

Using Critically Appraised Topics to Teach Evidence-based Management to Graduate Business Students

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Introduction

Evidence-based management is about utilizing existing scientific and organizational research evidence to optimize organizational success. It is a skill that will enhance future business leaders' abilities to make informed decisions, such as using evidence to reform hiring practices, developing new training programs, or optimizing worker health.¹ In order to do this, students need to learn what “evidence is available, and they need to know how to apply it.”² Evidence summaries provide an overview of the literature on a topic and come in many different forms. One of the quickest types of evidence summaries to produce that is relevant to evidence-based management is a critically appraised topic (CAT) that can take only a few days to produce.³ A CAT is a quick assessment of what is known in the scientific literature about a topic. It uses aspects of systematic review methodology with concessions made due to the shorter timeframe to search, select, appraise, and synthesize evidence.⁴

There are many benefits to conducting CATs that make them suitable for the management classroom. They can be conducted in a relatively short amount of time from days to weeks and can serve as a course assignment. They incorporate scholarly literature and lead to implications for practice, which may help students see the relevance of academic research to management decision-making. They also have a step-by-step methodology that needs to be followed, which mimics the research process and reduces bias. Finally, they incorporate critical appraisal, which gets students thinking about how research is designed and how study design choices impact the quality or reliability of the resulting evidence. Going through the process of creating an evidence summary turns students into active consumers of literature as opposed to passive readers.⁵

The skills acquired by students while conducting a CAT relate well to the Association of College & Research Libraries' (ACRL) *Framework for Information Literacy for Higher Education*.⁶ Steps such as question formulation, determining the scope, searching for evidence, synthesizing the literature, and the value of information for decision making align with the Research as Inquiry, Searching as Strategic Exploration, Scholarship as Conversation, and Information Creation as a Process frames.

The Centre for Evidence-Based Management (CEBMA) has a detailed, open access, fully reproducible guide to conducting CATs that is an essential resource for teaching the process (hereafter referred to as the CEBMA guide).⁷ It includes descriptions for each step and provides multiple examples from differing industries or contexts. These examples can be used in the lecture, which may help minimize preparation time, and are derived from management contexts that business students can relate to. This lesson illustrates one way of teaching graduate management students how to conduct a CAT utilizing the CEBMA guide as a companion guide and required reading.

This lesson plan teaches toward a specific course assignment—a group assignment where the deliverable is a twenty-page CAT on a topic relevant to the course's content. If the course includes a CAT assignment, then further support may be beneficial. The success of the CAT assignment depends on the collaboration between the librarian and the faculty member, as the faculty member must be supportive of librarian involvement in the development of the deliverables.

Planning

Number of participants

This session is applicable to a class size of up to 60 students. It could be adapted to a larger class, with a moderate increase in session time to account for the additional time needed for activity one. The lesson works more efficiently when groups are pre-determined.

Audience

Graduate-level students in management, including MBA students, especially in organizational behavior and human resources courses due to the diverse nature of the scholarly literature in the field

Preparation and Resources

The librarian will need to

1. select a researchable topic as a case study example for each activity and create activity worksheets;

2. create a slide deck using examples of their own or those from the CEBMa guide; and
3. look up database operators for the database selected for the demonstration and incorporate these into the slide deck.

Databases

Business Source Premier/Complete (EBSCO) or ABI/Inform (ProQuest) are both exemplar subscription databases for this lesson. Both databases offer similar functionality, contain scholarly journals, and can batch export.

Description of Lesson/Activity

Learning outcomes

By the end of the session, students will be able to do the following:

1. Describe the steps and limitations to conduct a CAT.
2. Create a focused researchable question using the PICOC mnemonic.
3. Create and execute a multiline search strategy in a database using subject headings and keywords.
4. Describe the process for applying inclusion/exclusion criteria to select studies relevant to their topic.
5. Describe the purpose of critical appraisal and where to find critical appraisal checklists.

Time required

This lesson plan is designed for a two-hour, forty-five-minute session, with a fifteen-minute break included mid-way. The timeline is shown in figure 19.1 below.

Description	Time
<p>Lecture: Introduction to evidence synthesis, evidence synthesis types, what is a CAT, and what are the steps to conduct a CAT.</p> <p>Activity One: PICOC activity</p>	0–45 min
<p>Lecture: Searching for information (what is a subject heading, what is a keyword, search operators such as truncation, proximity/wildcards, what fields to search in a database, and Boolean operators).</p> <p>Demonstration in Business Source Premier/Complete: Locating and searching using subject headings, how to construct a keyword search using operators and field searching, how to combine search lines together using Boolean operators, how to use database filters to limit date, language, source type, etc.</p>	45–90 min
15-minute break	
<p>Lecture: The remaining seven steps for conducting a CAT are covered including study selection, data extraction, critical appraisal, results, implications, limitations, and conclusions.</p> <p>Activity Two: Students are given a topic and must define their understanding of the important concepts and then create a list of keywords, find subject headings, and create a multi-line search in Business Source Complete.</p>	105–165 min

Figure 19.1

Lesson plan outline.

Teaching Outline

Lecture: Part One

The lecture begins with an introduction to evidence-based management and evidence synthesis. The definition of evidence synthesis is provided as well as a brief description of some of the different types of evidence synthesis, such as meta-analysis, systematic reviews, or scoping reviews. This is followed by a definition of a CAT and an introduction to the eleven steps of the process (figure 19.2) as detailed in the CEBMa guide. Each step is described briefly so students conceptually understand the entire process. Thereafter, the how-to part of the CAT process begins.

Steps in the CAT process
Step 1. Background
Step 2. Formulating the CAT question
Step 3. Defining inclusion criteria
Step 4. Search strategy
Step 5. Study selection
Step 6. Data extraction
Step 7. Critical appraisal
Step 8. Results
Step 9. Conclusion
Step 10. Limitations
Step 11. Implications and recommendations

Figure 19.2

Steps of a CAT, as described in the CEBMa guide.

Each step is now covered in detail, such that students can understand how to go about conducting each stage. The CEBMa guide provides great examples, which can be used as part of the teaching slide deck.

Step 1 is the background stage, which provides context for the research question. This is where the practical application for the CAT can be emphasized. A simple case study scenario can be utilized effectively—for example, a scenario in which an employer is considering creating flexible work arrangements for some groups of employees and is interested in identifying the evidence in this area. What kinds of flexible work arrangements are most effective, and what are the impacts on employee wellbeing? A case study such as this shows how an everyday decision that a company must make can incorporate scientific evidence.

Step 2 is the research question or the CAT question. Students work with the question framework PICOC (population, intervention, comparison, outcome, and context). The PICOC mnemonic utilized in the CEBMA guide (p. 7) is derived from the PICO mnemonic used in the health sciences to create a focused, clinical question.⁸ The use of PICOC to create a focused question is then demonstrated via an example. The librarian takes a broad unfocused question (such as, Is social media harmful?) and incorporates

missing PICOC elements to create a narrow, focused question. Creating focused questions is a critical skill that is practiced in activity one.

Activity one (~15 minutes)

Similar to the example demonstrated by the librarian, activity one takes a broad unfocused question and asks students to add missing PICOC elements to create a complete, focused research question. The activity one worksheet (see appendix 19A) shows an example question for this activity. Students work in groups of four to five to create a research question in the allocated time (five minutes). Then, each group shares its PICOC elements and research question with the class. The librarian comments on each groups' question by pointing out where more detail may be required or on the uniqueness of the question generated. The questions generated by students in this activity are often different, and it is good to mention this diversity in the de-brief to show how one broad question can lead to multiple questions that are more focused and therefore feasible to research.

Step 3 is defining the inclusion and exclusion criteria. Common criteria are listed, such as dates, publication types, geographic region, etc., along with an explanation of how these may be justified for a CAT. The content up to this point takes around forty-five minutes depending on how much time was spent on activity one.

Step 4 is searching, which is lengthy and where many questions may arise. This is also a step where the CEBMa guide can be expanded on as it does not cover search commands, processes, and techniques. Students should be introduced to the following basics of database searching, including:

- Subject headings, including an explanation of how they are determined and applied in a database
- Keywords, including how to generate a list of synonyms (including alternate spellings, regional terms, etc.)
- Database operators, including truncation (*), proximity operator (N#), quotation marks (“ ”) for forced phrase searching, and Boolean operators (OR or AND)
- Field searching, including why we would want to search the title and abstract fields and not the full-text or all fields option

This is followed by a live demonstration in Business Source Complete, including:

- Where to find subject terms (subject headings) and how to add them to a search line
- How to search keywords (with the appropriate operator, such as truncation applied) and how to select the appropriate fields to search
- How to combine search lines to create a building block type search (from the Search History section)
- How to limit to peer-reviewed articles as most CATs will incorporate only scholarly literature. This stage also includes a discussion on date ranges and how to filter by language.

A complete example search strategy is created by the librarian as part of the demonstration to show students how to go from start to finish for this step. One of the example topics in the CEBMa guide, the impact of smiling in job interviews,⁹ is simple and works well for a class demonstration. A similar topic that could be used is the impact of humor in job interviews. Both topics have only two main search concepts: job interviews and either smiling or humor. The concepts in these examples do not have too many alternate terms or synonyms and are easily understood by students. This brings the class to the midway break.

Lecture: Part Two (~45 minutes)

The second half of the class starts with the librarian addressing questions arising from the content in the first half of the class. Thereafter, we cover the remaining seven steps starting with Step 5 (study selection), which is where inclusion and exclusion criteria are applied to each result found from the search to determine whether it is relevant. This can be demonstrated by asking students to assist with making the decision on whether to include or exclude the first ten results of your database search, based on the research question and loosely described inclusion criteria. This screening demonstration is an example of title/abstract screening. After this, the second level of screening based on an evaluation of the full text of an article is described. Students are also introduced to how the study selection results can be reported, via a narrative summary and a flow diagram.

The librarian then describes data extraction (Step 6) with reference to the relevant pages in the CEBMa guide. The example data extraction table (figure 19.3) is very useful to point out to students, as a visual example helps clarify the expectations for this step.

Author & Year	Sector/ Population	Design + Sample Size	Main Findings	Effect Size	Limitations	Level
Abraham & Graham-Rowe (2009)	Systematic review; 2/3 RCT; 1/3 quasi-experimental	Worksite; 8 studies; N = 624 employees	Worksite physical activity interventions which include specific goal setting, goal reviews (i.e., follow-up), and graded tasks have a small, positive impact on fitness-related outcomes	Small	Limited relevance to the review question	AA
Bandura & Locke (2003)	General population	Traditional literature review	Discusses the importance of self-efficacy for understanding, predicting, and changing people's performance or goal attainment. Self-efficacy is stated to be related (based on meta-analytical findings from previous studies), among others, to more proactive (self-set) goal-setting, challenging goals, and faster goal attainment, as well as effort and performance	No effect sizes provided	No systematic search, no information regarding design of included studies	D
Brown, 2005	Canadian government employees in a training program	Randomized controlled trial, N = 74, field setting	Both participants who were urged to do their best and those who set proximal (shorter-term) as well as distal (= longer-term) goals had increased transfer of training (= maintenance of learned material over time and generalization of learned material from the classroom to the workplace context) relative to those who set only distal outcome goals. There was no significant difference in the transfer level of participants urged to do their best and those who set proximal plus distal goals. In addition, there was no difference between the experimental conditions regarding the effect on self-efficacy. This suggests that the conclusion that distal outcome goals are not effective in bringing about an increase in transfer when participants are learning new skills	Small	Short time frame between training and measurement (six weeks)	A

Figure 19.3

Example data extraction table shown in the CEBMa guide.¹⁰

This lesson covers critical appraisal (Step 7) in the form of a brief description. It introduces the purpose of critical appraisal and provides links to resources, such as the critical appraisal checklists that have been created by CEBMa, but does not teach how to do critical appraisal or discuss the intricacies of bias in study design.

Step 8 (Results), Step 9 (Conclusion), Step 10 (Limitations), Step 11 (Implications and recommendations) are then briefly introduced, and students are referred to the CEBMa guide for further reading.

Activity two (~30–40 minutes)

The remaining time in the session is allocated to activity two (see appendix 19B). In this activity, students work in groups of four to five. They are provided a research question (example: What are the mental health/wellbeing outcomes of flexible working arrangements?) and must first define the two main concepts (flexible work arrangements and employee wellbeing) and then generate a list of search terms. Then, they must create a multi-line search strategy in Business Source Complete for at least one search concept, or both if time permits. Meanwhile, the librarian goes from group to group to answer questions and assist with technical directions or troubleshooting. If there is time available at the end, groups can share their search with the class, and a discussion about what is missing can follow. Alternatively, searches from two groups can be compared to show the approach used by each group, and the similarities and differences.

Additional details

When this session was taught alongside CAT assignments, students had to submit a protocol, which included the research question, inclusion criteria, database search strategy, and planned data extraction categories. Feedback on the protocol was provided by the librarian to each group during a mandatory consultation, including suggestions and revisions to the search strategy. This ensured that students were using appropriate search strategies that led to a reasonable volume of results. It was also the stage at which further clarification on the subsequent steps (study selection, data extraction, and critical appraisal) was sought by students and was a way of providing ongoing support. The librarian can also expect multiple follow-up emails and consultations based on group needs.

Transferability

Databases

This lesson can be adapted to work with any database that has keyword searching, subject headings, the ability to create multi-line searches, and batch exporting of records.

Note: Database operators mentioned in our lesson are specific to Business Source Complete and will need to be replaced by those relevant to the database chosen, which can be found in a database's help guide.

Ability to transfer to online or to in-person

This session can be transferred to an online environment. Cloud-based versions of the worksheet can be used in lieu of printed worksheets. Group activities can be done in breakout rooms. Facilitating activity two may be difficult for one librarian in a class of fifty

students; we recommend having an additional librarian to co-facilitate online sessions. We also suggest expanding the group sizes for activity two to six students per group to reduce the number of groups.

To different class sizes or audiences

This can also be delivered as a stand-alone information literacy session to show how a quick assessment of the literature on a topic may be conducted. The focus would then be on determining the background, defining the research question, searching for scholarly literature, identifying relevant studies by applying inclusion criteria, and describing a process to extract the results of interest from each article. Synthesis and appraisal could be briefly mentioned or referred to in the additional readings/resources section instead.

The lesson plan is designed for a class time of two hours and forty-five minutes, due to the hands-on activities. A larger class size can be accommodated by trimming the amount of time allocated to the final activity by removing the de-brief. Instead, feedback can be provided to each group during facilitation of the activity.

Appendix 19A

Activity 1: Creating a PICOC research question

Question idea: Does surveillance negatively impact behavior?

Defining your question using PICOC

P (Population) –

I (Intervention or Exposure)—Surveillance

C (Comparison) –

O (Outcome)—

C (Context) –

Create a focused, answerable question incorporating relevant PICOC elements:

Instructions:

1. Identify any possible PICOC elements from the provided research question(s) and fill them into the PICOC template. This has been partially done for you.
2. Come up with the remaining PICOC elements using your creativity.
3. Is your **Intervention** specific enough and your **Outcome** measurable? If not, then revise it.
4. Create a one-sentence research(able) question that incorporates at least 3 PICOC elements.

Appendix 19B

Activity 2: Searching

Research Question: What are the effects of flexible working conditions on employee health and wellbeing?

Part 1. Before you can search, it is important to define each of your concepts.

A. Definition (with examples/inclusion/exclusion criteria) of “Flexible working conditions”:

B. Definition (with examples/inclusion/exclusion criteria) of “Employee health and wellbeing”:

Part 2: For the above research question, can you generate a list of keywords and subject headings that you might use to create your search strategy in Business Source Complete.

	Flexible Working Conditions		Health and Wellbeing
Keywords (including operators and truncation)	1.		1.
	2.		2.
	3.		3.
	4.		4.
	5.		5.
	6.		6.
Subject headings/terms	1.		1.
	2.		2.
	3.		3.
	4.		4.

Part 3: Your task is to create a search in the Business Source Complete database and fill in the table below with your search lines. This will also tell you the number of references you can expect for a search on this topic.

Business Source Complete	
Search string/terms	# of results
S1:	
S2:	
S3:	
S4:	
S5:	
S6:	
S7:	
S8:	
S9:	
S10:	

Endnotes

1. Denise M. Rousseau, "Is There Such a Thing as 'Evidence-Based Management'?" *The Academy of Management Review* 31, no. 2 (2006), <https://doi.org/10.5465/amr.2006.20208679>.
2. Rousseau, "Is There Such a Thing," 266.
3. *CEBma Guideline for Critically Appraised Topics in Management and Organizations*, Center for Evidence-Based Management, 2017, accessed November 26, 2020, <https://cebma.org/wp-content/uploads/CEBma-CAT-Guidelines-vs-2.0.pdf>.
4. *CEBma Guideline*.
5. Rob B. Briner and Neil D. Walshe, "From Passively Received Wisdom to Actively Constructed Knowledge: Teaching Systematic Review Skills as a Foundation of Evidence-Based Management," *Academy of Management Learning & Education* 13, no. 3 (2014), <https://doi.org/10.5465/amle.2013.0222>.
6. *Framework for Information Literacy for Higher Education*, Association of College & Research Libraries, 2015, accessed November 26, 2020, <http://www.ala.org/acrl/files/issues/infolit/framework.pdf>.
7. *CEBma Guideline*.
8. W. Scott Richardson, Mark C. Wilson, Jim Nishikawa, and Robert S. A. Hayward, "The Well-Built Clinical Question: A Key to Evidence Based Decisions," *ACP Journal Club* 123, no. 3 (1995): A12–A13.
9. *CEBma Guideline*, 11.
10. *Ibid.*, 14.

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