Behind the Search: How Natural Language Search Builds Boolean Logic

Grade Level: Middle School (Grades 7-8) or High School (Grades 9-12)

Time Required: 45 minutes

Introduction

When students type a question or phrase into an EBSCO database, they can use **Natural Language Search (NLS)** — a simple, conversational way to find information. What they may not realize is that NLS automatically constructs a **Boolean search string** behind the scenes.

This lesson helps students see how EBSCO translates natural questions into Boolean logic. By revealing the **refined query**, students gain insight into how keywords, synonyms, and connectors work together to create precise, relevant search results.

AASL National School Library Standards (2018)

This lesson supports the following shared foundations, domains and competencies from the AASL Framework for Learners.

Inquire:

- **I.A.1:** Learners display curiosity and initiative by formulating questions about a personal interest or a curricular topic.
- **I.B.3:** Learners engage with new knowledge by following a process that includes generating products that illustrate learning.

Explore:

- **V.A.1:** Learners develop and satisfy personal curiosity by reading widely and deeply in multiple formats and writing for a variety of purposes.

Engage:

- **VI.A.2:** Learners follow ethical and legal guidelines for gathering and using information (paraphrased).
- **VI.B.1:** Learners responsibly and ethically share new information with others (paraphrased).

Learner Objectives

- Understand how Natural Language Search (NLS) functions within library databases.
- Observe how EBSCO translates a natural language query into a Boolean search string.

- Recognize how Boolean logic (AND, OR, NOT) refines search results.
- Reflect on how understanding search structure can improve research efficiency.

Materials Needed

- Computers or tablets with access to an EBSCO database (e.g., Explora, History Reference Ultimate, Literary Reference Ultimate)
- Projector or screen for demonstration
- Whiteboard or digital presentation tool
- Student handout/assessment: *Behind the Search: How Natural Language Search Builds Boolean Logic*

Procedure

Hook/Introduction (10 minutes)

"Most of us type full questions into Google — but library databases think differently. Let's see how EBSCO turns your natural question into a structured search."

1. Ask students: "What do you type when you search for something online?"
2. Discuss answers — most will use full questions or phrases.

   Explain: "EBSCO's Natural Language Search (NLS) lets users type naturally — but behind the scenes, it's building a Boolean query that helps find better, more precise results. Today we'll look at how the *same search* behaves differently depending on how we phrase it and whether NLS is turned on."
3. Display a visual comparing:
   - Natural input: "Why are bees important to the environment?"
   - Database's refined query: (bees AND environment) AND (importance OR role OR impact)

Demonstration (10-15 minutes)

Explain that you'll compare how EBSCO interprets different types of searches.

Step 1: Begin with a non-conversational keyword search with **NLS off**.

a. Type a simple keyword string (e.g., *teen mental health social media*).

b. Click **Search** to generate your result list. How many results do you get?

Step 2: Repeat the same non-conversational keyword search with **NLS on.**

a. How many results do you get now? (Should be a lot more!)

b. Look for the link that says "Show refined query" at the top of your results list. (See next page for screenshot.)

c. Briefly discuss how the system builds Boolean logic from keyword input.
   - How did the database expand or narrow the terms?
   - What synonyms or related terms did it add?

- How does this Boolean structure help?

d. Write examples on the board to highlight Boolean operators and grouping.

Tip: You can pause to show students how synonyms and related terms appear in parentheses — this helps connect what they see on screen to Boolean structure.

Step 3: Try the same idea as a conversational question with **NLS off**.

a. Type: *How does social media affect teen mental health?*

b. Run the search.

c. Ask students what differences they notice compared to the keyword search (e.g., fewer/no results).

Step 4: Turn **NLS on** and repeat the same conversational question.

a. Run the search again.

b. Click “Show refined query” to reveal the Boolean structure.

c. Highlight how the Boolean version becomes richer, with synonyms and grouped concepts.

d. Discuss why NLS makes these decisions and how it helps researchers.

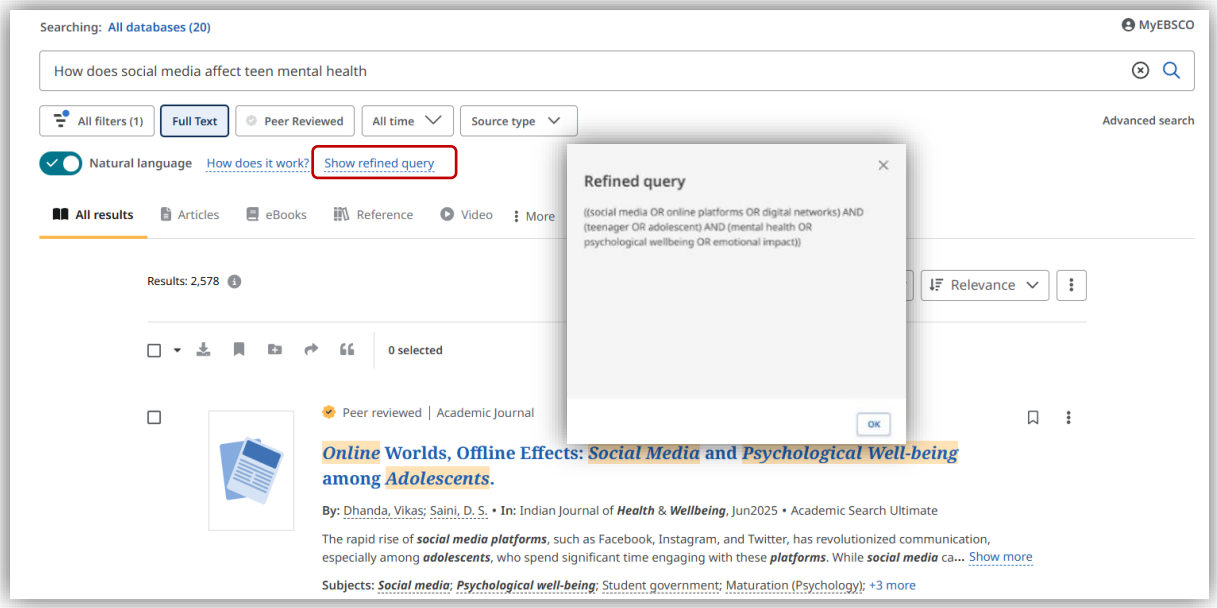
Step 5: Compare all four versions.

a. Project or write the Boolean strings so students can compare them side by side.

b. Guide students to recognize how:

- Keywords → produce a simple Boolean structure
- Conversational + NLS off → stays close to literal phrasing
- Conversational + NLS on → expands into concept clusters and synonyms

This comparison prepares them for the worksheet and reinforces how NLS “thinks.”



Student Exploration (15 minutes)

Distribute Student Worksheet. Do one sample search as a class and then ask students to choose a second topic to try on their worksheet.

1. Choose a research topic (e.g., climate change, animal testing, music and learning).
2. Type a natural language search into the database.
3. Click “Show refined query” and record the Boolean version on your handout.
4. Note any patterns — such as use of AND, OR, or parentheses.
5. Compare how the Boolean query changed or refined your understanding of your topic.

Wrap-Up / Discussion (5 minutes)

Facilitate a quick discussion:

1. **What surprised you about the Boolean version?**

   Sample responses:

   - “I didn’t realize the database added so many synonyms and related words automatically.”
   - “I was surprised that it used parentheses and quotation marks — I didn’t know databases worked like that.”
   - “It was cool to see that my question turned into a really long Boolean search with AND and OR in it.”
   - “I didn’t expect it to separate my question into keywords instead of keeping it as a full sentence.”

   Key idea: Students recognize that the database is translating their natural question into a structured Boolean search, adding terms and logic automatically.

2. **Why do you think EBSCO uses Boolean logic behind the scenes?**

   Sample responses:

   - “Because Boolean logic helps the database search more accurately and find relevant results.”
   - “It helps the system understand what’s important in my question and what can be left out.”
   - “Boolean logic makes the search more efficient — it’s like giving the database specific instructions.”
   - “It makes sure I don’t just get random results that match one word in my question.”

   Key idea: Students understand that Boolean logic improves search precision, ensuring relevant, organized, and efficient results.

3. **How might understanding this process help when you start your next research project?**

   Sample responses:

   - “I’ll think more carefully about the keywords I use.”
   - “If my search doesn’t work well, I can try to build or adjust the Boolean version myself.”
   - “I’ll understand what’s happening when I click ‘Show refined query,’ and I can use that to refine my topic.”

- "Knowing how the system works helps me feel more confident using the database instead of just guessing what to type."

Key idea: Students recognize that understanding the connection between NLS and Boolean logic empowers them to refine searches and become more independent, strategic researchers.

Assessment

Student Handout: "Behind the Search: How Natural Language Search Builds Boolean Logic"
Students demonstrate understanding by:

- Recording their natural language and refined Boolean queries
- Noting key operators or patterns in the Boolean string
- Reflecting on how NLS supports better search results

The handout serves as both a formative assessment and a take-home reference for future database use.

Student Name: _____ Date: _____ Class: _____

Behind the Search: How Natural Language Search Builds Boolean Logic

Discover how EBSCO translates your questions into Boolean logic

When you type a question or phrase into an EBSCO database, you're using **Natural Language Search (NLS)** — just like you would in Google. But behind the scenes, the database is building a **Boolean search string** to find the most relevant results. That means it's adding **operators** (like AND, OR, and NOT) and **synonyms** to make your search smarter.

Example

- **You type:** *Why are bees important to the environment?*
- **EBSCO builds this Boolean query:** ((bees OR pollinators) AND (environmental importance OR ecosystem role OR ecological significance) AND (biodiversity OR agriculture OR plant reproduction))

Database Insight:

- Boolean logic is the "language" databases use to connect ideas.
- Natural Language Search translates *your language* into *database language.*

Try It Yourself

Follow the steps below to see how NLS builds Boolean logic in your search.

1. Choose a research question or topic. _____

   _____
2. Type your question or phrase into the database search bar.
   (Example: How does social media affect teen mental health?)
3. Run the search.
4. Look for the link that says "Show refined query" at the top of your results list. Click the link.
5. Copy the refined Boolean query here: _____

   _____
6. Which Boolean operators (AND, OR, NOT) do you notice in your refined query? _____
7. What synonyms or related words did the database add? _____

   _____

Think Like the Database

When you type in a question, the database turns it into keywords and Boolean operators. Now it's your turn — try to do the same!

1. **Rewrite** your question using just keywords: _____

   _____

2. **Compare** your version to the database's refined query. What did the database add or change?

   _____

   _____

Reflect

1. What surprised you about the Boolean version of your search?

   _____

   _____

   _____

2. Why do you think the database uses Boolean logic behind the scenes?

   _____

   _____

   _____

3. How might understanding this process help when you start your next research project?

   _____

   _____

   _____

Pro Tip: Even when you search in natural language, thinking in **keywords** helps the database build a better Boolean query. The clearer your keywords, the more focused your **results**.