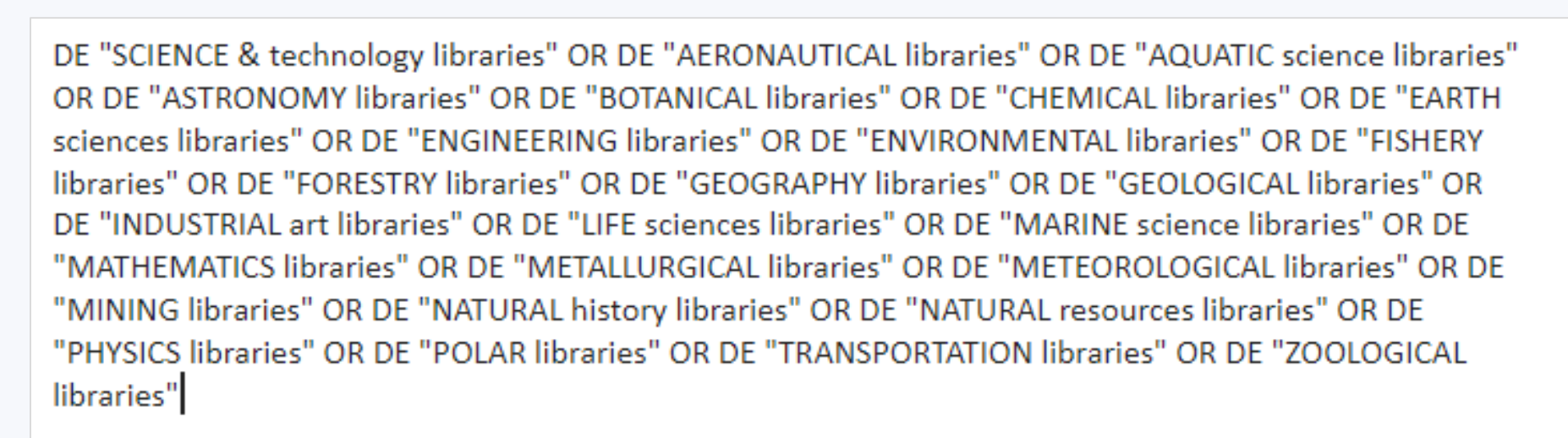
Our initial search string for records under the "Science & Technology Libraries" subject term.

2. Data Visualization

Text mining and visualization tools allowed us to identify additional key terms. Abstract word frequencies and phrases were generated in **Voyant** after commonly used words (e.g. libraries, information, etc.) were removed. Additional terms were identified through the **Systematic Review Accelerator.** Terms added to the search string from our visualizations include: data, horticultural, combinatorial, software, ecological, herbarium, statistical, laboratory, botanical, tropical, bibliometrics, and altmetrics.
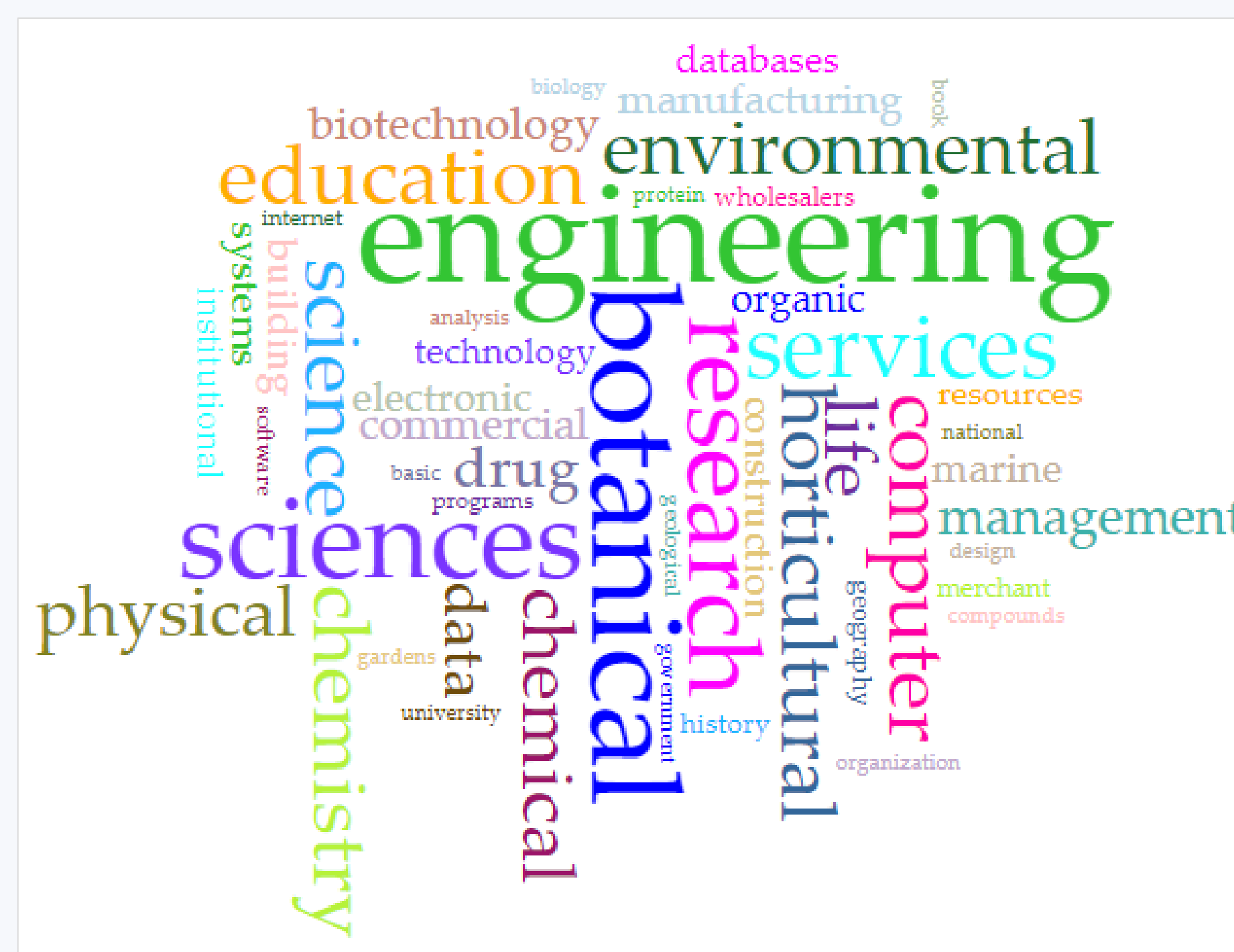

Screen captures from the Voyant tool.

3. Refining the Search String

Expert advice from two librarians—one at UMD and one in the Netherlands—allowed us to refine our final search string parameters. **Google Ngram** was used to examine several search terms revealed in the environmental scan to determine when they became more popular in the books in Google's corpus. Based on a number of search terms and phrases, we determined a final time frame from 1990-present. While **BalancedBraces** is traditionally used by coders to understand coding syntax, we used it to help us better visualize our search string. This was an invaluable tool and saved us a lot of time.
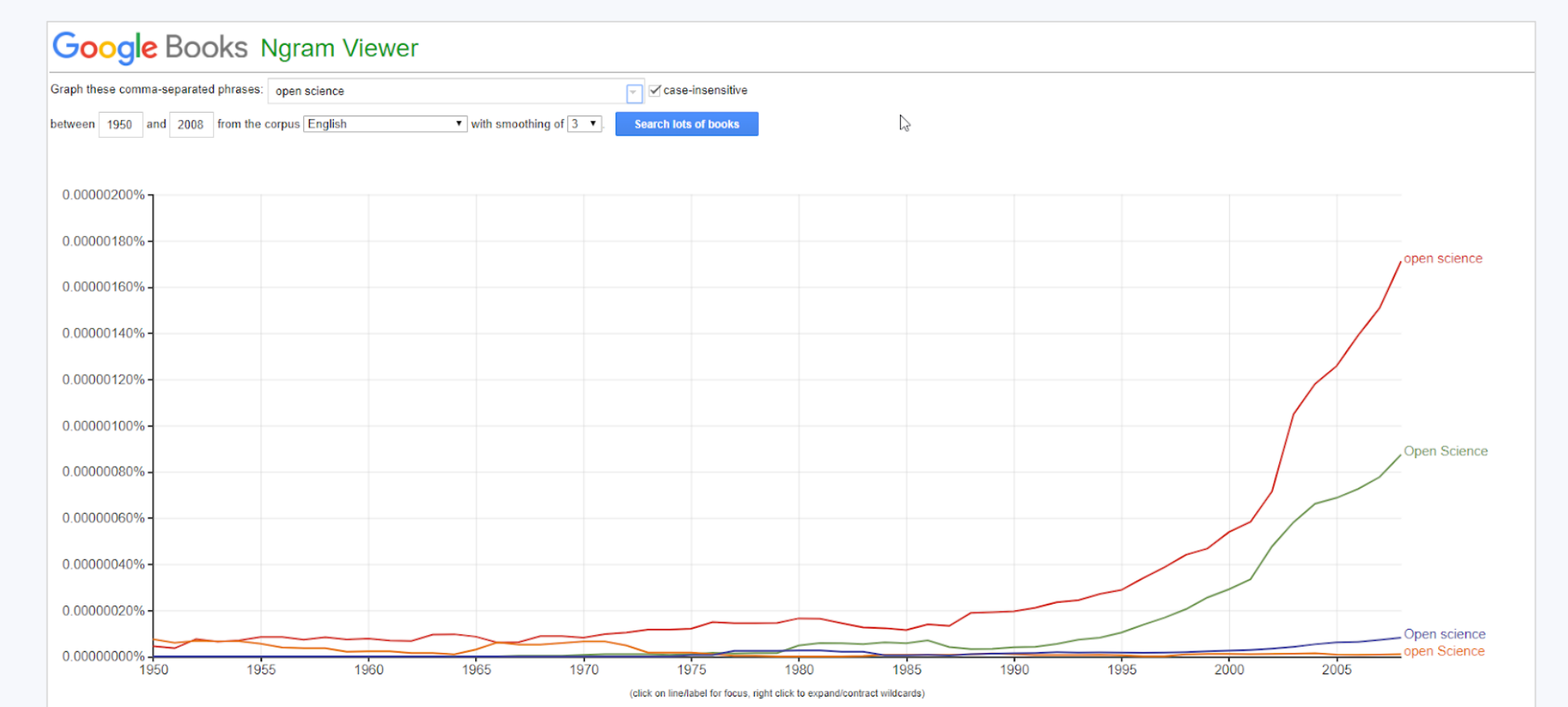
A screen capture of Google Ngram viewer
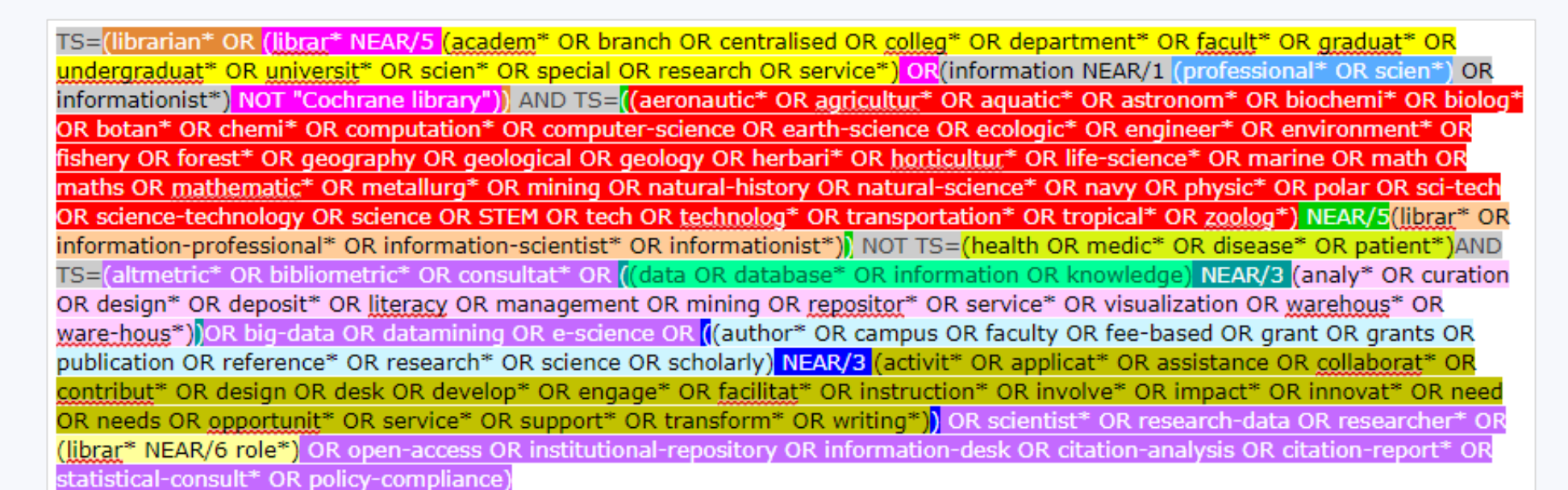
A screen capture of BalancedBraces.

TOOLS USED

 Voyant for text mining abstract terms

 Systematic Review Accelerator to produce a word frequency analysis

 Google Books Ngram Viewer to identify popularity of certain phrases over time

 BalanceBraces.com to visualize and debug search strings

Four other visualization tools were tested and proved too cumbersome in terms of data cleanup and formatting: **Tableau**, **Gephi**, **JSTOR Text Analyzer**, and **VosViewer**.

RESULTS

librarians/libraries	STEM		research support	
academic librar*	aeronautic*	life science*	altmetric*	datamining	reference desk
branch librar*	agricultur*	marine	bibliometric*	e-science	reference service*
centralised faculty librar*	aquatic	math*	big data	fee-based library services	repository
college librar*	astronom*	metallurgical	citation-analysis	grant	research assistance
department librar*	biochemi*	mining	citation-report*	grant application*	research clinic*
departmental librar*	biolog*	natural history	combinatorial	grant writing	research consultation*
graduate librar*	botan*	natural resources	consultation	information desk	research instruction
information professional*	chemi*	navy	consultative service*	information literacy	research practice*
information scientist*	computational	patent*	copyright	institutional repository	research role*
informationist	computer science*	physic*	data analysis	Institutional Review Board	research service*
library and information scientist*	earth science*	polar	data curation	knowledge management	research support
library science*	ecological	sci-tech	data depository	librarian role	research support service*
library scientist*	engineering	science	data management	meta-analysis	researchers needs
library services	environmental	science and technology	data mining	metrics	scientific research
research librar*	fishery	science-technology librar*	data visualization	open access	statistical
special librar*	forest*	STEM	data warehouse	policy compliance	systematic review*
undergraduate librar*	geography	tech*	database design	publication support	
university librar*	geological	technolog*			
science librar*	geology	transportation			
	herbarium	tropical			
	horticultural	zoolog*			

Our final search string was built from the terms listed above and used to run queries in six EBSCO databases—including *Academic Search Ultimate* and *Library and Information Science Source,* as well as *Web of Science*. 27,358 records from all databases have been loaded into the **CADIMA** systematic review tool and 15,356 records remained after deduplication.

CONCLUSIONS

Many of the steps employed in the environmental scanning process allowed us to understand our search data better. However, some of the data visualization tools were less beneficial for us but may be more useful at the beginning of the brainstorming process, for early career librarians, or when subject headings are not readily available for the topic of interest.

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