Institute for Meta-Synthesis

Module 1:
Introduction and Basic Concepts

Sub-Module 1a:
User Guide Introduction

About the User Guide

This user guide was created as a tool to help you learn how to conduct qualitative meta-syntheses. The guide addresses the steps of a particular type of qualitative meta-synthesis called **systematic thematic synthesis**. We progress through the steps of this approach, from laying the foundation of your meta-synthesis project to writing and publishing a manuscript where you synthesize the existing literature around your chosen topic.

These steps are actively used by us, the Double Bind Research Team at TERC (authors of this guide led by Drs. Maria Ong and Nuria Jaumot-Pascual), and have been refined over the past 15 years. Prior to reading through this user guide, you should have an idea of a topic you would like to study for a qualitative meta-synthesis. The topic may be vague or specific, but this user guide will be most useful if you know what you would like to research.

This user guide is divided into eight modules. The first four modules of this user guide will focus on understanding the purpose of a meta-synthesis and the steps involved in collecting literature to conduct a qualitative meta-synthesis. The fifth and sixth modules will discuss the coding process and how to draft sections of your meta-synthesis paper, including how to develop your synthesis findings. The seventh and eighth modules will focus on the writing process as it relates to publishing your meta-synthesis paper and writing a grant proposal for a meta-synthesis project. The modules and sub-modules, which address specific module topics, are listed below in Table 1a.1.

Table 1a.1. Structure of the user guide by module and sub-module

Module 1: Introduction and basic concepts 1a. Introduction 1b. Basic concepts 1c. Glossary	**Module 2: Pre-search** 2a. Synthesis questions and theoretical framework 2b. Criteria 2c. Search engines 2d. Search terms, Boolean rules, and search strings
Module 3: Search and selection 3a. What is a start set? 3b. Inclusion and exclusion decision-making 3c. Critical appraisal 3d. Forward and backward snowballing	**Module 4: Analysis – intro and preparation** 4a. Five cycles of analysis 4b. Reading academic literature 4c. Creating analytical memos
Module 5: Analysis – first and second cycles 5a. What is coding? 5b. Creating a codebook 5c. Deductive coding 5d. Inductive coding 5e. Hybrid coding	**Module 6: Analysis – third to fifth cycles** 6a. Thematic Analysis 6b. Findings and Discussion 6c. Conclusions, recommendations, and other sections
Module 7: Writing and publishing 7a. Nature of writing 7b. Structuring the first half of your meta-synthesis 7c. Identifying a publication outlet 7d. Publication process	**Module 8: Proposals for funding** 8a. Requests for proposals 8b. Establishing the need 8c. Theoretical framework and methods 8d. Project expertise and institutional capacity 8e. Dissemination plan, timelines, and other proposal elements

Our team understands that different readers may be in different stages of conducting qualitative meta-syntheses. We created this guide in a modular fashion, so if you are at a more advanced stage of your meta-synthesis project, you may find information on the precise module or sub-module about which you would like to learn. In other words, it is possible to use this user guide without carefully reading through each module. However, we highly recommend that you at least skim through modules with content with which you are already familiar, as we often refer to prior sub-modules for context. This will minimize confusion when encountering these sub-module references.

Activities are embedded in each sub-module for you to complete as you progress through the user guide. Although we provide recommended lengths of time to complete the activities *as exercises,* they are **not** guidelines for the length of time you should take to complete these phases of your actual meta-synthesis project. It will likely take much longer to complete each step of the meta-synthesis than what is described for each exercise in this guide.

Additionally, this user guide will refer to a group as "we," which is in reference to the Double Bind Research Team and what they have done in their own research. However, we will often refer to the individual reader of this user guide as "you," as it relates to the specific steps needed to conduct a qualitative meta-synthesis and write a meta-synthesis paper or grant proposal.

Before we begin introducing you to the basic concepts of a meta-synthesis, we would like to describe some of our earlier synthesis work to illustrate the potential usefulness and impact of meta-synthesis work. Our meta-synthesis experiences began with projects on women of color in science, technology, engineering, and mathematics (STEM) higher education and careers. This work laid the foundation for the next two syntheses on women of color in engineering and computing higher education and professions. It is also the basis for the creation of this user guide.

The Beginning of Double Bind Meta-Syntheses: Translating Research into Policy and Practice

In 2006, our Double Bind Team leader, Dr. Maria Ong, began a small meta-synthesis project called Inside the Double Bind. For this project, she and her TERC-based team at the time – consisting of a postdoctoral fellow, a graduate researcher, and two undergraduate research assistants – developed a qualitative meta-synthesis on pieces that had been published about women of color in STEM since 1970. This meta-synthesis was eventually published in the *Harvard Educational Review* (Ong et al., 2011) and is now widely known and cited in the field of broadening participation in STEM education. For example, it was quoted in an amicus brief submitted to the U.S. Supreme Court in support of affirmative action in the *Fisher vs. the University of Texas* case (Levine & Ancheta, 2013).

From this meta-synthesis, the Double Bind Team created a policy brief for promoting women of color in STEM, drawing information directly from the meta-synthesis. In February 2009, she presented the policy brief to the Committee on Equal Opportunities in Science and Engineering – or CEOSE – which is a congressionally mandated advisory committee to the NSF on issues of diversity and inclusion. CEOSE members invited her to organize the Mini-Symposium on Women of Color in Science, Technology, Engineering, and Mathematics, which took place in the fall of that year. This Mini-Symposium has since, directly or indirectly, influenced multiple publications on women of color. Further, the American Chemical Society (ACS) was a co-sponsor of the Mini-Symposium, and the ACS Women Chemists of Color organization was born at this event.

Following the Mini-symposium, Dr. Ong authored a proceedings report (Ong, 2010). From this report, CEOSE made 10 recommendations to NSF and U.S. Congress for promoting women of color. NSF has acted on several of these recommendations, including funding at least five projects, including annual conferences and web support programs for women of color in STEM. The recommendations are also referenced in the National Science Foundation's Career-Life Balance Initiative. See Figure 1 for a dendrogram detailing the impact a meta-synthesis can have on policy and practice.

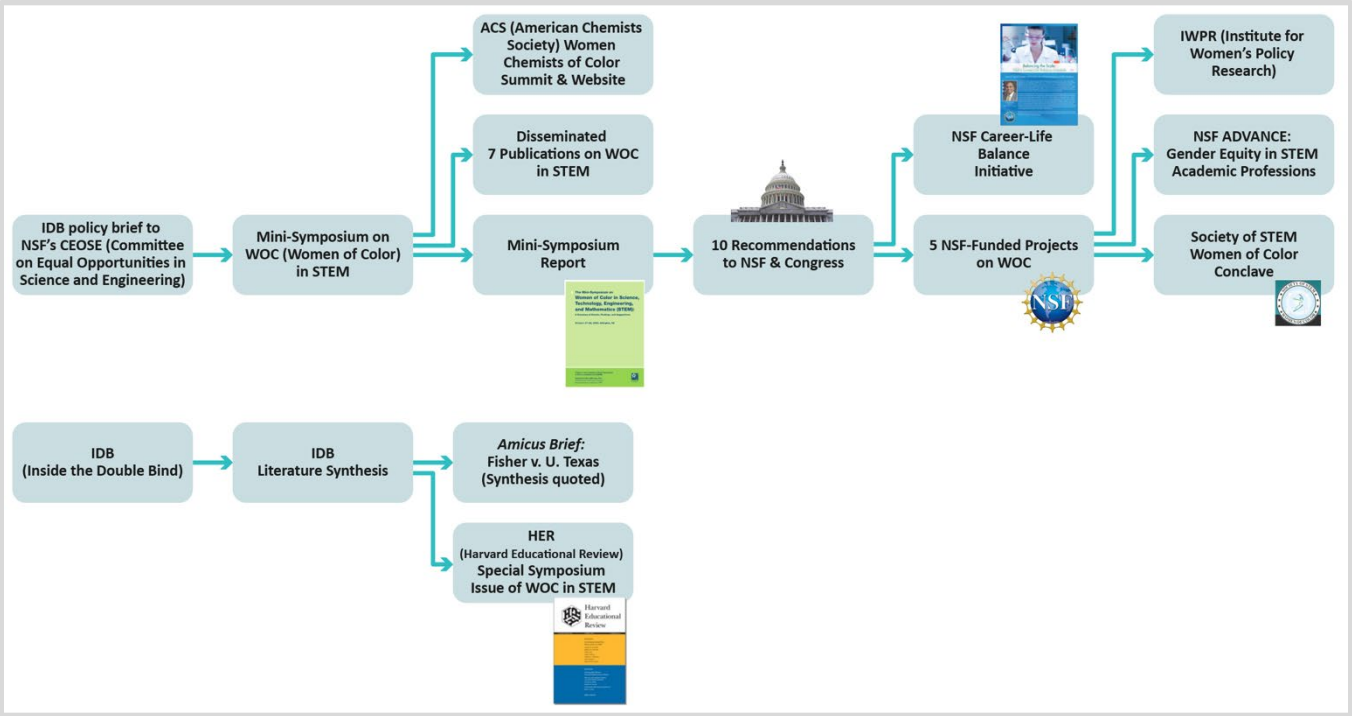

Figure 1a.1. Dendrogram of Dr. Maria Ong's first meta-synthesis and its impact on policy and practice

Following this meta-synthesis on women of color in STEM, Dr. Ong continued her synthesis work with Dr. Nuria Jaumot-Pascual on the experiences of women of color in engineering higher education and professions (2014-2018). Most recently, Drs. Ong and Jaumot-Pascual, along with two additional researchers from TERC, completed their meta-synthesis project on women of color in computing higher education and professions (2018-2021). Thus far, the Double Bind Research Team has written or contributed to five systematic thematic meta-synthesis publications on the experiences of women of color in STEM, engineering, or computing (Ong et al., 2011; Ong et al., 2020; Jaumot-Pascual et al., 2021a; Jaumot-Pascual et al., 2021b; National Academies of Sciences, Engineering, and Medicine, 2021). They have now turned to teaching others how to conduct meta-synthesis projects with a particular focus on STEM education and equity.

Important Considerations and Decisions to Make Before You Begin

Before delving into a meta-synthesis project, it is important to consider the following:

1. The topic you are interested in researching and synthesizing
2. The time you are able to commit to conducting a meta-synthesis
3. Whether you will conduct a meta-synthesis alone or in a team

These three factors are critical in helping you determine how to approach the next seven modules. When considering the topic you are interested in researching and synthesizing, it is important to decide how much time you can commit to conducting a meta-synthesis. If you only have six months to a year to dedicate to a meta-synthesis project, then you should consider choosing a topic that is more focused and specific rather than

a topic that is broad. Depending on the topic you have chosen and the time you are able to commit to this work, it is also helpful to think about whether you should recruit another person or a team to assist you with the project.

As we indicated above, the three meta-synthesis projects led by Dr. Ong have always been conducted in team settings (with 4-5 people on each team). These projects lasted approximately three years (or more) from start to finish, with the engineering and computing meta-synthesis projects being informed by each other and by Dr. Ong's initial meta-synthesis on women of color in STEM. Thus, each project refined the processes already developed by the team. For example, we used an updated codebook that was initially created by the engineering meta-synthesis team for the computing meta-synthesis project. As will be discussed in Module 5, this codebook was a living document that was refined over several years. Although each project had a different STEM disciplinary focus, the project teams were not starting from scratch. However, it still took three years to complete a systematic thematic meta-synthesis project from start to finish.

From our experience, working in a team for our meta-synthesis projects has been efficient given the thousands of pieces of literature we have sifted through to generate our final set of literature in each respective project. Our team recommends that you work with internal and/or external collaborators and potentially other experts to make it easier to produce a high-quality meta-synthesis project in a reasonable timeframe. See Table 1a.2 for a list of some pros and cons to consider when working on a meta-synthesis alone or in a team. Once you have considered these factors, you will feel more at ease as you progress through this user guide.

Table 1a.2. The benefits and drawbacks of working on a meta-synthesis project alone or in a team

TIME	
Team	**Individual**
Pros: Can divide the work among team members; there are more eyes to sift through the literature **Cons:** Need to manage/coordinate other people and their schedules, and build consensus	**Pros:** Can work around your own schedule and at your own pace **Cons:** Project can take a long time to complete if not very focused

PRE-SEARCH	
Team	**Individual**
Pros: Team members may have experience with different search engines/directories or know of appropriate theoretical frameworks that you may not be familiar with; access to team members' diverse areas of expertise **Cons:** Need to invest time in building consensus around search criteria	**Pros:** Can freely select the topic, theoretical framework, and criteria on your own without consulting others **Cons:** You may lose the value of having diverse perspectives; have to rely on your own knowledge of theoretical frameworks/search engines/directories

SEARCH AND SELECTION	
Team	**Individual**
Pros: Different team members may have access to different resources due to their institutional affiliations (e.g., an undergraduate student intern may have access to a university's digital holdings); dividing the work among team members **Cons:** Need to invest time in building consensus around inclusion/exclusion criteria and critical appraisal; need to make sure to stay organized among team members; need to train team members to make sure your approach is consistent across all members	**Pros:** Can implement criteria without outside input; may be easier to stay organized (if you are already an organized person); do not have to spend time training anyone **Cons:** May not have access to different resources beyond your own institutional affiliation; may be hard to stay organized (if you are not an organized person); have to do all the work on your own

ANALYSIS	
Team	**Individual**
Pros: Have different perspectives of the data (e.g., team members may bring a new definition to a code that you would not have considered alone); dividing the work among team members **Cons:** Need to make sure to have a codebook and clear definitions for codes so that everyone on the team understands and uses the codes accurately; you may need to arrive at a consensus with your team member(s) on data when you are coding and do not agree on your codes	**Pros:** Easier to adjust codes or your codebook as you go along since you do not need the consensus of other people **Cons:** Do not have the perspectives of other people; have to do all the work on one's own

WRITING AND PUBLISHING	
Team	**Individual**
Pros: Can divide and conquer the different sections of the manuscript or proposal **Cons:** Have to blend the voices and writing styles of multiple people into one cohesive piece	**Pros:** Do not have to worry about dealing with multiple writing styles; can freely write in your own voice **Cons:** Lose the value of having different perspectives; writing process may be slower

FUNDING	
Team	**Individual**
Pros: Team members may have access to different sources of funding for the project; can assist with grant proposal writing **Cons:** May be difficult to get enough funding for all team members; takes time to coordinate team members to develop a grant proposal and receive funding	**Pros:** Do not have to worry about funding other people; can potentially do the meta-synthesis without external funding depending on your employment situation and institutional affiliation **Cons:** Do not have funding dedicated to the project, which means you may have to work on the meta-synthesis for free and may not have funds to purchase some of the literature, software, or other resources needed for your analysis

User Guide Authors

Maria (Mia) Ong, Ph.D. Senior Research Scientist and IMS Principal Investigator.

Nuria Jaumot-Pascual, Ph.D. Research Scientist and IMS Co-Principal Investigator.

Lisette Torres-Gerald, Ph.D. Senior Research Associate and IMS Project Coordinator.

Audrey Martinez-Gudapakkam, M.A. Senior Researcher.

Christina Bebe Silva, B.S.W. Researcher.

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Team Members (Prior and Current): Ada Ren-Mitchell (user guide, presentation, & web design), Angela D'Souza & Erica Cruz (beta-testers), Jennie Gottschalk (editor), Janet Smith (evaluator and provided resources for user guide), Lorelle Espinosa, Jodut Hashmi, Apriel Hodari, Rachel Kachchaf, Lily Ko, Heather Lavender, Valerie Martin, Gary Orfield, Carol Wright, & Katie Yao

Partners and Advisors: Maura Borrego, Rebecca Davis, Jori Hall, Felicia Jefferson, & Elizabeth Pope (provided feedback to early versions of the user guide), Mona Abo-Zena & Detris Adelabu

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Institute for Meta-Synthesis

Sub-Module 1b:
Basic Concepts

Objectives

In this sub-module, you will learn to understand:

- The purpose of literature synthesis.
- The difference between the different types of review and synthesis articles.
- What a qualitative meta-synthesis is.
- The different types of qualitative meta-synthesis approaches, including systematic thematic synthesis.

Main Concepts

WHY IS THE SYNTHESIS OF ACADEMIC LITERATURE NECESSARY?

Synthesizing literature serves three main purposes: access, theory development, and informing policy and practice. For some scholars, conducting qualitative meta-synthesis work is part of their main scholarship areas, where they may contribute to their discipline's body of knowledge and to the synthesis methods field.

ACCESS

New research literature is constantly being published. It would be impossible for any scholar to review all new publications, understand main findings, and draw conclusions for practice in a particular discipline or area. Thus, having access to literature that synthesizes collections of literature, which have been selected according to a set of criteria, provides scholars with access to overviews of a broader set of academic writing in an efficient manner.

THEORY DEVELOPMENT

Bringing together the findings and discussions of a set of primary research reports through synthesis provides authors with the opportunity to have a bird's eye view of the advances in that area. Qualitative meta-syntheses support the identification of patterns and the generation of new insights for the development of new theory, which can lead to the development of process frameworks and theories that are generalizable or transferable beyond the findings of one single primary research report. Some examples of theory development identified and provided by Barbara Paterson (2012) include:

- Providing an overview of a body of work and revealing more powerful explanations than those available in a single study. This can lead to greater generalizability and increased levels of abstraction (e.g., Sherwood, 1999).

- Revising current understandings of a particular phenomenon (e.g., Paterson, 2001).
- Exploring differences and similarities across settings, populations, and researchers' disciplinary, methodological, and theoretical perspectives.
- Generating models or theories that can be explored in later research (e.g., NHS CRD, 2001).
- Providing a historical overview of the study of a phenomenon.
- Providing more powerful explanations for a phenomenon.

Additionally, synthesizing literature also helps identify the gaps in the literature and provides direction for future research.

INFORMING POLICY AND PRACTICE

Not all primary research reports result in recommendations but, instead, require additional steps to distill findings into feasible recommendations that can inform policy and practice. However, given that qualitative meta-syntheses bring together a broad view of a phenomenon and access to recommendations from a broad set of primary research reports, syntheses can provide guidance for policy and practice. This is particularly applicable for studies that evaluate the effectiveness of certain programs or interventions.

OFFSETTING SMALL NUMBERS

One of the most common critiques of qualitative research is that it is conducted with small numbers of participants, which limits the generalizability of findings from a statistical perspective (Pawley, 2019). Qualitative meta-synthesis addresses this issue by bringing together a set of qualitative studies to synthesize their findings into meta-findings that are based on the aggregation of the participants of all the included studies.

Synthesis Questions

To guide your meta-synthesis, you need to consider the results you expect to obtain from it. You need to ask yourself what new results will come from the meta-synthesis, what will be learned, and how the meta-findings may support theory development and the identification of gaps in the literature. The responses to these questions will guide your decision-making process to move the work forward, such as the type of literature to include and the type of analysis to use. For example, if you want to understand how the experiences of a specific population have been described in the literature to develop broader categories, you will need to focus your search and selection efforts on finding primary sources that focus on first-person experiences and not on programs or interventions. You will also need to use analysis methods that allow you to create broader categories, such as hybrid coding and thematic analysis (Fereday & Muir-Cochrane, 2006). **«Sub-Module 2a»** provides detailed instructions on how to develop synthesis questions.

Literature Review vs. Systematic Review vs. Meta-Synthesis vs. Meta-Analysis

There is confusion around the similarities and differences between the different approaches to reviewing and synthesizing literature. In this section, we will compare and contrast four approaches: literature review, systematic review of the literature, meta-synthesis, and meta-analysis. These are not all the approaches that exist but are some of those that are most commonly found in the literature. Before diving into each type to see the differences and similarities, we need to understand that these four types of approaches have in common the fact that they all have the goal of bringing together the results from multiple studies. However, they differ in how they pursue this goal.

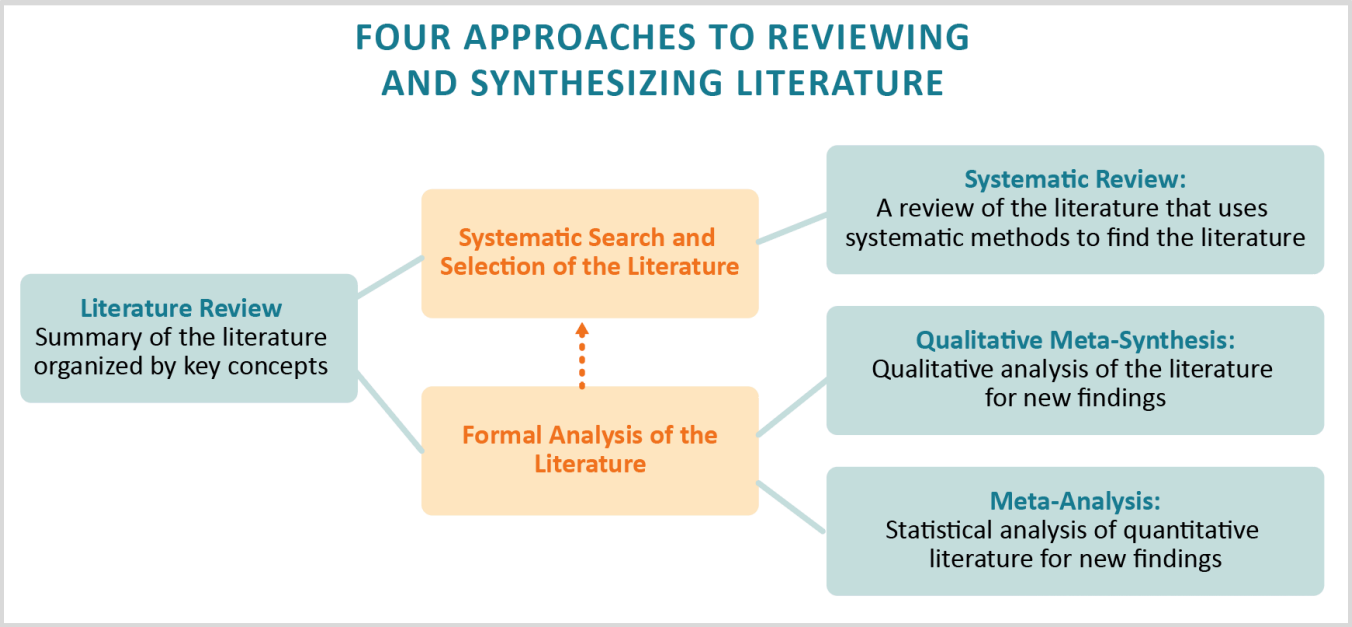

Figure 1b.1. Four approaches to reviewing and synthesizing literature

According to Rowley and Slack (2004), "[t]he **literature review** identifies and organizes the concepts in relevant literature" (p. 31). The purpose of a literature review is to "[distill] the existing literature in a subject field; ... to summarize the state of the art in that subject field. From this review of earlier and recent work, it becomes possible to identify areas in which further research would be beneficial" (Rowley and Slack, 2004, p. 32). This is often used to frame a specific study that the author of the review will conduct. It is not *systematic*, meaning that it does not try to include all the existing literature on the topic of interest or to use methods that are replicable by others. It also does not use analysis methods (e.g., narrative analysis, thematic analysis) to arrive at its conclusions.

In addition, there are **systematic reviews of the literature**, which are a sub-category of literature reviews. The main differences between a literature review and a systematic review of the literature are that:

- A literature review examines a bounded set of literature that is relevant for a study, while a systematic review uses systematic methods to identify a comprehensive set of literature on the topic of interest.
- A literature review is usually a section of a manuscript, while a systematic review typically stands alone.
- A literature review frames the theoretical grounding of a study and makes the argument to justify conducting it, while a systematic review seeks to provide an overview of the literature in a specific area to identify areas that need further research.
- Literature reviews are used in any field of study, independently of the methodological orientation, while systematic reviews typically address the "effectiveness of interventions, which often focus on randomized controlled trials" (Pham et al., 2014, p. 371).

Meta-synthesis is an umbrella term for different study designs that qualitatively synthesize primary studies. It is "the synthesis or amalgamation of individual qualitative research reports (commonly called 'primary research

reports') that relate to a specific topic or focus in order to arrive at new or enhanced understanding about the phenomenon under study. It entails an interpretive process" (Hannes & Lockwood, 2012, p. 1). This interpretive process that Hannes and Lockwood mention refers to the use of analysis procedures (e.g., narrative analysis, discourse analysis, thematic analysis) to develop meta-findings from the selected literature. Further, qualitative meta-synthesis can integrate the literature in order to develop new theory and unify disparate ideas and types of literature. It includes meta-ethnographies, meta-summaries, meta-aggregations, critical interpretive syntheses, and thematic syntheses, among others (see Booth et al., 2016). There are different methods to identify the literature that will be included in a meta-synthesis, so it can be systematic or not. The specific type of meta-synthesis that we will see in the modules in this User Guide is systematic; it uses methods that are reproducible by others and that seek to access a comprehensive set of literature on the topic.

A **meta-analysis** is "the statistical combination of results from multiple studies in order to yield results which make the best use of all available evidence" (Schmid et al., 2020, p. vii). As such, it pools results from studies to aggregate them mathematically, seeking statistical generalization. Given its methodological orientation, meta-analyses exclusively synthesize the findings of comparable studies that used experimental designs.

As you can see, though there are similarities among the four approaches, there are also key differences. One is that the literature review usually does not stand on its own, but provides the framing for a study, while a systematic review, a meta-synthesis, and a meta-analysis are studies in and of themselves.

The difference between meta-synthesis and meta-analysis lays in the types of studies included in each and the methods used to synthesize them. A meta-analysis brings together quantitative studies using statistical methods, while a meta-synthesis brings together studies using interpretive methods. The main differences between a systematic review and a meta-synthesis lie in the literature selection and analysis methods. While a systematic review uses systematic literature search and selection methods, a meta-synthesis may or may not use these methods. Lastly, while a meta-synthesis employs analysis and interpretation methods to synthesize the literature's findings to develop overall findings, a systematic review usually does not.

A Focus on Qualitative Meta-Synthesis

Given that the focus of these modules is qualitative meta-synthesis, we will do an overview of the different types of meta-syntheses. We will also take a closer look at the specific type of meta-synthesis that our team uses and that will be the focus of the rest of the modules in this User Guide.

TYPES OF QUALITATIVE META-SYNTHESES

Several authors have created classifications for different types of meta-syntheses, such as Booth et al. (2016) and Dixon-Woods et al. (2005). The different types of qualitative meta-syntheses are determined by the different considerations given by synthesis authors when they are making decisions. For example, Booth et al. (2016) included the following considerations in their classification:

- Review question (fixed vs. emerging)
- Epistemology (e.g., generation of theory, testing of theory, aggregative, interpretive)
- Time/time frame (degree of iteration and integration, points of integration)
- Resources (personnel, funding, effort)
- Expertise (e.g., in qualitative research, in systematic reviewing, in topic area)

- Audience and purpose (e.g., academics, policymakers, practitioners) and
- Type of data (e.g., thick/thin, likely number of relevant studies, unit of analysis)

In addition, we would also include: systematic vs. non-systematic (e.g., scoping) approaches to literature, type of data analysis (e.g., thematic analysis, content analysis), and type of literature included (e.g., qualitative only, multi-methods, research studies only, essays). The different combinations of these considerations produce many different types of meta-syntheses. Booth et al. (2016), for example, described 19 different types, including critical interpretive synthesis, grounded formal theory, meta-aggregation, meta-ethnography, meta-narrative, realist synthesis, and thematic synthesis. Based on this classification, we describe the type of qualitative meta-synthesis that our team uses as systematic thematic synthesis.

SYSTEMATIC THEMATIC SYNTHESIS

Systematic thematic synthesis "compiles a comprehensive set of research on a phenomenon and uses thematic analysis to identify key themes across the research that expand theoretical understanding of the literature as a whole" (Ong et al., 2020, p. 2). This type of synthesis was first described by Thomas and Harden (2008). It is systematic because the methods that it uses for the search and selection of the literature seek to include the most comprehensive set of literature possible. This means that the synthesis authors establish a set of criteria that the literature will need to meet for its inclusion and that they will cast a broad net to identify as much literature as possible. It also uses thematic methods of analysis, which allow for the integration of qualitative, quantitative, and mixed methods at the same time that they retain contextual information necessary for interpretation. In the following modules of this User Guide, we will learn the methods that the Double Bind Research Team at TERC uses for systematic thematic synthesis (e.g., Ong et al., 2020).

Activity 1b.1.

Read Ong et al. (2020). (Est. time to read 45 mins.) Take 10-15 minutes to answer the following questions:

- What makes this synthesis systematic?
- What makes it thematic?

Activity 1b.2.

Skim Booth et al.'s (2016) article. (est. time 10-15 mins). Then study their classification of synthesis methods (pp. 20-21). Take 20-25 minutes to answer the following questions with your synthesis project idea in mind.

- What synthesis method would you choose for your project? Why?
- Are there any elements in your synthesis project that you could modify in order to fit it into one of the types listed in the classification?

Additional Resources

- For more information on the definitions of different types of quantitative and qualitative reviews, check out "Systematic Reviews and Other Review Types" by Temple University Libraries - https://guides.temple.edu/c.php?g=78618&p=3879604

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Institute for Meta-Synthesis

Glossary Terms

Advisory board *Sub-Module 8d*	An advisory board is a group of professionals who have been selected to support a project team because their areas of expertise complement those of the team. They typically provide feedback on the team's work and can help carry out different tasks throughout a project that are pertinent to their areas of expertise. The advisory board may also have an evaluative capacity, such as conducting process evaluation. Advisors are typically senior in their field, but they do not need to be, particularly in emerging areas with limited available expertise. They can be internal or external to the project team's institution.
Analytical themes *Sub-Module 6a*	Analytical themes are words or phrases that represent new interpretations of a literature data set, going beyond simply describing the primary studies to generating "new interpretive constructs" (Thomas & Harden, 2008, p. 1). Analytical themes can be more abstract than descriptive themes, but they ultimately need to be able to describe or explain all of your descriptive themes as well as address your research questions.
Author agreement *Sub-Module 7d*	An author agreement is a legal agreement between the author(s) and publisher. It is a declaration, signed by the author(s), that the manuscript submitted is an original work that has not been published and is not currently being considered for publication elsewhere. Author agreements may also dictate the terms of ownership and copyright, distribution and reproduction rights, and licensing.
Backward snowballing *Sub-Module 3d*	Backward snowballing is a sampling strategy for literature searches that complements forward snowballing. It is the process of using the reference list of each of your articles to identify new papers to include in your meta-synthesis.
Blinded submission *Sub-Module 7d*	A blinded submission is a manuscript that has been stripped by the publisher of all indicators of an author's identity, including name and affiliated organizations and projects, before it is reviewed by an editor.

Boolean rules *Sub-Module 2c and 2d*	Boolean rules are rules that determine what your search will generate based on "true" and "false" logic statements. The combination of keywords, operators (such as AND, OR, and NOT), parentheses, and quotation marks will assist you with narrowing or broadening your literature search.
Codebook *Sub-Module 5a, 5b, 5c, and 5e*	A codebook is a record of the codes you use for coding your data that includes sections that help in understanding what each code means and how to implement it, such as a title for the code, a description, and examples.
Codes *Sub-Module 4a*	Codes are words or short phrases that you create based on the data or that you assign based on concepts from your selected theoretical framework. They summarize meanings that you then group together and use to explain your phenomenon of interest.
Coding *Sub-Module 4a and 5a*	Coding is a process of examining the data that helps you to break down the data into smaller pieces that have a core feature in common and can thus be grouped together (see Sub-Module 5a, first cycle of coding). Once you have codes, you can develop code categories that bring together related codes (see Sub-Module 5a, second cycle of coding).
Computer-assisted qualitative data analysis software (CAQDAS) *Sub-Module 5a*	CAQDAS (pronounced "kack-duss") are software packages that can be used to store, organize, and manage data, in addition to coding and analyzing it. They support your meta-synthesis by assisting with organizing and working with your data, but they do not code or analyze the data for you.
Concept map *Sub-Module 2a*	A concept map is a diagram typically comprised of circles and lines that allows you to brainstorm ideas and explore relationships between concepts. Reorganizing disciplinary knowledge in a visual network of information rather than a textual, linear form can help you to identify gaps in the literature as well as in your thinking.
Conference proceedings *Sub-Module 2c*	Conference proceedings are the published record of a professional or academic meeting sponsored by a society or association. It usually includes abstracts or reports of papers presented by the participants.

Co-PI or Co-Principal Investigator *Sub-Module 8d*	Co-PIs are individuals who assist the PI (Principal Investigator) with the conceptualization, oversight, and management of a research project.
Data saturation *Sub-Module 3d*	Data saturation is the point during the search process at which you can stop data collection because including additional studies do not add any new insights.
Database *Sub-Module 2c*	A database compiles resources on a specific discipline that an individual or an organization has selected for their quality and relevance. They contain references for journal articles and typically offer the widest possible retrievals of peer-reviewed material. They may have full-text resources available for downloading.
Deductive coding *Sub-Module 5a, 5b, 5c, and 5e*	Deductive coding is a top-down method by which you use predetermined codes based on a particular theoretical framework, knowledge of the literature, or your synthesis questions. Deductive coding is an example of first cycle coding. You develop your deductive codebook before coding with an initial set of codes from the selected theory, and let the theory guide the data analysis.
Descriptive themes *Sub-Module 6a*	Descriptive themes are themes that closely represent what was found in the primary studies. They are the result of first cycle coding, where you group the data into batches of shared meaning. They are specific and closely tied to the data.
Desk rejection *Sub-Module 7d*	A desk rejection means that a manuscript has been rejected by a journal editor without being sent out for review. There are various reasons for desk rejection, the most common being improper fit for the journal, the manuscript not following the requirements of the journal (e.g., formatting), and poor writing quality.
Double-blind review *Sub-Module 7d*	A double-blind review during the manuscript reviewing process involves the reviewer and author being anonymized and not knowing the identity of each other.
Evidence *Sub-Module 4c and 6b*	In our meta-synthesis methods, evidence means examples and quotes from the data as well as explanations in the authors' words that support the main argument so that the reader can understand it.

External evaluator *Sub-Module 8d and 8e*	An external evaluator is a person outside your organization whose primary goal is to ensure that your activities are consistently aligned with your project goals and objectives.
First cycle coding *Sub-Module 5a*	First cycle coding is a first "pass" at coding where you begin to get familiar with and make sense of the data. During this phase, you break the data down into smaller pieces that have core features or meanings in common and begin to group them together. Examples of first cycle coding include deductive and inductive coding.
Forward snowballing *Sub-Module 3d*	Forward snowballing is a sampling strategy that is typically part of a systematic literature search. It helps in the identification of relevant studies by using the start set (which is the initial set of literature found through inputting search strings into selected search engines) to trace recent publications that cite literature in that set.
Free-text words *Sub-Module 2c and 2d*	Free-text words are terms located within the title of the article, the abstract, or the full text of the publication. These include keywords associated with the topic or research question for your meta-synthesis project that you generate or identify in relevant articles.
Gantt chart *Sub-Module 8e*	A Gantt chart is a visual display, often a type of bar chart, that illustrates the project schedule, dependency relationships between activities, and the current schedule status. Some may also indicate who is responsible for the work at each stage. These charts are easy for reviewers to follow because they show the overlapping, simultaneous progress of the different parts of the project and take up minimal space in the proposal.
Golden quotes *Sub-Module 5b*	"Golden quotes" is a term created and used by the authors of this User Guide to refer to quotes that provide particularly insightful examples from the data.
Gray literature *Sub-Module 2b and 2c*	Gray literature is any literature that contains unpublished studies and/or manuscripts that have not been peer reviewed. These include: book chapters, conference proceedings, dissertations, government reports, and white papers.

Hybrid coding *Sub-Module 5b and 5e*	Hybrid coding is a method that uses both inductive and deductive coding practices; it is a melding of inductive codes that are generated from the data with deductive, theory-driven codes. Hybrid coding is an example of second cycle coding, where you identify relationships between the codes you have applied in the first cycle of coding.
Index terms *Sub-Module 2c and 2d*	Index terms, also known as subject headings, are terms assigned to articles by authors and managers of bibliographic databases. These may be technical terms that are used in the specific area of your meta-synthesis that are not commonly used otherwise. Index terms may also be specific to a particular database.
Impact factor *Sub-Module 7c*	The impact factor of a journal is a metric used to evaluate the journal's relative importance within its field. The impact factor is determined by measuring the frequency with which the "average article" in a given journal has been cited within a particular time period. It is commonly perceived that the higher the impact factor, the higher the quality of the journal due to the demand of its articles by readers in the field.
Inductive coding *Sub-Module 5b, 5d, and 5e*	Inductive coding, or open coding, is a method of developing your codes as they appear in your textual data. You move from specific observations drawn from the data and generate your own codes, rather than starting with a preset list of codes. Inductive coding is an example of first cycle coding. It is a bottom-up approach, as you are creating codes that are rooted in the data and looking at patterns with the aim of developing theory.
Interpretation/ interpreting *Sub-Module 6b*	Interpretation (or the verb "interpreting") involves the understanding of the larger context and social significance of the findings described beyond a specific meta-synthesis project, such as understanding the relationships that exist among different elements of the findings. It involves making inferences of how and why those findings occurred based on the description provided.

Literature review *Sub-Module 1b and 8b*	The literature review is a distillation, organization, and description of concepts within the literature of a particular field. The purpose of a literature review is to summarize where the field is currently with the goal of identifying gaps in the literature where new research questions can be asked and pursued. It is not systematic, meaning that it does not try to include all the existing literature on the topic of interest or to use methods that are replicable by others. It also does not use analysis methods (e.g., narrative analysis, thematic analysis) to arrive at its conclusions.
Meta-analysis *Sub-Module 1b*	A meta-analysis is the statistical combination of results from multiple studies in order to yield results that may be generalizable for a particular phenomenon.
Meta-engine *Sub-Module 2c*	A meta-engine is a search engine tool that has the capacity to conduct searches in several search engines at the same time. An example is WorldWideScience (https://worldwidescience.org), which calls itself "the Global Science Gateway." It allows you to search multiple databases at once.
Meta-synthesis *Sub-Module 1b*	A meta-synthesis is an umbrella term for different study designs that synthesize qualitative primary studies. It synthesizes individual or primary works belonging to a specific topic "in order to arrive at new or enhanced understanding about the phenomenon under study. It entails an interpretive process" (Hannes & Lockwood, 2012, p. 1).
Open peer review *Sub-Module 7d*	Open peer review is a manuscript review process in which all involved parties – publisher, editor, and author – know the identities of one another.
ORCID number *Sub-Module 7d*	ORCID stands for "Open Research and Contributor ID"; an ORCID number is a unique, persistent identifier that allows a researcher to be connected to their contributions. You may register for your ORCID number at orcid.org.
Parking lot *Sub-Module 5b and 5e*	The parking lot is a temporary code category that the authors of this User Guide use to place codes that seem relevant to a meta-synthesis project that require further development and evidence.

Peer review *Sub-Module 7c and 7d*	In the peer review process, reviewers who have experience in research and publishing similar work are asked to evaluate manuscripts to support editors' decision-making about the publication of manuscripts. Reviewers typically suggest revisions and make recommendations about manuscripts' publication.
Peer-reviewed journals *Sub-Module 2b and 7c*	Peer-reviewed journals are publications that publish articles that have gone through a process called peer review. In this process, colleagues with experience in research and publishing similar work review a manuscript, suggest revisions, and generally help editors make decisions about the publication of manuscripts.
PI or Principal Investigator *Sub-Module 8d*	PI stands for Principal Investigator, who is the person responsible for overseeing and managing a research project.
Positionality statement *Sub-Module 7b*	A positionality statement is a brief statement of your background and identities – for example, gender, race/ethnicity, disability status, class, profession, or discipline – that might influence or bias your interpretations of the data.
Pre-submission inquiry *Sub-Module 7c*	A pre-submission inquiry is a brief, informal query, usually conducted via email, from a potential author to an editor seeking advice about whether or not a particular topic or methodological approach would be a good fit for the editor's journal.
Pre-writing phase *Sub-Module 7a*	The pre-writing phase is the first phase of the writing cycle that involves preparation work prior to actual writing. Preparatory activities for a meta-synthesis manuscript may include gathering evidence and observations; deciding the intended audience, manuscript purpose and context; refining synthesis questions; brainstorming; and concept mapping.
Primary code *Sub-Module 5b*	A primary code is an umbrella term or phrase that summarizes more specific terms, otherwise called secondary codes. For example, a primary code might be "experiences of discrimination," which would encompass different forms of discrimination. "Being harassed" or "suffering microaggressions" would be secondary codes.

Program officer *Sub-Module 8d*	A program officer is a professional who works for a funding agency, such as the National Science Foundation, to coordinate funding around a specific topic or area. Part of the program officer's job is to guide interested applicants.
Proofs *Sub-Module 7d*	Proofs are typeset, penultimate versions of the manuscript that are sent to the author for review. Proofs are the final opportunity prior to publication to make small, last-minute edits.
Quartile *Sub-Module 7c*	In statistics, a quartile is a data set that is divided into four parts. In academic publishing, a quartile refers to a position (first, second, third, or fourth) in which a group of journals is ranked relative to its peer journals, with first quartile typically indicating the highest frequency of citations.
Re-writing / Revision phase *Sub-Module 7a*	The re-writing/revision phase is the third phase of the writing cycle that involves reviewing and evaluating your draft while considering the clarity, logic, and robustness of your argument or evidence, then making improvements where needed.
RFP (Request for proposals) *Sub-Module 8a*	This acronym stands for "request for proposals." The RFP is a call or solicitation for proposals, and it usually includes a list of performance expectations that you must meet when asking for funding. The RFP often reflects the funding agency's goals, objectives, and investment priorities that you and/or your team must meet to be funded.
Search directory *Sub-Module 2c*	A search directory (or web directory) is a catalog of websites or other resources organized by category by an individual or organization to make it easier for people to find information. College libraries often have directories, where they compile resources according to the needs that they have identified among their target population. An example is Internet Sites by Subject by McLennan Community College (https://mclennan.libguides.com/internet-sites/welcome).
Search engine *Sub-Module 2c*	Search engines, such as Google Scholar, use computer algorithms to search the Internet and identify items that match the words you enter. The information is compiled by artificial intelligence technology.

Search string *Sub-Module 2d*	A search string is a combination of search terms and Boolean operators that you insert in a search engine's search bar to conduct a literature search.
Second cycle coding *Sub-Module 5a and 5e*	Second cycle coding is a second round of iterative coding where you develop a deeper knowledge of your data. It involves organizing and re-analyzing data to identify relationships between codes and bring together groups of similar codes to develop an overall understanding of the data. Hybrid coding is an example of second cycle coding.
Secondary code *Sub-Module 5b*	A secondary code is a narrow code that might be encompassed by an umbrella term, or primary code. For example, a secondary code would be a specific form of discrimination, such as "being harassed" or "suffering microaggressions." These secondary codes would be part of the larger primary code "experiences of discrimination."
Single-blind review *Sub-Module 7d*	A single-blind review process is a traditional manuscript review process in academia, in which reviewers know the identity of the manuscript author, but the author is prevented from knowing the identities of the reviewers.
Snowballing *Sub-Module 3d*	Snowballing is a systematic sampling strategy for literature searches to identify relevant studies by using a start set of literature. It includes backward and forward snowballing.
Solicitation *Sub-Module 8a*	Solicitation is an informal term for an RFP or "request for proposals." See Glossary term "RFP."
Sufficient description *Sub-Module 6b*	Sufficient description refers to the need to provide information that allows the reader to understand the situation, thoughts, and environment of the people represented in the manuscript or report. Authors should use evidence, such as examples and quotes from the data, and explanations in the authors' words that support the main argument.
Synthesis question *Sub-Module 2a*	The synthesis question is the question that you want to answer with your meta-synthesis project. It delimits the scope and guides the decisions you will need to make throughout the project.

Systematic review of the literature *Sub-Module 1b*	A systematic review of the literature is a stand-alone manuscript that uses systematic methods to identify a comprehensive set of literature on a topic. Given its systematic nature, it provides a comprehensive overview of the literature in a specific area to identify topics that need further research. It typically does not use formal analysis methods to develop findings.
Systematic thematic synthesis *Sub-Module 1a and 1b*	A systematic thematic synthesis is a comprehensive set of research on a phenomenon that uses thematic analysis to identify key themes across the research literature. It can lead to an expanded theoretical understanding of the phenomenon as a whole. This type of synthesis is systematic because the authors establish a set of literature inclusion criteria and cast a broad net to identify as much literature as possible. They also use thematic methods of analysis, which allow for the integration of qualitative, quantitative, and mixed methods while they retain contextual information necessary for interpretation.
Themes *Sub-Module 4a, 5a and 6a*	Themes are groupings of similar codes or code categories, or underlying ideas across codes. The authors of this User Guide develop descriptive and analytical themes. See descriptions for these two types of themes in the glossary.
Theoretical framework *Sub-Module 2a*	A theoretical framework helps to guide and direct the synthesis process; it is a particular perspective, or lens, through which to examine a topic.
Triple-blind review *Sub-Module 7d*	A triple-blind review is a manuscript review process in which the editor and reviewers do not know the identity of the author, and the author does not know the identities of the editor or reviewers.
Truncation *Sub-Module 2c and 2d*	Truncation is a function used in the Boolean rules of search engines in which you replace the letters within keywords with symbols as wildcards. For example, if a search engine allows you to use * as a truncation sign, then we can do a search for "biolo*" that would refer to all the words that start with "biolo," such as "biology" and "biological."
Unblinded submission *Sub-Module 7d*	An unblinded submission is manuscript whose author's identity is known by the editor and the reviewers.

White paper *Sub-Module 2c*	A white paper is an informational document (e.g., report, guide) usually issued by a company or non-profit organization to concisely inform readers about a complex issue and to present their perspective on the matter. It is meant to help readers understand an issue, solve a problem, or make a decision. It also helps to promote or highlight the features of a solution, product, or service that the organization offers or plans to offer. White papers are also used as a method of presenting government policies and legislation and gauging public reaction.
Writing phase *Sub-Module 7a*	The writing phase is considered the "middle" phase of the writing cycle that involves the actual writing of your manuscript. Writing activities may include organizing ideas; making an argument; showing evidence to support your claims; and presenting themes.

Institute for Meta-Synthesis

Module 2: Pre-Search Process

Sub-Module 2a:
Synthesis Questions and Theoretical Framework

Objectives

In this sub-module, you will learn to understand:

- The utility of synthesis questions in qualitative meta-synthesis work.
- How a concept map aids in the process of creating a synthesis question.
- The role of a theoretical framework in a synthesis.

Main Concepts

Formulating a Synthesis Question

A **synthesis question** is the question that you want to answer with your meta-synthesis project. It delimits the scope and guides the decisions you will need to make throughout the project, such as the type of literature to include. An appropriate synthesis question is particularly important for a meta-synthesis project because it will help you decide on the pre-specified eligibility criteria that you need for your review protocol (to be discussed in **«Sub-Module 2b»**). It will also help to guide the entire synthesis process. In qualitative research, the convention is to begin a study by formulating a broad synthesis question that asks about a single phenomenon or concept. Oftentimes, this synthesis question emerges from reading the literature and looking at what is known and what is not known in the field. It can also arise from personal experience or from observations of a particular event.

For meta-synthesis research, there are different types of synthesis questions, which depend on the kinds of literature and topics researchers are interested in. For meta-syntheses of literature on programs or interventions, Pearson et al. (2005) identify four types of synthesis questions (see Table 2a.1.).

Table 2a.1. Types of synthesis questions identified by Pearson et al. (2005) with synthesis question examples

Type of synthesis question	Example
Revolve around effectiveness of a program	What is known about the effectiveness of program X among population A?
Understand program feasibility	What is known about the feasibility of program X to address issue A?
Understand the appropriateness of a program or intervention	What is known about the appropriateness of program X to address issue A?
Focus on meaningfulness of a given phenomenon from the perspective of a specific population	What is known about the role of phenomenon X in the experiences of population A?

According to Finfgeld-Connett (2018), synthesis questions can also target three types of theory development, such as guiding the researcher toward the explication of a process, describing the attributes of a process, or developing a theoretical framework (see Table 2a.2 for examples).

Table 2a.2. Types of synthesis questions identified by Pearson et al. (2005) with synthesis question examples

Type of synthesis question	Example
Theory development	How does the literature support, contradict, or extend X theory?
Explicating a process	What is known about the main phases that constitute process X?
Describing the attributes of a process	What is known about the attributes of process X?
Developing a theoretical framework	How does the existing literature contribute to the understanding of phenomenon X?

The range of synthesis questions for a meta-synthesis is broad; therefore, researchers need to think about their goals, the topic, and the type of literature available to help them as they shape their synthesis question.

A great way to begin to identify a synthesis question is by generating a **concept map**. A concept map is a diagram typically comprised of circles and lines that allows you to brainstorm ideas and explore relationships between concepts. Reorganizing disciplinary knowledge in a visual network of information rather than a textual, linear form can help you to identify gaps in the literature as well as in your thinking. To form a concept map, you start by drawing a circle in the middle of a piece of paper and writing the central concept in the middle of the circle. Then, list any other concepts, findings, authors, etc. that are associated with the central concept. Try to work from general to specific, drawing new circles for each new concept. Link the words with lines if there is a relationship between them, writing a phrase or sentence that joins the ideas next to the line. The concept map will become increasingly useful as you begin to read the literature to help to solidify a synthesis question.

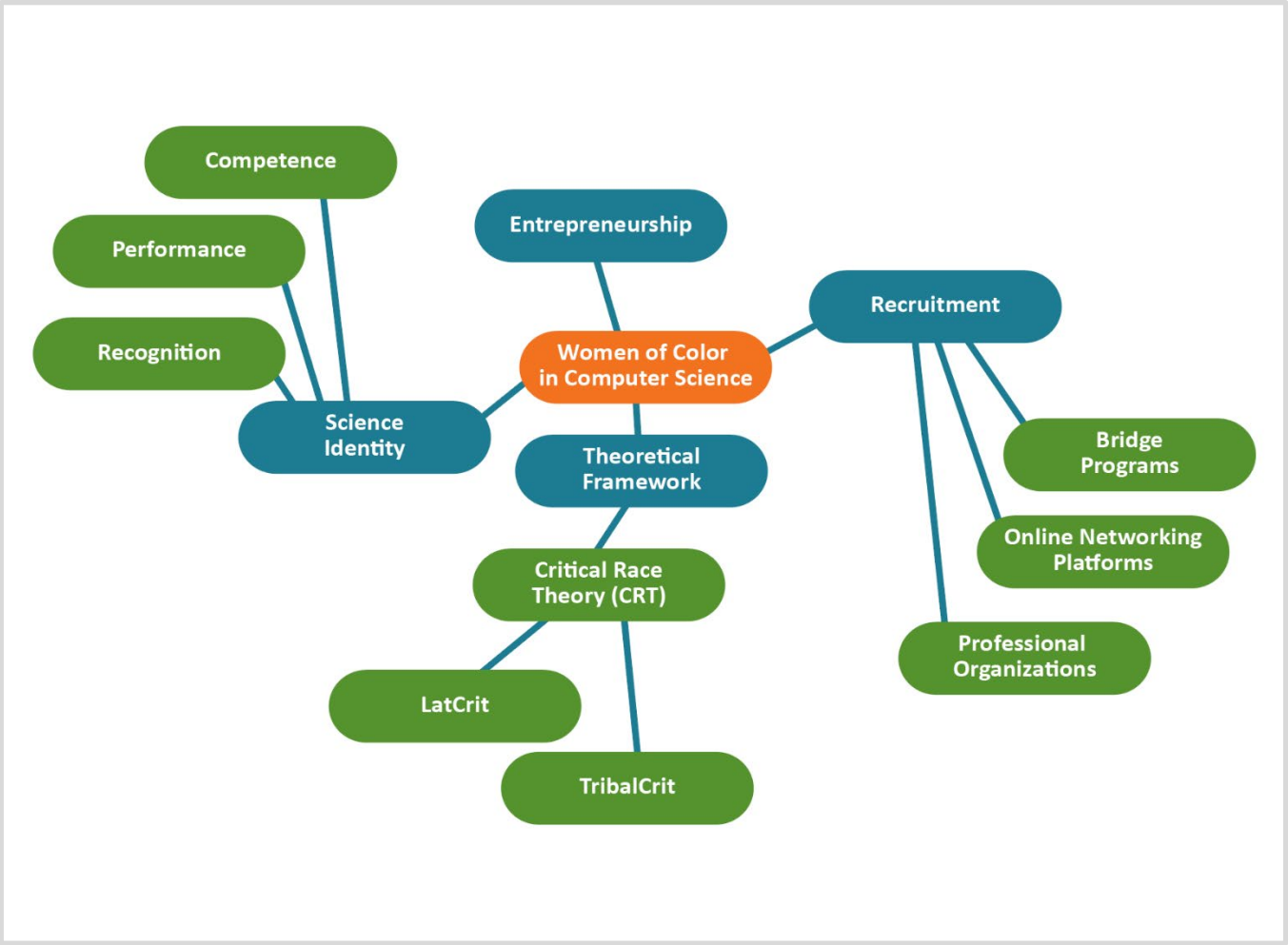

Figure 2a.1. Example of a concept map

Activity 2a.1.

Take 15-20 minutes to create a concept map based on a topic about which you are interested in conducting a qualitative meta-synthesis. Reflect on what has been documented in the literature so far or what you have personally or professionally experienced.

Activity 2a.2.

Looking at your concept map, take 5-10 minutes to draft an initial synthesis question for your qualitative meta-synthesis project. Remember: it should be open-ended and relatively broad.

No matter how a synthesis question is conceived, a viable one should be clear, open-ended, and specify the topic and the site of the study (Creswell, 2009). It should start with the words "what" and "how" and be accompanied by exploratory verbs, such as "discover," "explore," and "describe" (Creswell, 2009, p. 130). In thinking about formulating effective synthesis questions for evidence-based healthcare practice, Booth (2006) states, "Formulating the question is fundamental to evidence-based practice, irrespective of the discipline involved" (p. 365). He recommends using the mnemonic device SPICE, which stands for Setting, Perspective, Intervention/phenomena of interest, Comparison, and Evaluation (Booth, 2004). Another framework that is useful in determining whether a synthesis is viable is the FINERMAPS framework developed by Ratan, Anand, and Ratan (2019). You can practice using these frames in Activities 3 and 4 in this sub-module.

Activity 2a.3.

Frame and refine your synthesis question. Using the **SPICE** framework by Booth (2006) found in Appendix 2a, take 10-15 minutes to look over your initial synthesis question and answer the following questions:

Setting – Does your synthesis question include a specific geographic location or setting? Where is your synthesis question situated (e.g., higher education setting, elementary schools, U.S. hospitals, etc.)?

Perspective – Who is this synthesis for? What population is being studied? Whose perspective/s are you considering?

Intervention/Phenomena of Interest – What intervention or phenomena of interest are you looking to examine?

Comparison – What are you comparing this intervention or phenomena of interest to (either explicitly or implicitly)?

Evaluation – What result are you looking to examine (e.g., graduation rates, retention, etc.)?

Activity 2a.4.

Consider the impact of your synthesis question. Using the **FINERMAPS** framework by Ratan, Anand, and Ratan (2019), take 10-15 minutes to evaluate whether your synthesis question is viable. See Appendix 2a for a FINERMAPS worksheet.

Feasible – Is the posed synthesis question feasible for you to carry out? In other words, do you have the knowledge, time, and resources required to address the synthesis question?

Interesting – Do you find the posed synthesis question inherently interesting?

Novel – Is the posed synthesis question going to add something new or address a gap in the literature? Is it also simple and clear?

Ethical – Does the synthesis question minimize harm to participants and conform to institutional review board (IRB) standards?

Relevant – Is the posed question of interest to scholars in your discipline?

Manageable – Is the work needed to address the posed synthesis question manageable for you?

Appropriate – Is the posed synthesis question appropriate for you, your discipline, and your institution to address?

Potential value and publishability – Would addressing the posed synthesis question have significant implications for your field, community, policy, or society? Would your findings be publishable?

Systematic – Can you address the posed synthesis question in an organized, step-by-step way?

If you answered NO to any of the above questions, revisit, revise, and reassess your synthesis question.

Selection and Use of a Theoretical Framework

In qualitative meta-synthesis research, the theory frames the findings, analysis, and discussion of the study. It is often the lens by which the researcher is examining the data they are collecting; it indicates how the researcher is positioning themselves in relation to the work. It oftentimes informs the methodology, or how the study is conducted. Theory can also be used to provide broad explanations of phenomena or can be generated at the end of a study as a result of patterns in the findings.

The selection and use of a **theoretical framework** need to be in line with the synthesis author's theoretical inclinations and relevant to the study's topic or discipline. A theoretical framework helps to guide and direct the review process. It can assist you with decision-making along the way as well as provide additional insights in how to look at or approach a particular synthesis question. Your choice of theoretical framework will also guide the development of your analysis and discussion for your synthesis project.

Together, your synthesis question and theoretical framework will keep your project clear and focused. For example, our team's synthesis project on women of color in engineering utilized critical race theory (CRT) and

intersectionality as our theoretical frameworks to inform the synthesis question of: *What factors influence women of color's persistence in undergraduate engineering education?* For this question, intersectionality is used to draw attention to the ways some individuals are simultaneously minoritized and oppressed in multiple ways, and CRT calls for an asset-based approach when examining the experiences of people of color.

If you are uncertain of which theoretical framework to choose, read several articles related to your synthesis topic, paying close attention to the literature they cite in the theoretical framework sections. We will come back to the importance of the synthesis question and theoretical framework in **«Sub-Module 7b»** – Structuring the First Half of Your Meta-Synthesis Manuscript.

Additional Resources

- For the SPICE framework worksheet and the FINERMAPS worksheet, see Appendix 2a.

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Appendix 2a.1. SPICE Framework Worksheet

In the article by Andrew Booth (2006) entitled "Clear and present questions: Formulating questions for evidence based practice," the author discusses the importance of questioning in healthcare fields. He notes how the questions we ask stem from our background knowledge and things that we are curious to explore. To assist others developing research questions that are clear and focused, he developed the SPICE framework:

- **Setting –** where?
- **Perspective –** for whom?
- **Intervention/Phenomena of Interest –** what?
- **Comparison –** compared with what?
- **Evaluation –** with what result?

Example

For example, if we were considering doing a meta-synthesis on women of color in computer science, our responses could look like:

- **Setting –** United States, higher education, undergraduate level, predominantly white institutions
- **Perspective –** women of color, undergraduates, Black and Latina women, majoring in computer science
- **Intervention/Phenomena of Interest –** academic success
- **Comparison –** White men and women, undergraduates, majoring in computer science
- **Evaluation –** graduation rates, retention rates from year to year, cumulative GPA, major GPA

Our possible research question would be:
How are Black and Latina women of color majoring in computer science achieving academic success at predominantly white institutions compared to their white peers?

Questions to Answer

Take 10-15 minutes to answer these questions in as much detail as possible.

For the purposes of your meta-synthesis work, you may find it helpful to adjust this framework as follows:

- **Setting –** Does your synthesis question include a specific geographic location or setting? Where is your synthesis question situated (e.g., higher education setting, elementary schools, U.S. hospitals, etc.)?

  <type something>

- **Perspective –** Who is this synthesis for? What population is being studied? Whose perspective are you considering?

  <type something>

- **Intervention/Phenomena of Interest –** What intervention or phenomena of interest are you looking to examine?

  <type something>

- **Comparison –** What are you comparing this intervention or phenomena of interest to (either explicitly or implicitly)?

  <type something>

- **Evaluation –** What result are you looking to examine (e.g., graduation rates, retention, etc.)?

  <type something>

Using key words from your responses, formulate a research question to guide your meta-synthesis work.

<type something>

Appendix 2a.2. FINERMAPS Framework Worksheet

If you have developed your own synthesis question, it will be important to consider its impact and whether it is viable. Simmi Ratan, Tanu Anand, and John Ratan (2019) created the FINERMAPS framework as a way to delineate the traits of a good research question. The acronym stands for the following:

- **Feasible –** the research is within the ability of the investigator to carry out. They can carry out the methodology, has access to participants and collaborators, and has the funding to conduct the research.
- **Interesting –** the research is motivating to you and can be supported with academic literature
- **Novel –** the research question is simple, clear, and gives a new insight to the topic. The purpose of the question can be to confirm or refute established findings, generate new findings or theories, or find new ways to look at data in the field.
- **Ethical –** the research needs to minimize risk of harm to participants, provide confidentiality and privacy, avoid deception, and allow participants to withdraw from the research at any point during the study.
- **Relevant –** the research is grounded in the literature and is of interest to people in the field.
- **Manageable –** the research can be managed by the investigator. They can handle the work and time that the project needs.
- **Appropriate –** the research questions is logical and related to what is being studied.
- **Potential value and publishability –** The research could make an impact on the field.
- **Systematic –** The research can be "structured with specified steps to be taken in a specified sequence in accordance with the well-defined set of rules."

Questions to Answer

After developing your synthesis question, take 10-15 minutes to answer the following questions for yourself:

- **Feasible –** Is the posed synthesis question feasible for you to carry out? In other words, do you have the knowledge, time, and resources required to address the synthesis question?

  <type something>

- **Interesting –** Do you find the posed synthesis question inherently interesting?

  <type something>

- **Novel –** Is the posed synthesis question going to add something new or address a gap in the literature? Is it also simple and clear?

  <type something>

- **Ethical –** Does the synthesis question minimize harm to participants and conform to institutional review board (IRB) standards?

  <type something>

- **Relevant –** Is the posed question of interest to scholars in your discipline?

  <type something>

- **Manageable –** Is the work needed to address the posed synthesis question manageable for you?

  <type something>

- **Appropriate –** Is the posed synthesis question appropriate for you, your discipline, and your institution to address?

  <type something>

- **Potential value and publishability –** Would addressing the posed synthesis question have significant implications for your field, community, or society? Would it affect policy? Would your findings be publishable?

  <type something>

- **Systematic –** Can you address the posed synthesis question in an organized, step-by-step way?

  <type something>

Institute for Meta-Synthesis

Sub-Module 2b:
Criteria

Objectives

In this sub-module, you will learn:

- The importance of developing literature selection criteria.
- To distinguish between different types of criteria.
- How to establish search, selection, and quality appraisal criteria.
- To develop selection criteria for the intended meta-synthesis project.

Main Concepts

The set of literature to be synthesized is a key component of a meta-synthesis given that it determines what can be reported in terms of content and in breadth. Synthesis authors need to ensure that the literature fits the topic and purpose of the synthesis, and that they include a comprehensive set of literature that will provide a full picture of the topic. For these purposes, synthesis authors need to establish a set of criteria that will guide the search and selection of the literature.

Before setting the criteria, set the parameters of your qualitative meta-synthesis. The first three parameters are:

1. What type of synthesis you want to conduct (e.g., thematic synthesis, meta-ethnography). In these modules the focus will be on conducting a systematic thematic synthesis.
2. What is the focus of the synthesis (e.g., specific topic it will tackle, historic vs. current trends, population, type of study).
3. What synthesis question are you trying to answer.

In this sub-module, the focus will be on the fourth parameter, which is:

4. What types of literature and studies to include.

You will need to decide what types of literature you want to include in your synthesis project. See Table 2b.1 for examples.

Table 2b.1. Types of literature to consider including in your synthesis

Type of Literature	Examples
Peer-Reviewed	Articles in **peer-reviewed journals** (e.g., *Journal of Higher Education*, *Journal of Engineering Education*)
Non-Peer-Reviewed	Journal articles and other publications that do not undergo peer review process (e.g., *Harvard Educational Review*)
Empirical Research	Research and evaluation studies that collect data from participants and analyze data to develop findings
Non-Empirical Work	Opinion pieces, thought pieces
Published	Journal articles, conference proceedings
Gray Literature	Dissertations, reports, white papers

If you are tackling a synthesis in a well-established area such as self-efficacy in STEM or science identity where many empirical studies are published, considering only peer-reviewed literature (which means literature that has been read by established colleagues in the field at the time of submission and advised for publication, with or without revisions) may be a good option to ensure that the literature is meeting the standards held by reviewers and publishers, since they will be well-acquainted with commonly cited works. However, if you are tackling an emergent area of study such as women of color who are graduate students in STEM, published, peer-reviewed publications may be quite limited.

In these cases, the inclusion of **gray literature** is key to ensure that the most recent research is accounted for in the synthesis and to see where emerging researchers are focusing their research. Gray literature are pieces that are unpublished or are published in non-commercial form, including conference proceedings, dissertations, and reports. According to Mahood, Van Eerd, and Irvin (2014), gray literature can be reflective of up-to-date and high-quality research on certain topics. For example, if you plan on conducting a qualitative meta-synthesis of all the published studies on women of color in undergraduate engineering education in the last 30 years, you will need to decide whether to include literature that is not peer-reviewed. There may be evaluation reports on undergraduate engineering education programs and initiatives that were commissioned by an organization or funder that are not published in a journal. It would be wise to include these reports and other types of publications, such as conference proceedings, in your meta-synthesis.

If you have conducted searches in academic search engines, you are familiar with the experience of an overwhelming number of results that seem impossible to tackle. By setting criteria that will guide your work, you can better manage the large number of results. You need to think about how you are going to search, select, and appraise the quality of the literature under consideration. However, even if you are using the criteria at different moments of the process, in the end, all of these criteria should be applied to the results of your searches. In this way you will obtain a set of literature that conforms to your needs for the meta-synthesis.

Search Criteria

For the search criteria, you need to consider how search engines work and how you can input search terms and dates to obtain the most inclusive yet most targeted results. Some of the criteria that will be helpful to consider during the search process include:

- population
- type of study
- type of context
- year of publication

If we continue using our previous example of women of color in undergraduate engineering education some of the search criteria may include:

Example 2b.1. Search criteria for literature on women of color in undergraduate engineering education

• Discipline: Studies need to include programs in engineering.

• Population: Studies need to include senior high school women of color.

• Publication date: Studies need to be published between 1991 and 2021.

Selection Criteria

Selection criteria will be applied once we have found literature that is potentially relevant, and we need to weed out studies that are not. We need to establish criteria that are not easy to include in a search, such as the type of publication we want to include and the national origin of study of participants. In our synthesis example on the pre-college summer program, some of the selection criteria may include:

Example 2b.2. Search criteria for literature on pre-college summer program

• Type of publication: Peer-reviewed and grey literature (e.g., dissertations, reports, conference proceedings).

• Participants' origin: National U.S. participants and immigrants attending programs based in the U.S. and territories.

Quality Appraisal Criteria

Not all studies are made available to the public with the same degree of attention to methodology and quality standards. To ensure that a synthesis puts forth quality meta-findings, it is necessary to include a set of criteria that addresses the minimum acceptable standard for a study's inclusion in a synthesis. We will look at critical appraisal criteria in more detail in **«Sub-Module 3c»**, and we will explore the implementation of the search and

selection criteria in «Sub-Module 3a». However, returning to our synthesis example on the pre-college summer program, some of the quality appraisal criteria may include:

Example 2b.3. Search criteria for literature on pre-college summer program

- Empirical study: Articles and other literature need to be empirical studies (e.g., no essays).
- Research elements: Articles and other literature need to include the basic research elements (e.g., research questions/hypotheses/purposes, theoretical framework and literature review, research methods, findings substantiated with evidence).

Activity 2b.1.

Take 20-30 minutes to create a list of search, selection, and quality appraisal criteria that would be appropriate for your topic, based on the synthesis question(s) you developed in Sub-Module 2a and based on the focus of your synthesis project.

Additional Resources

Table 1 on page 585 of the following article offers an example of search, selection, and quality appraisal filtering criteria that are applied to literature for inclusion in a meta-synthesis. Note that the criteria stem from the project's research question.

Ong, M., Jaumot-Pascual, N., & Ko, L. T. (2020). Research literature on women of color in undergraduate engineering education: A systematic thematic synthesis. *Journal of Engineering Education, 109*(3), 581–615. https://doi.org/10.1002/jee.20345

References

Ong, M., Jaumot-Pascual, N., & Ko, L. T. (2020). Research literature on women of color in undergraduate engineering education: A systematic thematic synthesis. *Journal of Engineering Education*, *109*(3), 581–615. https://doi.org/10.1002/jee.20345

Walsh, D., & Downe, S. (2006). Appraising the quality of qualitative research. *Midwifery*, *22*(2), 108–119. https://doi.org/10.1016/j.midw.2005.05.004

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Sub-Module 2c:
Search Engines

Objectives

In this sub-module, you will learn:

- To understand the purpose of Boolean rules and how to use them.
- To understand what gray literature is and its relevance in literature syntheses.
- To identify the best search engines and directories for the intended meta-synthesis project, keeping in mind the research question and types of literature needed.

Main Concepts

When planning your strategy to find the literature to include in your synthesis, you need to decide what literature search tools you will use, and which tool will be helpful for each step. There are different options available online which we will examine below.

Search Engines, Web Directories, and Databases

Search engines, such as Google Scholar, use computer algorithms to search the Internet and identify items that match the words entered into the search bar. The information is compiled by artificial intelligence technology. The advantage of using a search engine is that you can sometimes get free access to full texts of articles, as well as organizational reports and recent publications. The disadvantage is that it can be time-consuming to narrow down your search or assess how trustworthy the information is.

A **search directory** (or web directory) is a catalog of websites or other resources organized by category by an individual or organization to make it easier for people to find information. College libraries often have directories of resources compiled according to the needs identified among their target population. An example is Internet Sites by Subject by McLennan Community College (https://mclennan.libguides.com/internet-sites/welcome).

A **database** compiles resources on a specific discipline that an individual or an organization has selected for their quality and relevance. They contain references for journal articles and typically offer the widest possible retrievals of peer-reviewed material. They may have full-text articles available for download. Since some databases may also require a subscription, you will have to be associated with an institution with access to those databases, use interlibrary loan (ILL), or pay for a subscription or copies to access the articles.

Examples of databases are:

- Science Direct (https://www.sciencedirect.com/)
- WorldCat (https://www.worldcat.org/)
- Web of Science (https://www.webofknowledge.com)
- Scopus (https://www.scopus.com/)
- PubMed (https://pubmed.ncbi.nlm.nih.gov/)

Different databases index different journals, so it is often necessary to include more than one to have a broader reach. An example is The Collection of Computer Science Bibliographies (https://liinwww.ira.uka.de/bibliography/). The "About the Collection" page states, "This is a collection of bibliographies of scientific literature in computer science from various sources, covering most aspects of computer science. The bibliographies are updated weekly from their original locations such that you'll always find the most recent versions here." Thus, this collection is curated around the particular topic of computer science.

There are also other tools, such as **meta-engines**, that have the capacity to conduct searches in several search engines at the same time. An example is WorldWideScience (https://worldwidescience.org), which calls itself "the Global Science Gateway." They claim that their gateway "accelerates scientific discovery and progress by providing one-stop searching of databases from around the world." Having a one-stop place for searches is certainly convenient. However, the sheer volume of resources that such a gateway combs through makes results less precise than those of other search tools.

Depending on the topic of the meta-synthesis, it may be necessary to access recent publications, unpublished reports, older academic articles, or gray literature, which are not accessible through the tools listed so far. **Gray literature** is anything that contains unpublished studies and/or manuscripts that have not been peer reviewed, and they include:

- book chapters
- **conference proceedings**
- dissertations
- government reports
- **white papers**

If these types of gray literature are relevant to your synthesis, it may be necessary to use complementary tools to find them, such as:

- ProQuest Dissertations & Theses (https://www.proquest.com/index)
- Social Science Research Network (SSRN) eLibrary (https://www.ssrn.com/index.cfm/en/)

Whether you begin your search process by using a search engine, directory, or database, it is important for you to test a variety of methods to assess which ones give you the highest number of relevant retrievals and use a relatively large number of them. As you can see, each search tool has its own features, advantages, and

drawbacks. For example, one may be focused on a particular discipline, while another provides access to an interdisciplinary range of publications; one may be updated on a regular basis, while another uses artificial intelligence to retrieve its results; one may solely focus on dissertations, while another only includes peer-reviewed literature. Our recommendation is to use a combination of tools for your search to counteract the drawbacks of one with the strengths of another and to take advantage of the different features of each. We will now introduce some strategies that you can use to make your searches more efficient and systematic, and then go into greater detail in **«Sub-Module 2d»**.

Activity 2c.1.

With your specific meta-synthesis project in mind, take 10-15 minutes to create a list of search engines that would be appropriate for your selected topic.

Efficient Searching

Other strategies to make the search process as efficient as possible include understanding how to effectively use index terms, free-text words, Boolean rules, and truncation (Heyvaert et al., 2017).

Index terms, or subject headings, are terms assigned to articles by authors and managers of bibliographic databases. These may be technical terms that are used in the specific area of your meta-synthesis that are not commonly used otherwise. Index terms may be specific to a particular database.

On the other hand, **free-text words** are terms located within the title of the article, the abstract, or the full text of the publication. This includes key words associated with the topic or research question for your meta-synthesis project that you generate or identify in relevant articles. For a very targeted search, index terms might be the best strategy. However, if your intention is to be comprehensive in your searches, using both index terms and free-text words would spread a broader net.

Boolean rules are rules that determine what your search will generate based on “true” and “false” logic statements. The combination of keywords, operators (such as **AND**, **OR**, and **NOT**), parentheses, and quotation marks will assist you with narrowing or broadening your literature search.

You can also use **truncation**, which is where you replace the letters within keywords with symbols as wildcards. For example, if a search engine allows you to use * as a truncation sign, then we can do a search for “biolo*” that would refer to all the words that start with “biolo,” such as “biology” and “biological.” We will explain how to use Boolean operators and truncation (or wildcards) in the next sub-module (**«Sub-Module 2d»**).

Whatever search engines, directories, or databases you use during your meta-synthesis project, it is essential for you to document all of the decisions you make throughout the process. Heyvaert and colleagues (2017) particularly recommend that you keep detailed records of the bibliographic databases you search, the terms and combinations of terms you use, and the rationale for your decisions.

You should also record the number of retrieved publications in each search and how many you keep from each. These decisions can be tracked using Microsoft Suite, Google Suite, or other file applications available to you. If you are working in a team, consider using a cloud-based application to share your decisions. The more organized and detailed you are in documenting what you have done and why, the easier it will be to write up your meta-synthesis project later. A template is provided in Table 2c.1 below for your use..

Activity 2c.2.

Once you have created your list of search engines from Activity 2c.1, take 15 minutes to research the Boolean rules of your search engines and record them. We will revisit these Boolean rules in Sub-Module 2d – Search Terms, Boolean Rules, & Strings.

Table 2c.1. Search Engines Template

Start your own spreadsheet file to keep track of the various search engines, directories, and databases you test for your meta-synthesis project.

Use one tab per search engine.

Search Engine Name	
Link	

Search String	Type of Search: Title / Full Text	Number of Total Hits	Approximate Number to Keep	Description: Types of Literature, Topics Covered, etc.	Recommendation (Keep Engine or Not Keep)	Notes

Additional Resources

- Review our team's list of the most commonly used search engines and directories labeled "Search Engines List." This document is in Appendix 2c.
- Keep track of the various search engines, directories, and databases you want to use in your meta-synthesis project using our "Search Engines Template." This document may be found in Appendix 2c.
- Read: The Beginner's Guide to Boolean Search Terms [blog post] - https://www.socialtalent.com/blog/recruitment/the-beginners-guide-to-boolean-search-terms
- Read: Mahood, Q., Van Eerd, D., & Irvin, E. (2014). Searching for grey literature for systematic reviews: challenges and benefits. *Research Synthesis Methods*, *5*(3), 221-234. https://doi.org/10.1002/jrsm.1106
- Read: What Are The Top 100 Search Engines For Academic Research? https://www.teachthought.com/learning/100-search-engines-for-academic-research/

References

Heyvaert, M., Hannes, K., & Onghena, P. (2017). *Using mixed methods research synthesis for literature reviews*. Sage.

Appendix 2c. Search Engines for Academic Research

General

1. **iSEEK Education**
   (https://education.iseek.com/iseek/home.page): Targeted search engine designed for students, teachers, administrators, and caregivers.
2. **RefSeek**
   (https://www.refseek.com/): One billion documents, web pages, books, journals, newspapers, and more, without sponsored links or commercial results.
3. **Virtual LRC**
   (https://www.virtuallrc.com/): Custom Google search, featuring academic information websites curated by teachers and library professionals around the world to share resources for academic projects.
4. **OAIster**
   (https://www.oclc.org/en/oaister.html): Millions of digital resources from thousands of contributors, featuring open access resources.
5. **Internet Public Library**
   (https://www.ipl.org/): Find resources by subject through the Internet Public Library's database.
6. **Microsoft Academic Search**
   (https://www.microsoft.com/en-us/research/project/academic/): Access to more than 38 million different publications, with features including maps, graphing, trends, and paths that show how authors are connected.
7. **Google Trends**
   (https://trends.google.com/trends/?geo=US): Find searches that correlate with real-world data.
8. **Wolfram|Alpha**
   (https://www.wolframalpha.com/): This search engine finds links, answers questions, does analysis, and generates reports.

Meta Search

1. **Dogpile**
   (https://www.dogpile.com/): Results from Google, Yahoo!, and Bing, with categories including Web, Images, Video, and even White Pages.
2. **MetaCrawler**
   (https://www.metacrawler.com/): "Search the search engines," returning results from Google, Yahoo!, and Bing.

Databases and Archives

1. **Ag Data Commons**
   (https://data.nal.usda.gov/): Data access system maintained by the US Department of Agriculture's

(USDA) National Agriculture Library. Holds data files managed directly by NAL and links to datasets and resources located on other websites.

2. **Astrophysics Data System** (https://ui.adsabs.harvard.edu/): The SAO/NASA Astrophysics Data System (ADS) is a Digital Library portal for researchers in astronomy and physics, operated by the Smithsonian Astrophysical Observatory (SAO) under a NASA grant. The ADS maintains three bibliographic databases containing more than 10.7 million records.
3. **BioMed Central** (https://www.biomedcentral.com/): Dedicated to open research, with over 290 quality peer-reviewed journals in biology, clinical medicine, and health.
4. **Chemistry Commons** (http://network.bepress.com/physical-sciences-and-mathematics/chemistry/): Almost 20,000 scholarly open access articles on various aspects of chemistry.
5. **Elsevier Open-Access Journals** (https://www.elsevier.com/open-access/open-access-journals): Peer reviewed journals that are free to access and download from Science Direct.
6. **JSTOR Open Access Books** (https://about.jstor.org/oa-and-free/): Scholarly books, journal articles, images, and media that are free to access.
7. **Physics Commons** (http://network.bepress.com/physical-sciences-and-mathematics/physics/): Almost 25,000 scholarly open access articles on physics.
8. **PubMed** (https://pubmed.ncbi.nlm.nih.gov/): More than 24 million citations for biomedical literature from MEDLINE, life science journals, and online books, including links to full-text content from PubMed Central and publisher web sites.
9. **SciTech Connect** (https://www.osti.gov/): Science, technology, and engineering research information from the U.S. Department of Energy.
10. **Library of Congress** (https://www.loc.gov/): Searchable source documents, historical photos, and extensive digital collections.
11. **National Archives** (https://www.archives.gov/): Online, public access to historic documents, research, and government information.
12. **arXiv e-Print Archive** (https://arxiv.org/): (Cornell University) e-prints in math, science, and related subjects, with over 756,000 documents.
13. **National Agricultural Library** (https://www.nal.usda.gov/main/): (U.S. Department of Agriculture) global information for agriculture.
14. **Smithsonian Institution Research Information System** (https://siris.si.edu/): More than 7.4 million records from the Smithsonian's museums, archives, and libraries.

15. **CIA World Factbook**
    (https://www.cia.gov/the-world-factbook/): Major reference information around the world, including history, people, government, and economy.
16. **OpenDOAR**
    (https://v2.sherpa.ac.uk/opendoar/): Directory of Open Access Repositories. Freely available academic research information.
17. **Catalog of U.S. Government Publications**
    (https://catalog.gpo.gov/F?RN=156786945): Descriptive records for historical and current publications, with direct links where available.

Books and Journals

1. **WorldCat**
   (https://www.worldcat.org/): Items from 10,000 libraries worldwide, with books, DVDs, CDs, and articles.
2. **Google Books**
   (https://books.google.com/): Index of the world's books, millions for free and others you can preview.
3. **ScienceDirect**
   (https://www.sciencedirect.com/): Scientific, technical, and medical research in peer-reviewed journals, articles, book chapters and open access content.
4. **Vadlo**
   (https://vadlo.com/): Life sciences search engine offering protocols, tools, forums, and PowerPoints for scientific research and discovery.
5. **Google Scholar**
   (https://scholar.google.com/): This search engine specializes in articles, patents, and legal documents, and also has a resource for gathering citations.
6. **SpringerLink**
   (https://link.springer.com/): Electronic journals, protocols, and books; browse publications by collection and content type.
7. **Directory of Open Access Journals**
   (https://doaj.org/): Searchable journal of full-text quality controlled scientific and scholarly journals.

Science

1. **SciSeek**
   (https://www.sciseek.com/): Science search engine and directory. Browse by category, search by keyword, and add new sites to the listings.
2. **Chem BioFinder**
   (https://www.cambridgesoft.com/databases/login/?serviceid=128): Look up information about chemicals, including their properties and reactions.
3. **SciCentral**
   (https://www.scicentral.com/): A source for literature searches, journals, and databases.

4. **Strategian** (https://www.strategian.com/): All fields of science. Free full-text books, patents, and reports, full-text journal and magazine articles, special collection of vintage biology.
5. **Science.gov** (https://www.science.gov/): More than 50 databases and 2,100 selected websites from 12 federal agencies.
6. **Analytical Sciences Digital Library** (https://home.asdlib.org/): Peer-reviewed, web-based educational resources in analytical sciences, featuring a variety of formats for techniques and applications.
7. **WorldWideScience** (https://worldwidescience.org/): Global science gateway, precise search results in the sciences, with an option to select specific databases and find resources by language.

Math and Technology

1. **MathGuide** (http://www.mathguide.com/): Database of high-quality Internet math resources.
2. **ZbMATH Online Database** (https://www.zbmath.org/): Millions of entries from thousands of serials and journals dating back to 1826.
3. **CiteSeerX** (https://citeseerx.ist.psu.edu/index;jsessionid=8103FB8DF7DCE8379BCC54095341E591): Searchable access to the Scientific Research Digital Library.
4. **The Collection of Computer Science Bibliographies** (https://liinwww.ira.uka.de/bibliography/): Three million references to journal articles, conference papers, and technical reports in computer science.

Social Science

1. **Behavioral Brain Science Archive** (https://www.cambridge.org/core/journals/behavioral-and-brain-sciences): Searchable archive of psychology and brain science articles.
2. **Social Science Research Network** (https://www.ssrn.com/index.cfm/en/): Social science research from specialized networks including cognitive science, leadership, management, and social insurance.
3. **PsycLine** (http://www.psycline.org/): Access to more than 2,000 psychology and social science journals online; needs a username and password.

Open access and Other

1. **Fish Thinkers Blog** (https://fishthinkers.wordpress.com/2017/03/29/5-free-ways-around-the-great-paywall-of-academia/): How to access free publications.
2. **Open Access Button** (https://openaccessbutton.org/about): Access to free, full-text articles.
3. **Unpaywall** (http://unpaywall.org/?utm_source=email): Open access through software integration with other databases.
4. **Onlineschools.org** (https://www.onlineschools.org/open-access-journals): List of open access resources.
5. **Elsevier Open Access Journals** (https://www.elsevier.com/about/open-science/open-access/open-access-journals)
6. **Wiley Open Access Journals** (https://authorservices.wiley.com/open-research/open-access/browse-journals.html)
7. **ProQuest Dissertation & Theses** (https://www.proquest.com/pqdtglobal)
8. **LearnTechLib** (https://www.learntechlib.org/about/editlib-to-learntechlib/): Open access to resources related to the intersection of learning and technology.
9. **Networked Digital Library of Theses and Dissertations (NDLTD)** (http://www.ndltd.org/)
10. **PsycEXTRA** (https://www.apa.org/pubs/databases/psycextra/content-providers): Conference materials, factsheets, and other hard-to-find content in the field of psychology
11. **Social Science Research Network (SSRN) eLibrary** (https://www.ssrn.com/index.cfm/en/)

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Sub-Module 2d:
Search Terms, Boolean Rules, & Strings

Objectives

In this sub-module, you will learn:

- To (re)familiarize yourself with how to identify and generate search terms.
- How to easily build, test, and use search strings to conduct searches related to the intended meta-synthesis project.
- To understand the differences between sampling strategies.
- To identify a sampling strategy that works best for the intended meta-synthesis project.

Main Concepts

Search Terms

When thinking about the terms that you will use to search for the literature to include in our meta-synthesis, you can use three main strategies:

1. Use **index terms** (which are the thesaurus terms assigned to publications rather than words that appear in articles)
2. Use **free-text** (or keywords, which are the words used in the titles, abstracts, and full text of a publication)
3. Use a combination of index terms and free-text

Although index terms allow for more precise searches, they may not retrieve all the relevant papers because different publications may use different terms, which may not coincide with those that the authors use. Thus, using a combination of the two may produce results that include more potential literature for inclusion.

When choosing the terms that you will use for the searches, consider which categories of descriptors are likely to bring back relevant results and which are not. List all of the categories for your synthesis that will have a role in the inclusion or exclusion of literature. Useful categories typically include, but are not limited to:

- population (e.g., gender, race/ethnicity, ability, national origin);
- disciplinary area (e.g., engineering, biology, all STEM disciplines);
- methodological focus (e.g., study design, data collection or analysis methods);

- theoretical framework (e.g., critical, narrative, phenomenological); and
- type of study (e.g., evaluation, basic research).

Activity 2d.1.

With your specific meta-synthesis project in mind, take 5-10 minutes to list the main categories of search terms that you will need to use.

Let's think through an example. Imagine that you are interested in doing a meta-synthesis that focuses on studies on women of color in undergraduate engineering education that used Critical Race Theory (CRT) and related theories. For the theoretical framework category, you will want to include formal terms such as "Critical Race Theory," "Latino Critical Race Theory," and "Tribal Critical Race Theory," as well as neologies (or newly coined words or phrases) such as "LatCrit" and "Tribal Crit" that refer to the same theories but in abbreviated form. At the same time, using a general term such as "critical theory" might not be useful because it may also bring up troves of literature that uses Marxist or feminist frameworks that are not part of your meta-synthesis.

Next, you will need to think about the population category to identify which types of terms will be useful. You will likely need to consider both the gender and race/ethnicity categories to identify terms such as "Black," "Hispanic," "Native," "Asian," and so on. You will also need to think about alternative terms for those you already have, such as "African American" and "Indigenous." Some will have more than one alternative and they may have variants, such as "Latino," "Latina," and "Latinx." In some cases, you may need to consider historical terms that are not currently used, such as "Afro-American," if you are considering historical literature. For this example, these terms would not be relevant given that CRT developed in the 1980s, when such terms were not generally used. Decisions about terms will have an impact on which literature will appear in your searches, so you want to consider them carefully.

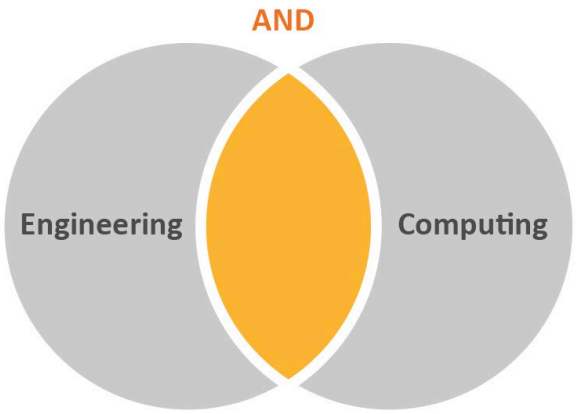
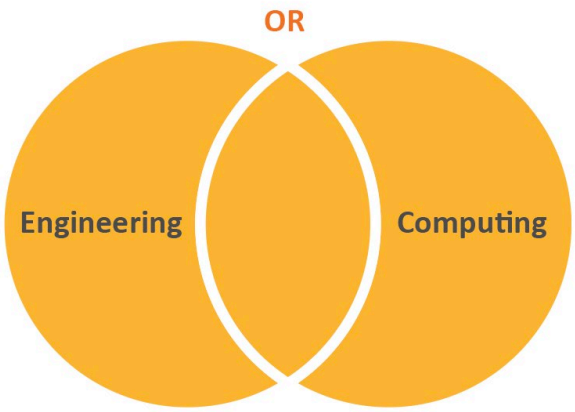
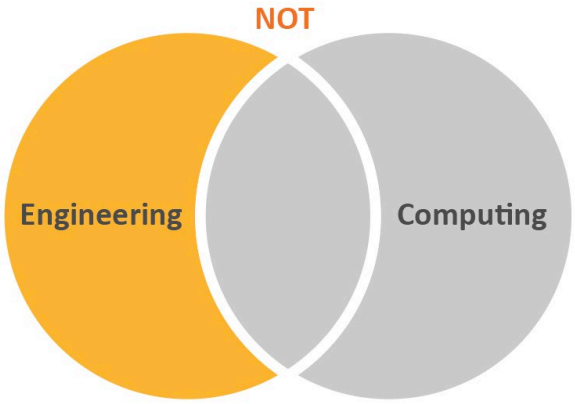
Activity 2d.2.

Once you have your main categories from Activity 2d.1, take 15-20 minutes to list the relevant search terms for each of them.

Boolean Operators

Boolean operators, such as **AND**, **OR**, and **NOT**, are variables that indicate whether something is "true" or "false" in a search; they are used in combination with keywords or index terms to organize and filter your searches (see Figure 2d.1 for an example). If you want separate concepts to be included in the same article reference, then you would use the operator **AND** in the search bar. However, if you are trying to use synonyms of a concept to locate all possible references associated with that topic, then you would want to use the operator **OR**. This operator broadens your search to encompass as much relevant material as possible. To exclude a topic while focusing your search on a specific concept, then you would want to use the Boolean operator **NOT**.

*Table 2d.1. How to use the Boolean operators **AND**, **OR**, and **NOT** using engineering and computing as example subjects in a Venn diagram*

Boolean operator: AND Using **AND**, this search will identify pieces that include both engineering and computing	
Boolean operator: OR Using **OR**, this search will identify pieces that include engineering, or computing, and with both engineering and computing	
Boolean operator: NOT Using **NOT**, this search will identify pieces that include engineering and exclude computing	

Truncation

Lastly, we can use **truncation** (or wildcards) by replacing sections of a word with an asterisk to allow for derivative words to be found (e.g., wom*n to find both woman and women). Truncation can assist with locating references to concepts that have different spellings (e.g., U.S. versus U.K. spellings of words) or if the concept can have different tenses, plurals, or associations (e.g., using "ecolog*" in a search can result in "ecology," "ecological," and "ecologies"). The use of the asterisk (*) truncates terms and allows for variability in the term. In this case, Latin* would bring back results for Latin, Latino, Latina, Latinx, and their plural forms. Thus, the use of **Boolean rules** in the construction of the search strings ensured that the resulting literature fit our needs as much as possible. Table 2d.1 shows examples of words with truncations and their results.

Table 2d.2. Examples of truncation

Word with Truncation	Example of Results
Latin*	Latin, Latino, Latina, Latine, Latinx, and plural forms
Engineer*	Engineer, engineers, engineering
Wom*n	Woman, women, womxn, womyn

Search Strings

A **search string** is a combination of search terms and Boolean operators that you insert in a search engine's search bar. The previous sub-module addressed the need to learn the Boolean rules of the chosen search engines. We will be using those rules now to build the search strings for our searches. With an interest in including as comprehensive a set of literature as possible, we want to cast the broadest net possible with our search terms. To accomplish this, we build search strings of all possible combinations of our search terms with Boolean operators so that each string includes terms from each of our essential categories. Using the women of color example in the previous section on search terms, we would have four categories: **theoretical framework**, **discipline**, **gender**, and **race/ethnicity**. Here are two examples of strings that you may use for this meta-synthesis topic using Google Scholar's standard operators (**AND** and **OR**):

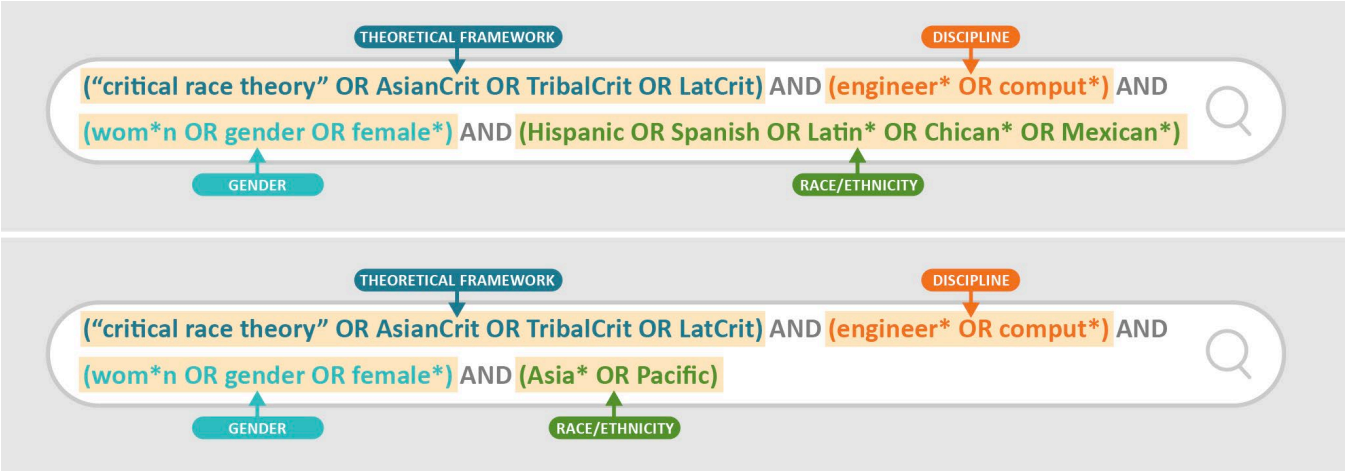


Figure 2d.1. Two examples of search strings with four categories

With the use of parentheses, we grouped the words from one category together. You want to make sure to use parentheses to group compound Boolean operators. Note that we used quotation marks around "critical race theory" in order to search for the specific word combination or exact phrase. When doing a Boolean search, use quotation marks whenever your keyword consists of more than a single word. Going back to the search string examples, the use of **OR** ensured that at least one of the words inside of the parentheses appeared in the results. The use of **AND** ensured that all results included terms from each of the categories in our synthesis.

Keep in mind that different search engines and directories might use different operators. For example, Google Scholar uses the vertical bar (**|**) in place of **OR**, and the operator **AND** is implied between closed parentheses. Some search engines and directories may also require you to use hyphens to group words.

Other Search Rules or Functionalities

In addition to the Boolean rules, consider if the search engine or other tools you use have other elements that will allow you to further define your searches. For example, in some engines, you can restrict the searches to a certain range of years, or you may be able to restrict searches to only the abstracts. Both will allow for more precise results. At the same time, the use of these strategies may leave out relevant pieces. Imagine that in the example used in this sub-module, the authors of a particular study did not mention their theoretical framework in the abstract. Their study would not appear in a search that was limited to the abstract, leaving out a relevant piece. Thus, we recommend that you make sure to refer to the Help button or link for each search engine and directory that you use in order to familiarize yourself with the search rules and functionality capabilities.

Conducting Searches

Once the search strings are built, the search process consists of entering the strings in the search engine and sorting through the results. At this stage, it is very important to stay organized because, despite the precision of our search terms and strings, many searches will return thousands of results. We will talk about the process of sorting through results in Module 3, but we would like to introduce a couple of ideas here regarding that process:

- **You need to keep track of the results.**
  Record how many and which results have been sorted through, the reasons they were included or excluded, and so on. Spreadsheets are a very simple, yet very useful, way of keeping track. An example of how to track your search results can be seen in Table 2d.2.
- **You need to decide how far into your search you are willing to spend time sorting through results.**
  Our team decided that, for each search, we would continue sorting as long as there were results that were potentially relevant to the synthesis. Once we stopped finding potentially relevant results, we sorted through subsequent results for three additional pages and then stopped. This helped the team manage time and resources devoted to the search process.

Table 2d.3. Example of search result tracker

Search engine used (if start set)	
Search string used (if from start set) or article snowballing from	
Link to list of results	
Number of results on search engine or article snowballing from	
Number of results kept	

APA citation for literature piece of interest	**Link to literature result**	**Criterion 1**	**Criterion 2**	**Criterion 3**

Activity 2d.3.

Take 15-30 minutes to begin constructing and testing search strings using Boolean operators and truncation.

Additional Resources

- Watch a demonstration about how to develop search terms, Boolean rules, & strings: https://tinyurl.com/IMSSearchTermsEnginesStrings
- Keep track of your searches. An example of a tracking spreadsheet may be found in Table 2d.3.
- Watch this YouTube video by WaldenULibrary for further guidance on Boolean operators: https://www.youtube.com/watch?v=bCAULDuMcso

Institute for Meta-Synthesis

Module 3:
Search and Selection

Submodule 3a:
What is a Start Set?

Objectives

In this sub-module, you will learn:

- To understand what a start set is and how it is developed.
- To understand the purpose and role of a start set of literature in a meta-synthesis.
- To be aware of the need to use multiple strategies to access the literature.

Main Concepts

The Start Set

Now that you have gone through the pre-search process in **«Module 2»**, you have the main elements to start searching for the literature that you will include in the synthesis: search, selection, and critical appraisal criteria; search engines and their Boolean rules; and search terms and strings. You are now ready to start conducting searches using your selected search tools by inputting your search strings with the appropriate search parameters (e.g., publication date range, searching full text vs. only abstracts and titles).

Once you conduct the searches using the strings you created, it is important to keep track of the results obtained in each step, such as how many hits result from each search, how many are selected for further inspection, and which ones have already been discarded. Table 3a.1 is an example of a simple system to track the search engines, search strings, and results for each initial search. At this stage, you will be implementing the search, selection, and critical appraisal criteria that you have selected for your study. (We will take a closer look at how to apply these criteria in **«Sub-Modules 3b and 3c»**.) As a result of your searches and the implementation of your criteria, you will obtain the initial group of full-text pieces of scholarship that will contribute to answering your synthesis questions and that is called the **start set** (Wohlin, 2014). You will use the

literature in the start set as the basis for the subsequent systematic search and selection process called snowballing to search for further scholarship.

Table 3a.1. Search string tracker

Search engine used	
Type of search *(e.g., full text, title)*	

Search string used	**Total results**	**Number kept**

The purpose of conducting a systematic search and selection process is to find all the existing literature that is relevant to the synthesis question, so that it can be included in the synthesis through your searches using your selected search engines and/or directories. However, even search engines claiming to have access to everything due to the reach of their crawlers (which are artificial intelligence programs created to scour websites for literature) do not find everything. In some cases, it is a matter of lag time between publication and online availability; in other cases, it has to do with how accessible a specific study is due to where it was published. For example, we may find that a relevant piece of scholarship did not appear in our initial searches because the journal where it was published is not indexed. However, we may be able to find it through snowballing if other studies cite it.

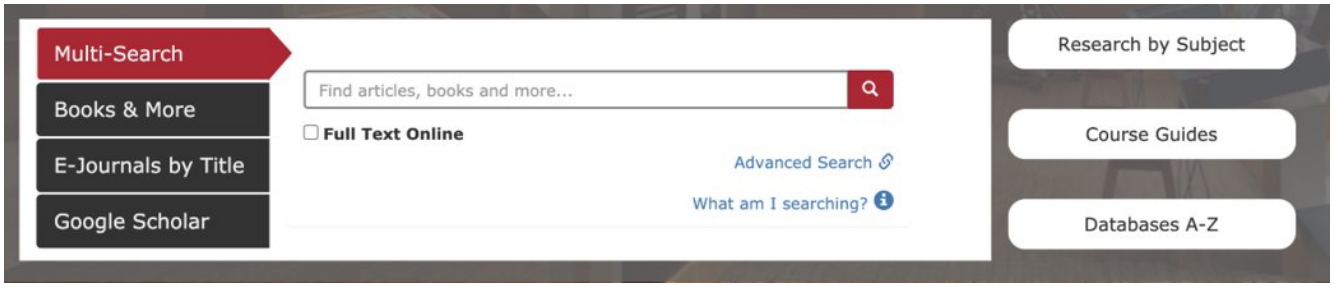
Given that all subsequent literature searches are dependent on the start set through forward and backward snowballing (we will look at snowballing in detail in **«Sub-Module 3d»**), you need to be particularly systematic in the searches using your selected search engines and/or directories to ensure that you cast the broadest possible net to identify the largest quantities of potentially relevant scholarship.

Accessing the Literature

Nowadays, you can access a lot of the relevant literature for a synthesis online. In some cases, the search engine or directory you use may provide access to the full text. Sometimes you may find the full text through the website of the organization where the publication originated, a social networking platform for academics (such as Academia.edu or ResearchGate), an open access website (such as those we shared in **«Sub-Module 2c»**) or simply through a general web search engine.

However, not all relevant literature will be freely available online, particularly books, reports, and the latest publications. An academic library may be the best tool to access these publications, such as the University of Georgia's academic library search engine (see Figure 3a.1). In addition to the library's electronic and physical holdings, it is possible to request publications through interlibrary loan. This type of loan effectively provides library users with access to literature in any library within its network. Remember that public libraries sometimes have partnerships with university libraries and may allow you to access their holdings. An example of this is the GALILEO Consortium in Georgia, which includes the University System of Georgia, Georgia Technical Colleges, public and private schools, and Georgia's Public Libraries.

Figure 3a.1. Search engine from the University of Georgia's academic library



Another strategy is to contact members of your professional network that you think may have access to additional literature. Sometimes a publication is not available through any of the outlets you have access to. In these cases, we recommend directly contacting the authors of the piece. We have found that authors are usually open to sharing their scholarship and having it be part of syntheses because that contributes to the dissemination of their work. An example of an email request to an author can be seen in Figure 3a.2. An e-mail template can be found in the appendix.

Figure 3a.2. Sample email to author to request studies

To: maria_ong@terc.edu

Subject: Publication in the Journal of Engineering Education

Dear Dr. Maria Ong,

My name is Dr. Lisette Torres-Gerald, and I am a Visiting Assistant Professor at Salem State University. I am working with collaborators on a systematic thematic meta-synthesis project on the lived experiences of women of color in undergraduate education programs in STEM. We came across your article "Research literature on women of color in undergraduate engineering education: A systematic thematic synthesis" in the Journal of Engineering Education, and we would love to include it in our analysis. Unfortunately, we do not have access to it through our institutions. Would you be willing to provide us with a copy of your article? In addition, are there any other publications that you know of related to women of color in undergraduate STEM programs that we should make sure to include in our meta-synthesis work?

Thank you for your time and consideration. We look forward to hearing from you.

Sincerely,

Lisette

Activity 3a.1.

With your specific meta-synthesis project in mind, take 10 minutes to think about the following:

- Is there a type of literature or study that you may not find through the traditional search engine searches?
- What might be alternative and more effective ways of searching for them?

Activity 3a.2.

Using the search engines and/or directories you selected and the search strings that you created in Module 2, take 10-15 minutes to conduct a few searches for your literature start set.

- What do you notice about the results of your searches?
- Is there a type of study or literature format that is not coming up in your searches?
- Are there other search engines or directories that would be helpful to find this type of literature?

References

Wohlin, C. (2014, May). Guidelines for snowballing in systematic literature studies and a replication in software engineering. In *Proceedings of the 18th international conference on evaluation and assessment in software engineering* (pp. 1-10). Association for Computing Machinery. https://doi.org/10.1145/2601248.2601268

Appendix 3a. Template Email

To: **AUTHOR EMAIL**

Subject: Publication in **JOURNAL NAME**

Dear Dr. **AUTHOR'S NAME**,

My name is **NAME**, and I am a **TITLE** at **INSTITUTIONAL AFFILIATION**. I am working with collaborators on a systematic thematic meta-synthesis project on **SYNTHESIS TOPIC**. We came across your article "**ARTICLE TITLE**" in the **JOURNAL NAME**, and we would love to include it in our analysis. Unfortunately, we do not have access to it through our institutions. Would you be willing to provide us with a copy of your article? In addition, are there any other publications that you know of related to **SYNTHESIS TOPIC** that we should make sure to include in our meta-synthesis work?

Thank you for your time and consideration. We look forward to hearing from you.

Sincerely,

YOUR NAME

Institute for Meta-Synthesis

Sub-Module 3b:
Inclusion and Exclusion Decision-Making

Objectives

In this sub-module, you will learn:

- How to systematically screen the literature to separate publications that will not be used in the meta-synthesis project from those that will be used.
- How to use search and selection criteria to filter literature.
- To create and use a tracking form for the intended meta-synthesis project.

Main Concepts

Now that we have conducted literature searches, we need to make decisions about which pieces we need to keep and which ones we need to discard for the meta-synthesis. In this sub-module, we will look at the different phases in the process where we will screen the literature to make inclusion and exclusion decisions to arrive at the literature to be included in the meta-synthesis.

Filter 1: The Initial Screening Phase

The main goal of Filter 1, which is the initial screening phase, is to conduct a first approximation to the literature resulting from your searches using your selected search engines and search strings. (Later, you will use this same screening phases for the selection of literature found through methods other than internet searches.) In this first screening phase, you will review the immediately available information, such as titles and abstracts, to sift through those studies that obviously do not fulfill your criteria.

Once you begin your search, we recommend creating a form, called a "tracking form," to track the literature you find and your decisions to keep or discard each piece. This can be a table with your inclusion and exclusion criteria listed in order of importance "so that the first no response can be used as the primary reason for exclusion of a study" (Heyvaert et al., 2017, p. 98). It is recommended to pilot your tracking form to ensure that it works in the intended ways. This tool will help you begin curating your start set of literature (and later the literature you find through snowballing) that will go through subsequent screenings (i.e., Filter 2 and Critical Appraisal, which will be reviewed in **«Sub-Module 3c»**). We will discuss the elements of the tracking forms and what you will need to keep track of in the "Tracking the Process" section later in this sub-module.

As you go through your search process using the search engines, Boolean rules, and search strings you created in previous sub-modules, you will review the titles and abstracts of publications that come up in your search

results. As you review and sift through these results, save your decisions, references, and links to abstracts of publications that seem to be relevant in your tracking form. If, during Filter 1, you are not sure whether you should exclude a study, then you should keep the publication in the "include" pile. A study can always be removed during the second screening of the literature after reading the full text.

Table 3b.1 shows a tracking form to track Filter 1 decisions for a project we conducted that searched for literature that reported on the intersectional experiences of women of color in engineering higher education in the U.S. and that were published between 1999 and 2019. Categories in the tracker included: gender, race, findings of the study report on intersectionality of gender and race, discipline (in this case, engineering), demographic location of the study (U.S. population), career level (higher education), publication date (in this case, 1999-2019), type of publication (e.g., peer-reviewed empirical research study, report, conference proceedings), and Filter 1 decisions. We also tracked the search string used to identify the literature pieces, the full references of the pieces of literature, and a hyperlink to where the piece of literature was published (see Search String Tracker in **«Sub-Module 3a»**). We have included some examples of potential findings for such a project to show how this type of tracking form can be used (see Table 3b.1).

For our team, it was helpful to use numerical values to identify whether literature pieces fulfilled the Filter 1 criteria. If a piece fulfilled a criterion, the team used "1" to note this. If a piece did not fulfill a criterion, the team used "0" to note this. Below is an example of using this number system to track Filter 1 decisions.

Table 3b.1. Filter 1 tracker with examples

Reference	Pub.Date	Women	Of Color	Engineering	Higher Education	US Popul.	Intersection	Empir. Study	F1 Decision
Alonso	2012	1	1	1	1	1	1	1	Keep
Fleming	2008	1	1	1	1	1	1	Unclear	Keep

Once you have reviewed all your pieces for Filter 1, the pieces that had the potential to fulfill your criteria based on their titles and abstracts will then move to the second screening phase, which we call Filter 2. As we mentioned earlier, at the end of Filter 1 you will likely have literature in your results that you are not sure fulfill your criteria but that have the potential to do so. It is the role of Filter 2 to screen out those that do not.

Filter 2: Second Screening Phase

The main goal of Filter 2 is to closely examine the literature resulting from Filter 1 to make inclusion and exclusion decisions. In this second screening phase, you will need the studies' full text to sift through those that do not fulfill our criteria. Filter 2 is thus a much more stringent application of the search and selection criteria that we applied in Filter 1. Once again, it is vital to be as transparent as possible about the decision-making process and document all decisions and rationales using the tracking form. Being detailed and organized throughout your meta-synthesis project will help enhance the validity of your synthesis and effectively communicate your findings when reporting on them. Table 3b.2 below provides an example of Filter 2 screening.

Table 3b.2. Filter 2 tracker with examples

Reference	Pub.Date	Women	Of Color	Engineering	Higher Education	US Popul.	Intersection	Empir. Study	F2 Decision
Alonso	2012	1	1	1	1	1	1	1	Keep
Fleming	2008	1	1	1	1	1	1	0	Discard

Activity 3b.1.

Take 20–30 minutes and use the tracking form for Filters 1 and 2 we provided in Tables 3b.1 and 3b.2 as a reference to generate your own tracking form for your intended meta-synthesis project employing the search and selection criteria you developed in Module 2.

Activity 3b.2.

Take 30–40 minutes to apply your search and selection criteria to the search results from Sub-Module 2b using your tracking form for Filters 1 and 2.

Tracking the Process

Heyvaert et al. (2017) recommend being thorough in tracking your activities when conducting the different steps of the work. The tracking form that we have talked about earlier is the tool that we recommend you use for this purpose. We list the elements of the work they recommend tracking along with brief explanations and some examples from our own work:

- **Sampling strategy.**
  In our case, we conduct systematic meta-syntheses, so we use an exhaustive sampling strategy, which includes forward and backward snowballing. Others may use purposeful or selective sampling, where they do not seek to gather all the existing studies on the topic of their synthesis, but those that best answer their synthesis' research question.
- **Which resources were searched.**
  These consist of the search engines or directories you selected in **«Module 2»**, such as Engineering Village or Google Scholar.
- **Number of retrieved publications for each engine.**
  In each tracking form for Filters 1 and 2, you should record how many results you got when conducting each search and how many you retained from that total. These numbers are useful to have for reporting purposes to give readers a sense of the scope of your meta-synthesis.

- **Number of duplicate publications excluded.**
  Our team keeps a running list of publications that team members have considered, independently of their inclusion or exclusion. This way, we avoid repeating the evaluation of the same piece over and over, saving time and resources.
- **Multiple publication bias.**
  Research teams may publish more than one manuscript using the same data set. Multiple publication bias may be an issue you run into in your project. If multiple publications report results from the same study, you will need to bundle them into one study and consider them as one unit for the meta-synthesis. You will need to be clear about how these were bundled and treated in the meta-synthesis through your use of references and explain your rationale for it.
- **The search, selection, and quality appraisal criteria.**
  The tracking form is useful to record how each piece of literature fulfills each of your meta-synthesis criteria (search, selection, and critical appraisal).
- **Number of pieces of literature that were included and excluded.**
  It is useful to track these numbers so that later you can break them down in different ways, such as by search engine and filter, for reporting purposes.
- **How others were involved in the process.**
  If you are working in a team, you will want to record how many people were involved and whether they were content experts, methodologists, or both. In our team, we include both content and methodology experts to ensure a thorough consideration of both areas for each piece of literature. We also have at least two team members conduct the critical appraisal of each study.
- **How disagreements about inclusion/exclusion decisions were handled.**
  You will need to record what processes are in place for decision-making when disagreements arise when working with a team. For example, our team uses consensus processes (in which we discuss the different options until we reach an agreement) to check when questions and disagreements about the application of the criteria arise. Other teams may prefer to vote or find other ways to make inclusion/exclusion decisions.

This information will be useful when writing your meta-synthesis findings and methods section for publication.

Additional Resources

- For guidance on techniques used to identify articles for inclusion in systematic reviews and syntheses: Booth, A. (2006). “Brimful of STARLITE”: Toward standards for reporting literature searches. *Journal of the Medical Library Association* (JMLA), 94(4), 421-429.
- For an overview of methods to conduct systematic reviews and syntheses: Booth, A. (2016). Searching for qualitative research for inclusion in systematic reviews: A structured methodological review. *Systematic Reviews*, *5*(74), 1-23. doi: 10.1186/s13643-016-0249-x

References

Heyvaert, M., Hannes, K., & Onghena, P. (2017). *Using mixed methods research synthesis for literature reviews*. Sage.

Institute for Meta-Synthesis

Sub-module 3c:
Critical Appraisal

Objectives

In this sub-module, you will learn:

- To understand the purpose and importance of critical appraisal in the meta-synthesis process.
- To learn the differences among critical appraisal approaches.
- To develop a critical appraisal instrument for your meta-synthesis project.
- To understand how to use the outcomes of a critical appraisal in your meta-synthesis project.

Main Concepts

As we saw in **«Sub-module 3b»**, not all studies are made available to the public with the same degree of attention to methodology and rigor. For example, an article might not include an explanation of how data was collected and analyzed, or the evidence might not warrant the claims the study authors make in their findings and discussion. Thus, to ensure that a synthesis puts forth rigorous meta-findings (which are the findings of the meta-synthesis and synthesize the findings from the individual studies included), it is necessary to include a set of criteria that addresses the minimum standards acceptable for studies' inclusion in a synthesis.

One of the tasks you need to conduct as part of a synthesis is to decide how you will appraise the rigor of the literature, either by selecting a pre-existing critical appraisal instrument or by developing your own. Your decision will have a role in how you appraise the literature you find, and which literature is included in the synthesis, so it is important to carefully weigh the consequences of choosing or developing a critical appraisal instrument. Generally, pre-existing instruments include elements of research methodology (e.g., having a research question, including a description of data collection and analysis methods) to take into account in the appraisal and other elements, such as the ethical dimensions of a study, the use of sufficient evidence to support findings, and the existence of an audit trail. In order to track these elements, some critical appraisal instruments include checklists, questions to guide the process, or lengthy templates; some use a scoring system of the extent to which each criterion is fulfilled in a Likert scale format (e.g., not fulfilled, mostly not fulfilled, partially fulfilled, fulfilled), and others use absolute, true/false statements to indicate whether or not a criterion is minimally fulfilled.

Walsh and Downe (2006) analyzed eight existing checklists and summary frameworks to assess studies' quality and created a comprehensive list of summary criteria for appraising qualitative research studies. This list includes eight stages with their corresponding essential criteria. Below is a summary of the most relevant criteria:

1. **scope and purpose**
    - research questions/aims/purposes/hypotheses
    - literature review
    - an established link between study and literature
2. **design**
    - rationale for design
    - appropriateness of setting
    - method
    - data collection consistency
3. **sampling strategy consistency**
    - justification, description, explanation of disparities with plan
4. **appropriate analytic approach**
    - name
    - appropriateness for study
    - data saturation
5. **interpretation**
    - description of context
    - audit trail
    - data supports interpretation
6. **demonstrated reflexivity**
    - evidence of self-awareness
    - insight
    - positionality
7. **demonstrated sensitivity to ethical concerns**
    - IRB approval
    - documentation of consent
    - data protection
8. **evidence of relevance and transferability**
    - discussion of limitations
    - discussion of significance of the work
    - inclusion of recommendations for future work

We consider this list a useful starting point for the identification of criteria to include in a critical appraisal instrument. You will need to decide which criteria to include according to their research questions, the

availability of literature in their chosen field, the standards for research in their field, and any other applicable consideration. Two main questions that our team factor into our appraisals are whether the inclusion of these criteria is common practice in the discipline and whether the absence of one of the criteria would compromise the rigor of the study as a whole.

Activity 3c.1.

Take 10-15 minutes to write your stance on critical appraisal for your meta-synthesis, including the main criteria for inclusion and how strict their implementation will be. Make sure to include why you have taken that stance.

You will also need to make decisions about whether you want to use a points system for the degree each criterion is fulfilled (e.g., Likert scale) or a checklist (i.e., fulfilled vs. not fulfilled) and the flexibility with which the criteria will be applied. Similar to our discussion of filtering in **«Sub-Module 3b»**, once decisions around the critical appraisal instrument are in place, you will need to apply each of the criteria to all the literature that has fulfilled the search and selection criteria to make decisions about whether it will be part of the synthesis or not. As with Filters 1 and 2, you will need to track your critical appraisal decisions in a tracker similar to Table 3c.1.

Table 3c.1. Critical appraisal tracker

Reference	RQ/Purpose/ Hypothesis	Th. Framework/ Lit Review	Description of Methods	Description of Partic & Contx	Sufficient Evidence	QA Decision
Alonso	1	1	1	1	1	Keep

Decisions such as flexibility when implementing the criteria are important because they may have an impact on the number of pieces of literature that will make it through all the filters. If your definition of the critical appraisal criteria is very strict and you are studying an emergent area of study, the process may yield an insufficient number of studies for a meaningful meta-synthesis. Or the opposite may be true: If your definition of the criteria is too loose, the process may yield a really large number of studies, which may make the synthesis process unmanageable.

Based on our experience, we recommend testing your critical appraisal instrument before implementing it to all your literature. This testing guided us to make some changes to our original set of critical appraisal criteria. Although we initially included the description of limitations in the studies as one of the criteria, we ultimately decided not to do so. After appraising several pieces in our start set, we realized that the inclusion of a description of the study's limitations was not very common in the literature for our synthesis. If we had kept that critical appraisal criterion, the number of studies to include in our synthesis would have decreased considerably, diminishing its scope.

Activity 3c.2.

Take 20-30 minutes to develop a critical appraisal instrument. Articulate to yourself the reasons for including, or excluding, each criterion you consider. Test the instrument in Activity 3c.3.

Activity 3c.3.

Take 30 minutes to conduct a critical appraisal of two pieces of literature you are considering for your start set (that you found in the activity in Sub-Module 3a).

- What do you notice about the literature you appraise?
- Are there any criteria that are not commonly fulfilled by your literature?

Adjust your instrument accordingly and record how and why changes were made.

References

Walsh, D., & Downe, S. (2006). Appraising the quality of qualitative research. *Midwifery*, *22*(2), 108-119. https://doi.org/10.1016/j.midw.2005.05.004

Institute for Meta-Synthesis

Sub-module 3d:
Forward and Backward Snowballing

OBJECTIVES

In this sub-module, you will learn:

- To follow the processes to identify literature using forward and backward snowballing so that you recognize the different approaches and what they consist of.
- To name the pros and cons of using forward and backward snowballing.
- To practice forward and backward snowballing for your own intended meta-synthesis project.
- To determine when it is appropriate to stop the snowballing process.

Main Concepts

An effective search and selection process that has the goal of casting the most inclusive net possible for a systematic meta-synthesis is **snowballing**; this includes forward and backward snowballing. We generally follow Wohlin's (2014) description of the snowballing process (see Figure 3d.1 below).

Forward Snowballing

Forward snowballing is a sampling strategy for literature searches that can help you identify relevant studies by using your start set (see **«Sub-modules 3a»**) to trace recent publications that cite literature in that set. You may conduct forward snowballing using the "Cited by" feature available on Google Scholar and other search engines like Engineering Village (a link to a forward snowballing video mini-tutorial can be found in the Additional Resources). Like your initial search and selection process (described in Modules 2 and 3), you will review the *Cited by* results and identify pieces of literature that fit your research question by conducting Filter 1, Filter 2, and Critical Appraisal as described in **«Sub-modules 3b and 3c»**. Forward snowballing adds newer literature to the synthesis.

Activity 3d.1.

Spend 10-15 minutes conducting forward snowballing using a literature piece related to your meta-synthesis project, such as those you used to conduct critical appraisal in Sub-Module 3c.

Backward Snowballing

Backward snowballing is a sampling strategy for literature searches that complements forward snowballing. It is the process of "using the reference list to identify new papers to include" (Wohlin, 2014, p. 3).

For this strategy, we examine each reference list or bibliography of the pieces of literature include in the start set and exclude any publications that do not match the search and selection criteria. Then, duplicate publications need to be removed (i.e., any papers you have already evaluated). This will result in a list of references that will need to be assessed for potential inclusion in the meta-synthesis project.

Next, you will again go through the process of reviewing these new additions and identify among them pieces of literature that fit your research question by conducting Filter 1, Filter 2, and Critical Appraisal as described in **«Sub-Modules 3b and 3c»**. The process of backward snowballing adds older literature to the synthesis. If date of publication is one of the criteria for your synthesis (e.g., 1999-2019), depending on how old a piece of the start set is, this may automatically exclude a lot of the literature for consideration. A link to a video mini-tutorial on backward snowballing can be found in the Additional Resources.

Activity 3d.2.

Spend 10-15 minutes conducting backward snowballing using a literature piece related to your meta-synthesis project, such as those you used to conduct critical appraisal in Sub-Module 3c.

According to Wohlin (2014), one of the main advantages to forward and backward snowballing is that you begin the processes with your start set, which is relevant to your study, and use its contents to locate publications that are likely to fit your synthesis. A potential disadvantage of this sampling strategy is that relying on literature pieces that cite each other may lead to the collection of a homogenous or insular group of publications due to the influence of the start set (e.g., if the authors in your initial literature only cited certain authors or from certain journals). This could result in a small and biased sample of literature from the larger population of publications related to your topic of interest.

Activity 3d.3.

Take 5-10 minutes to consider the following question: What do you notice about the results of each snowballing technique?

Heyvaert et al. (2017) also state that snowballing can result in in an overrepresentation of published research (as opposed to gray literature, including government reports, unpublished work, dissertations, conference proceedings, and others). We can counteract this potential threat by casting the broadest net possible in the pre-search process, using several search engines and directories and using an inclusive list of search terms, and by emailing our networks for additional resources. Remember to also consider including gray literature and non-academic publications in your start set. This will help to avoid getting an insular set of literature.

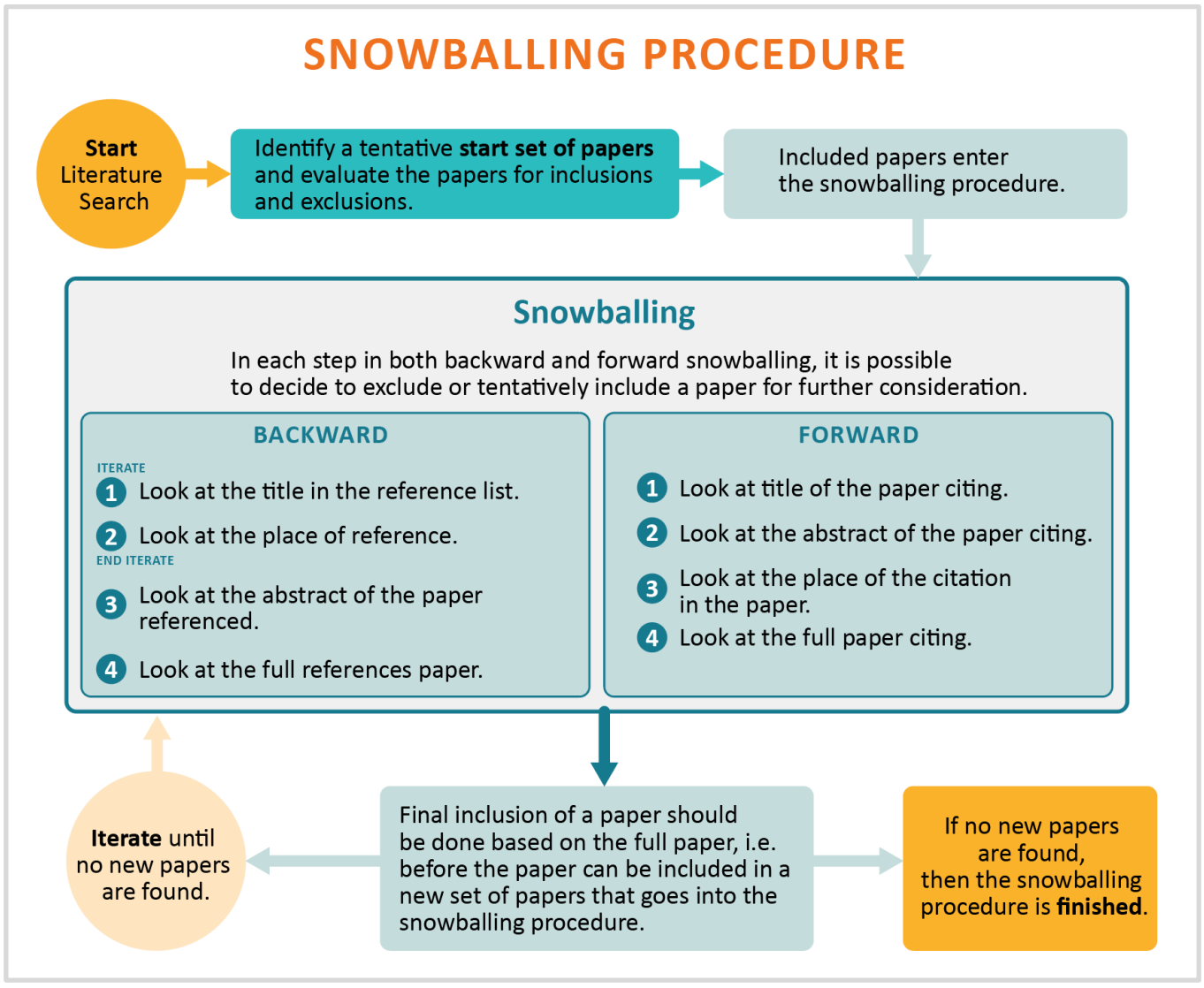


Figure 3d.1. Snowballing procedure based on Wohlin (2014, p. 4)

When to Stop Sampling

It will be necessary to stop sampling at some point to continue with the meta-synthesis project, but how do we know when we have collected enough literature? Researchers who employ purposeful sampling often use **data saturation** or data sufficiency logic to guide them. Heyvaert et al. (2017) define data saturation logic as the logic that "the data collection stops when a saturation point is reached" (p. 82), which means that including more studies during the search process does not necessarily add any new insights. Meanwhile, the data sufficiency logic is the logic that data saturation is never truly achieved and that the researchers should determine when to stop the search process because they know what is considered to be "sufficient evidence" in their field.

In a systematic meta-synthesis, the goal is to include a comprehensive set of literature, which means that the intent is to find all the relevant literature, independently of whether or when there may be data saturation or data sufficiency. Wohlin (2014) recommends continuing to snowball the literature resulting from the snowballing process until it produces no new relevant references for the synthesis. To ascertain that this point has been reached, synthesis authors can contact some of the authors of the included papers that they may know to see if they have any suggestions on other publications that should be considered for inclusion.

A caveat to this process is practicality and budget. There is a limit to the time and resources that one can devote to this process until reaching the point recommended by Wohlin (2014). Our team stops snowballing after snowballing the results of the first round (i.e., snowballing of snowballing) because the second round has produced diminishing returns given that most of the literature we found was quite recent and had not been cited yet, and had bibliographies that did not include references that were new to us. In essence, we conduct two rounds of snowballing.

Additional Resources

- To watch a video tutorial on how to conduct forward snowballing, please click this link: https://tinyurl.com/IMSFWDSnowballing
- To watch a video tutorial on how to conduct backward snowballing, please click this link: https://tinyurl.com/IMSBWDSnowballing

References

Heyvaert, M., Hannes, K., & Onghena, P. (2017). *Using mixed methods research synthesis for literature reviews*. Sage.

Wohlin, C. (2014, May). Guidelines for snowballing in systematic literature studies and a replication in software engineering. In *Proceedings of the 18th international conference on evaluation and assessment in software engineering* (pp. 1-10). Association for Computing Machinery. https://doi.org/10.1145/2601248.2601268

Institute for Meta-Synthesis

Module 4:
Analysis – Intro and Preparation

Sub-Module 4a:
The Five Cycles of Analysis

Objectives

In this sub-module, you will learn:

- To review the different analysis cycles: coding, thematic analysis, development of findings, and discussion.
- To understand how each cycle of analysis feeds into the next.

Main Concepts

Preview of the Five Cycles of Analysis

In the following modules, we will talk about the different approaches to coding, how to develop themes through thematic analysis, how to develop findings, and how to write up the discussion section. In this sub-module, we will talk about how all these individual steps are part of the overall analysis process. Keep in mind that the analysis process is iterative and cyclical. This means that each cycle typically goes through several iterations and that cycles feed into each other. Let us briefly review each of the analysis cycles to see how they build on each other.

- *First and second cycles:*
  In **«Sub-Module 5a»**, we will discuss **coding**, which is a "word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data" (Saldaña, 2016, p. 3).
- *Third cycle*:
  In **«Sub-Module 6a»**, we describe the development of **themes**, which are groupings of similar codes or

code categories, or underlying ideas across codes. We will see the development descriptive and analytical themes.

- *Fourth cycle*:
  In **«Sub-Module 6b»**, we introduce the development of **findings**. In qualitative meta-synthesis, findings both describe and interpret what has been learned in the study.
- *Fifth cycle*:
  Also in **«Sub-Module 6b»**, we describe how to develop the **discussion**. This is the section in a manuscript where you will discuss the meta-synthesis findings in light of the literature and/or the chosen theoretical framework, possibly introduce new interpretations of the data, and share implications for future research, policy, and practice.
- For extended examples of each, refer to **«Sub-Modules 5b, 6a, and 6b»**. **«Sub-Module 5b»** includes an extended example of how to create a codebook. **«Sub-Modules 6a and 6b»** include examples of each of the themes, the findings, and the discussion.

How the Five Cycles Build upon Each Other

We understand that the final goal of the work that we are describing in these modules is to develop a manuscript for publication in which you synthesize the existing literature around a topic related to STEM or STEM education and minoritized groups (see **«Module 7»** for more information about writing and publishing). The breakdown of the five cycles relates to the methods section that you will need to write for your manuscript and to the overall structure of a typical paper in education research. For example, having a good understanding of how each analysis cycle builds on another will help in describing the analysis methods you use. Also, findings and discussion, which are two of the cycles of analysis we describe, are also sections typically found in education research manuscripts. Let us now look at how each cycle of analysis feeds into the next.

Figure 4a.1 shows how the analytical process moves from one cycle to the next by incorporating what we developed in the previous cycle into the next and progressively moving it from specific to general.

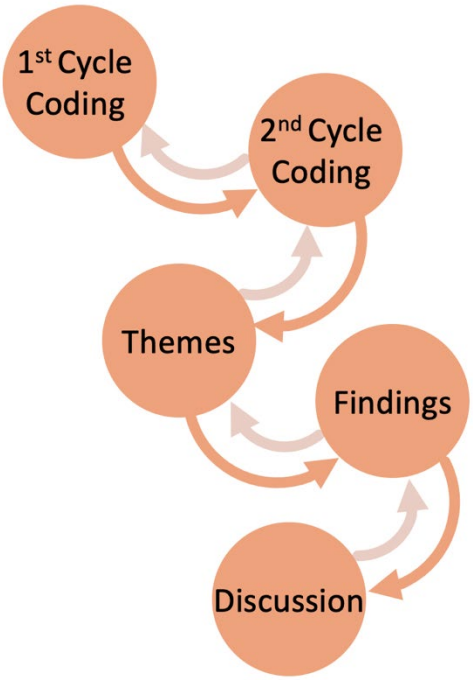


Figure 4a.1. The five cycles of analysis

The analytical process starts with familiarizing yourself with the study's data (in this case, the data is the literature included in the meta-synthesis). This is where all your analysis is grounded and where you will need to get the evidence that will support your claims. It is important to be familiar with your data, so we recommend reading through your final set of literature and using active reading strategies such as the development of analytic memos (see **«Sub-Module 4c»**) and using the strategies discussed in **«Sub-Module 4b»**.

Once you are familiar with your data, develop codes. **Codes** stem from the data and summarize pieces of meaning. Coding helps you break down the data into smaller pieces that have core features or meanings in common and can thus be grouped together (see **«Sub-Module 5a»**, first cycle of coding). Once you have codes, develop **code categories** that bring together related codes (see **«Sub-Module 5a»**, second cycle of coding).

Develop **themes** by bringing together **code categories** under an umbrella idea that summarizes and unifies meaning that appears across codes (see **«Sub-Module 6a»**). Developing themes helps in finding the commonalities that are present in your data.

You will then develop **findings** by bringing together your **themes** and overlaying an interpretation of the phenomenon at hand. Developing findings helps in understanding the relationships between themes. They help you to start seeing the overall picture of what you are learning from your data (see **«Sub-Module 6b»**).

From there you can develop the **discussion** by looking at the findings through the lens of the literature and theoretical framework and thinking of their implications beyond your particular meta-synthesis project. Developing the discussion allows you to put our findings within the context of the literature and to see how they may support and improve future research, policy, and practice (see **«Sub-Module 6b»**).

It is important to understand that this is not a summative process where you simply use the pieces from the previous cycle to build the next cycle. Analysis is a reflective and iterative process of sensemaking that helps to move from the specificity of your data to progressively more general understandings in each of the cycles.

Additional Resources

- For extended examples of each element referenced in this Sub-Module, refer to **«Sub-Modules 5b, 6a, and 6b»**.
- **«Sub-Modules 5b»** includes an extended example of how to create a codebook.
- **«Sub-Modules 6a and 6b»** include examples of each of the themes, the findings, and the discussion.

References

Heyvaert, M., Hannes, K., & Onghena, P. (2017). Using mixed methods research synthesis for literature reviews. Sage.

Saldaña, J. (2016). *The coding manual for qualitative researchers* (3rd edition). Sage.

Institute for Meta-Synthesis

Sub-Module 4b:
Being Strategic when Reading Academic Literature

Objectives

In this sub-module, you will learn:

- To be more efficient, strategic, and focused when reading academic literature.
- To understand that academic literature can be read in different ways according to your goals and theoretical framework.
- How to identify the relevant element of the literature you are including in your meta-synthesis.

Main Concepts

Reading Academic Literature Towards a Meta-Synthesis

A meta-synthesis project involves sifting through and reading hundreds of publication pages. Though seemingly daunting, there is a way to get through it all. First, it is important for you to be familiar with the typical organizational structure of publications in your field. Every discipline has its own variation of what sections are included in a research publication, and this also differs depending on the journal or publication outlet. Generally, you can expect the following sections named in this way:

- Abstract
- Introduction/Review of the Literature
- Methods, Results/Findings
- Conclusions/Discussion
- References

Some articles will also include appendices or supplementary materials.

It is recommended that (1) you keep the full texts of publications that will be included in your analysis organized and separated from other literature related to the project (e.g., literature that was considered for Filter 2 but that did not fulfill our criteria for inclusion); and (2) that you do not read linearly.

Before diving into a study, you should read the title, abstract, and conclusions of a study first to get a general understanding of the topics and whether it is worth investing more time on (Subramanyam, 2013).

Then, depending on your meta-synthesis topic or research-question or theoretical framework, you will pay more attention to certain sections over others. For instance, for our research on women of color in engineering, we mainly focused on the methods, results/findings, and conclusions/discussion. Reading the methods section was key to understand to what extent each study fulfilled our critical appraisal criteria (see **«Sub-Module 3c»**).

Reading the findings and discussion allowed us to see if the study fulfilled our search and selection criteria (e.g., the studies reported on the intersection of gender and race/ethnicity) (see **«Sub-Module 3b»**), and to identify the findings that were relevant to our meta-synthesis. If your project is focused on methodology, then you would pay particular attention to the introduction and methods sections. If your project focuses on the use of a specific theory in research, you will want to concentrate on the literature review and the discussion.

Reading Critically

You know what sections to read, but what are you reading for?

The specifics of what you are looking for will depend on the selection criteria you generated a priori for your meta-synthesis project. It is important to be a critical reader at all times.

Being a critical reader means that you should approach a text thoughtfully, deeply, and purposefully. Our team has systematized this critical reading process through the creation of analytical memos (see **«Sub-Module 4c»**). It is also important to record your decisions and rationales throughout the process. This involves reading your key sections slowly, maintaining a curious and questioning frame of mind, asking yourself questions that examine the author's assertions and the piece as a whole, including:

- **Key concepts:**
  What are the key concepts put forth by the author? Are they defined? Are they implemented consistently across the manuscript?
- **Claims:**
  Are the claims made by the author clear? How would you summarize them in a few sentences? Is the evidence presented in the piece substantial, sufficiently supported, and consistent with the author's claims? Does the author explain the presence of exceptions?
- **Consistency:**
  Are the different elements of the piece consistent with each other? For example, are the theoretical framework and the methods used consistent? Are the theoretical framework and the findings consistent?
- **Challenging the field:**
  Does the piece challenge what is known in the field? If so, how?
- **Red flags:**
  Are there any red flags that make the reader question the claims made by the author? What are these red flags?

- **Fitting in:**
  How does this piece fit with the other literature you are considering for the meta-synthesis? How does the theoretical framework of the meta-synthesis help you glean insights from the piece you are reading?

These questions will help you in keeping a critical attitude toward what you are reading, question what you are reading to make your own decisions about it, and not merely take the author's words as the complete truth. These questions will also help you in thinking about how each piece of literature fits in the overall meta-synthesis from the theoretical framework and synthesis questions.

One thing we would like to note is that, although it is not necessary to record the answers to the questions above, it may be helpful for you to do so. As mentioned above, the analytical memos that we will describe in **«Sub-Module 4c»** are a helpful tool to keep track of some of this information and to support your critical reading. However, they are not designed to guide your critical reading as described above.

Additional Resources

- For scholars new to reading academic literature, check out "How to read academic papers without freaking out" [blog post] - https://medium.com/ai-saturdays/how-to-read-academic-papers-without-freaking-out-3f7ef43a070f
- For scholars who would like more information on the techniques involved in reading scholarly literature, check out the video "How to Read an Academic Paper" by TEDEd - https://ed.ted.com/on/N1PGnyHL/

References

Subramanyam, R. V. (2013). Art of reading a journal article: Methodically and effectively. *Journal of Oral and Maxillofacial Pathology, 17*(1), 65-70. https://doi.org/10.4103/0973-029X.110733

Institute for Meta-Synthesis

Sub-Module 4c:
Creating Analytical Memos

Objectives

In this sub-module, our objectives include:

- To understand what an analytical memo is and its purpose.
- To understand the components of an analytical memo in the context of a meta-synthesis.
- To learn what details are important for inclusion in an analytical memo, and how to avoid losing context.

Main Concepts

This submodule explains our team's approach to developing and using analytical memos. We developed this system through the years to make the work on meta-synthesis in a team more efficient. Our analytical memos have not always followed the format that we detail here, as they have considerably evolved throughout the years.

What is an Analytical Memo?

Analytical memos serve as summaries of the main findings and recommendations for each piece of literature in your set, distilling the elements of interest for the meta-synthesis. They include summaries of each topic by the synthesis author, summaries of the topic by the literature piece's author, and evidence supporting the topic. They use a similar process to selective annotation when critically reading and consolidate the elements of interest into one concise document per literature piece.

By creating memos and then using them as a reference for later in the meta-synthesis process, you limit the necessity of returning to the original source during the analysis and writing process. Using memos is especially helpful when working in a team and/or when the meta-synthesis includes longer pieces, such as dissertations or books.

Purpose of Creating Memos

The purpose of the memo is to make the coding process (described later in **«Module 5»**) much more manageable and targeted. As noted above, analytical memos help in distilling information that is relevant to your research purpose. For example, if we are conducting a literature meta-synthesis on the experiences of women of color in computing, we would want to look at our elements of interest -- the findings and discussion --

and condense these into an analytical memo. In qualitative studies, authors tend to provide multiple examples to support their findings. Memos should record only the best 1-2 examples for each identified finding or theme. Once you have read through all your literature pieces and written corresponding memos, you will then move on to the coding process. It is important to note that you will be coding the memos and **not** the full text of literature. You will continue to use the literature to check for accuracy as needed, but your main source of data will come from the memos.

Components of a Memo

Analytical memos and their components may differ from researcher to researcher depending on the focus of the meta-synthesis. The analytical memo described here is the format that we have successfully used in previous literature synthesis projects. First, we included the following as a heading:

- Name of Memo Writer
- Date
- Citation (APA, MLA, Chicago, etc.)

This heading is useful to keep track of the memo development process. For instance, having a record of who on the team wrote the memo and when may be helpful to track the decisions made in the writing of the memo, in case questions arise at other moments of the meta-synthesis' development.

As we noted above, analytical memos will vary based on the purpose of the research. For example, in one of our projects, we synthesized literature on experiences of women of color in engineering higher education and careers. We were interested in identifying themes that appeared as findings across the literature. Also, we were interested in the application of what was learned from the literature, so recommendations were an important part of the literature to consider.

Given the central role of themes and recommendations in our work, memos included the following components:

- Title of the theme
- Summary by the memo writer
- Summary of the theme in the memo writer's own words
- Contextual information (participants' demographics and context of the research)
- Summary by the author(s) of the piece of literature
- Evidence that supports the theme
- Recommendations by the author(s) of the piece of literature

Title of the theme refers to the themes you identify as findings of the study. For example, if you read a section of the findings that speaks to the reasons African American undergraduate students chose an historically Black college or university (HBCU) for their STEM degrees, you may use "Reasons to Choose an HBCU" as the title of the theme you would like to include in your memo. You can also decide to use the titles of the themes that are

identified by the author of the piece. In that case, it is important to indicate it by using proper citation practices (i.e., quotation marks and page number).

Summary by the memo writer refers to the summary of each theme you, as the memo writer, identify in the literature and that you explain in your own words. It is connected to the summary of the findings as explained by the author of the piece of literature (see next section). Your summary should include two main components: (1) a summary of the theme in your own words, and (2) information that will be useful later on to help maintain the context where the theme originated, such as demographic details of participants (e.g., gender, race/ethnicity, student or professional) and context of the research (e.g., geographic location, workplace, undergraduate education, graduate school).

An example of this is the following: "*Researchers in this study found that amongst the 20 women of color (15 African American/Black, 10 Asian, 3 Hispanic, 2 Native) who were undergraduate students in a Midwestern institution of higher education they interviewed, most shared that…*" As mentioned, this description helps in maintaining the context of the research, particularly when writing the Findings section of the literature meta-synthesis. It provides immediate access to information useful to the meta-synthesis writer to describe the participants and contexts of the various studies included in the meta-synthesis.

To ensure that our literature summaries stood out and were easily differentiated from what the author of the piece wrote, we formatted our own words it in italics. You may use other strategies that signal that this section is not directly taken from the literature you are working with (e.g., highlighting, underscoring, enclosing it in a box), but you should ensure that it is clearly identifiable.

Summary by the author(s) of the piece of literature refers to the paragraphs written by the author(s) of the study to introduce and explain their findings in the appropriate sections (e.g., findings and discussion). By including the author summary, it ensures the presentation of their findings in the way the authors intended. It also provides the reader of the memo a point of comparison to check its consistency with the summary by the memo writer. Make sure to use proper citation practices when copying from the literature (e.g., quotation marks, page numbers) to avoid mixing the two kinds of summaries.

Evidence refers to the data used by the authors to support their claims for each theme. This may include qualitative data collected from participant interviews (i.e., quotes) or quantitative data (e.g., statistics). As we noted above in the summary by the author of the piece, you want to make sure that the evidence you choose to include in your analytical memo reflects the claims that the authors are making in their own analysis. When using direct quotes, make sure to use proper citation practices. This will make it easier to find the quote if you need to return to the original piece.

When considering what evidence to include in the memo, it is important to find the best examples and to consider to what extent the evidence included supports the claims made in the memo writer's and the author's summaries. Typically, we include the best one to two examples in our analytical memos. However, you need to be careful to include a variety of participants' quotes to ensure broad representation.

We have found ourselves with literature at this stage that (even though they appeared to fulfill our search, selection, and quality appraisal criteria) included evidence that was not consistent with the theme that it was supposed to support. This indicated that the quality appraisal criteria were not appropriately fulfilled and was grounds for the exclusion of the study from the meta-synthesis.

Recommendations refer to advice and suggestions provided by the literature piece's authors that may describe implications of the study's findings for others like the study's participants, for future research, and policy or promising practices for institutions. Including recommendations in the memos can later support writing the last sections of a meta-synthesis, such as the conclusion and recommendations. Recommendations can be helpful in the translation of the findings of the meta-synthesis into actionable points.

When gathering recommendations, it is important to pay particular attention to whether the recommendations put forth by the study's authors are supported by the study's findings, are relevant to the topic of the study, and are relevant to your synthesis question. The format of the information gathered for the recommendations can follow the format above (title, summary by memo writer, etc.) or not. In our work, we have not used that format and simply collected the quotes by the authors of the piece of literature (with proper citation practices) and indicated what type of recommendation it was (e.g., for future research, for employers, for institutions of higher education, for women of color in STEM).

Deciding What is Important to Include

Sometimes it is hard to decide what is important to include in your analytical memo because everything seems important. However, given that the purpose of the memo is to distill the literature piece into its most relevant findings, it should be shorter than the actual publication where it comes from and it should break down findings into pieces that make sense by themselves and that paint a larger picture of the piece of literature as a whole. Things to consider when deciding what to include in a memo are:

- Choose the best or most striking examples, quotes, or statistics that best illustrate the piece of literature's findings and that you can imagine using in your meta-synthesis.
- Choose examples, quotes, or statistics that provide different perspectives on the same finding to offer a more complete picture of it.
- If you work in a team, work together in pairs to select the best evidence and find consensus with team members when disagreements emerge.

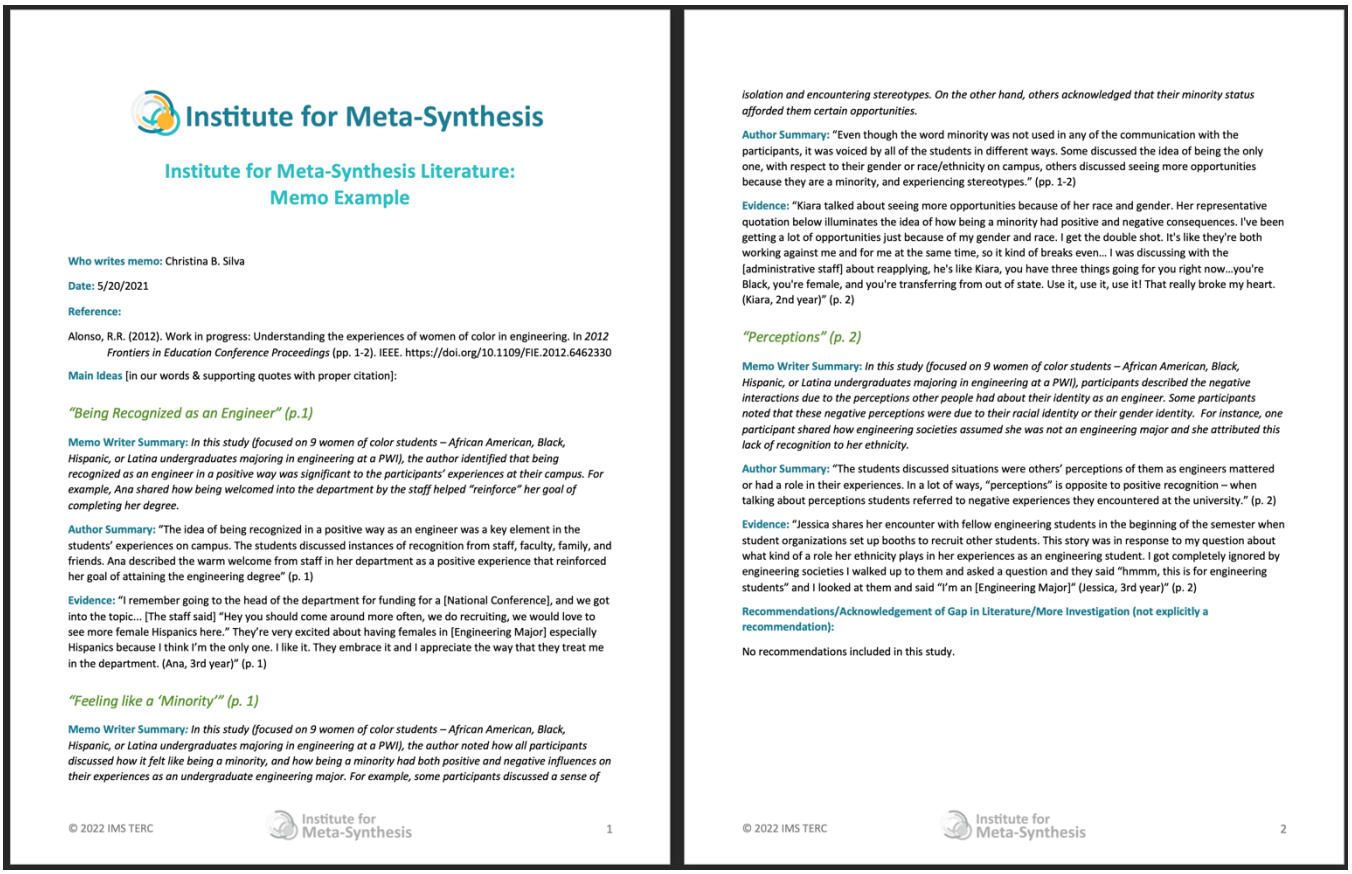
Sometimes, we may find that the author of a piece of literature that generally fulfills our quality appraisal criteria makes vague claims or does not provide strong evidence for some of their claims. In those cases, we recommend including only those findings that are supported by credible, substantiated evidence and not including those findings that are not. Including findings that are not well supported will negatively affect the development of strong meta-findings for your meta-synthesis and generally have a negative impact on your work.

How to Avoid Losing Context

As described in the section on the *Summary by the Memo Writer*, one of the strategies to avoid losing context is providing all the necessary detail in in that summary, such as participants' demographic information and the institutional context of the study, among others. When stripped of its context, a quote from the literature that provides an excellent illustration of a finding, loses its meaning and its potential impact. As a result, the memo loses most of its function because you would need to go back to the original source to understand why the

quote was included in the memo in the first place. The inclusion of your summary is another strategy to limit the likelihood of losing context or unintentionally distorting their words.

To help you understand what an analytical memo is and what it looks like, we have included an example of a completed memo in Figure 4c.1 (also Appendix 4c).



Institute for Meta-Synthesis

Institute for Meta-Synthesis Literature: Memo Example

Who writes memo: Christina B. Silva

Date: 5/20/2021

Reference:

Alonso, R.R. (2012). Work in progress: Understanding the experiences of women of color in engineering. In *2012 Frontiers in Education Conference Proceedings* (pp. 1-2). IEEE. https://doi.org/10.1109/FIE.2012.6462330

Main Ideas [in our words & supporting quotes with proper citation]:

"Being Recognized as an Engineer" (p.1)

Memo Writer Summary: *In this study (focused on 9 women of color students – African American, Black, Hispanic, or Latina undergraduates majoring in engineering at a PWI), the author identified that being recognized as an engineer in a positive way was significant to the participants' experiences at their campus. For example, Ana shared how being welcomed into the department by the staff helped "reinforce" her goal of completing her degree.*

Author Summary: "The idea of being recognized in a positive way as an engineer was a key element in the students' experiences on campus. The students discussed instances of recognition from staff, faculty, family, and friends. Ana described the warm welcome from staff in her department as a positive experience that reinforced her goal of attaining the engineering degree" (p. 1)

Evidence: "I remember going to the head of the department for funding for a [National Conference], and we got into the topic… [The staff said] "Hey you should come around more often, we do recruiting, we would love to see more female Hispanics here." They're very excited about having females in [Engineering Major] especially Hispanics because I think I'm the only one. I like it. They embrace it and I appreciate the way that they treat me in the department. (Ana, 3rd year)" (p. 1)

"Feeling like a 'Minority'" (p. 1)

Memo Writer Summary: *In this study (focused on 9 women of color students – African American, Black, Hispanic, or Latina undergraduates majoring in engineering at a PWI), the author noted how all participants discussed how it felt like being a minority, and how being a minority had both positive and negative influences on their experiences as an undergraduate engineering major. For example, some participants discussed a sense of*

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isolation and encountering stereotypes. On the other hand, others acknowledged that their minority status afforded them certain opportunities.

Author Summary: "Even though the word minority was not used in any of the communication with the participants, it was voiced by all of the students in different ways. Some discussed the idea of being the only one, with respect to their gender or race/ethnicity on campus, others discussed seeing more opportunities because they are a minority, and experiencing stereotypes." (pp. 1-2)

Evidence: "Kiara talked about seeing more opportunities because of her race and gender. Her representative quotation below illuminates the idea of how being a minority had positive and negative consequences. I've been getting a lot of opportunities just because of my gender and race. I get the double shot. It's like they're both working against me and for me at the same time, so it kind of breaks even… I was discussing with the [administrative staff] about reapplying, he's like Kiara, you have three things going for you right now…you're Black, you're female, and you're transferring from out of state. Use it, use it, use it! That really broke my heart. (Kiara, 2nd year)" (p. 2)

"Perceptions" (p. 2)

Memo Writer Summary: *In this study (focused on 9 women of color students – African American, Black, Hispanic, or Latina undergraduates majoring in engineering at a PWI), participants described the negative interactions due to the perceptions other people had about their identity as an engineer. Some participants noted that these negative perceptions were due to their racial identity or their gender identity. For instance, one participant shared how engineering societies assumed she was not an engineering major and she attributed this lack of recognition to her ethnicity.*

Author Summary: "The students discussed situations were others' perceptions of them as engineers mattered or had a role in their experiences. In a lot of ways, "perceptions" is opposite to positive recognition – when talking about perceptions students referred to negative experiences they encountered at the university." (p. 2)

Evidence: "Jessica shares her encounter with fellow engineering students in the beginning of the semester when student organizations set up booths to recruit other students. This story was in response to my question about what kind of a role her ethnicity plays in her experiences as an engineering student. I got completely ignored by engineering societies I walked up to them and asked a question and they said "hmmm, this is for engineering students" and I looked at them and said "I'm an [Engineering Major]" (Jessica, 3rd year)" (p. 2)

Recommendations/Acknowledgement of Gap in Literature/More Investigation (not explicitly a recommendation):

No recommendations included in this study.

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Figure 4c.1. Example of an analytical memo

Activity 4c.1.

Take 20 minutes to select one piece of literature from your set, select one topic identified by the author(s) and write a Summary by Memo Writer with all the elements described above. Once you have the summary by the memo writer, identify and quote the author(s)' summary followed by two participants' quotes.

Activity 4c.2.

Take 45 minutes to an hour to create a full analytical memo for a piece of literature included in your set.

Additional Resources

- To see the full example of the analytical memo for Alonso (2012) created by the Institute for Meta-Synthesis Team, please see the document labelled "Analytical Memo Example – Alonso 2012" in Appendix 4c.

Alonso, R.R. (2012). Work in progress: Understanding the experiences of women of color in engineering. In *2012 Frontiers in Education Conference Proceedings* (pp. 1-2). IEEE. https://doi.org/10.1109/FIE.2012.6462330

Appendix 4c. Analytical Memo Example

Who writes memo: Christina B. Silva

Date: 5/20/2021

Reference:

Alonso, R.R. (2012). Work in progress: Understanding the experiences of women of color in engineering. In *2012 Frontiers in Education Conference Proceedings* (pp. 1-2). IEEE. https://doi.org/10.1109/FIE.2012.6462330

Main Ideas [in our words & supporting quotes with proper citation]:

"Being Recognized as an Engineer" (p.1)

Memo Writer Summary: *In this study (focused on 9 women of color students – African American, Black, Hispanic, or Latina undergraduates majoring in engineering at a PWI), the author identified that being recognized as an engineer in a positive way was significant to the participants' experiences at their campus. For example, Ana shared how being welcomed into the department by the staff helped "reinforce" her goal of completing her degree.*

Author Summary: "The idea of being recognized in a positive way as an engineer was a key element in the students' experiences on campus. The students discussed instances of recognition from staff, faculty, family, and friends. Ana described the warm welcome from staff in her department as a positive experience that reinforced her goal of attaining the engineering degree" (p. 1)

Evidence: "I remember going to the head of the department for funding for a [National Conference], and we got into the topic... [The staff said] "Hey you should come around more often, we do recruiting, we would love to see more female Hispanics here." They're very excited about having females in [Engineering Major] especially Hispanics because I think I'm the only one. I like it. They embrace it and I appreciate the way that they treat me in the department. (Ana, 3rd year)" (p. 1)

"Feeling like a 'Minority'" (p. 1)

Memo Writer Summary: *In this study (focused on 9 women of color students – African American, Black, Hispanic, or Latina undergraduates majoring in engineering at a PWI), the author noted how all participants discussed how it felt like being a minority, and how being a minority had both positive and negative influences on their experiences as an undergraduate engineering major. For example, some participants discussed a sense of isolation and encountering stereotypes. On the other hand, others acknowledged that their minority status afforded them certain opportunities.*

Author Summary: "Even though the word minority was not used in any of the communication with the participants, it was voiced by all of the students in different ways. Some discussed the idea of being the only one, with respect to their gender or race/ethnicity on campus, others discussed seeing more opportunities because they are a minority, and experiencing stereotypes." (pp. 1-2)

Evidence: "Kiara talked about seeing more opportunities because of her race and gender. Her representative quotation below illuminates the idea of how being a minority had positive and negative consequences. I've been getting a lot of opportunities just because of my gender and race. I get the double shot. It's like they're both working against me and for me at the same time, so it kind of breaks even… I was discussing with the [administrative staff] about reapplying, he's like Kiara, you have three things going for you right now…you're Black, you're female, and you're transferring from out of state. Use it, use it, use it! That really broke my heart. (Kiara, 2nd year)" (p. 2)

"Perceptions" (p. 2)

Memo Writer Summary: *In this study (focused on 9 women of color students – African American, Black, Hispanic, or Latina undergraduates majoring in engineering at a PWI), participants described the negative interactions due to the perceptions other people had about their identity as an engineer. Some participants noted that these negative perceptions were due to their racial identity or their gender identity. For instance, one participant shared how engineering societies assumed she was not an engineering major and she attributed this lack of recognition to her ethnicity.*

Author Summary: "The students discussed situations were others' perceptions of them as engineers mattered or had a role in their experiences. In a lot of ways, "perceptions" is opposite to positive recognition – when talking about perceptions students referred to negative experiences they encountered at the university." (p. 2)

Evidence: "Jessica shares her encounter with fellow engineering students in the beginning of the semester when student organizations set up booths to recruit other students. This story was in response to my question about what kind of a role her ethnicity plays in her experiences as an engineering student. I got completely ignored by engineering societies I walked up to them and asked a question and they said "hmmm, this is for engineering students" and I looked at them and said "I'm an [Engineering Major]" (Jessica, 3rd year)" (p. 2)

Recommendations/Acknowledgement of Gap in Literature/More Investigation (not explicitly a recommendation):

No recommendations included in this study.

Institute for Meta-Synthesis

Module 5:
Analysis – First and Second Cycles

Sub-Module 5a:
Coding

Objectives

In this sub-module, you will learn to understand:

- What codes and coding are, and how computer-assisted software may support coding.
- Why coding is useful in synthesis work.
- The two coding cycles and how they fit within the five cycles of coding.
- Differences between coding approaches.

Main Concepts

What is Coding?

Coding is one possible first step towards data analysis that seeks to help make sense of the data as a whole. It is the iterative process of grouping similar pieces of data together. This means that you will be searching and identifying concepts, finding relationships between them, and organizing them.

Codes can summarize, condense, or reduce data (Saldaña, 2016). Groupings of similar codes and code categories are referred to as **themes**. We will talk about how to develop themes in **«Submodule 6a»** – Thematic Analysis. According to Creswell (2009), coding "involves taking text data or pictures gathered during data collection, segmenting sentences (or paragraphs) or images into categories and labeling those categories with a term" (p. 186). Saldaña (2016) states that a code "is most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data" (p. 3).

Table 5a.1 shows an example of a code that our team uses, with an abbreviated definition, and an example from our meta-synthesis work on women of color undergraduates in engineering.

Table 5a.1. Example of a code with definition and example from data on women of color undergraduates in engineering

Code	Definition	Example from the Data
Social Discomfort	Factors causing the participant to not relate well to people in the social context of the participant's STEM climate. Includes feelings of "not fitting in," feelings of difference in the STEM community; difficulty in forming and participating in academic and social support groups; lacking individuals who guide her and share her experience, or individuals and groups that provide safe havens from subtle and blatant hostilities in the greater STEM culture.	"Kiara talked about seeing more opportunities because of her race and gender. Her representative quotation below illuminates the idea of how being a minority had positive and negative consequences. *I've been getting a lot of opportunities just because of my gender and race. I get the double shot. It's like they're both working against me and for me at the same time, so it kind of breaks even.... I was discussing with the [administrative staff] about reapplying, he's like Kiara, you have three things going for you right now … you're Black, you're female, and you're transferring from out of state. Use it, use it, use it! That really broke my heart." (Alonso, 2012, p. 2)*

The creation and testing of a collection of codes results in a **codebook**. In a codebook, each entry should have the elements in Table 5a.1: (1) the name of the code; (2) the definition of the code; and (3) examples from literature data illustrating the code's definition. The codebook will help with data management by organizing segments of similar or related text to assist in interpretation and sensemaking. We will talk more about the relationship between coding and other stages of analysis in **«Sub-Module 6b»**, and we will describe how to create a codebook in **«Sub-Module 5b»**.

Once your codebook is established and tested with a few sample pieces of literature, you will be ready to begin coding. You can code manually or by using **computer-assisted qualitative data analysis software (CAQDAS**, pronounced "kack-duss"), such as NVivo or Atlas.ti. CAQDAS can be used to store, organize, and manage the data, in addition to coding and analyzing it. CAQDAS are particularly helpful when you need to work in a team and/or with large amounts of data. If you are interested in learning more about CAQDAS, the Qual Page compiles a useful list of resources (see Additional Resources below).

Why Code?

You code your data to find patterns. Patterns that can be found include regularities, similarities, frequency, sequence, correspondence, and causation (Saldaña, 2016). These patterns, or categories and themes, make it easier to summarize and interpret your findings by providing a structure to your data. They will also make the writing of the meta-synthesis report or publication simpler. Lastly, the coding process is important in terms of

credibility; potential reviewers and readers of your work will have confidence in your findings because you engaged in a rigorous, systematic approach to analyzing your data.

Coding Cycles

Saldaña (2016) described coding as occurring in two main cycles according to when they take place: first cycle and second cycle coding. “First cycle methods are those processes that happen during the initial coding of the data” (p. 68). Thus, **first cycle coding** is a first pass at making sense of the data, where you are getting familiarized with it to start the analysis process. Deductive (**«Sub-Module 5c»**) and inductive (**«Sub-Module 5d»**) are examples of first cycle coding.

According to Saldaña “Second cycle methods … are a bit more challenging because they require such analytic skills as classifying, prioritizing, integrating, synthesizing, abstracting, conceptualizing, and theory building. If you have taken ownership of the data through careful first cycle coding (and recoding), the transition to second cycle methods becomes easier” (Saldaña, 2016, p. 69). This **second cycle coding** is a second round of iterative coding where you develop a deeper knowledge of your data. It involves organizing and re-analyzing data to create links between the different codes and to develop an overall understanding of the data. Depending on how you did the first cycle coding and your initial findings, you may need to either lump smaller codes into larger ones or split your initial codes into smaller ones. **Hybrid coding** (**«Sub-Module 5e»**) is an example of second cycle coding. Examples of first and second cycle coding approaches can be found in Saldaña’s (2016) book.

With the introduction of Saldaña's coding cycles, we wanted to underscore that coding is an iterative process, in which researchers develop an increasingly nuanced understanding of their data with each cycle. Figure 5a.1 shows how the five cycles of analysis build onto each other, moving from specific to general, in this case with emphasis on the focus of this sub-module, the first two cycles of analysis.

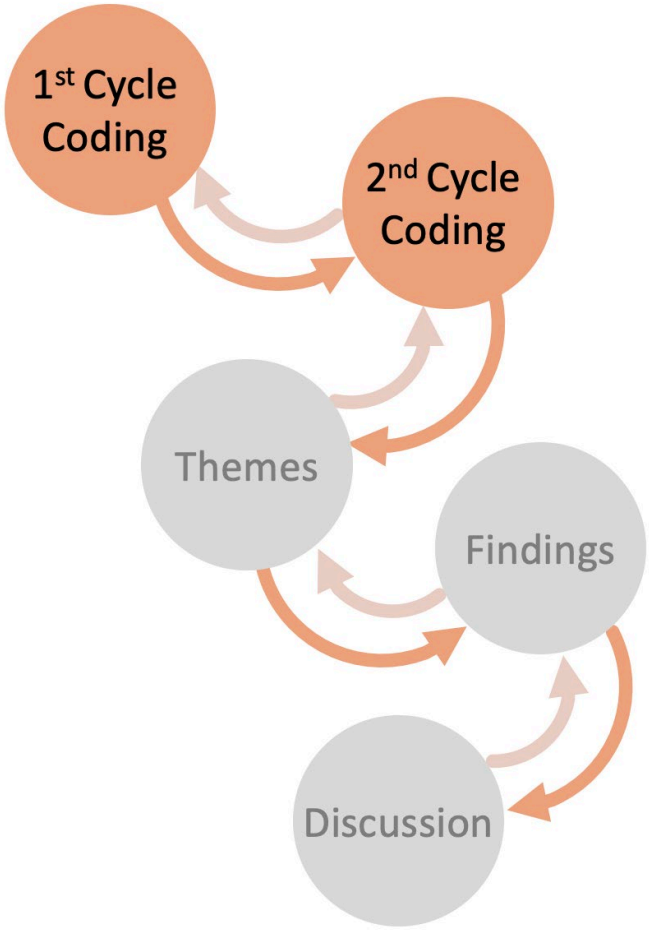

Figure 5a.1. Five cycles of analysis – first and second cycles

Different Approaches to Coding and More on CAQDAS

There are different approaches to coding your data, independent of the coding cycle you are in. You can develop your codes as they emerge from your textual data (inductive or open coding, **«Sub-Module 5d»**), or you can use predetermined codes based on a particular theoretical framework or what you know about the literature (**deductive coding**, **«Sub-Module 5c»**). You can also use a combination of terms that come out of the data and preset codes (hybrid coding, **«Sub-Module 5e»**). We will address these three main coding approaches and the process of deciding among them in the next few sub-modules.

Activity 5a.1.

Take 15 minutes to examine 3-5 pieces of literature that you have gathered for your meta-synthesis.

Identify the coding approaches the authors have used. Is there a coding approach – deductive, inductive, or hybrid – that appears more frequently than others?

The specific coding approach that you choose for your own meta-synthesis will depend on your synthesis questions, theoretical framework, and the ultimate purpose of your work (e.g., theory development or confirming theory). We recommend that you choose the coding approach you will use before starting the first cycle of coding. If you are planning to use CAQDAS, this will allow you to decide which tools within the software will be most useful to you. CAQDAS will **not** code the data for you. You will also need to set aside time to learn to use it so that it is as useful as possible and so that it does not overwhelm the process. At the same time, you should be aware that you might need to change your coding plans to ensure the best fit between your coding approach and your project. If you do need to change your plans, you will need to go back to your chosen CAQDAS to ensure that it can accommodate the changes and that you have the best tools at your disposal for the work you are doing.

Additional Resources

- To learn more about CAQDAS, see this page of resources compiled by the Qual Page – https://qualpage.com/qda/
- For beginning scholars who want to learn more about coding, check out this website: "Learn to Code Qualitative Data" – https://getthematic.com/insights/coding-qualitative-data/
- If you are a beginning scholar who prefers learning via audio and video, check out the YouTube video "Beginner's Guide to Coding Qualitative Data" by Quirkos – https://www.youtube.com/watch?v=lYzhgMZii3o
- For a discussion of coding and how to do it by hand, check out the YouTube video "What Does Coding Look Like? Qualitative Research Methods" by Mod•U: Powerful Concepts in Social Science – https://www.youtube.com/watch?v=phXssQBCDls
- This book includes a description of a broad variety of coding approaches, and thus works as a guide or manual. It is one of the most broadly used references for data analysis in qualitative research – Miles, M.B., & Huberman, A.M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd edition). Sage.

References

Alonso, R.R. (2012). Work in progress: Understanding the experiences of women of color in engineering. In *2012 Frontiers in Education Conference Proceedings* (pp. 1-2). IEEE. https://doi.org/10.1109/FIE.2012.6462330

Creswell, J.W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd edition). Sage.

Saldaña, J. (2016). The coding manual for qualitative researchers (3rd edition). Sage.

Institute for Meta-Synthesis

Sub-Module 5b:
Creating a Codebook

Objectives

In this sub-module, you will learn:

- To understand what a codebook is and its purpose.
- To create a codebook for the intended meta-synthesis project.

Main Concepts

What is a Codebook?

A **codebook** is not a book, as the name inaccurately suggests. It is "a table or record that contains a list of … codes that researchers use for coding data" (Creswell, 2009, p. 187) that includes a title for the code, a description, and examples. Even if you begin with a priori codes (or in-hand codes) and their definitions prior to the official coding process, as you would in deductive coding, the codebook can evolve and change with the data as you code. A common way to format your codebook is to make and assign columns for code names, definitions for codes, and specific examples of the code from the textual data in your meta-synthesis. See Tables 5b.1 and 5b.2 below for examples of an abbreviated codebooks. Table 5b.1 shows the general structure, while Table 5b.2 shows the codes with their titles, definitions, and examples.

Codebooks are useful in terms of organizing your coding process, documenting your rationale for the use of particular codes, and making sure you are staying aligned with a theoretical framework, if you are using a framework to structure your meta-synthesis project. They are also helpful in providing a consistent understanding around the meaning of codes when you have multiple researchers working on the same project.

How to Create a Codebook

GETTING STARTED

Now, we will further explore how you can create your own meta-synthesis codebook by providing an overview of our team's process. You may use this process or a different one, depending on your project and your preferences. As will be discussed in **«Sub-Module 5c»**, **deductive coding** provides a set of codes from the literature and relevant theory, while **inductive coding**, which will be discussed in **«Sub-Module 5d»**, arrives at a set of codes developed from the data. **Hybrid coding**, which will be discussed in **«Sub-Module 5e»**, supports the development of a set of codes that integrate deductive and inductive codes.

From our experience, we recommend that you, either alone or in your research team, start with deductive coding by brainstorming about the repeated terms or commonly described phenomena that you are seeing in the literature as you are filtering through it and as you generate analytic memos. Include these terms or descriptive phrases and, if appropriate, any constructs from the theoretical framework you are using in your meta-synthesis in the first draft of your codebook. Along with the code names, make sure to provide good, detailed definitions of the codes as well as examples from the data that illustrate those codes. Begin coding. As you come across data that do not fit the deductive codes, start developing inductive codes. One way to bring together your deductive and inductive codes is by placing your inductive codes into your **parking lot** and developing them as you code, bringing inductive codes into your codebook once they have substantial definitions and examples. The parking lot is where you can temporarily place codes that seem relevant to your meta-synthesis project but require further development and evidence.

In some cases, you may inductively find data that fits your deductive codes, but they may bring a new nuance to the code. Make sure to record this nuance of your deductive code through inclusion of definitions and examples. Throughout the process, you will probably make changes to the codebook as you come across data that do not align with your a priori codes or if you feel like your current codes are too broad. Remember that the construction of a codebook is an iterative process that involves making coding decisions. You should keep track of these decisions in your codebook as well; it will assist you when it comes down to writing up your meta-synthesis methods for publication. In our team, we have addressed this in a couple of different ways: (1) having a running document listing all the changes made to the codebook and the dates the changes were made, and (2) using a notation system within the codebook for codes that have been newly added. As you can see, the codebook is a living document that evolves throughout your coding process.

STRUCTURING THE CODEBOOK

As we build the codebook, we want to think about how the different codes go together and how they relate to each other. Do you have different categories of codes? For example, you may have some codes that have to do with people, others that have to do with places, and others that have to do with curriculum. You may want to organize the codes in those three categories. Do you have codes that are different aspects of the same idea or phenomenon? For example, you may have a code that refers to stereotypes, another that refers to microaggressions, and a third one that refers to harassment. You may want to bring them together under one larger umbrella term or phrase (also known as a **primary code**) that encompasses different forms of discrimination. In such a structure, you would have categories of codes (e.g., people, places, curriculum), primary codes (e.g., forms of discrimination), and **secondary codes** (also known as sub-codes; e.g., stereotypes, microaggressions, and harassment). Such a way of structuring your codebook could look as follows:

1. Category
    1.1. Primary Code
        1.1.1.Secondary Code
        1.1.2.Secondary Code
    1.2. Primary Code
2. Category
    2.1. Primary Code
        2.1.1.Secondary Code

Let us now look at the example of how our team developed and structured the codebook for one of our systematic thematic synthesis projects.

Codebook Example

In this example, we will go through the creation of the codebook for the meta-synthesis on women of color in undergraduate engineering education. A modified example of our overall coding structure for the meta-synthesis is detailed in Table 5b.1 and Table 5b.2. Both tables illustrate the titles, definitions, and examples of codes that were part of our codebook. We had previously done meta-syntheses on women of color in other STEM disciplines, so we had the codebooks we had already produced.

We had developed three categories of codes: person, action, and time stamp. We also had other codes, which included a "parking lot," recommendations, and "golden" quotes. As mentioned earlier, the parking lot is where we kept codes that seemed to be relevant for the current project. Some of the codes that started in the parking lot stayed there because they did not rise to the relevance we had expected them to reach (e.g., work/life & school/life balance), while other codes were moved to an appropriate category because they did reach sufficient relevance (e.g., giving back/activism). When we refer to a code rising to sufficient relevance, it means that there is enough evidence supporting the code. It is not simply one short instance, but a phenomenon that appears repeatedly or that appears with depth and nuance in the data. The recommendations code included explicit or implicit recommendations by the authors of the literature. **Golden quotes** were quotes that provided particularly insightful or illustrative examples of the code we were applying and are thus double coded.

For the project on women of color in undergraduate engineering education, we decided to keep the overall coding structure. We also kept many of the codes that we had previously used, but made several changes based on what we had learned since our previous meta-synthesis and based on inductive coding of our memos. For example, we integrated the construct of social pain in our 2020 meta-synthesis on women of color in undergraduate engineering education (Ong et al., 2020) in this codebook by introducing the primary codes of *Belonging/Social Comfort* and *Not-Belonging/Social Pain*. Through inductive coding, we added the secondary code of *Economic Considerations* to our *Identification/Self-Expectations* primary code. We considered this secondary code an intrinsic part of the overall *Identification/Self-Expectations* primary code because it was related to the interest and passion that individuals in the literature had for engineering. See Table 5b.1 for more details on how we organized the categories, primary codes, and secondary codes.

Table 5b.1. Example of codebook structure for Synthesis on Women of Color in Engineering (*PI: Ong, NSF-1427129)*

1) Person/Support Entity	3) Action/Type of Support (or lack thereof)
a) Advisor/Supervisor b) Family c) Peers/Social Group d) Teacher/Professor e) Mentors f) Internship g) Support Programs h) Institution/Department	a) Identification/Self-Expectations a) Economic considerations b) Navigation c) Social Comfort d) Social Discomfort b) Isolation ii) Prove-it-again iii) Recognition/Reputation iv) Spotlighting v) Microaggressions e) Giving Back/Activism
2) Time Stamp	**4) Parking Lot**
a) Undergraduate b) Graduate c) Workplace d) Transitional Period(s) e) Other Time Periods	a) Work/Life & School/Life Balance b) Other
	5) Recommendations
	a) For Institutions/Departments/Faculty b) For Women of Color c) For Future Researchers d) Other

Table 5b.2. Example of an abbreviated codebook

Primary Code	Definition
Action/Type of Support	
Identification	Factors causing strong identification or dis-identification with STEM content. **Example:** "I have always been good at math and I really enjoyed learning how to take things apart and put them together."
Navigation	Strategies or mechanisms used to persevere on the STEM school and career path, or cope during hard times in STEM. **Example:** "My mentor helped me identify different internship opportunities that helped me further my engineering skills."
Social Comfort	Factors causing the participant to relate to people (peers, teachers/professors, advisor, etc.) in the social context of the participant's STEM climate to be easier or more difficult. **Example:** "What really helped me stay motivated was my engineering student group, where I felt welcomed and seen as an engineer."

Social Discomfort	Factors causing the participant to not relate well to people (peers, teachers/professors, advisor, etc.) in the social context of the participant's STEM climate. **Example:** Many women of color participants in this study described how they felt they were the only ones in their engineering classrooms. Oftentimes, they had trouble finding peers who would want to complete assignments with them.
Giving Back/Activism	STEM-related volunteer or part-time paid work to increase recruitment and/or retention of others (e.g., women, minorities, low-income kids) in STEM; "doing good," as far as outreach or community service related to STEM; looking out for others; communal responsibility with regard to STEM-related work. **Example:** "Participants in this study shared how they pursued engineering as a way to serve as a role model for young women of color to see that they could also pursue engineering too."
Person/Support Entity	
Advisor/ Supervisor	The degree program or STEM program advisor in an academic setting; the supervisor in a work setting.
Family	Member of her family, including parents, significant other, siblings and extended family.
Peers/ Social Group	Groups, or non-family individuals, can be in either STEM or non-STEM contexts.
Teacher/ Professor	The participant's teacher or professor; includes other professors at the participant's university that may not be directly teaching the participant. May also include teacher's assistant.
Mentors	Mentor or role model (positive or negative influence) that does not fall under any other codes listed above.
Internship	Short-term jobs, including co-ops and internships, in STEM field while as student.
Support Programs	Social & content-based group, e.g., STEM diversity conferences, STEM school clubs, affinity groups for women or minorities, programs providing preparation for future studies or careers, community training programs.
Institution/ Department	The academic or workplace administration; program staff; department staff; other person at her institution or organization that's not an advisor, teacher, professor, or peer.
Time Stamp	
Undergraduate	Findings on undergraduate school (or any formal education between high school and graduate school education, e.g. technical or associate's degree, or just courses), or events that occur during that time frame.
Graduate	Findings on graduate school, or events that occur during that time frame

Transitional period(s)	Findings on school, work, specific roles, or events that occur between high school and undergrad; between undergrad and grad school; and between work-to-school or school-to-work, and work-to-other work transitions. May also mean "over time," e.g., changes measured over time in a longitudinal study across more than one life stage.
Other Time Periods	This includes homemakers and unemployed, unspecified periods of time that do not fit the other time stamps (e.g., during childhood, as I was growing up, I have always done this), during elementary and secondary school, or unknown periods of time. This also includes when the time period is unclear.
Parking Lot	
Work/Life & School/Life Balance	The balance between school and/or work and life (e.g. family and childcare, convenience and benefits of job and location, flex time, part-time, support from leadership); includes institutional policies, concerns for future balance issues, and understanding/description of what a typical schedule in her field is like; encouragement or desire to pursue activities, hobbies, and other interests outside of STEM, and its fit or conflict with STEM culture.
Other	Use this code when you the other codes above do not appear to be appropriate for the section you are coding; refer to this code after the coding process to identify how it should be coded.
Recommendations	
Recommendations for Institutions/ Departments	Advice that the literature provides for departments, institutions, and other structured organizations related to WOC student retention.
Recommendations for Women of Color	Advice that literature provides for women of color.
Recommendations for Future Researchers	Advice that the literature provides for future researchers.

We developed the *Economic Considerations* secondary code because, by reading the literature, we found that authors and their participants talked about the desire to have better lives through accessing well-paying jobs in the engineering industry. This was part of their drive to pursue and persist in engineering. We considered that this secondary code – *Economic Considerations* – **was** a factor that caused women of color in the literature to identify or dis-identify with engineering content. Thus, it belonged in the *Identification/Self-Expectations* primary code. See Table 5b.3 for an example of a primary code with this secondary code, along with its title, definition, and examples.

Table 5b.3. Example of an extended code with title, definition, and examples

Title of code	Category: Action / Type of Support > Primary code: Identification/Self-Expectations
Definition of code	Factors causing strong identification or dis-identification with Engineering/STEM content, including: • feelings or observations of fitting in via content competence or incompetence; • increasing or losing desire for the field; • wanting to switch out of field; • how a participant sees herself or what she expects of herself (abilities, confidence level, fit) in Engineering/STEM; • self-recognition as a "science person" or expressions of self-efficacy • academic/disciplinary/professional identity: how participant's sense of self is associated with academic activities and perceived success • self-motivation: why she is getting into Engineering/STEM, why she does/wants to do Engineering/STEM; • internal factors (e.g., resilience, grit, stubbornness, personality traits, personal philosophies, intrinsic motivation) that enable persistence in Engineering/STEM. **Secondary Code: Economic considerations.** Expectation/intention to find a job, make money, and/or stop having financial difficulties. NOTE: Accepting or rejecting scholarships is part of navigation.
Examples	**Primary code: Identification/Self-Expectations.** E.g., "My father always says that I came up with the most challenging questions as a kid. Hearing those stories reinforces who I am. This is what makes me good at engineering. I know how to ask the right question, how to dig deeper." **Secondary Code: Economic considerations.** E.g., "Seven of the participants indicated another factor in their decision to major in computer science was they knew they would be able to find a well-paying job upon graduation. Gloria explained her decision to change majors to engineering by saying, 'Being able to find a job after graduation was a huge consideration on my part.'"

Often codes have two sides, such as *Social Comfort* and *Social Discomfort*. In such cases, meta-synthesis authors need to consider to what extent these need to be separate codes or secondary codes stemming from a primary code. We decided that, in this case, we expected that they needed to be separate primary codes based on our experience in our previous meta-synthesis work. In other cases, such as mentoring, there were concepts that had more than one dimension. We had found that the literature included participants who searched for mentors, or people who could help them navigate their career path; the literature also included participants in

studies who chose to serve as mentors to others, such as girls of color in K-12. In this case, we had to think about whether both of these dimensions of mentoring belonged together. We decided that they did not and separated them into *Finding Mentors* and *Being a Mentor*. We considered *Finding Mentors* was part of the *Navigation* primary code because participants in studies were trying to navigate the engineering environment by looking for guides. We decided that *Being a Mentor* was part of the *Giving Back/Activism* primary code because the main thrust behind being a mentor was to help others navigate the engineering environment.

We hope that these examples help illustrate the types of decisions that you will need to make when developing your own codebook. It is not a straightforward process, but one where you will need to reconsider your codes and how you structure them in an iterative manner. To demonstrate the extent to which this is an iterative process, we will share that in one of our previous projects, our team had a total of 18 versions of the codebook before the final one.

References

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd edition). Sage.

Ong, M., Jaumot-Pascual, N., & Ko, L. T. (2020). Research literature on women of color in undergraduate engineering education: A systematic thematic synthesis. *Journal of Engineering Education*, 109(3), 581-615. https://doi.org/10.1002/jee.20345

Institute for Meta-Synthesis

Sub-Module 5c:
Deductive Coding

Objectives

In this sub-module, you will learn:

- To understand what deductive coding is and its purpose.
- To code using deductive coding for your meta-synthesis project.

Main Concepts

What is Deductive Coding?

Deductive coding is a top-down method by which you use predetermined codes based on a particular theoretical framework, what you know about the literature, or your synthesis questions (Patton, 2002). You let the theory guide the data analysis. You develop your **codebook** (see **«Sub-Module 5b»**) before coding with an initial set of codes from the selected theory. This codebook will typically include the name of the codes, a definition for each code, and then a specific example pulled from the literature. Often, the goal of deductive coding is to confirm an established theory rather than to generate your own theory. The process involves matching the data with the predetermined codes that you develop from the theory. Deductive coding would be an example of first cycle coding (see **«Sub-Module 5a»**) as a first approach to the data (Saldaña, 2016).

How to Conduct Deductive Coding

Before starting to code, you will develop your codebook by taking the main topics in the theoretical framework, synthesis questions, and/or other literature that you have chosen and writing them up as codes (i.e., name of the code, definition, and example). Once you have developed the codebook, it is time to assign codes to excerpts of text. In the case of our team, we code the memos that we have created. Others conducting meta-synthesis work who do not use memos may code directly from the full-text literature in their set.

It is likely that existing theory does not account for everything that you find in your data, making it necessary to adjust the codebook as needed when you come across an observation that does not fit the pre-established codes. You may need to expand the definition of a code so that the new data fits, or you may need to create new codes because the original codes cannot explain the new data. When this happens, you are starting to move into hybrid coding, which we will see in more detail in **«Sub-Module 5e»**. The goal is to move from broad categories based in theory to specific examples from the data that support those categories. In the end, you

should be able to determine whether or not the theoretical framework can fully explain the data. Any data that is not accounted for by the theoretical framework has the potential to expand it and add a contribution to the theory.

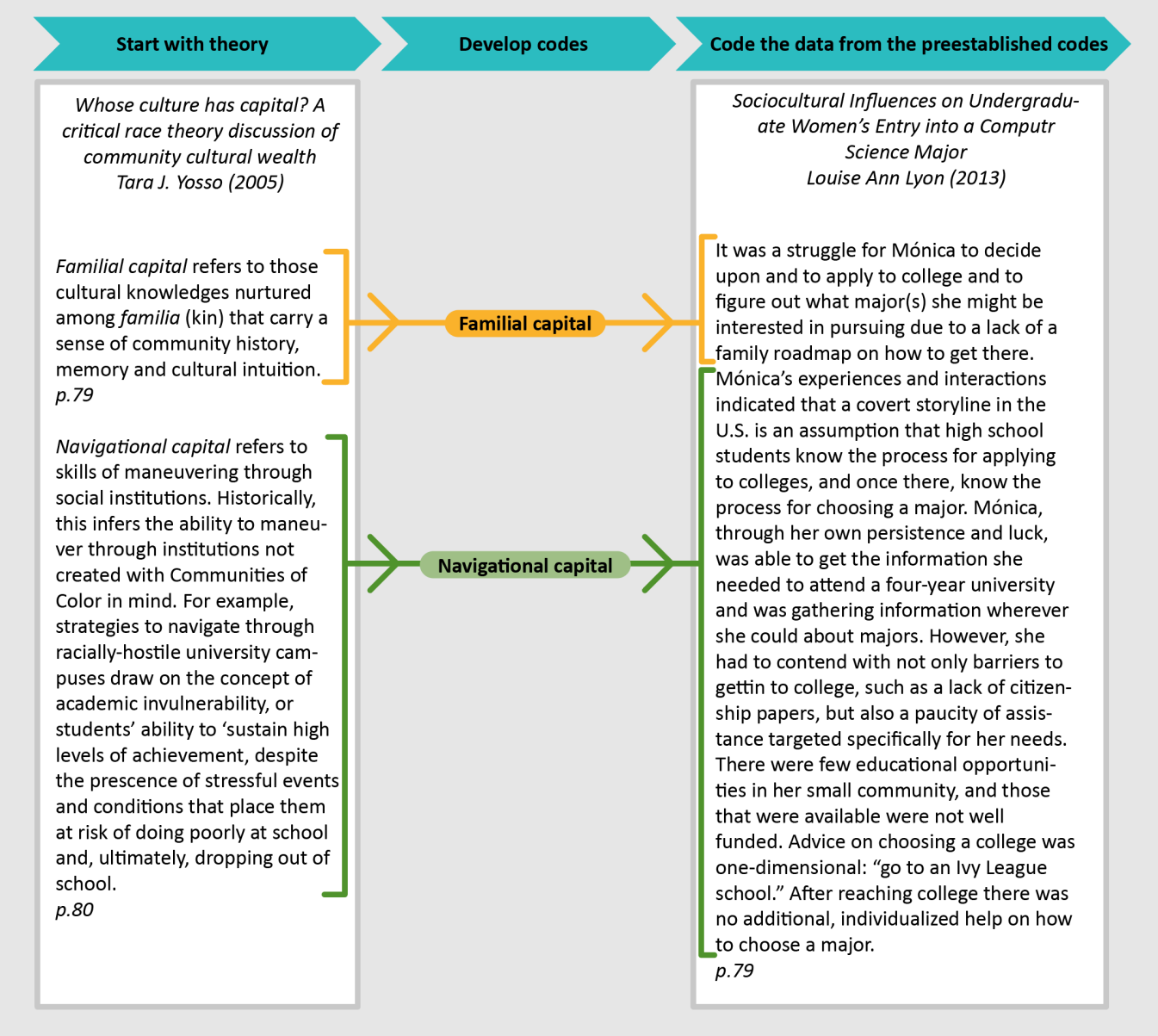

Figure 5c.1. From codes to data in deductive coding

Let us think through the example shown in Figure 5c.1, with data taken from our team's meta-synthesis on women of color undergraduate students in engineering. If you are using Tara Yosso's (2005) theory of community cultural wealth, one concept that may be used as a code would be **familial capital**, marked in yellow, which is defined as "the cultural knowledge nurtured among family members that carry a sense of community history, memory, and cultural intuition" (p. 79). In this case, the term **familial capital** becomes the code with which you code your own literature. Here it applies to a piece in our team's meta-synthesis, where the author

describes how Monica, an undergraduate student, struggled to pick a major due in part to a lack of family guidance. Similarly, you may use **navigational capital**, marked in green, as one of the codes.

As you have seen, you should let your codebook evolve during your analysis so that it can incorporate new conceptualizations. At the same time, it should still reflect the structure of your pre-selected theoretical framework at the end of your analysis. When you go to write up your findings later, you will then be able to discuss how you utilized the theoretical framework as well as how your work expands upon the theory.

Activity 5c.1.

Take 20-30 minutes to choose a theoretical article that you identify as key to the topic you chose for your meta-synthesis. Create a list of deductive codes with definitions and examples based on this article.

Activity 5c.2.

Once you have developed an initial deductive codebook, take 20-30 minutes to practice coding deductively with your analytical memos (or a piece of literature) from your meta-synthesis study. For an example of a coded memo, see "IMS-Alonso_Memo-Coded", which you can access in Appendix 5c.

Activity 5c.3.

Take 20 minutes to find a deductive code that you have created that has two or more dimensions. Remembering what you learned about categories and primary and secondary codes in Sub-Module 5b, think about how you will structure the code if it has two opposite sides or if it has multiple dimensions (i.e., more than two sides). Record your decisions and rationale in your codebook.

Additional Resources

- For an example of a coded analytical memo, see the Alonso (2012) memo the Institute for Meta-Synthesis Team created, which you can find in Appendix 5c labelled “IMS-Alonso-2012-CodedMemo".

References

Lyon, L. A. (2013). *Sociocultural influences on undergraduate women’s entry into a computer science major* (Publication No. 3588781) [Doctoral dissertation, University of Washington]. ProQuest Dissertations Publishing.

Patton, M. Q. (2002). *Qualitative research and evaluation methods.* Sage.

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Appendix 5c. Alonso 2012 Coded Memo

Who writes memo: Christina B. Silva
Date: 5/20/2021
Reference:
Alonso, R.R. (2012). Work in progress: Understanding the experiences of women of color in engineering. In *2012 Frontiers in Education Conference Proceedings* (pp. 1-2). IEEE. https://doi.org/10.1109/FIE.2012.6462330

Main Ideas [in our words & supporting quotes with proper citation]:

“Being Recognized as an Engineer” (p.1)

Person/support entity > *Professor*

Action / Type of Support > *Belonging*

Time stamp > *Undergraduate Experiences*

Memo Writer Summary: *In this study (focused on 9 women of color students – African American, Black, Hispanic, or Latina undergraduates majoring in engineering), the author identified that being recognized as an engineer in a positive way was significant to the participants’ experiences at their campus. For example, Ana shared how being welcomed into the department by the staff helped “reinforce” her goal of completing her degree.*

Author Summary: "The idea of being recognized in a positive way as an engineer was a key element in the students' experiences on campus. The students discussed instances of recognition from staff, faculty, family, and friends. Ana described the warm welcome from staff in her department as a positive experience that reinforced her goal of attaining the engineering degree" (p. 1)

Evidence: "I remember going to the head of the department for funding for a [National Conference], and we got into the topic...[The staff said] "Hey you should come around more often, we do recruiting, we would love to see more female Hispanics here." They're very excited about having females in [Engineering Major] especially Hispanics because I think I'm the only one. I like it. They embrace it and I appreciate the way that they treat me in the department. (Ana, 3rd year)" (p. 1)

"Feeling like a 'Minority'" (p. 1)

Person/support entity > *Advisor*

Action / Type of Support > *Social Discomfort*

Time stamp > *Undergraduate Experiences*

Memo Writer Summary: *In this study (focused on 9 women of color students – African American, Black, Hispanic, or Latina undergraduates majoring in engineering), the author noted how all participants discussed how it felt like being a minority, and how being a minority had both positive and negative influences on their experiences as an undergraduate engineering major. For example, some participants discussed a sense of isolation and encountering stereotypes. On the other hand, others acknowledged that their minority status afforded them certain opportunities.*

Author Summary: "Even though the word minority was not used in any of the communication with the participants, it was voiced by all of the students in different ways. Some discussed the idea of being the only one, with respect to their gender or race/ethnicity on campus, others discussed seeing more opportunities because they are a minority, and experiencing stereotypes." (pp. 1-2)

Evidence: "Kiara talked about seeing more opportunities because of her race and gender. Her representative quotation below illuminates the idea of how being a minority had positive and negative consequences. I've been getting a lot of opportunities just because of my gender and race. I get the double shot. It's like they're both working against me and for me at the same time, so it kind of breaks even… I was discussing with the [administrative staff] about reapplying, he's like Kiara, you have three things going for you right now…you're Black, you're female, and you're transferring from out of state. Use it, use it, use it! That really broke my heart. (Kiara, 2nd year)" (p. 2)

"Perceptions" (p. 2)

Person/support entity > *STEM Peer/Support Programs*

Action / Type of Support > *Social Discomfort*

Time stamp > *Undergraduate Experiences*

Memo Writer Summary: *In this study (focused on 9 women of color students – African American, Black, Hispanic, or Latina undergraduates majoring in engineering), participants described the negative interactions due to the perceptions other people had about their identity as an engineer. Some participants noted that these negative perceptions were due to their racial identity or their gender identity. For instance, one participant shared how engineering societies assumed she was not an engineering major and she attributed this lack of recognition to her ethnicity.*

Author Summary: "The students discussed situations were others' perceptions of them as engineers mattered or had a role in their experiences. In a lot of ways, "perceptions" is opposite to positive recognition – when talking about perceptions students referred to negative experiences they encountered at the university." (p. 2)

Evidence: "Jessica shares her encounter with fellow engineering students in the beginning of the semester when student organizations set up booths to recruit other students. This story was in response to my question about what kind of a role her ethnicity plays in her experiences as an engineering student. I got completely ignored by engineering societies I walked up to them and asked a question and they said "hmmm, this is for engineering students" and I looked at them and said "I'm an [Engineering Major]" (Jessica, 3rd year)" (p. 2)

Recommendations/Acknowledgement of Gap in Literature/More Investigation (not explicitly a recommendation):
No recommendations included in this study.

Institute for Meta-Synthesis

Sub-Module 5d:
Inductive Coding

Objectives

In this sub-module, you will learn:

- To understand what inductive coding is and its purpose.
- To be able to use inductive coding in the intended meta-synthesis project.

Main Concepts

What is Inductive Coding?

Inductive coding, or open coding, is a method by which you develop your codes as they appear in your textual data (Strauss & Corbin, 1998). You are moving from specific observations that you are drawing from the data and generating your own codes, categories, and themes, rather than starting with a preset list of codes (as we did in deductive coding in **«Sub-Module 5c»**). Inductive coding is considered to be a bottom-up approach, as you are creating codes that are rooted in the data and looking at patterns with the aim of developing theory.

Oftentimes, researchers engaging in inductive coding begin by using participants' words (or in our case, authors' words) to code the data, and these codes are then modified throughout the coding process as new information or new insights are developed. Inductive coding is particularly useful in areas where there is little existing theory, there is little data about the topic of research, or if the goal is to contribute to theory development through the expansion of previous theory or through the creation of new theory. Those using inductive coding need to be aware that even if the goal is to develop theory, that is not always the outcome. It is also often used as a first cycle coding to do a first approach to the data (see **«Sub-Module 5a»**).

How to Conduct Inductive Coding

As mentioned in **«Sub-Module 4b»**, it is recommended that you read through the selected textual data first, jotting down notes in the margins of the articles or the memos you developed for your meta-synthesis. After going through several of the papers or memos, make a list of topics, clustering similar ones together as categories. Use the list and return to the pieces of literature or memos you reviewed to see how the codes align. You can write the codes from your list next to the appropriate segments of text. You can go line-by-line for a more detailed approach to your data or by paragraphs for a more general view.

As we noted in «Sub-Module 5b», you may need to either lump more specific codes into more general ones or split your initial more general codes into more specific ones. If you choose to code line-by-line, you may need to reduce the list of codes by lumping them into larger categories that are more descriptive. If you choose to code in larger segments, you may need to break your codes into more specific ones that help you to understand the inner workings of a code. The process of inductive coding is iterative; thus, you should be frequently going from your codes to the raw data and back again, evaluating how your codes "fit" the data and the patterns that you are seeing. The goal is to move from codes to broader categories and then to generate themes. In the end, those themes are used to form the basis of your findings or to develop a theoretical framework (or expand an existing theoretical framework) to explain your synthesis data. We will cover thematic analysis in «Sub-Module 6a». See Figure 5d.1 for an illustration of how inductive coding moves from data to codes.

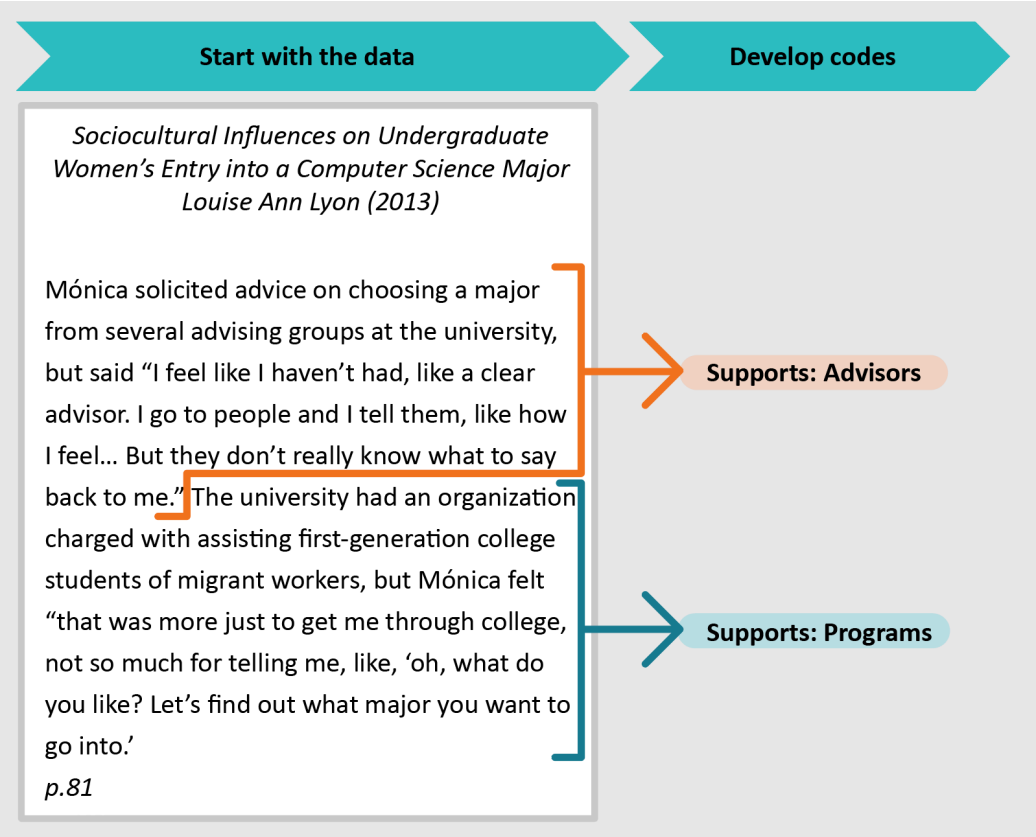

Figure 5d.1. From data to codes in inductive coding

Let us think through an example to illustrate how we may use inductive coding in a meta-synthesis on the experiences of women of color in undergraduate engineering education. Imagine that you have read through memos you generated using literature on women of color in undergraduate engineering education. You start to notice that the women in the literature talked about how different people in their engineering departments, for example, played an influential role in their motivation and persistence in their studies. This could be a first code called *influential people*.

As you continue coding, you notice that some of these influential people function as barriers and others as supports. This will mean splitting your original code of "influential people" into two different codes ("influential people: barriers" and "influential people: supports") and going back into previously coded memos to recode them according to the new, more nuanced codes. Your process might be the opposite and you may start with smaller codes, such as "barriers" and "supports" that you may need to lump together into more general codes. In either case, you will engage in an iterative process where you need to revisit previously coded material in order to recode with your new, more refined codes.

As we noted in **«Sub-Module 5b»**, you will keep track of your codes, definitions, and examples in your codebook. With inductive coding, you will need to update the codebook as needed. The specific process you use for coding and re-coding may be slightly different depending on whether you are working in a team or on your own. It will also depend on whether you have chosen to utilize computer-assisted qualitative data analysis software (CAQDAS) or to code by hand. In any case, this process will mean that you will need to return to pieces you have previously coded and that you keep track of where you are in the process.

Activity 5d.1.

Using your analytical memos from Sub-Module 4c, or a piece of literature from your meta-synthesis study, take 20 minutes to practice inductive coding. An example of a coded memo, "IMS-Alonso_Memo-Coded", may be found in Appendix 5d.

Activity 5d.2.

Take 20 minutes to find an inductive code that you have created that has two or more dimensions. Remembering what you learned about categories and primary and secondary codes in Sub-Module 5b, think about how you will structure the code if it has two opposite sides or if it has multiple dimensions (i.e., more than two sides). Record your decisions and rationale in your codebook.

Additional Resources

- For an example of a coded analytical memo, see the Alonso (2012) memo the Institute for Meta-Synthesis Team created which you can find in Appendix 5d labeled “IMS-Alonso-2012-CodedMemo".
- For examples on inductive versus deductive coding, check out “Inductive or Deductive? Two Different Approaches” from the website, The Principles of Sociological Inquiry: Qualitative and Quantitative Methods here – https://saylordotorg.github.io/text_principles-of-sociological-inquiry-qualitative-and-quantitative-methods/s05-03-inductive-or-deductive-two-dif.html

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Creswell, J.W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd edition). Sage.

Strauss, A.L., & Corbin, J.M. (1998). *Basics of qualitative research techniques: Techniques and procedures for developing grounded theory* (2nd ed.). Sage.

Institute for Meta-Synthesis

Sub-Module 5e:
Hybrid Coding

Objectives

In this sub-module, you will learn:

- To understand what hybrid coding is and its purpose.
- To understand how to conduct hybrid coding.
- To be able to use hybrid coding in the intended meta-synthesis project.

Main Concepts

What is Hybrid Coding?

Hybrid coding is a method that uses both inductive and deductive coding practices; it is a melding of emergent codes that are generated from the data with theory-driven codes (Federay & Muir-Cochrane, 2006). As we have seen in **«Sub-Module 5a»**, this coding approach is one of many and you will need to choose a coding approach according to your methodology, theoretical framework, and synthesis question. This approach has the advantage of allowing you to structure your meta-synthesis project around your research questions and theoretical framework while providing the flexibility to let you develop themes directly from the data. Hybrid coding would be an example of **second cycle coding**, where we approach the data to create relationships between the codes we have applied in the first cycle of coding (Saldaña, 2016).

How to Conduct Hybrid Coding

To conduct hybrid coding, you will need to use a combination of the processes described in **«Sub-Module 5d»** (inductive coding) and **«Sub-Module 5c»** (deductive coding) to create your codebook, which is the document that lists all the codes for a project with descriptions and examples (see **«Sub-Module 5b»**). Our team usually starts with deductive coding by creating a codebook based on theory and our knowledge of the field. Then we apply the deductive codes to our data to see what fits and what does not fit. When we identify data that does not fit our deductive codes, we inductively develop new codes that complement the codebook, making sure to develop them in the same format as the rest of the codes, with titles, definitions, and examples.

Sometimes, we are unsure whether the new, inductively developed code will be relevant for the overall analysis or if there will be enough data to substantiate it. When that is the case, we save the code in the **parking lot**

(see **«Sub-Module 5b»**), which is a section of the codebook where we keep codes that are underdeveloped or whose relevance still need to be determined. Codes stay in the parking lot until we have used them to code sufficient data. Having sufficient data means that it provides the basis for a good description and illustrative examples of the code. Once a parking lot code reaches that point, it becomes part of the overall codebook. Some codes stay in the parking lot and do not make it into the overall codebook. As the process of moving codes into and out of the parking lot exemplifies, hybrid coding is a reflexive and iterative process. See Ong et al. (2020) pages 12 and 13 for an example of how we have conducted this process in a qualitative meta-synthesis.

Once you have systematically gone through the data with both your deductive and inductive codes, begin to connect the codes and identify and cluster patterns in the data. The final stage of hybrid coding is a further grouping of the patterns that were previously identified from the coded text into hybrid codes and confirming that they are still representative of the initial data analysis and assigned codes. They should also align with your research questions.

Hybrid Coding Example

Let us look at an example. Imagine that you are conducting a qualitative meta-synthesis on the experiences of women of color undergraduates in engineering education using community cultural wealth (Yosso, 2005) because you want to maintain an asset-based perspective.

For your **deductive coding**, you may decide to use the theory's six types of capital as the basis for your coding framework. These codes would include aspirational, linguistic, familial, social, navigational, and resistant capital. As you apply the codes to your analytic memos or the literature, you may find that some codes are very useful. For instance, aspirational capital ("the ability to maintain hopes and dreams for the future, even in the face of real and perceived barriers," Yosso, 2005, p. 77) may apply to literature about motivation and persistence. However, you may also find that a lot of the literature includes discussion of barriers and takes a deficit-based perspective. You may realize that if you want to keep that literature in your synthesis, you need to include a set of **inductive codes** around barriers. You would conduct inductive coding to identify the different types of barriers, such as lack of accommodations, stigma, and stereotyping. Then you would work iteratively to integrate the two sets of codes (deductive and inductive codes) into your hybrid **codebook** so that you can apply them to your dataset. See Figure 5e.1 for a graphic representation of how you would conduct hybrid coding by moving from deductive coding to inductive coding.

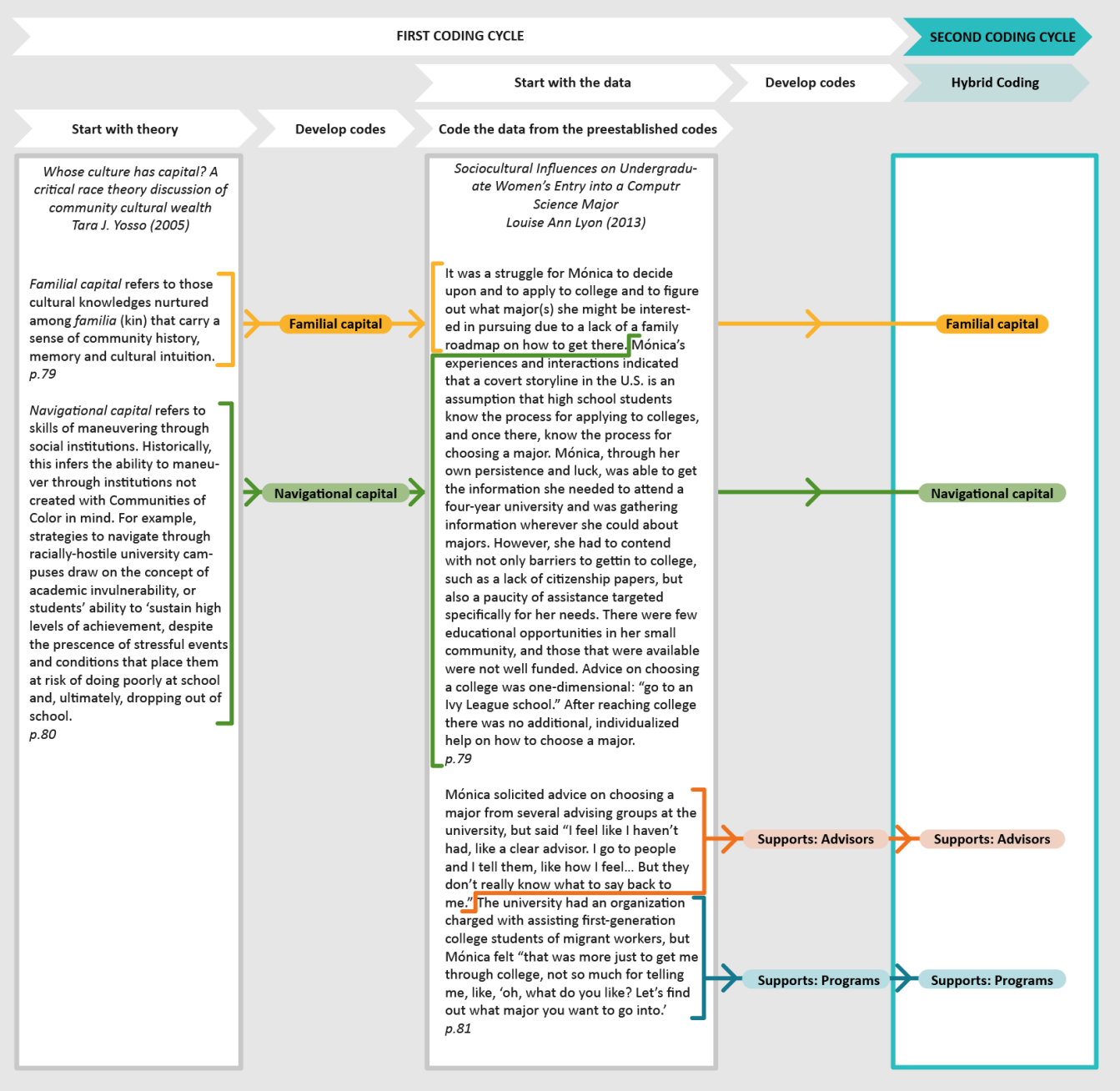

Figure 5e.1. The process of hybrid coding

Activity 5e.1.

Take 30 minutes to bring together the codes that you developed deductively (Sub-Module 5c) and inductively (Sub-Module 5d) and put them into one codebook.

- Are there codes that you had in both sets of codes? Which ones? Why do you think that is the case?
- Are there codes that you had in one set of codes but not the other? Which ones? Why do you think that is the case?

Activity 5e.2.

Take 30 minutes to practice conducting hybrid coding with your synthesis memos (see Sub-Module 4c). If you do not have memos, practice coding directly using 1-2 pieces of literature included in your data set.

- Which codes do you decide to put in the parking lot?
- Record the rationale behind the decisions in your codebook.

Activity 5e.3.

Take 10 minutes to think about the following: Now that you have experienced inductive, deductive, and hybrid coding, which of these approaches to coding is appropriate for your meta-synthesis? Why?

References

Creswell, J.W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd edition). Sage.

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods*, *5*(1), 80-92. https://doi.org/10.1177/160940690600500107

Ong, M., Jaumot-Pascual, N., & Ko, L. T. (2020). Research literature on women of color in undergraduate engineering education: A systematic thematic synthesis. *Journal of Engineering Education*, 109(3), 581-615. https://doi.org/10.1002/jee.20345

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Institute for Meta-Synthesis

Module 6:
Analysis – Third to Fifth Cycles

Sub-Module 6a:
Thematic Analysis

Objectives

In this Sub-Module, you will learn:

- To understand what thematic analysis is.
- To understand how to conduct thematic analysis.
- To practice thematic analysis in the context of the intended meta-synthesis project.

Main Concepts

At the end of this sub-module, we will have seen the last stages of a meta-synthesis project, which means that we will have started writing sections that we can use as part of a meta-synthesis manuscript. In module 7, we will go through the process of writing and publishing a meta-synthesis; so we will have the opportunity to review some of the concepts in this sub-module again.

Thematic Analysis

Thomas and Harden (2008) argue that the use of coding line by line enables you "to undertake what has been described as one of the key tasks in the synthesis of qualitative research: the *translation* of concepts from one study to another" (p. 5). This sub-module is dedicated to showing you how to do just that using thematic analysis.

WHAT IS THEMATIC ANALYSIS?

Thematic analysis is a specific data analysis method that consists of the identification of themes, or the process of unifying ideas across codes and code categories. This can be done within a single study or across multiple

studies. Given that we are working within the context of a thematic synthesis (which is a type of meta-synthesis, as we saw in Module 1), thematic analysis is the type of third cycle analysis we use (see Figure 1), and we implement it across the multiple studies included in our literature set. Thus, within a literature meta-synthesis, such analysis "involves the identification of prominent or recurrent themes and the summarization of the findings" of multiple studies included in the meta-synthesis (Heyvaert et al., 2017, pp. 184, 186). The advantages of using a thematic approach are that it provides a structure to identify important themes, to attend to themes that arise frequently, and to explore whether and how themes align with the synthesis questions.

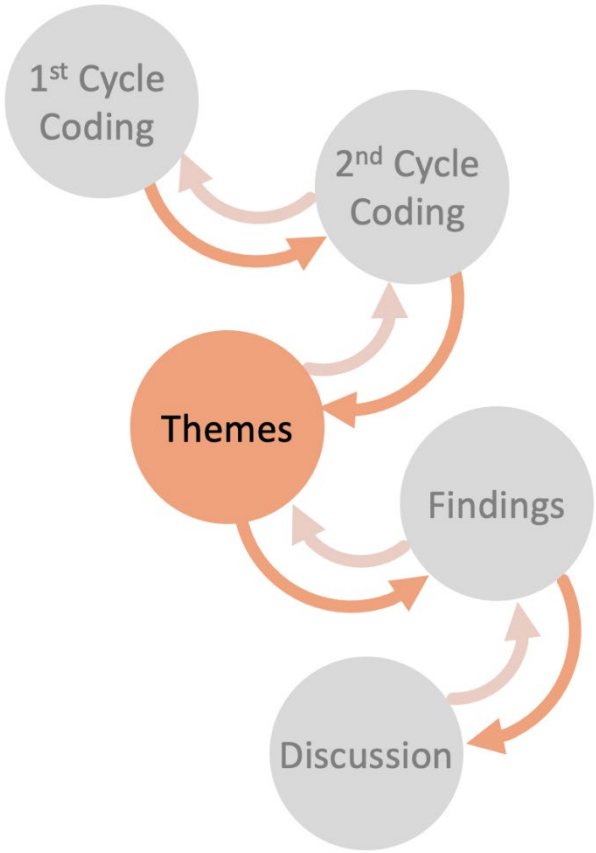

Figure 6a.1. Five cycles of analysis – third cycle

HOW TO CONDUCT THEMATIC ANALYSIS

Thomas and Harden (2008) suggest using a three-staged approach to doing thematic analysis.

- Code literature studies using the strategies described in **«Module 5»**.
- Develop **descriptive themes** (see Figure 6a.2 below, arrow A), which are themes that stay close to the primary studies (i.e., the literature in your data set). This means that they should closely represent what was found in those studies. You should organize the codes and code categories by looking at similarities and differences between them. Based on what you see, generate descriptive themes, and then you can group together codes that relate to the same topic, concept, metaphor, or idea. Make sure to keep track of which codes were grouped into which theme and your rationale for putting them in that theme.

- Generate **analytical themes** (see Figure 6a.2 below, arrow B) to cluster your descriptive themes. Analytical themes "represent a stage of interpretation whereby the reviewers 'go beyond' the primary studies and generate new interpretive constructs" (Thomas & Harden, 2008, p. 1). They can be more abstract than your descriptive themes, but they ultimately need to be able to describe or explain all your descriptive themes as well as address your research questions. See Figure 6a.1 for an illustration of the theme development process as developed by our team. Remember that, as we stated in **«Sub-Module 5d»**, inductive coding does not always result in theory development, even when it is the original purpose of the study.

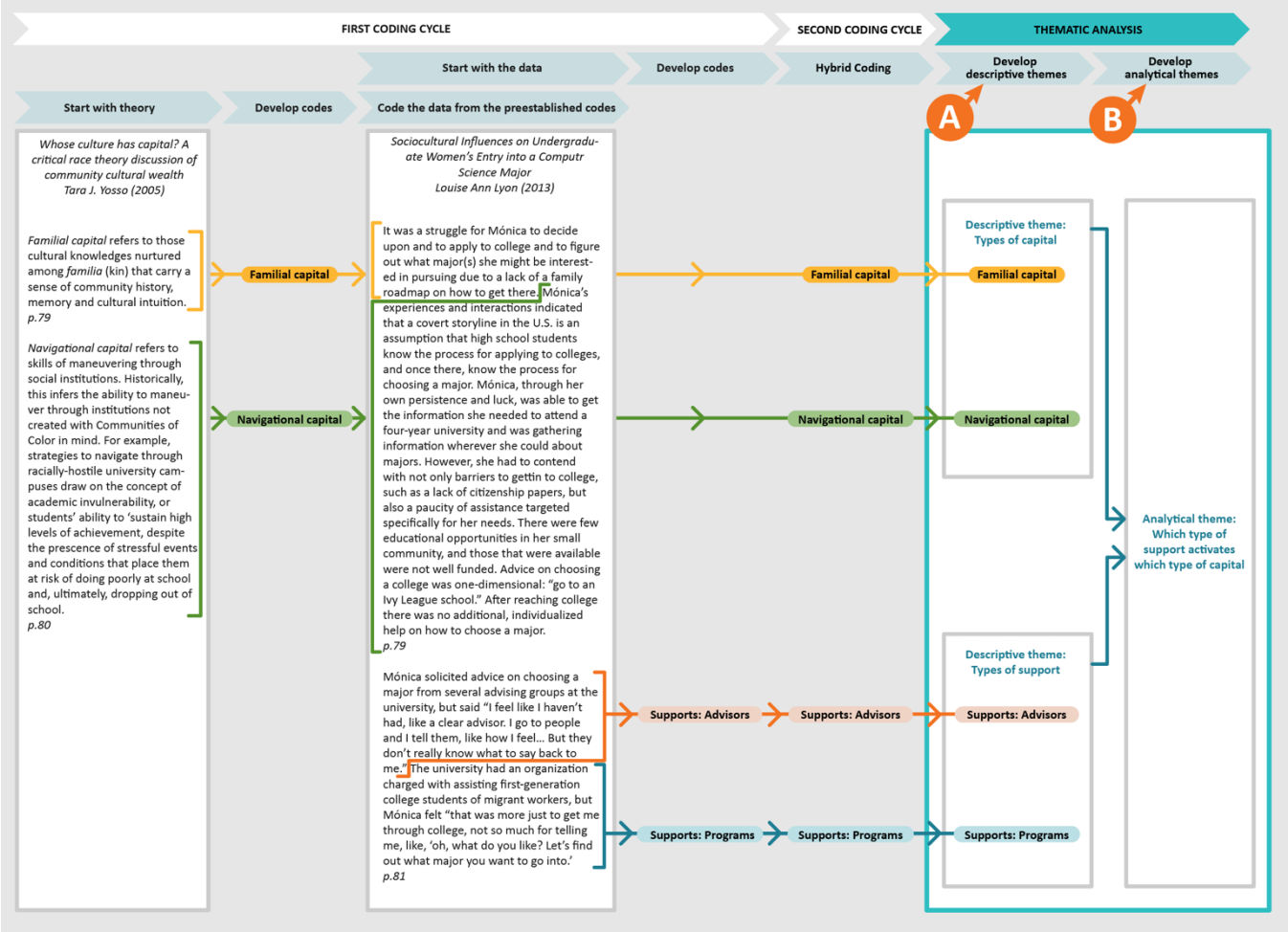

Figure 6a.2. Thematic analysis example

Activity 6a.1.

Take 30 minutes to practice conducting thematic analysis by developing descriptive and analytical themes based on the coding of your analytic memos or the literature included in your data set. Create one theme.

Example

In this example, we will continue using the meta-synthesis on women of color in engineering that we have examined in earlier sub-modules, in this case to look at the steps our team used to conduct thematic analysis.

Our team uses NVivo to code our data during our first and second cycles of analysis. If you do not have access to NVivo, please refer to Appendix 6a for alternative types of software packages for data management and analysis. Our team, at this point in the project, used NVivo to conduct queries by code. These queries resulted in lists of all the excerpts from our data that are assigned to the same code. Queries can be done so that the lists include the excerpts from single codes or from the intersection of two codes.

In our meta-synthesis on women of color in engineering, we conducted queries where we got lists of excerpts resulting from the intersection of two codes from the "Action/Type of Support" and the "Time Stamp" categories (see Table 6a.1 below to see the codebook we used). Based on our knowledge of the literature from reading it throughout the project and coding it, we found that the time stamp codes "transitional period(s)" and "other," did not contain much information. Thus, we decided to only focus on queries from the remaining three "time stamp" codes (undergraduate, graduate, and workplace) and their intersection with the action/type of support codes (e.g., navigation, leadership, giving back).

Table 6a.1. An example of a codebook structure for the Synthesis on Women of Color in Engineering project (PI: Ong; NSF-1427129)

1) Person / Support Entity	3) Action / Type of Support (or lack thereof)
a) Advisor/Supervisor b) Family c) Peers/Social Group d) Teacher/Professor e) Mentors f) Internship g) Support Programs h) Institution/Department	a) Identification/Self-Expectations i) Economic considerations b) Navigation c) Social Comfort d) Social Discomfort i) Isolation ii) Prove-it-again iii) Recognition/Reputation iv) Spotlighting v) Microaggressions e) Giving Back/Activism
2) Time Stamp	**4) Parking Lot**
a) Undergraduate b) Graduate c) Workplace ~~d) Transitional Period(s)~~ ~~e) Other Time Periods~~	a) Work/Life & School/Life Balance b) Other
	5) Recommendations
	a) For Institutions/ Departments/Faculty b) For Women of Color c) For Future Researchers d) Other

Team members then read through the query results to find patterns and create outlines of what we found to be the main themes in each of the codes' intersections, for example:

- undergraduate AND navigation
- undergraduate AND social discomfort
- graduate AND navigation
- graduate AND social discomfort
- workplace AND navigation
- workplace AND social discomfort

Once we created these outlines for each of the three time stamps, we compared them to see if there were overlapping themes. We then reorganized them so that the themes were related but overlapped as little as possible. When we had outlines that the team was satisfied with, we wrote out a title that was descriptive of the theme and included evidence from the literature that we thought supported the theme as developed. In our engineering education meta-synthesis, we looked at the literature that had to do specifically with women of

color in undergraduate education. We found that within the "social discomfort" code, there were structural hurdles that had to do with the culture of the institution of higher education and the generally held stereotypes about women of color. See Table 6a.2 for an outline sample of the "social discomfort" code for undergraduate students.

Table 6a.2. An example outline of themes from the code "social discomfort" for undergraduate students

Codes: Time Stamp – Undergraduate School AND Action/Social Support – Social discomfort		
Theme	Sub-Theme	Evidence
Departmental culture	Culture of exclusion and hostility	- Being the subject of subtle or overt racism or sexism (Bush, 2013; Camacho & Lord, 2011; Reyes, 2011; Shehab et al., 2007) - Experiences of sexual harassment (Gorman, 2014) - Being ignored or made invisible by white male professors and peers (Alonso, 2012; Bush, 2013; Camacho & Lord, 2011; Lord & Camacho, 2013; Reyes, 2011)
	Stereotypes	- Having to disprove negative stereotypes about intellectual abilities in engineering (Oden, 2003) - Experiences of being spotlighted (Carter, 2007; Carter Andrews, 2012; McLoughlin, 2005) - Racial stereotyping and being singled out (Litzler et al., 2011)

You can develop similar outlines across all the relevant themes across your coded data. Your theme outlines may show that you have enough data to support the development of more than one manuscript according to time stamps, career levels, or other specific themes. By the end of your project, you may have several meta-synthesis manuscripts.

Activity 6a.2.

Take 30 minutes to create a one-page outline of your themes, including examples from your meta-synthesis.

Additional Resources

- For a comparison of different software packages for data analysis and management, see the table created by D-Lab at the University of California, Berkeley in Appendix 6a. It is labelled "QDAComparisonTable"

References

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Appendix 6a. QDA Comparison Table

From D-Lab at the University of California, Berkeley. http://dlab.berkeley.edu/

QDA Software	**Atlas.TI**	**MaxQDA**	**NVivo**	**Dedoose**	**QDA Miner**
Website	atlasti.com	maxqda.com	qsrinternational.com	dedoose.com	provalisresearch.com
Price (subject to change)	Educational: $670 Student: $99 (2-year limit)	Educational: $495/565 Student: $86/115 (2-year limit)	Educational: $690 Student: $120 (1-year limit)	Student: $10.95/month 6+ users: $8.95/month	Educational: $595 (perpetual) or $288 (1-year limit)
Platform	Mac/PC	Mac/PC	Mac/PC	Web-based	PC
Document Types	rtf, txt, doc, docx, pdf, bmp, jpeg, tiff, mov, qt, au, snd, mpg, mp3	rtf, txt, doc, docx, pdf, mp4, mov, 3gp, 3ggp, m4v, avchd, mp3, wav, aac, m4a	rtf, txt, doc, docx, pdf, xls, mp3, m4a, wma, wav, mpg, mpeg, mpe, mp4, avi, wmv, mov, qt, 3gp, mts, m2ts	rtf, txt, doc, docx, xlm, xls, xlsx, htm, html, mp3, wav, m4a, wma, mp4	doc, docx, pdf, rtf, txt, html, csv, xls, xlsx, mdb, xml, sav, dbf, asci
Capacity for Medium (N>200) Projects	Not bogged down by medium sized projects	Not bogged down by medium sized projects	Buggy and crashes with medium projects	Medium projects may slow down the speed of the website	Not bogged down by medium sized projects
File Management	Data stored locally or on network Compressed backup file (copy bundle file)	Data stored locally or on network Can create copy of project file	Data stored in the database locally or on network Can create copy of project file	Data stored on Web Backup stored on Web	Data stored locally or on network (single file) Can create copy of project file
Teamwork	Projects cannot be accessed at the same time by different users	Projects cannot be accessed at the same time by different users	Simultaneous access in real time ONLY with the purchase of NVivo Server	Simultaneous access in real time	Projects cannot be accessed at the same time by different users

Merging Projects	Can merge projects to accommodate group work	Can merge projects to accommodate group work	Can merge projects to accommodate group work	No merge (but coders can work simultaneously)	Can merge projects to accommodate group work
Code Display	Codes are visible in margin Can assign colors to codes	Codes are visible in margin Can assign colors to codes	Codes are visible in margin	View codes by hovering on excerpt bracket	Codes are visible in margin Can assign colors to codes
Codebook	Primary display of codes is a flat code system	Primary display is hierarchical	Primary display is hierarchical	Primary display is hierarchical	Primary display is hierarchical
Code Results	Can print report of codes Report features include code by demographics	Can print report of codes Report features include code by demographics	Can print report of codes Report features include code by demographics	Can print report of codes Report features include code by demographics	Can print report of codes Report features include code by demographics
Metadata /Demographics	Categorical groups Import from Excel or enter manually	Table of variables Import from Excel or enter manually	Table of variables Import from Excel or enter manually	Table of variables Import from Excel or enter manually	Table of variables Import from Excel or enter manually
Notes	Comments can be attached to segments Can be retrieved with coded segments	Comments can be attached to segments	Comments can be attached to segments		Comments can be attached to segments
Memos	Can write project-wide memos Can attach memos to specific segments	Can write project-wide memos Can attach memos to specific segments	Can write project-wide memos Can attach memos to specific segments	Can write project-wide memos Can attach memos to specific segments	Can write project-wide memos Can attach memos to specific segments

Mixed Methods Features	Can import quantitative data from spreadsheets or use manual entry Can generate quantitative reports of qualitative codes	Can import quantitative data from spreadsheets or use manual entry Can generate quantitative reports of qualitative codes	Can import quantitative data from spreadsheets or use manual entry Can generate quantitative reports of qualitative codes	Can import quantitative data from spreadsheets or use manual entry Can generate quantitative reports of qualitative codes	Can import quantitative data from spreadsheets or use manual entry Can generate quantitative reports of qualitative codes Advanced functions include frequency analysis, hierarchical clustering, multidimensional scaling, crosstabs with statistical tests, heatmaps with dual clustering, correspondence analysis, code sequence analysis
Matrix Reports	Can produce customized frequency tables of documents and codes or demographics Can output code co-occurrence with other codes	Can produce customized frequency tables of documents and codes Can output code co-occurrence with other codes	Can produce customized frequency tables of documents and codes Can output code co-occurrence with other codes	Can produce customized frequency tables of documents and codes Can output code co-occurrence with other codes	Can produce customized frequency tables of documents and codes or demographics Can output code co-occurrence with other codes

Queries	Boolean (and, or, not, xor) Proximity searches (near) Can use both codes and demographics	Boolean (and, or, not, xor) Proximity searches (near) Can use both codes and demographics	Boolean (and, or, not, xor) Proximity searches (near) Can use both codes and demographics	Boolean (and, or)	Boolean (and, or, not) Proximity searches (near)
Making Diagrams (manual)	Diagrams can include documents, codes, segments, memos, families, and other network views Can link major project objects, including segments	Diagrams can include documents, codes, and memos Can link major project objects, except segments	Diagrams can include documents, codes, and memos Can link major project objects, except segments	No diagramming feature	No diagramming feature
Data visualization (automated)	None available	Report of code use within individual documents Reports of relationship between codes	None available	None available	None available
Weighting Text Segments	No weighting feature available	Can assign a weight to a code application Can create various reports based on code weights	No weighting feature available	Can assign a weight to a code application Can create various reports based on code weights	No weighting feature available

Lexical Searching /Text Analysis	Can auto-code based on words and phrases	Can auto-code based on words and phrases Can create customized dictionary using MaxDictio with MaxQDA Pro	Can auto-code based on words and phrases Can create a code based on a word in a frequency list	No auto-coding feature	Can auto-code based on words and phrases
Intercoder reliability	Only available through separate program, CAT	Can generate report with agreement percentages per code	Can generate report with agreement percentages per code and kappas per code	Can generate report with kappas and Pearson's correlation	Can generate report with agreement percentages per code.

Institute for Meta-Synthesis

Sub-Module 6b:
Findings and Discussion

Objectives

In this sub-module, you will learn:

- To understand what findings and discussion are.
- To understand how to develop the findings and discussion in a meta-synthesis.
- To practice the two in the context of the intended meta-synthesis project.

Main Concepts

What are Synthesis Findings?

The findings in a qualitative research study are a summary that describes and interprets what has been learned in the study and is supported by evidence from the study (Patton, 2002). Meta-synthesis findings are developed from analyzing the findings of other studies. They are the outcomes of a meta-synthesis process that links common findings across studies and the answers to your synthesis question(s). It may make sense to organize the reporting of your results by some of your analytic themes and/or major codes (see **«Module 5»** and **«Sub-Module 6a»**). We consider the development of findings to be the fourth cycle of analysis (see Figure 6b.1).

One way to approach writing this section is what Gopaldas (2016) refers to as the "Claim, Data, Elaboration" sequence (p. 119). This entails:

- stating your overarching claim,
- providing evidence from your data, and then
- expanding upon how your data justifies your claim.

Like findings from qualitative research studies, meta-synthesis findings combine sufficient description and interpretation. We refer to Patton (2002) to understand what **sufficient description** is: "Sufficient description and direct quotations should be included to allow the reader to enter into the situation and thought of the people represented in the report" (p. 503). Thus, authors should use **evidence**, such as examples and quotes from the data, and explanations in the authors' words that support the main argument so that the reader can understand it.

Interpretation involves your understanding of the significance of the findings described beyond your specific meta-synthesis project, such as understanding the relationships that exist among different elements of the findings. It involves making inferences of how and why those findings occurred based on the description provided (Patton, 2002).

How to Develop Meta-Synthesis Findings

In a meta-synthesis, recall that readers are relying on you to gather, synthesize, and report on a particular topic. Therefore, your findings should reflect only those literature pieces that were in your final synthesis set. As tempting as it may be, you should not include additional references from literature that is not part of the meta-synthesis data set to support or enhance the results (Finfgeld-Connett, 2018). If you use a quote from a literature piece, be sure that it is representative of the finding you are presenting and that you properly cite the source.

When writing the findings, we are explaining what we have learned so that others can understand it. This involves making decisions about what to include and what to omit from the story we are telling and how to organize what was learned in the study. This means showing instances in the evidence where your definition of the findings apply and creating coherence in what may be a set of interconnected and flowing facts. Creating coherence and organization often requires leaving out favorite pieces of analysis that do not fit the overall organizing structure (Patton, 2002). As Finfgeld-Connett (2018) asserts, "the findings should be fully explanatory by themselves, and references from the literature [beyond your data set] should not be used to support or enhance the results" (p. 67). This use of the literature is reserved to the discussion section, which we will discuss in the next section.

To start writing the findings, we suggest writing a description of a theme. The description needs to be "substantively significant and provide enough detail and evidence to illuminate and make that case" (Patton, 2002, p. 503). The description should not include every detail or become trivial and mundane. Thus, the difficulty in writing manageable descriptions lays in finding the balance of sufficient description and evidence while avoiding excessive detail.

Once you have the theme descriptions, you need to interpret them by connecting findings to larger societal issues. The description and the interpretation need to support each other, with the description providing the basis for the interpretation and the interpretation providing the larger context to understand the social significance of what is being described. Throughout the development of the findings, you will need to weave in evidence that supports the descriptions and interpretations so that they do not become detached from the reality of the studies where they were developed.

Once you have developed the findings through theme **descriptions**, **interpretations**, and **supporting evidence**, you will need to develop a structure that connects the different findings in an overall understanding of what they mean as a whole. This structure needs to reflect the research questions and conceptual map that you developed in **«Sub-Module 2a»**.

Findings Example

The coding in Figure 6b.1 illustrates through an example how we build a section of the findings in our meta-synthesis on women of color in engineering.

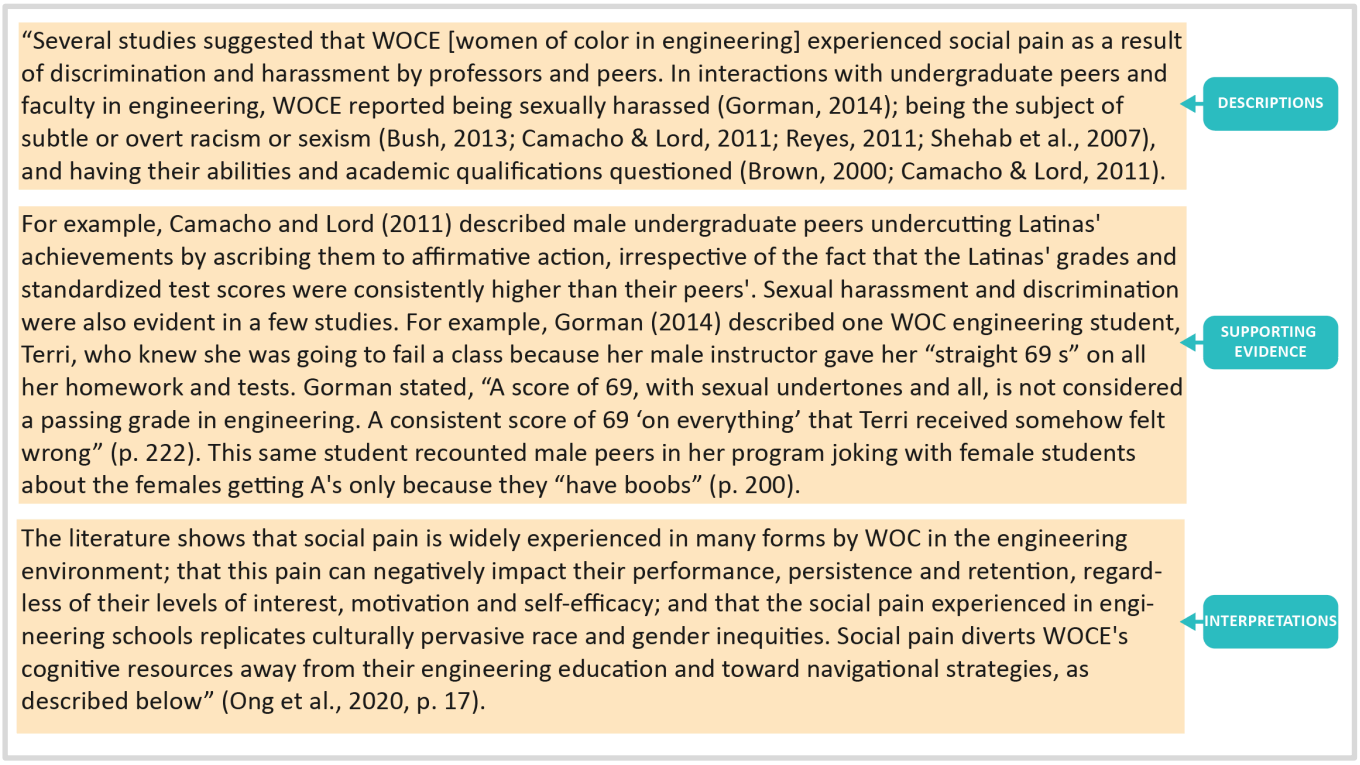

Figure 6b.1. Example of findings describing discrimination and harassment

This example includes a description of a finding from the team's engineering meta-synthesis (women of color are stereotyped), taking it from the specific to its larger social concerns (women of color need to assume the burden of disproving stereotypes to be able to stay in engineering), and providing a different instance from the evidence where the finding applies. In the example in Figure 6b.1, the finding in the first paragraph about discrimination and harassment is illustrated with examples such as Latinas' achievements being discounted and the sexual harassment of a student by a professor through his grading of her work. The second paragraph in Figure 6b.1 provides an interpretation of these findings by connecting them the societal concerns, which in this case is that women of color need to use cognitive resources, not only for their academic responsibilities but also to cope with discrimination and harassment.

Activity 6b.1.

Take 30 minutes to create a one-page outline of your initial findings, including examples from your meta-synthesis.

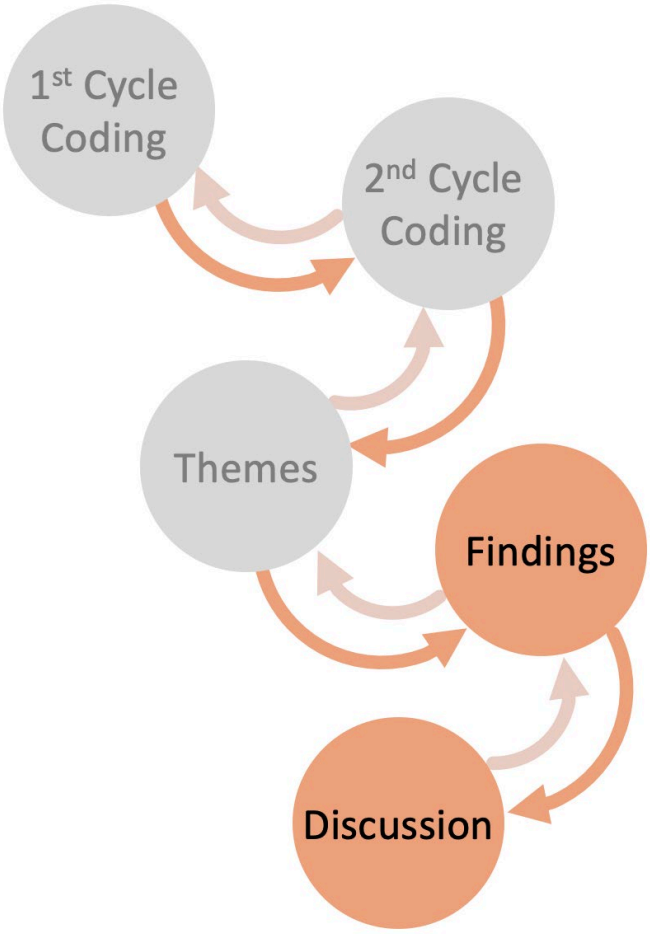

Figure 6b.2. Five cycles of analysis – fourth and fifth cycles

Developing the Discussion

WHAT IS THE DISCUSSION SECTION?

The discussion is the section in a manuscript where authors discuss the meta-synthesis findings in light of the literature from the literature review (if you have one) and/or the chosen theoretical framework and the implications for future research, policy, and practice (Heyvaert et al., 2017). The discussion presents the theoretical and practical significance of your study findings. You should provide the reader with a brief overview of your primary findings and then begin an exploration of the meaning and significance of those findings in light of the literature and your theoretical framework. You should discuss any trends and comparisons you have

found as well as strengths and limitations of those claims. Make sure to integrate the literature mentioned in the theoretical framework, revisiting its existing claims and then confirming, challenging, or extending those with the information you presented in your findings. If you challenge or extend existing theory, you may be creating or pushing theory in a new direction, which can be a key mark of a strong meta-synthesis. However, a meta-synthesis does not always create theory, so be cautious with your claims. Your discussion section should end with a consideration of the implications of your meta-synthesis and how your work can be applied in the field and elsewhere. You may also want to identify gaps in the current literature you synthesized, and thus present future research areas that can be pursued based on your findings. This means thinking of the implications of the findings beyond your particular meta-synthesis. In summary, the discussion section is where the circle of the story you want to tell closes by bringing together and integrating the different sections in a manuscript. We consider the development of the discussion to be the fifth cycle of analysis (see Figure 6b.2).

HOW DO WE DEVELOP THE DISCUSSION SECTION?

According to Heyvaert et al. (2017), discussing the meta-synthesis findings involves:

- Answering the research questions posed at the beginning of the meta-synthesis;
- Using the theoretical framework and/or review of the literature (if you have one) as a lens to make sense of the meta-synthesis findings (however, as noted earlier, meta-syntheses rarely include a review of the literature because their purpose as a whole is to provide an overview of the contributions of the literature);
- Reflecting on how methodological decisions affected the meta-synthesis, such as how your decisions around your search, selection, and critical appraisal criteria influenced the literature you included in the meta-synthesis; and
- Advancing the implications of the meta-synthesis findings and stating suggestions for future research, policy, and practice (though this last point could alternatively be discussed in the conclusions or recommendations section of your manuscript; check the author guidelines for your selected publication outlet).

A key element of a discussion section is our second point above – using theory to make sense of the synthesis findings. This is an opportunity for the meta-synthesis authors to point out how their meta-synthesis findings are applied examples of the theory and may contribute to and/or extend existing theory. Meta-synthesis authors have different options on how to do this. They may want to apply their chosen theoretical framework's constructs as the lens to look at their findings. They may also want to compare the findings of other studies or meta-syntheses to their own to see how they converge, diverge, or build on each other.

Discussion Example

Figure 6b.3 shows an example of how our team developed a section of the discussion in our meta-synthesis on women of color in engineering undergraduate education. This example corresponds to the development of the "Discrimination and harassment" finding we saw in Figure 6b.1 above using our chosen theoretical frameworks for our meta-synthesis. Specifically, Figure 6b.3 shows how our team used the constructs of social pain (Eisenberger & Lieberman, 2005) and community cultural wealth (Samuelson & Litzler, 2016; Yosso, 2005) to connect our findings to theory and to advance the implications put forth in the meta-synthesis.

We use highlighting in Figure 6b.3 to illustrate where the different constructs appear in the discussion and to show how we build on them to develop implications.

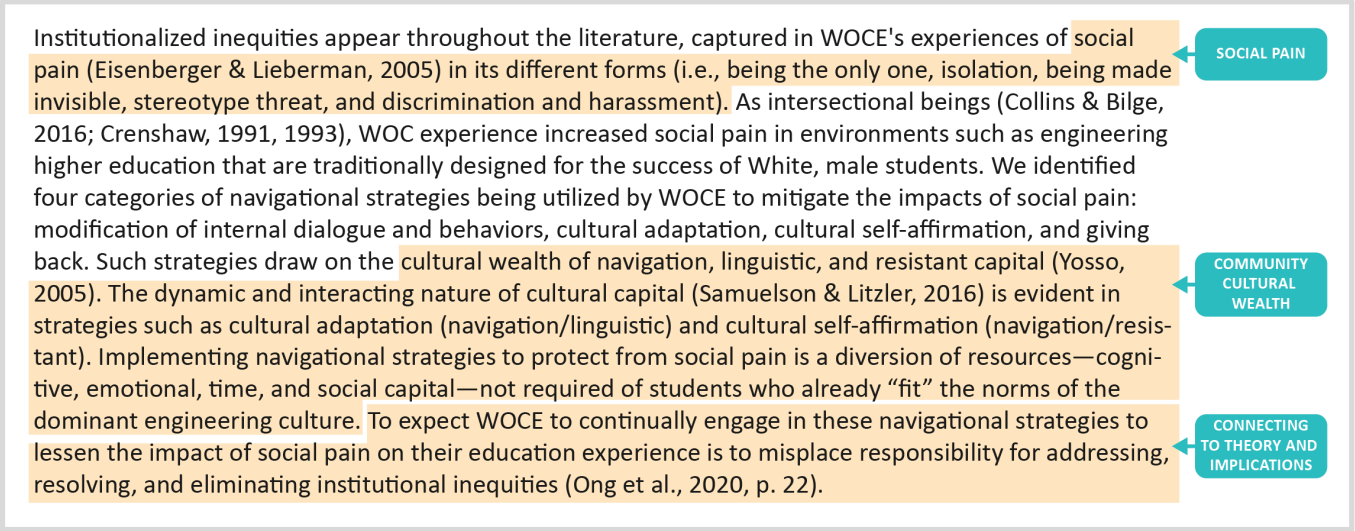

Figure 6b.3. How to use theory in the development of the discussion

Activity 6b.2.

Take 30 minutes to draft a discussion section for your meta-synthesis by:

- Reviewing your synthesis questions and writing about how the findings address them.
- Using your theoretical framework to talk about the findings.
- Reflecting on how your methodological choices impacted your findings.

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Institute for Meta-Synthesis

Sub-module 6c:
Conclusion, Recommendations, and Other Sections

Objectives

In this sub-module, you will learn:

- What conclusions and recommendations are.
- How to develop the conclusion and recommendations in a meta-synthesis.
- To practice the two in the context of the intended meta-synthesis project.
- To understand other sections that may be included in your meta-synthesis manuscript.

Main Concepts

What Is the Conclusion and Recommendations Section of a Manuscript?

The conclusion is the final section of a paper where the most important findings of the meta-synthesis are summarized and where the importance and implications of the study are briefly discussed, bringing the meta-synthesis full circle (Heyvaert et al., 2017). The conclusion of your manuscript should not be just a summary of your findings; you should be looking to briefly explain to the reader the significance and implications of your findings. What do they mean to the field and to society? What do they tell us in terms of what policies, practices, or future research should be carried out? Conclusions are the place where any of your final thoughts related to the findings and discussion sections of your meta-synthesis should be expressed and leave the reader with an overall understanding of the purpose of your synthesis. To further support this, you may also include recommendations in this section. The recommendations help in translating the findings of the meta-synthesis into applicable actions for those interested in applying what they learned from reading the manuscript in their workplaces and lives. If you do include recommendations, make sure that they address the findings and that they are connected to the literature included in the meta-synthesis.

How Do You Develop the Conclusion and Recommendations?

The conclusion should be brief and highlight each of the meta-synthesis' key findings. The recommendations that are often included in this section can be developed in a couple of ways. You may want to collect the recommendations from the literature in the meta-synthesis project and summarize them. For example, our team uses a set of codes to identify recommendations (see Table 6c.1 for an example of the structure of a codebook with the recommendations set of codes). You may want to advance your own recommendations

based on your own experience and knowledge of the field. These two approaches to developing recommendations can be used together. Independent of the approach chosen, meta-synthesis authors need to be careful to stay close to their findings when making recommendations. For example, it would not make sense to provide recommendations on pedagogical practices when the findings never address pedagogy.

Table 6c.1. An example of a codebook structure for the Synthesis on Women of Color in Engineering project (PI: Ong; NSF-1427129)

1) Person / Support Entity	3) Action / Type of Support (or lack thereof)
a) Advisor/Supervisor b) Family c) Peers/Social Group d) Teacher/Professor e) Mentors f) Internship g) Support Programs h) Institution/Department	a) Identification/Self-Expectations i) Economic considerations b) Navigation c) Social Comfort d) Social Discomfort i) Isolation ii) Prove-it-again iii) Recognition/Reputation iv) Spotlighting v) Microaggressions e) Giving Back/Activism
2) Time Stamp	**4) Parking Lot**
a) Undergraduate b) Graduate c) Workplace d) Transitional Period(s) e) Other Time Periods	a) Work/Life & School/Life Balance b) Other
	5) Recommendations
	a) For Institutions/ Departments/Faculty b) For Women of Color c) For Future Researchers d) Other

Conclusions Example

Figure 6c.1 is an illustration of how our team developed the beginning of the conclusion and recommendations section for our meta-synthesis on women of color in undergraduate engineering education. This example includes a brief summary of the findings and explains the types of recommendations that the reader will find in the following paragraphs. Note how the recommendation puts the emphasis of responsibility on changes that need to be implemented by leaders in institutions of higher education. We use highlighting in Figure 6c.1 to illustrate this.

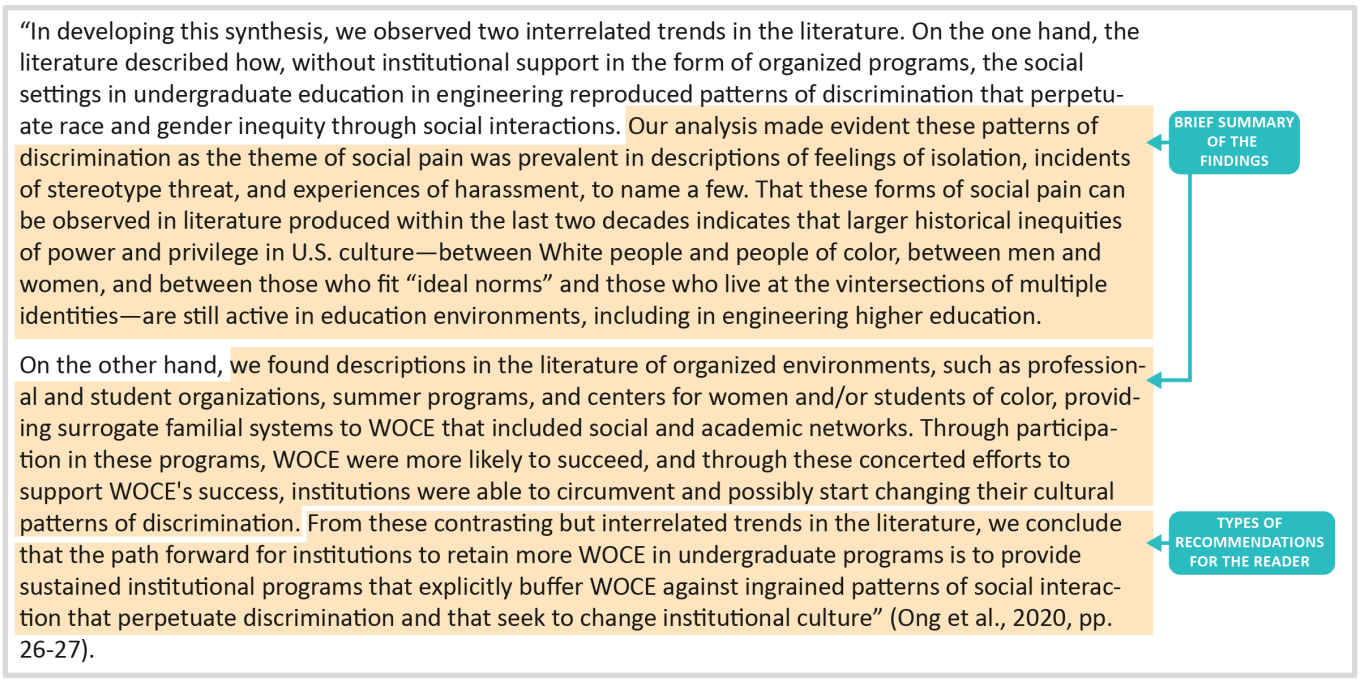

Figure 6c.1. The beginning of a conclusions and recommendations section

Where Do the Conclusion and Recommendations Go?

In the previous sub-module (**«Sub-Module 6b»**) we discussed developing your findings and discussion. The findings, discussion, conclusion, and recommendations sections that you will be developing are sections that typically appear in a qualitative meta-synthesis manuscript. Depending on the journal and the preferences of the authors, they can be combined or separated into several smaller sections. When a manuscript does not include recommendations, the discussion and conclusions can appear together as one section. These sections, in whatever combination they appear in your manuscript, need to be consistent and need to answer your research questions. For example, if your findings talk about discrimination and harassment, your discussion needs to address the same topics, without inserting new ideas that have not been addressed before.

Different journals may have different organizations for the conclusions and recommendations; so, it is important to check the guidelines of the journal where you are interested in publishing. In some cases, the discussion and the conclusions are expected to be together, while in others, they are expected to be separate. In other cases, recommendations are not expected to be part of a manuscript, while they are for other publication outlets. No matter what, make sure you thoroughly understand and are aware of the guidelines provided by your intended journal.

Other Sections

In addition to the aforementioned sections, manuscripts may include acknowledgments, abbreviations/glossary, disclosure of conflicts of interest, and appendices. You may find that some of these additional sections may be mandatory for certain journals, such as the acknowledgements section, which usually requires a statement as to whether the author has received funding for their work. However, most of these additional sections are optional and dependent on the needs of the manuscript.

Activity 6c.1.

Take 15-20 minutes to list all the topics you would like to include in your conclusion section.

Activity 6c.2.

Take 15-20 minutes to list recommendations you may include in your final manuscript grounded by the findings of your meta-synthesis project and for future research, policy implications, and practitioners in the field. Consider looking at the recommendations included in your literature to develop your own.

Activity 6c.3.

Take 10 minutes to review your journal guidelines to determine if your conclusions and recommendations will be within the same section or in two separate sections.

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Institute for Meta-Synthesis

Module 7:
Writing and Publishing

Sub-Module 7a:
The Nature of Writing

Objectives

In this sub-module, you will learn:

- To understand the cyclical nature of the manuscript writing process.
- To prepare for writing your manuscript.
- What to consider when re-writing a manuscript.
- To read one's own manuscript critically to implement improvements.

Main Concepts

A Note About the Cyclical Nature of Writing

The writing process is not a linear process that begins with the opening sentence and ends with a polished product. As Figure 7a.1 illustrates, it is a cyclical activity that is continually shaped by the addition of new information, experiences, and perspectives. In addition, the three phases of writing – pre-writing, writing, and re-writing/revision – can occur simultaneously and repeatedly throughout the creation of a text. It is important to understand that these phases do not occur in isolation from one another. For example, at the same time you are reading literature (part of the pre-writing phase), you should be paraphrasing or summarizing information, selecting illustrative quotes, and organizing your codes and themes (part of the writing or re-writing phases).

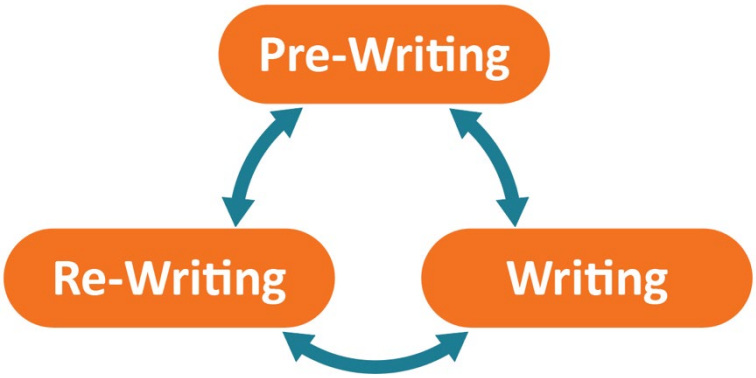

Figure 7a.1. The cyclical nature of writing

Let us clarify what we mean by the different phases of the writing process in creating a meta-synthesis publication. The **pre-writing phase**, often considered the "first" stage of writing, is the phase in which you gather evidence and observations. This includes determining search terms and criteria; identifying databases and their Boolean rules; finding literature potentially relevant to your research question; reading and selecting literature to synthesize; and analyzing the literature pieces or analytical memos – many of the steps that we have already addressed in Modules 2 through 6 within the context of a meta-synthesis project. The pre-writing process also involves thinking about the purpose, intended audience, and context of your manuscript, refining your synthesis question(s) and argument, as well as brainstorming, free writing, concept mapping, and talking over next steps with a peer or colleague.

The "middle" **writing phase** is typically thought of as the phase in which you put pen to paper, so to speak. In this phase, you organize your ideas based on what you read, your synthesis question(s), and argument. You insert yourself into the scholarly conversation by presenting evidence for your claim(s) via selective use of quotes, paraphrases, clear and vivid descriptions, themes, and citation practice. In relation to your meta-synthesis project, this is where your analytical memos, codebook and coded materials, and identified themes will come in handy as you begin to pull everything together into one cohesive manuscript.

The "final" phase of the writing process is the **re-writing or revision phase**. The term "revision" means to literally *see again*. Thus, the revision phase is about taking a second (or third, fourth, fifth, etc.) look at your text to examine the clarity and logic of your argument. Some questions to consider when thinking about the clarity and logic of your argument include:

- Does your evidence support your claim(s)?
- Do your topic sentences have transitional phrases to assist with the flow of the writing? Can a reader see and follow the structure of your manuscript?
- Does your voice as an author come through (i.e., did you make sure to synthesize the perspectives of other scholars while speaking to and emphasizing your view)?
- Does your chosen theoretical framework make sense in terms of how the findings are presented and analyzed?

- Do the findings push the field by generating new theory or expanding existing theory?
- What are the strengths and weaknesses of your argument or within the sections of your manuscript? Are you speaking to your intended audience?

It is highly recommended that you read your paper out loud to listen to its flow and clarity and to catch any spelling or grammar mistakes. Ask a peer scholar to read it, if possible. We also suggest walking away from your manuscript and coming back to it a few days later with a fresh mind and perspective.

As mentioned above, the process of writing is cyclical, and you might at times find yourself doing all three phases at once. Keep in mind that, like any piece of academic writing, the development of a high-quality meta-synthesis is slow but very rewarding.

Activity 7a.1.

Take 10 minutes to reflect on and write about your current writing process. What do you notice about your process? What do you think you need to work on or get help with?

Developing a Writing Practice

A common piece of advice given to new scholars in the academy is to write often, when you can, whenever you can. You should even develop a daily writing practice. This is great advice in theory, but not something that is easy to do in practice. Here are some tips to try to get you writing more efficiently and productively, but remember to ultimately do what works for you:

- Make sure to set aside a block of time for writing on a regular basis. It does not have to be daily or a huge block of time; it can be as little as 15 minutes per day. However, it does have to be frequent enough so that it becomes a habit. Schedule it into your workday in your calendar and treat it like a meeting you would have with a colleague.
- Set up a physical space for writing that is ideally distraction-free and cozy. Make it your own with all of your creature comforts and things you need to write productively.
- Get yourself in the writing mindset. A dedicated space and time for writing should help you to transition from thinking about the things you need to do to a quieter mind focused on writing. You may want to consider having a moment of silence or a 5 to 10-minute meditation prior to writing to help clear your mind and prepare yourself for writing.
- To keep yourself motivated and moving forward on your writing projects, set a realistic writing goal depending on your schedule. Start small and try not to go beyond 5 pages per day in order to avoid the “boom and bust” writing trap. Document how much time and writing you have accomplished. You can use a journal or an Excel spreadsheet to track your page or word count. You can also jot down next steps to jump start your next writing session.

- Make yourself accountable by joining a writing group or finding yourself a writing partner. A writing group or partner can help you talk through ideas, review manuscripts in progress, provide advice and feedback, and keep you motivated.

Activity 7a.2.

Look at your calendar for the next month. Identify regular blocks of time to write given your schedule and block them out. Then, take 15-20 minutes to set realistic weekly goals that you can meet.

Institute for Meta-Synthesis

Sub-Module 7b:
Structuring the First Half
of Your Meta-Synthesis Manuscript

Objectives

In this sub-module, you will learn:

- To revisit what you have learned in previous modules and use what you have written thus far to construct various sections of the manuscript.
- To comprehend the structure of a meta-synthesis manuscript for publication.
- To understand the structure and content of the different manuscript sections.
- To consider adding statements that describe your limitations and positionality.

Main Concepts

Using What You Wrote in Previous Modules

Throughout the modules, you learned about the steps involved in the development of a qualitative meta-synthesis project with the goal of publishing a manuscript that reports your process and findings. You are at the moment where you will bring together all that you have learned up until now to build the different pieces of your meta-synthesis manuscript. Your notes and documentation about your decisions and process will be key to supporting the development of the manuscript. We identify what you have learned in the modules and how they shape the key pieces of your meta-synthesis and highlight where those components should be located within your paper.

The Structure of a Meta-Synthesis Manuscript

The structure of your manuscript will vary according to your discipline, the journal you selected for submission, the nature of the specific research topic, and your individual preferences. However, it is recommended that theory-generating meta-synthesis articles use the same formatting as peer-reviewed research articles (Finfgeld-Connett, 2018). Generally, a meta-synthesis paper should include the following sections. The number of double-spaced pages for each section is provided as a rough guideline for an initial submission with a 10,000-word limit.

- Introduction (with Synthesis Questions) (2-3 pages)

- Theoretical Framework (3-4 pages)
- Methods (plus Positionality Statement) (8-10 pages)
- Findings or Results (10-12 pages)
- Discussion (4-6 pages)
- Conclusions and Recommendations (4-5 pages)

[Note: Literature reviews are typically omitted from meta-syntheses papers.]

Activity 7b.1.

Take 30 minutes to select and skim one of the following meta-synthesis articles. Identify and study the parts of the article we have discussed in this module.

Winterer, E. R., Froyd, J. E., Borrego, M., Martin, J. P., & Foster, M. (2020). Factors influencing the academic success of Latinx students matriculating at 2-year and transferring to 4-year US institutions—implications for STEM majors: a systematic review of the literature. *International Journal of STEM Education*, *7*(1), 1-23.

https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-020-00215-6

Denton, M., Borrego, M., & Boklage, A. (2020). Community cultural wealth in science, technology, engineering, and mathematics education: A systematic review. *Journal of Engineering Education, 10*9(3), 556-580.

https://onlinelibrary.wiley.com/doi/full/10.1002/jee.20322

Structure and Content of the Introduction, Theoretical Framework, and Methods

This sub-module describes the first three sections of a meta-synthesis manuscript. For information about how to develop the other sections of the manuscript, see **«Module 6»** (for Findings, Discussion, Conclusion, and Recommendations).

INTRODUCTION

The introduction of your meta-synthesis manuscript should describe the nature or motivation and context of your study. Typically moving from general to specific (see Figure 1 in Busse & August, 2020, p. 2), you should identify the subject, provide a background/landscape, and define the problem or question(s) you are attempting to address using supportive literature (Lester & Lester, 2015; Heyvaert et al., 2017). Your goal should be to clearly explain the objectives and rationale of your study – What is the topic/subject matter? What is the current state of the field in relation to the topic? What is the gap in the literature that your work will address and what is your claim based on the information you have gathered? What is the goal of your study? Why is this ultimately important to the field and to society? According to Lester and Lester (2015), you should "let the introduction and body work toward a demonstrative conclusion" (p. 218), which means that you should be walking the reader through the logic that you used to reach your synthesis question(s) and conclusions. Typically, the

introduction ends with your synthesis questions, and it may or may not have a brief explanation of your theoretical framework.

SYNTHESIS QUESTIONS

Synthesis questions are typically included at the end of the introduction. They might also be paraphrased again in the methods or discussion section. As we have seen earlier, thoughtful and well-designed synthesis questions will guide your decision-making and your attention to the literature that ends up being included in your synthesis (Borrego et al., 2014). Similarly, thoughtful and well-designed synthesis questions will influence the development of the manuscript by framing the focus of your study and guiding the reader to attend to the synthesis literature through the lens of these questions. To review the important functions of the synthesis question, see **«Sub-Module 2a»**.

THEORETICAL FRAMEWORK

As we described earlier, the theoretical framework is one of the most critical aspects for framing your manuscript. By stating the theoretical framework, you will inform the reader about the lens you used to design your study and analyze your findings. Make sure to illustrate why you selected the specific theoretical framework and how it fits with your overall synthesis question(s) (Gopaldas, 2016). Some equity-minded theoretical frameworks our team uses include critical race theory (Delgado & Stefancic, 2012), community cultural wealth (Yosso, 2005), and intersectionality (Collins, 2019).

The theoretical framework typically appears as its own section after the introduction. The theoretical framework will influence a significant part of the manuscript by directing your attention to how the meta-synthesis' findings are relevant in the context of the literature and the significance of your findings beyond your meta-synthesis. To review the important functions of the theoretical framework, see **«Sub-Module 2a»**.

METHODS

The methods section of your manuscript should clearly describe what you did in the study in enough detail for the reader to replicate it. It should also provide them with enough information for them to interpret and evaluate your findings. Gopaldas (2016) identifies research context, data collection, and data analysis to be the three most important elements in qualitative studies. The research context may be set by re-stating the synthesis questions or the theoretical framework that informs your study. The data collection and analysis components will be determined by your meta-synthesis process, as we saw in Modules 2 through 6, including pre-search decisions such as search terms and inclusion/exclusion criteria for searches; search strategies, databases, and filtering criteria; literature collection and filtering steps you followed; coding development and decisions; and other data analysis methods (Heyvaert et al., 2017; Ong et al., 2020). In this section, you may want to include a table of all works included in the synthesis and provide some key details, such as author and year published, literature format (e.g., journal article, conference proceeding), methodological stance (e.g., qualitative, mixed methods), and type of study (e.g., interview, ethnographic). In our publication on women of color in engineering, we additionally included details in the table on each work's STEM field focus, the career moment of participants (e.g., undergraduate, faculty), and race/ethnicity of participants as they were identified by the authors.

It is vital that you are transparent in your description of your meta-synthesis data collection and analysis methods and that you explain how you go beyond coding descriptions in your data analysis (Finfgeld-Connett, 2018). You should discuss as thoroughly, yet as concisely as possible, the methodological decisions you have

made during your meta-synthesis as well as your rationales behind those decisions (Heyvaert et al., 2017). We recommend reviewing «Module 3» for a review of search, selection, and critical appraisal procedures and Modules 4, 5, and 6 for a review of analysis procedures.

SEARCH, SELECTION, & CRITICAL APPRAISAL (MODULE 3)

It is vital that the decisions you have made during the planning and implementation of search, selection, and critical appraisal procedures appear in the methods section of the manuscript. The selection of search engines, the search, selection, and critical appraisal procedures, and the literature search strategies (e.g., snowballing procedures) determine the literature that will be included in the meta-synthesis. In addition, the decisions made in determining how these procedures will take place, such as which search engines to use and the specific criteria applied, are part of the methodological choices for the meta-synthesis.

ANALYSIS PROCEDURES (MODULES 4, 5, AND 6)

You should also include the decisions you have made in the different cycles of data analysis in the methods section of the manuscript. The coding approach (e.g., inductive, deductive, hybrid) and other analysis decisions (e.g., thematic analysis) determine how to approach the data and how to present the findings. In addition, the decisions made in determining the coding and analysis approaches are part of the methodological choices for the meta-synthesis.

Your notes and documentation about your decisions and processes throughout the development of the meta-synthesis phases will be very helpful at this point to support the development of the methods section of the manuscript that pertains to data analysis procedures.

Activity 7b.2.

Based on the decisions you made in Modules 2 through 6, take 30-60 minutes to outline the methods section of your meta-synthesis manuscript. Do not forget to address both data collection (e.g., selected search engines, criteria for search, selection, and critical appraisal of the literature, snowballing) and data analysis (e.g., types of coding and overall analysis strategy).

Structure and Content of Limitations and Positionality

Two other important (but sometimes optional) sections of a meta-synthesis manuscript are the limitations of the study and the positionality statement. Our team strongly urges you to consider the inclusion of both if your chosen journal allows them. The limitations section typically appears after the methods, in the discussion section, or at the end of the manuscript. The positionality statement will typically be part of the methods section or a separate section following the methods. Both are described in more detail below.

LIMITATIONS OF THE STUDY

When conducting a meta-synthesis, the study is, by nature, limited by the literature that is in existence. It may also be limited by methodological decisions that influenced the resulting literature data or the interpretations of the data (Price & Murnan, 2004). The purpose of a limitations section is to be transparent about what these limitations are and to acknowledge how, and to what extent, they may influence your findings, and how you are

addressing them within your manuscript to minimize any negative effects on your meta-synthesis. The types of limitations you could run into and document may include, among others: having small or uneven sub-groups of literature; lack of available or existing literature; and lack of reliable studies upon which the literature was based. In this section or elsewhere in your paper, you can describe how you addressed the limitations you identified. Below is a sample limitations section adapted from our paper on women of color in engineering (Ong et al., 2020):

Example 7b.1. Limitations

The limitations of this synthesis are mainly connected to our methodological choices. First, we decided to include empirical research on WOCE [women of color in engineering] published only between 1999 and 2015. This decision was based on the belief that older research may no longer be relevant to the contemporary experiences of WOCE, as well as the need to stop literature searches in order to advance to the next stage of the project. For the benefit of the reader, we conducted a cursory, non-exhaustive search of works on WOCE released between April 2015 and October 2019 and list the resulting 31 works in the Appendix of the article.

Another limitation is the possibility that our definition of empirical research eliminated qualified studies, even though we were relatively lenient in defining what constitutes the different components of a research study. … Another limitation is that the team did not disaggregate beyond race/ethnicity and gender by various social identities (e.g., class, sexuality, ability status). However, given that most of the literature did not include disaggregation by these categories, analysis beyond race/ethnicity and gender would have been of limited relevance. Finally, in the set of studies we synthesized there was an imbalance in the representation of different racial/ethnic groups due to the fact that the literature itself had focused more on some groups, such as African American women, than on others, such as Asian American and Native American women.

It may be tempting to not acknowledge the limitations of your meta-synthesis, but it is better that you acknowledge them up front, rather than have readers identify them later and negatively influence the article's trustworthiness. Furthermore, acknowledgment of a meta-synthesis' limitations demonstrates thoughtful and critical analysis of the synthesis problem and of the literature, as well as can be an opportunity to make suggestions for future research. Do not apologize for any of the limitations; just state them matter-of-factly and explain how you addressed them.

Activity 7b.3.

Take 15-20 minutes to consider and list the limitations you have encountered in conducting your meta-synthesis project.

POSITIONALITY STATEMENT

Our team encourages you to consider adding a positionality statement in your publication following your methods (or limitations) section. A positionality statement is typically a paragraph or two that describes the authors' background and identities that might influence or bias the interpretations and claims presented in the manuscript. The author is expected to reflect on the ways in which they foresee their positionality influences their interpretations and claims. The purpose of having a positionality statement is to show transparency, and thus build trustworthiness with your readers (Secules et al., 2021). Seen through an equity lens, stating your positionality further demonstrates an understanding that you are not claiming to see the data from a neutral, objective, or "higher" standpoint (Harding, 1992; Secules et al., 2021). A positionality statement might include your gender, race/ethnicity, disability status, class or socioeconomic status, profession, discipline, and/or other details that are relevant to the topic of your meta-synthesis. Our team's positionality statement always includes mention of the fact that our work is motivated by social justice purposes and how it shapes the focus of our research. Here is a sample statement from our meta-synthesis on women of color in computing graduate education (Jaumot-Pascual et al., 2021, p. 6):

Example 7b.2. Positionality statement

The authors of this synthesis identify as women who are minoritized due to their intersecting identities and/or their national origins/cultural backgrounds. As such, the team is interested in highlighting the experiences of WOC in engineering and diversifying engineering as social justice issues that will help in providing WOC with access to careers with growth and high pay potentials.

Activity 7b.4.

Take 15-20 minutes to draft a one-paragraph positionality statement that situates yourself within the context of your meta-synthesis project.

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Institute for Meta-Synthesis

Sub-Module 7c:
Identifying the Appropriate Publication Outlet

Objectives

In this sub-module, you will learn:

- To consider what journal can be the right fit for your meta-synthesis manuscript in terms of content and audience.
- To understand what a journal's author guidelines mean.
- How to use acceptance rate, quartiles, impact factors, and other related information to make decisions about where to submit a meta-synthesis manuscript.
- To understand how the peer review process works in a journal's publication process.

Main Concepts

Fit and Audience

The publication outlet where you decide to submit your meta-synthesis findings will depend on your field, the aim and scope of the publication, and whether there is an interest by the target audience. Ideally, you should find a publication outlet early in the writing process to tailor your work to the audience. You can start searching for an appropriate outlet by looking at where articles in your field typically get submitted as well as investigating where authors of meta-synthesis projects generally submit their work. Then, you should look at the journal's websites and learn about their focus by reading "About the journal," "Aims & scope," or similar sections on their site. It is also helpful to do a search within the journal to see if they have published syntheses, systematic reviews, or meta-analyses in the past; this is an indication of their potential openness to publishing your meta-synthesis manuscript. Make sure your meta-synthesis content aligns with the scope of the journal.

If you are not sure whether a particular journal in your area would be willing to publish a meta-synthesis, you can email the editor of the journal and ask for their advice; that is called a **pre-submission inquiry**. Know that submitting to a journal that does not accept your article type is a guaranteed way of getting your paper rejected. It is a good idea to have a short list of first-choice and second-choice journals lined up; if you are rejected from your first choice, then you can quickly re-group and revise your manuscript towards the requirements of the second choice. Our team creates a list of potential journals for each manuscript, where we keep track of information that is relevant for our decision-making, such as the journal's impact factor, the fit of our manuscript with the journal's purpose/mission, and whether they publish syntheses, among other

considerations. The last column, overall rank, is where we prioritize journals according to our intention to submit. See Table 7c.1 for an example of a journal tracker that we have used.

Table 7c.1. Example of a journal tracker

Title of Journal and Website	Aim, Scope, or Mission	Quartile Ranking	Impact Factor	Publishes Syntheses	Fit	Overall Rank

Activity 7c.1.

Spend 10-15 minutes searching, comparing, and selecting 2-3 journals that you would consider sending a manuscript of your meta-synthesis project. Make sure to check the journal's Scimago page (https://www.scimagojr.com/) and the journal's website.

We also recommend that you look at the Author Guidelines (also called Instructions for Authors or Submission Guidelines) and peer review process for each publication outlet that you are considering. Each journal will give you specific instructions on elements like the journal's preferred layout, word limit (including and excluding references), referencing style, and more. If you intend to submit your meta-synthesis work to a specific journal, make sure to format the manuscript accordingly so that it will have a higher probability of being reviewed. Additionally, academic journals are typically **peer-reviewed journals**, meaning that submissions are read by experienced colleagues in the field, who then advise the editor on whether or not the submission should be published. For academic journals, look at the peer review process to see what reviewers will be asked to evaluate your work on. Then, you can make sure that your submission addresses those areas. Knowing the peer review process will give you a sense of how long it will take for the editorial board of the journal to get back to you with their decision. If the wait for notification is too long, then consider submitting to a different publication outlet with a shorter turnaround time.

In terms of equity within the area of knowledge production and access, we encourage you to consider publishing your meta-synthesis work as an open access publication. Open access journals reduce the permission requirements on article use and eliminate the fees for readers, and many (though not all) maintain high standards in terms of quality of content and having peer review processes. Increasingly, academic journals are hybrid, with some articles being open access and others behind a paywall. With an open access journal or article, virtually anyone would be able to get and read your article for free without a subscription or payment. Open access articles receive more citations than subscription publications, which means that your work would potentially be cited more frequently. However, there are different types of open access journals (see Figure 7c.1). In some cases, the journal has publication fees and is open access. These provide equitable access to content but are not equitable in terms of who has access to publish due to the cost. The main drawback of this type of journal is that the publication cost falls on the author; you would have to pay a publishing fee to the journal. Make sure to know what the fees are, how they differ based on manuscript type, and whether you or

your institution would be able to cover the fees before submitting your manuscript. In other cases, the journal is open access and has no publication fees. In this case, both access to content and access to publication is equitable. These journals are harder to find, but they are slowly increasing in number.

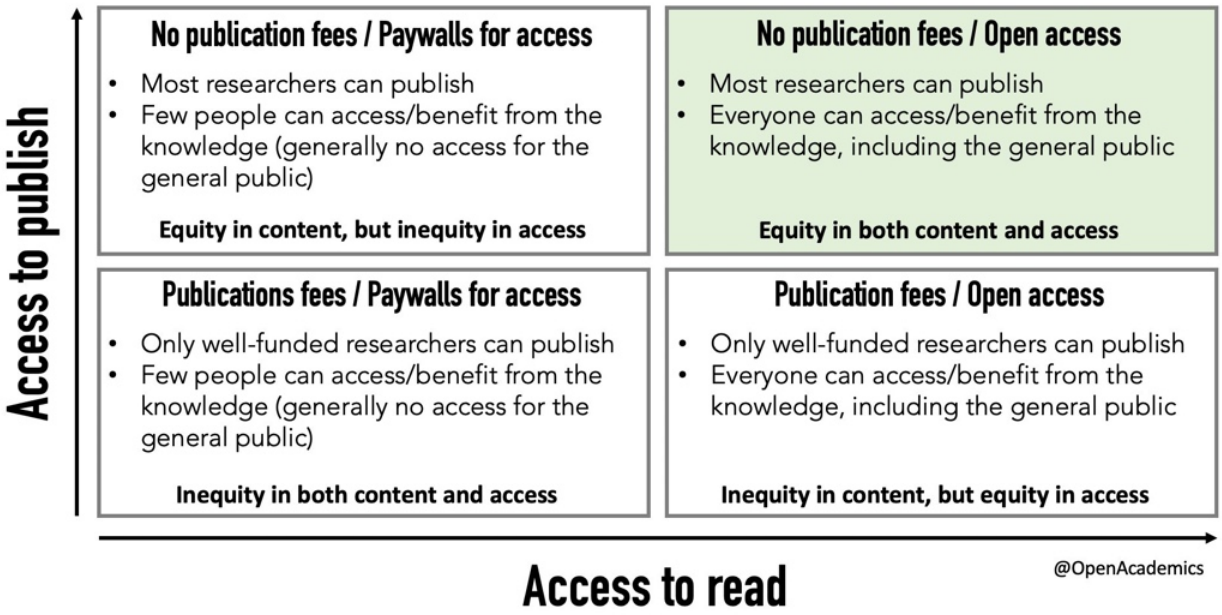

Figure 7c.1. A matrix of equity in access to publish and access to read (Borrowed with permission from @OpenAcademics)

One quick word of warning: beware of predatory journals. Publishers know the value and importance of publishing, and some are profiting from it. Lisa Lake (2016) from the Federal Trade Commission on Consumer Information has the following three recommendations for authors:

- Check with an academic librarian to see what they know of the journal where you are planning on submitting. They can also tell you if it is included in indexing services.
- Make sure that the existence of any publishing fees is made public by the journal.
- Make sure that the journal or publisher makes its publishing process public.

In summary, transparency in the processes and costs of publication are a good indicator of the trustworthiness of a journal. If you are not sure of your preferred journal's practices, contact the journal's editor for clarification and check with your academic librarian. If the journal editor's response is not satisfactory and your academic librarian is not familiar with the journal, it may be better to look for an alternative venue for the publication of your work.

Acceptance Rates and Impact Factors

In academia, the prestige and visibility of a journal is often associated with a journal's acceptance rate, quartile, and impact factor. These are research metrics that are assumed to be objective and supposedly determine the quality of the journal. The thought is that the more difficult it is to get your paper accepted by a journal (or the greater the rejection rate), the higher the quality of the journal. Similarly, a journal's **impact factor** is a metric used to evaluate its relative importance within its field by measuring the frequency with which the "average article" in a journal has been cited in a particular time period. The higher the impact factor, the higher the quality of the journal due to the demand of its articles by individuals in the field. Similarly, a journal's **quartile** (first, second, third, and fourth) are an indication of the frequency with which they are cited and the quality of the journal relative to others in the same field.

It is important to know that acceptance rates, quartiles, and impact factors can be manipulated by the journal to give the illusion of prestige and are not necessarily correlated with journal quality. Impact factors and other research metrics can also differ due to data sources, calculation method, and how they are being used. Therefore, if you decide to use these metrics to determine a publication outlet to submit your meta-synthesis work, then you should use both qualitative and quantitative information. Look at multiple metrics, since each one has its strengths and weaknesses. You should also consult with individuals who have published with the journal. In addition, look at who is listed as an editorial board member and the reviewers. If you see a mix of respected, established scholars as well as early career contributors, then the journal is most likely a good option. A useful tool to check for metrics, such as impact factor and quartile, is Scimago Journal and Country Rank (https://www.scimagojr.com/). In addition to metrics, it includes links to the journal pages and a description of the journal's scope.

Activity 7c.2.

Take 15 minutes to create an Excel document that tracks the journals you think are the best fit for your publication. Make sure to include the key information that you are interested in tracking, such as impact factor, whether they have published syntheses in the past, and potential fit for your manuscript.

Additional Resources

- Check out the website QualPage, which is currently maintained by Dr. Kathy Roulston, a professor in the Qualitative Research program at the University of Georgia. The website has at least 20 years of resources related to qualitative inquiry and publishing, CAQDAS, and teaching qualitative methodologies – https://qualpage.com/journals-publishers/
- Look for peer-reviewed, open access journals using the Directory of Open Access Journals – https://doaj.org/
- Learn more about how to spot a predatory journal by reading this 2018 *Typeset* blog post by Deb Mukherjee titled "Choosing the Right Journal — A Comprehensive Guide for Early-career Researchers" – https://blog.typeset.io/choose-right-journal-early-stage-researchers-guide-ea2cf236dde4

References

OpenAcademics [@OpenAcademics]. (2021, April 15). *No, and here's why it's a problem* [Tweet]. Twitter. https://mobile.twitter.com/OpenAcademics/status/1382723455750000645

Lake, L. (2016, August 26). Academics and scientists: Beware of predatory journal publishers. *Federal Trade Commission, Consumer Information.* https://www.consumer.ftc.gov/blog/2016/08/academics-and-scientists-beware-predatory-journal-publishers

Institute for Meta-Synthesis

Sub-Module 7d:
The Publication Process

Objectives

In this sub-module, you will learn:

- To understand the steps and considerations for the manuscript submission process.
- To identify the different types of manuscript reviews so you can be informed about how journals you are considering approach reviews.
- To comprehend the review process: the steps, who is involved, how long it takes.
- To determine what is expected from reviewers and authors during the review process.
- To figure out how to respond to a manuscript review.

Main Concepts

Manuscript Submission Process

Here is a quick summary of the submission process. More details about each step are below.

1. Read the author guidelines of your chosen journal and prepare your manuscript and accompanying documents accordingly.
2. Submit the manuscript. Understand the types of submission and peer review your chosen journal follows.
3. Wait the appropriate length of time for the review to take place. The journal's webpage should list the average length of time for you to receive reviews and editor's decision.
4. There is a broad array of editor's decisions you could receive, but the decision is most often either a "revise and resubmit" (R&R) or rejection. If you receive an R&R, plan to address all the reviewers' major concerns and some minor concerns. If you are rejected, learn what you can from reviewers' comments and quickly move on to your next journal of choice.

AUTHOR GUIDELINES

The author guidelines (sometimes called instructions to authors) provide key information about the journal's citation style requirements, including:

- Maximum length of the manuscript, usually given by word count

- What is part of the word count (check whether the abstract, references, table, or captions for graphics count toward the word limit)
- Formatting requirements (e.g., structured abstract, font, margins, citation style, section numbering, placement of tables and figures, blinded or unblinded)

Be sure your manuscript follows all requirements in order to avoid being outright rejected, otherwise known as a "desk rejection."

SUBMISSION TYPES

There are different types of manuscript submissions. The most common type is through an online portal hosted by the journal's publisher. Before entering the online portal, be sure to have information and documents ready, including:

- Your affiliation and contact information (and those of your co-authors, if any)
- The ORCID number for yourself and any co-authors. An **ORCID number** is a digital identifier that uniquely identifies you as a researcher. Register for an ORCID number at orcid.org.
- Keywords that describe your paper. Depending on the journal's specifications, these may be provided from a menu by the journal or created by you
- Long title and abbreviated title of your manuscript
- Title page
- Body of the paper with references, tables, figures, etc.
- Cover letter
- Supplemental documents
- List of names and contact information of potential reviewers
- List of names and contact information of people who are not suitable to review

Another type of manuscript submission, though rarer, is through email. For an email submission, you simply send all required materials to an email address provided by the journal. However, this type of submission is becoming less common.

Submissions can be blinded or unblinded. In a **blinded submission**, a publisher strips the identity of the authors from the title page and other documents before the editor evaluates it. In an **unblinded submission** – which is more common – the editor knows the identity of the authors. Note that blinded and unblinded submissions are different (though related) from blinded and unblinded peer reviews, discussed below.

Activity 7d.1.

Visit the websites of 2-3 journals that you are considering for a manuscript submission. Spend 15 minutes reviewing their author guidelines and peer review process.

Types of Peer Review

The credibility of a researcher hinges on the quality of their work. **Peer review** is one process in academia by which research is evaluated and validated by fellow scholars in the field (see Figure 7d.1 for a schematic of the review process). It is how the research community continues to improve upon findings and builds upon disciplinary knowledge. When you submit your manuscript to an academic journal, it typically goes to the editor who determines if the submission fits the journal's mission. If so, then the editor will pass the manuscript off to the managing editor or directly to reviewers, who are selected based on their area of expertise. The reviewers may or may not be given your name, depending on the type of review.

There are four types of review processes that are based on decreasing the amount of potential bias associated with the review – **single-blind**, **double-blind**, **triple-blind**, and **open peer review**. A *single-blind review* allows the reviewers to know the name of the manuscript's author, but the author is prevented from knowing the names of the reviewers. There are a few major concerns with this type of review, including: (1) it may allow reviewers to intentionally delay a publication so that they can write up and publish a similar article first; and (2) reviewers may be biased based on the identity of the author. In a *double-blind review*, the most common type of review in academic journals, the reviewer and the author are anonymized, which limits reviewer bias and any advantages well-known authors may have based on name recognition. There is still the possibility of reviewers identifying the author due to the topic, citational practice, or writing style, especially if the field is small. For both double- and triple-blind reviews, you, as the author, will likely have the responsibility to "blind" or "mask" your identity in the manuscript, such as citing yourself as "Author, 2019," instead of stating your true name. We suggest that, to avoid confusion, you create an unmasked version of your manuscript, then just before you submit, create a masked version. Keep both versions handy so you can compare versions and easily unmask yourself later in the process.

A *triple-blind review* prevents the reviewers and editor from knowing the name of the author (this is related to blind submission). The author also does not know the identities of the editor or reviewers. During the submission process, before the editor receives the manuscript, the name of the author is removed and replaced with an alphanumeric designation. This process minimizes bias against the author, though it can be more complicated for the editorial board in terms of keeping track of submissions. Lastly, there is the *open peer review*, which is the opposite of the triple-blind review. It is a process based on transparency by which everyone involved – the editor, reviewers, and author – know each other's names. Some people believe that this encourages transparency and prevents people from using the review process for their own personal agenda or from making hurtful comments, whereas others believe that this review process keeps people from providing truthful, critical constructive feedback for fear of retribution. We recommend that you are familiar with the review process for whichever publication outlet you ultimately decide to submit your meta-synthesis project.

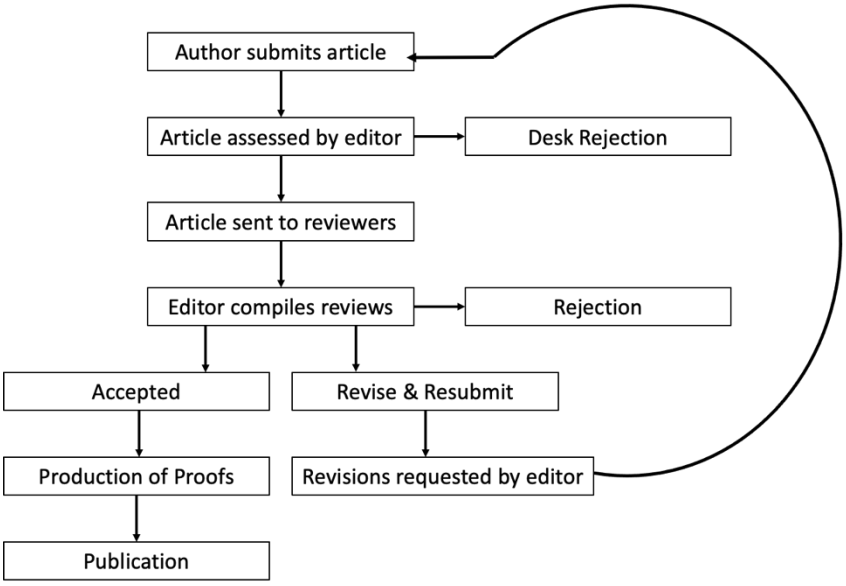

Figure 7d.1. A general diagram of the peer review process

Identifying Potential Reviewers and Non-Reviewers

Authors often have the option of listing potential reviewers for their manuscript. This option would allow you to identify experts in your field who might be interested and advocate for the publication of your piece. These experts might also give you insightful feedback that would improve your manuscript. Be sure to have on hand the names and contact information of 2-3 experts. Note that the editors may or may not take up your suggestions, but they are always pleased to have their pool of suitable potential reviewers enlarged. Likewise, you might also have the possibility of listing people who would *not* be suitable to review your work. People who would be on this list would include people with whom you have a conflict of interest (e.g., your advisor) or with whom you have ideological or other professional conflicts.

What to Expect During and After the Review

As mentioned earlier, the editor reviews the manuscript to determine whether it fits the journal's mission. If they determine that it does not, the manuscript receives what is called a **desk rejection**. When this happens, the manuscript is not sent out for review and the authors receive little feedback.

If the manuscript aligns with the journal's mission, two to four reviewers are typically assigned to every article submission, and each reviewer is given a specific amount of time to review and evaluate it based on the general rubric of the journal. Reviews can take from a few weeks or months depending on the availability of reviewers and reviewers' and editors' schedules (the COVID-19 pandemic has elongated the review time). The role of the reviewer is to identify the strengths and weaknesses of the manuscript and to provide constructive feedback. They should offer suggestions on how to improve the work in a professional, respectful manner as well as

provide their honest opinion as to whether the manuscript should be accepted in the journal based on the quality of the research and its potential to advance the field.

The reviewers submit their feedback to the editor, who compiles and summarizes the comments to share with the author. The editor then informs the author of the decision along with the reviewers' suggestions. Common decisions include the following:

- Accept with no revisions – this is very rare, but it does happen.
- Accept with minor/major revisions – the manuscript will be published by the journal if all of the requested revisions are addressed adequately by the author.
- Revise and resubmit – this decision is usually given when there are conflicting reviews or if the editor or reviewers want to see substantial changes made to the manuscript. The editor sends the revised manuscript out for a second round of reviews (usually with the same reviewers) before making an official final decision. There is no guaranteed acceptance, even if the author addresses all of the reviewers' concerns.
- Rejection – this decision occurs frequently, but it is not necessarily related to the quality of the manuscript, as it may be due to a lack of fit with the journal or other reasons out of the hands of the author.

Although the feedback provided by reviewers is supposed to be respectful and constructive, sometimes it is not. When this happens, it often has more to do with the reviewer than with the manuscript itself. The manuscript may address a topic that the reviewer has a personal issue with, or it may use a methodology that they do not know or understand, or something else entirely. If this happens to you, first take a break from it to distance yourself from it so that you can come back to it without an emotional response. Then read the feedback critically without taking it personally, trying to find the useful nuggets of information that you can use for the improvement of your manuscript. You may even want to share your reviews with a peer or mentor to try to get some perspective on what was written. Another strategy that may be helpful to do is to re-write the negative feedback in your own words in a way that keeps the useful information but softens the critique. If there is feedback that the author disagrees with, it is perfectly acceptable for them to let the editor know that, providing a rationale for why the suggestions will not be incorporated in the manuscript revision.

The author is typically given 1-2 months to make the requested changes to the manuscript. In their response to the editor, they must provide a copy of the revised paper, prefaced with a description of how each of the reviewers' major concerns were addressed. The review process, from manuscript submission to publication, can take anywhere from 6 months to two years, depending on the number of rounds of review the manuscript goes through.

Once the manuscript is accepted for publication, the author will need to review proofs, sign an author agreement, and process payment of open access fees, if they apply. **Proofs** are the typeset manuscripts as they will be published. They are the last chance for authors to make any changes, and usually changes are minor, such as typos and misplaced captions for images. An **author agreement** is a contract between the author and the publisher about the copyright and the use of the work. Once the manuscript is published, authors can disseminate it while keeping in mind the parameters agreed upon in the author agreement.

Institute for Meta-Synthesis

Module 8:
Proposals for Funding

Sub-Module 8a:
Request for Proposals (RFPs)

Objectives

In this sub-module you will learn:

- To search for and identify RFPs related to your intended meta-synthesis project.

Main Concepts

Request for Proposals

Requests for proposals, or RFPs, are documents generated by funding agencies, including foundations, non-profit organizations, businesses, and government agencies, that announce new funding opportunities and solicit project ideas. A more informal term is **solicitation**. An RFP or a solicitation typically outlines:

- **eligibility requirements** (e.g., being a nonprofit, not being church-affiliated)
- what **types of projects** they are looking for (e.g., testing an intervention, basic research)
- anticipated **funding amount**
- **budget limitations** (e.g., cap for indirect costs)
- **preparation and submission requirements**, which may include the requirement to submit a letter of intent that is due a few weeks or months before the proposal deadline
- **deadlines**
- They can also include:
    - the **goal that the funding agency** wants to achieve

- the **expected scope** of the project
- the **evaluation criteria** that will be used to assess submitted project ideas

According to Cronan (n.d.), the funding agency views the RFP as "a **non-negotiable listing of performance expectations** reflecting the agency's goals, objectives, and investment priorities that the team must meet to be funded" (p. 55).

Where Do You Find RFPs?

If you don't know which agencies fund the type of work you want to do, you may want to begin your search by typing "RFP" or "request for proposals" or "solicitation" in a search engine. You can further limit your results by setting a timeframe (e.g., RFPs over the last month) and by adding the name of your discipline or research interest. However, as you do this search, beware of illegitimate websites and organizations. One way to verify an organization is to search for it using a website such as guidestar.org that collects verified information about nonprofit organizations through 990s and direct reporting.

An alternate way for finding RFPs is by talking to other researchers in the field to learn about organizations which typically fund the area of work you are interested in. This may help you identify local organizations that announce funding opportunities. Below in the section for "Additional Resources" you will find a list of organizations and/or websites where you can find RFPs from federal organizations such as grants.gov or private foundations like the Foundation Center.

Yet another way to find RFPs is to join a mailing list or register for newsletters from organizations that share information about funding in your area of research. Below in the "Additional Resources" section are some examples of organizations such as the *Foundation Directory* or the *Spencer Foundation* that announce funding opportunities in STEM education (among other fields) and express special interest in equity and inclusion.

Activity 8a.1.

Take 25-30 minutes to search for current RFPs in your field. If there are any that invite synthesis proposals, identify the topics funded, expectations for proposal content (i.e., details that must be in the proposal) and deliverables, and timeline for submission. Identify an RFP to potentially apply to for your meta-synthesis project.

Below are two examples of solicitations that expressly ask for synthesis proposals. These solicitations are expired but these organizations have similar RFPs on a regular basis:

- NSF EHR Core Research: https://www.nsf.gov/pubs/2021/nsf21588/nsf21588.pdf
- Long Term Ecological Research Network: https://lternet.edu/synthesis/request-for-proposals-2020/

How to Find a Solicitation for a Synthesis in an RFP

To find RFPs that focus on meta-synthesis work, be aware that sometimes RFPs for syntheses are embedded in larger RFPs that fund a collection of project types. Also note that RFPs for synthesis proposals may be rare in many disciplines.

Here is an example (Example 8a.1) to help you identify a solicitation for a synthesis proposal. Often within a larger RFP for the National Science Foundation's EHR Core Research program (2021, p. 5), you may find one paragraph indicating an interest in a synthesis proposal.

Example 8a.1. Synthesis solicitation #1

Synthesis Proposals combine fundamental knowledge and findings on a topic of critical importance to STEM learning, education, broadening participation, or workforce development. They should strive both to present the state of the knowledge on an area, across disciplines where appropriate, as well as highlight issues for future research. Synthesis proposals should explain and justify the methodological approach (e.g., meta-analysis or meta-synthesis) to be adopted, and should outline the steps for literature identification, decision points (e.g., identifying inclusion and exclusion criteria and outcome measures of interest), and systematic techniques to ensure all relevant research is included and that information is gathered accurately across studies. Proposals should place particular emphasis on the goals and outcomes of the synthesis and the dissemination plan. (https://www.nsf.gov/pubs/2021/nsf21588/nsf21588.pdf)

Here is another example of a (now expired) synthesis solicitation (Example 8a.2), also from the National Science Foundation. This call for synthesis proposals is also part of a larger call for proposals. It came in the form of a Dear Colleague letter requesting proposals on the specific topic of testing new methodologies for STEM learning.

Example 8a.2. Synthesis solicitation #2

Synthesis proposals seek support for the synthesis and/or meta-analysis of existing knowledge on a topic of critical importance to STEM learning and/or education, or for the diffusion of research-based knowledge. Investigators are permitted to propose conferences and other meetings as one of the means of completing the syntheses and diffusing the research-based knowledge that is developed. Additional emphasis will be placed on the proposed dissemination plan. (https://www.nsf.gov/pubs/2019/nsf19036/nsf19036.jsp)

How Do You Select an RFP?

To select the RFP that works for you, you would need to consider if the topics funded, expectations for proposal content, deliverables, and timeline for submission are practical and manageable for you. If the timeline is not manageable, you can plan on submitting in the next round of the RFP. You should also check the award amount and decide if it is reasonable for what the funding agency is asking for. As Cronan (n.d.) states,

A flawed understanding of the requirements of the program funding solicitation and the role it plays in planning, developing, and writing a successful research narrative is one of the common reasons proposals are poorly reviewed and declined by funding agencies (p. 54).

Thus, you must make sure that your work, in turn, is a research interest of the funding agency. If you have any questions or concerns related to your understanding of the solicitation, you should do a close reading of the RFP, talk to colleagues who have been funded by the organization, or contact the program officer at the funding agency (Cronan, n.d.). A program officer is a professional that works for the funding agency to coordinate funding around a specific topic or area. A program officer is familiar with what the funding agency is interested in funding and the mechanics of the funding process with their agency. Guiding those interested in applying to their agency is part of their job as program officers.

The takeaway should be that there is not just one way to find potential sources of funding and depending on your area of research, you may need to be patient, persistent, and willing to search broadly and speak to many people to identify opportunities for your synthesis.

Activity 8a.2.

Take 25-30 minutes and click on the URL of one of the synthesis solicitations mentioned above (https://www.nsf.gov/pubs/2021/nsf21588/nsf21588.pdf or https://www.nsf.gov/pubs/2019/nsf19036/nsf19036.jsp), skim the RFP, and do a thought experiment with a synthesis proposal in mind. What expectations do the funders set for topics and proposal content? What are the expected activities or outputs? Does the RFP mention the amount of the award?

Additional Resources

Federal RFPs

The link below provides access to information about federal grant-making agencies. Each agency may have grant programs that individuals can research for funding opportunities for their meta-synthesis project.

- https://www.grants.gov/learn-grants/grant-making-agencies.html

Organizations/Websites for Researching Foundation RFPs

The links below are from organizations that aggregate research funding opportunities. Individuals interested in seeking funding for their meta-synthesis projects can start with the links provided below.

- https://www.guidestar.org/search
- https://doresearch.stanford.edu/funding
- https://med.stanford.edu/rmg/funding/grants.html
- https://ors.duke.edu/funding-opportunities/funding-search-tools
- https://researchfunding.duke.edu/
- https://pivot.proquest.com/ (You must be affiliated with an institution that subscribes to Pivot-RP in order to create an account.)
- https://fconline.foundationcenter.org/welcome/quick-start (This requires a paid subscription.)
- https://grantstation.com/ (This requires a paid subscription.)

Organizations that Support Education Meta-Syntheses

Individuals interested in seeking funding for an equity and education-focused meta-synthesis can start with the links provided below. The third link for the National Science Foundation is specifically for STEM and STEM education-focused synthesis grants.

- W.T. Grant Foundation: http://wtgrantfoundation.org/
- Spencer Foundation: https://www.spencer.org/
- National Science Foundation: https://www.nsf.gov/ (This government agency has several directorates with different funding programs. For example, the Directorate for Education and Human Resources (EHR) offers funding for meta-synthesis proposals through funding programs such as AISL (Advancing Informal STEM learning)).

References

Cronan, M. (n.d.). *Strategies for planning, developing, and writing large team grants*. Academic Research Funding Strategies, LLC. https://www.research.fsu.edu/media/2281/strategies-for-planning-developing-and-writing-large-team-grants.pdf

Institute for Meta-Synthesis

Sub-Module 8b:
Research Vision, Rationale, Goals and Objectives, and Outcomes

Objectives

In this sub-module, you will learn:

- How to state the research vision of your meta-synthesis project.
- How to succinctly state the goals and objectives of your meta-synthesis project.
- How to write a rationale that stresses the urgency and novelty for your meta-synthesis.
- To project the outcomes of the project, if funded, so that reviewers and funders can envision the benefits arising from funding you.

Main Concepts

Each of the elements described below – research vision, goals and objectives, rationale, and outcomes – is essential to creating a strong proposal. Our team thinks of these elements as comprising the "front matter" of a proposal. However, the order of how each of the elements is presented in a proposal is dependent upon the requirements of RFPs (which may require other, or additional, information) and the flow of the proposal itself. Following the description of each element is an example drawn from our successful synthesis proposal on literature on women of color in engineering called *Engineering Beyond the Double Bind* (*EBDB*, NSF-EEC-1427129).

The Research Vision

The grant proposal structure proposed by Cronan (n.d.) starts with the development of a research vision, which is a statement that "provides the global, unifying, thematic overview of the research to be accomplished over the proposed funding period and its significance and value-added benefits to the funding agency mission, or to the research field itself" (p. 80). Essentially, this is where you **show reviewers how your meta-synthesis work fits within the context of the proposal solicitation**. The research vision summarizes your project narrative so that reviewers and funders immediately see how your project potentially adds value to the funder's mission. In your research vision description, you need to:

- demonstrate that you know what is going on in your field,

- provide a succinct description of the context of your proposed meta-synthesis study, and
- "present a vision that advances the field in some important way" (Cronan, n.d., p. 154).

Below is an example of a research vision from our team's engineering proposal:

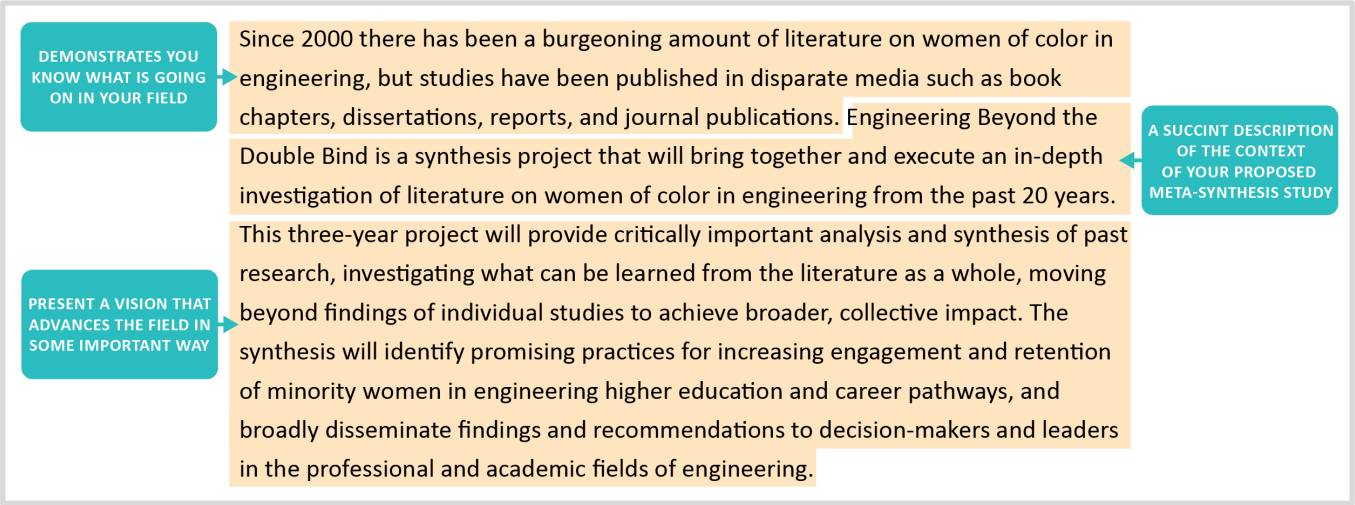

Figure 8b.1. Example research vision

Activity 8b.1.

Take about 20 minutes to write a research vision statement (2-3 sentences).

Rationale for the Meta-Synthesis

You will need to have a compelling meta-synthesis rationale – or a statement of the importance of the problem you want to solve. The purpose of your rationale should be to **illustrate what the anticipated contribution will be to the discipline as a result of your meta-synthesis project.** Some examples of contributions you can make with a meta-synthesis include:

- Bringing together literature that is scattered across many disciplines and/or literature types that have not yet been brought together.
- Informing scholars and practitioners – in a succinct way – about literature on your topic, which has exploded in recent years.
- Using meta-synthesis to potentially resolve a research disagreement.
- Identifying important gaps or disagreements in current knowledge that warrant further study.
- Potentially identifying a scholarly intervention or advancement to the field or addressing a critical societal issue.

For an extended explanation of the reasons to conduct a meta-synthesis and for literature supporting these reasons, refer to **«Sub-Module 1b»**.

Your meta-synthesis rationale must be situated within your field's literature. The **literature review** within your proposal narrative should meet the following criteria:

- Present a discussion of relevant research studies that are most closely related to the topic.
- Describe, cite, and comment on the current state of research knowledge around the study topic or issue.
    - Provide an overview of what is known and unknown in the field related to your topic (Ahram & Erickson, 2020).
- Point out the gaps that your proposed study will address without belittling the work of others (Sandelowski & Barroso, 2003), for example:
    - Never use the word "fail" in describing what other researchers did not do.
    - Make sure to describe the work of other researchers accurately.

Below is an example of the rationale from our team's engineering meta-synthesis proposal:

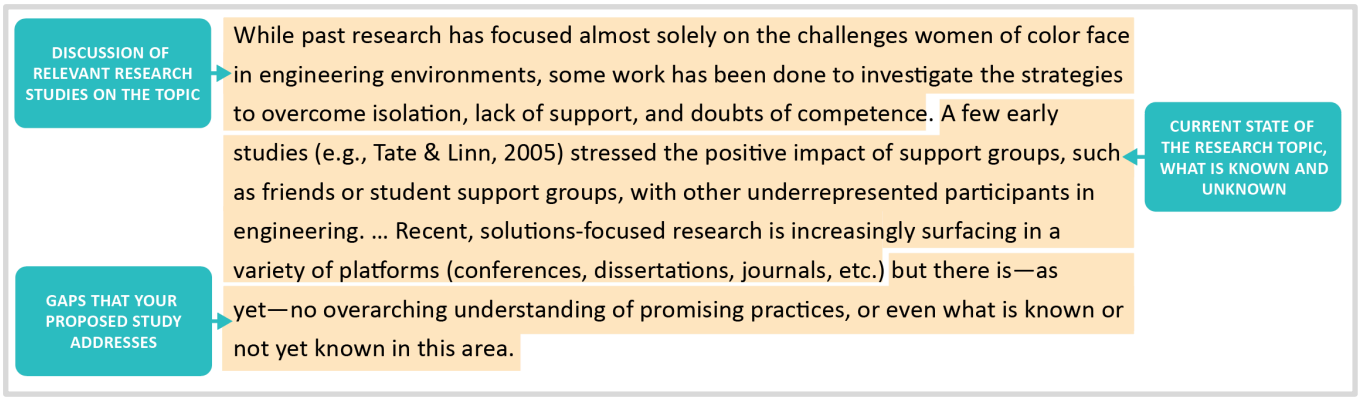

Figure 8b.2. Example rationale

In this example, our team emphasized our unique approach, which was to focus on positive, solutions-based research literature (as opposed to studies focused on more common deficit approaches), and that the literature related to this topic was recent but scattered in different types of media.

Strengthening Your Rationale

To ensure you have a strong rationale, make sure to:

- Be concise.
- Ensure your citations are from reputable and/or peer-reviewed sources. This includes:

- Including classic citations (widely regarded as original or foundational knowledge of the field, e.g., Crenshaw (1993) for intersectional theory).
- Include "recently published" citations according to the standards of your discipline. For example, in STEM education, research published during the last decade would be considered recent literature.

- Advance equity and inclusion. Our team recommends practicing ***citational justice*** by citing women and non-white authors in your theoretical framework (Mott & Cockayne, 2016) and other sections of your proposal. Additionally, many funding agencies are increasingly interested in broadening participation and creating equitable systems. Thus, practicing citational justice (in addition to consciously including equity and inclusion as a focus) in your proposals may make it more fundable. Some resources to learn more about citational justice include:
  - Mott, C., & Cockayne, D. (2017). Citation matters: mobilizing the politics of citation toward a practice of 'conscientious engagement.' *Gender, Place & Culture*, *24*(7), 954-973. https://www.tandfonline.com/doi/abs/10.1080/0966369X.2017.1339022?journalCode=cgpc20
  - https://www.citeblackwomencollective.org/
  - https://www.colorado.edu/education/2020/07/21/help-us-engage-and-advance-citation-justice-alumni-and-graduates-color

Activity 8b.2.

Take 30-60 minutes to draft an outline of your rationale (1-2 pages) for your meta-synthesis project. Include some citations of the major theories you will be drawing on.

Goals and Objectives

The goals of the synthesis study are the **overarching, long-term, major accomplishments** that you will reach over the course of the grant period. The most salient goal in a synthesis proposal should be to answer your synthesis question, which should be carefully developed (see **«Sub-Module 2a»**) and stated near the beginning of your proposal. Objectives are the **actual steps you will take** to achieve each goal. You should state the goals and objectives of your study early in the proposal.

It is important that the goals and objectives of the synthesis study are aligned with each other – and that they address the synthesis question. In Table 8b.1 and Example 8b.3, there are two examples drawn from our team's engineering meta-synthesis proposal of the same goals and objectives represented as a chart and in text, to convey how the goals and objectives are aligned. Both address the synthesis question: "According to the existing empirical literature, what factors affect the experiences, participation, and advancement of women of color in engineering from the stages of early college education through their careers?"

Table 8b.1. Representation of goals and objectives in a chart

Goals	Objectives
1. Build new knowledge and understanding of the positive and negative factors affecting the retention of women of color within academic programs and in professional settings for engineering.	1.a. Analyze ways in which personal characteristics and interpersonal interactions promote, or hinder, women of color in engineering. 1.b. Construct new knowledge and understanding by analyzing and synthesizing information from diverse sources.
2. Make methodological contributions through the testing and refinement of meta-synthesis tools and processes.	2.a. Develop, test, and refine tools and processes involved in conducting meta-syntheses.

Example 8b.3. Representation of goals and objectives in text

Goal 1: Build new knowledge and understanding of the positive and negative factors affecting the retention of women of color within academic programs and in professional settings for engineering.

Objectives for goal 1:

1.a. Analyze ways in which personal characteristics and interpersonal interactions promote, or hinder, women of color in engineering;

1.b. Construct new knowledge and understanding by analyzing and synthesizing information from diverse sources.

Goal 2: Make methodological contributions through the testing and refinement of meta-synthesis tools and processes.

Objective for goal 2:

2.a. Develop, test, and refine tools and processes involved in conducting meta-syntheses.

Activity 8b.3.

Take 45-60 minutes to write out your goals and objectives. Be sure to check that your goals directly relate to your synthesis question, and that your objectives describe practical steps towards achieving each goal.

Outcomes and Impact

Your research outcomes include the **answers to your synthesis questions**; they are also the **products of the project.** Impacts are the **influences or effects** that your project outcomes will have.

- Some funders will require specific statements about the expected **contributions to the existing knowledge base** and/or the ways in which the project will contribute to **supporting equity and inclusion.**
- You should be clear about the impact your work will have on stakeholders including the research community. Who will benefit from your meta-synthesis work and in what ways? You can address this at the individual, institutional, local community, regional, national, and/or societal levels.

Below is an example statement from our team's engineering meta-synthesis proposal that speaks to how the project *outcomes* will contribute to, and *impact*, the existing knowledge base (see Figure 8b.3).

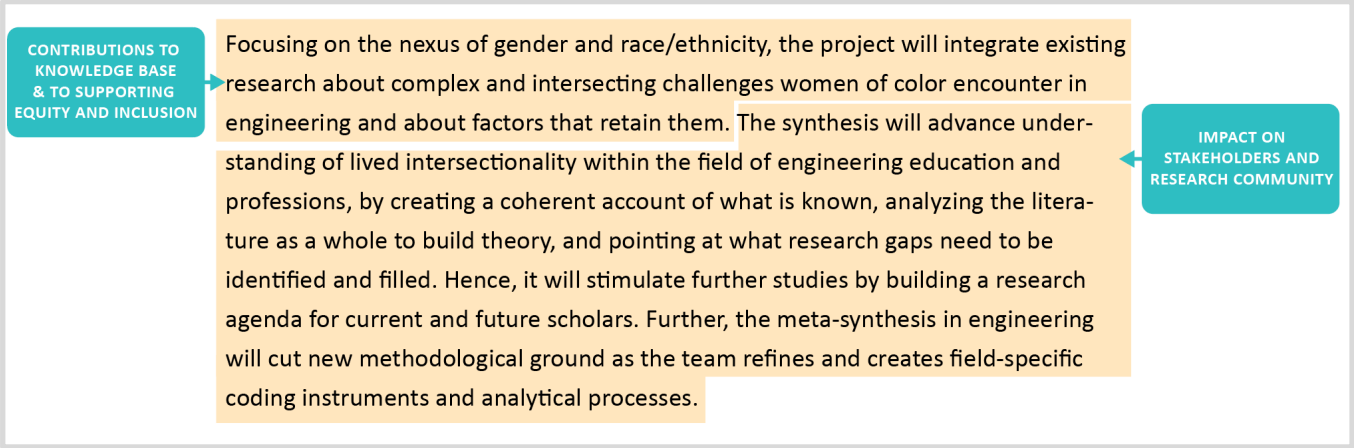

Figure 8b.3. Example outcome and impact statement #1

Below is another example statement, also from the engineering meta-synthesis proposal, where our team details how *outcomes* from the project would positively *impact* the STEM enterprise and society by diversifying the U.S. workforce (see Figure 8b.4).

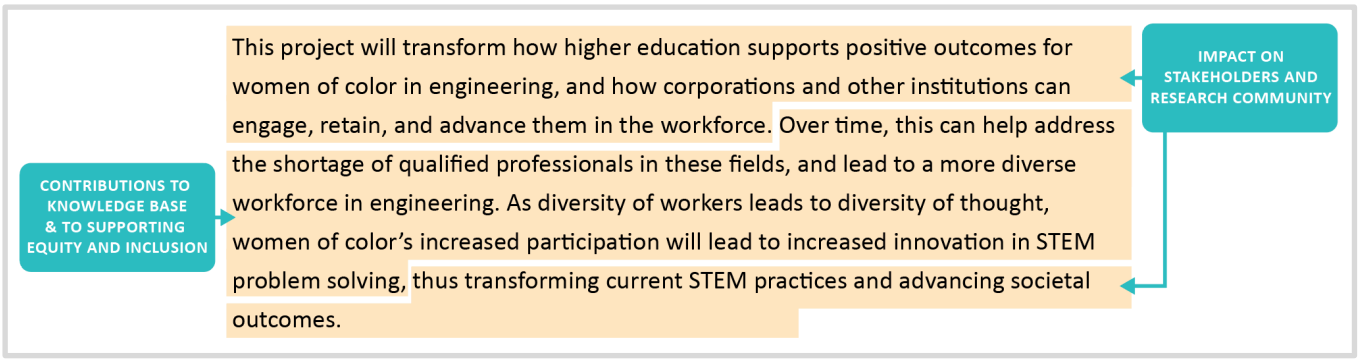

Figure 8b.4. Example outcome and impact statement #2

Activity 8b.5.

Take 30-40 minutes to write out your outcomes and impact statement. Be sure to check that they are related to your goals and objectives.

Additional Resources

- This book offers step-by-step guidance on academic research and writing, including electronic research.
    - Lester, J. D., & Jr., Lester, J. D. (2015). *Writing research papers: A complete guide* (16th edition). Pearson Education. Available in your local library or for purchase at your local bookstore or online. https://www.amazon.com/Writing-Research-Papers-Complete-Guide/dp/0321952952
- This article argues for awareness of "politics of citation" and resistance to the ways in which citation, as a measure of knowledge production, typically favors one group over others.
    - Mott, C., & Cockayne, D. (2017). Citation matters: Mobilizing the politics of citation toward a practice of 'conscientious engagement'. *Gender, Place & Culture*, *24*(7), 954-973. https://doi.org/ https://doi.org/10.1080/0966369X.2017.1339022

References

Ahram, R., & Erickson, F. (2020). *A guide to writing successful field-initiated research grant proposals*. Spencer Foundation. https://www.spencer.org/resources/a-guide-to-writing-successful-field-initiated-research-grant-proposals

Crenshaw, K. (1993). Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. In D. K. Weisberg (Ed.), *Feminist legal theory: Foundations* (pp. 383-95). Temple University Press.

Cronan, M. (n.d.). *Strategies for planning, developing, and writing large team grants*. Academic Research Funding Strategies, LLC. https://www.research.fsu.edu/media/2281/strategies-for-planning-developing-and-writing-large-team-grants.pdf

Sandelowski, M., & Barroso, J. (2003). Writing the proposal for a qualitative research methodology project. *Qualitative Health Research*, *13*(6), 781-820. https://doi.org/10.1177/1049732303013006003

Institute for Meta-Synthesis

Sub-Module 8c:
Theoretical Framework and Methods

Objectives

In this sub-module you will learn:

- To understand the importance of selecting a theoretical framework that aligns with your synthesis question(s).
- To learn to describe your methods to a set of reviewers who may or may not have meta-synthesis expertise.
- To learn to describe your (or your team's) qualifications in terms of prior work related to the proposed project.

Main Concepts

Each of the elements described below – theoretical framework and methods, and prior work related to the proposed project – will give reviewers a strong sense of your approach to the project, how you will conduct your meta-synthesis activities, and how you have been successful completing projects in the past. As stated in the previous sub-module, the order of how each of the elements is presented in a proposal is dependent upon the requirements of RFPs and the flow of the proposal.

Theoretical Frame

«Sub-Module 2a» described how you should frame your meta-synthesis activities through a theoretical frame. **Theory can inform how the study is conducted (i.e., the methodology) and the lens by which data are examined**. For these reasons, it is important to state the theoretical frame in your meta-synthesis proposal, providing clear descriptions and citations. If you have done the exercises in **«Sub-Module 2a»**, you may be able to transfer and refine what you have already written.

One example of how a theoretical frame can be used comes from our synthesis work on women of color in engineering education (NSF-EEC-1427129) in which our team stated that we would draw upon the theory of community cultural wealth (CCW, Yosso, 2005), an approach based in critical race theory that focuses on *assets* that members of minoritized groups bring to their educational experiences. This framework, we argued, would enable us to stay attuned to literature that focused on *self- or community-based solutions* for persistence in engineering education. This approach would illuminate strengths that women of color brought to this discipline, as well as the ways that institutions could further support them. Furthermore, in the theoretical frame section,

your proposal should make the case for how the current knowledge base and its theoretical underpinnings justify new investment in the proposed line of inquiry, and how the project and its findings are likely to build upon and refine existing relevant theory. Continuing our example from above, we stated that our application of CCW would take an assets-based approach to studying strategies for success and barriers to persistence for women of color in engineering higher education.

Activity 8c.1.

Take 1.5-2 hours to identify a theoretical framework for your proposal. If you did the theoretical framework activity in Sub-Module 2a, it may take you less time; simply transfer and refine it.

Methods

The methods section should be a succinct and coherent description of your meta-synthesis activities. The methods should be clearly geared towards answering your synthesis question(s), which you should consider re-stating at the beginning of this section. In a strong methods section, reviewers should be able to imagine you doing each task and understand how a given task is closely connected to the one before it and after it. Our earlier modules (3 through 7) described the tasks outlined below, which you may adapt and flesh out for your own Methods section.

- **Step 1: Pre-Search: Setting Up the Data Collection**
    - Establishing search and selection criteria
    - Testing and selecting search engines
    - Selecting search terms and creating search strings
- **Step 2: Data Collection**
    - Establishing the start set
    - Forward and backward snowballing
    - Selecting relevant literature
    - Applying filters
        - Filter 1 and Filter 2
        - Critical Appraisal
- **Step 3: Hybrid coding and analysis**
    - Establishing a codebook
    - Testing and refining codebook with subset of literature
    - Applying codes to full set of literature
- **Step 4: Synthesizing and drawing conclusions**

- Developing meta-themes using thematic analysis
- Identifying relationships between meta-themes
- Connecting, comparing, contrasting existing and newly emerging meta-themes

Throughout this section, be sure to cite relevant methods and theoretical literature that connects with your work and show that it is a well thought-out, unique project. One example for using theory in your analysis work would be incorporating "navigation" as a code drawn from Yosso's (2005) concept of navigational capital. Citing Thomas and Harden (2008) is an example for using literature to support your methods choice if you are conducting thematic synthesis, because this piece provides guidance through a structured example of how they implemented this meta-synthesis design to their work.

Finally, some funders require a statement about any certifications you have to conduct meta-synthesis or research (e.g., CITI or NIH) and/or IRB pre-approvals you have for your proposed project. Alternatively, you may need to declare that you will follow all IRB requirements from your organization in conducting your proposed project. Such statements may be placed at the end of the Methods section (an alternative place would be the Biographical Statement).

Activity 8c.2.

Take 60-90 minutes to draft a methods section for your proposal. If you have done the activities related to methods in Modules 3 through 7, transfer and refine here.

Prior Work Related to the Proposed Project

The purpose of this section is to demonstrate to reviewers and funders that you have successfully led, or co-led related grants, and that they should have confidence to fund you yet again. In this section, list only the project(s) in which you have participated that are related to your proposed meta-synthesis – the project may be related in terms of topic or research skills. For each project describe:

- Its purpose,
- Findings and contributions to the knowledge base,
- Contributions to society
- Dates of the project,
- Name(s) of the project leaders,
- Funder and award number,
- Grant amount,
- Your specific role on the project, and
- Relationship to the proposed project.

Below is an example from our team's computing project that incorporate these elements into a brief paragraph.

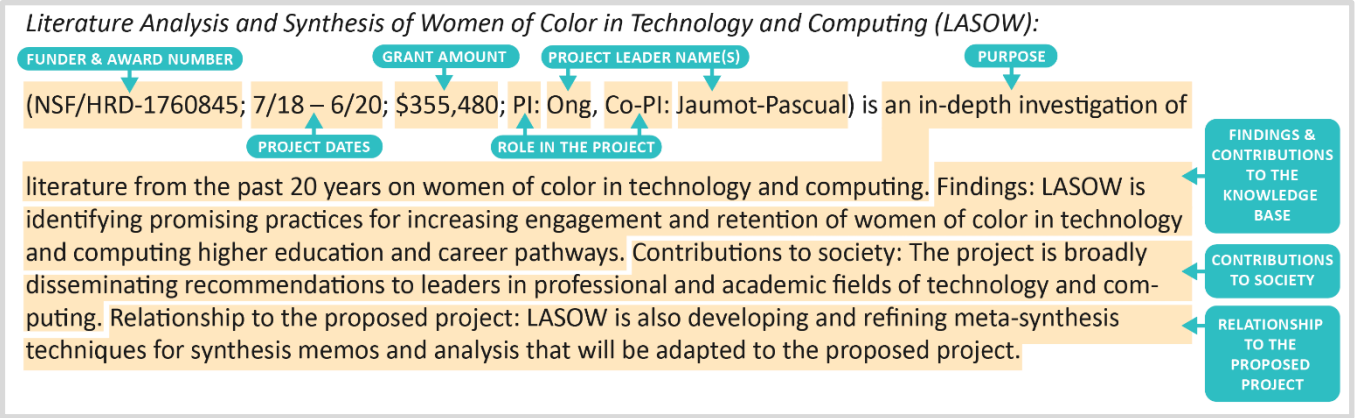

Figure 8c.1. Example of prior work related to the proposed project

You may also want to specifically name the relationship between past projects and your meta-synthesis proposal. Regardless of the size of the project, it is important for you to mention any prior projects that are related to your proposal. Here is an example from our team's EBDB proposal, which highlighted and described how a past interview project related to our proposed meta-synthesis:

Example 8c.2. Prior Work Related to the Proposed Project

The earlier study focused on individual experiences and on an examination of STEM organizations, was solely based on interviews. This process indicated patterns of persistence and success as they related to women's participation in support programs and STEM inclusion conferences. The proposed meta-synthesis project is designed to *complement* this earlier study, by examining these factors, among others, across empirically-based works and by applying formal analysis to the past 10 years of research.

The main point of these descriptions is to establish your familiarity with the topic and/or expertise in methods. If you do not have any past related projects, it is important to state this up front so that reviewers will not think you have omitted a section. You can make a short statement, such as "[Name] has no relevant funding to report," and/or "The proposed project will be [Name's] first grant."

Activity 8c.3.

Take 30-45 minutes to draft the "Prior Works Closely Related to the Proposed Project" section of a proposal.

References

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, *8*(45). 1-10. https://doi.org/10.1186/1471-2288-8-45

Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race Ethnicity and Education, 8*(1), 69-91. https://doi.org/10.1080/1361332052000341006

Institute for Meta-Synthesis

Sub-Module 8d:
Project Expertise and Institutional Capacity

Objectives

In this sub-module, you will learn:

- To write effectively about the expertise of yourself and senior partners on your project.
- To differentiate between the roles of an evaluator and advisory board, and how to determine which is best for your project.
- To effectively convey the capacity of your institution to support your meta-synthesis project.

Main Concepts

As we explained in **«Module 1»**, a meta-synthesis project can be difficult to do alone. Our team recommends that you work with internal and/or external collaborators and potentially other experts. This sub-module will cover aspects of building the key personnel for a successful meta-synthesis project and how to write about the expertise of yourself, your team, and your evaluator and/or advisory board. The last section briefly discusses how to write about the institutional capacity of your organization to support your proposed project.

Key Personnel

The proposal will include a section for Key Personnel. The purpose of this section is to further establish the qualifications of yourself and other members as researchers to do a meta-synthesis. This section should contain brief paragraphs of each senior person involved in your project and what expertise or skills they contribute. If team members have previously been involved in related projects but they were not part of their leadership, this is a good place to highlight that involvement. Be sure that the project responsibilities you list are complementary to the ones you list for yourself. For example, consider including team members with areas of expertise such as library science, the content area of your proposal, or expertise in methods. This section should include descriptions of:

- **Yourself** (**Principal Investigator**, **PI**): Person responsible for overseeing and managing the entire research project.
- **Principal Investigators (Co-PIs) and Partners** (internal or external): Other people who assist with overseeing and managing the research project.

- **Senior Personnel**: Other researchers or personnel on the project who do not have responsibility for leading the project but are contributing to the project through their expertise and accomplishing specific tasks.
- **Consultants**: Experts who play a small, specialized role in your project.

In a brief paragraph for each person, provide the following details:

- Name
- Title
- Role and current organization
- Intended role on the proposed project (e.g., Principal Investigator)
- Areas of expertise
- Related publications, presentations, or awards, if any
- Related past or current related work or volunteer activities, if any
- Responsibilities on the proposed project

Activity 8d.1.

Take 10-20 minutes to create an ideal list of personnel for your meta synthesis project, including yourself, your project team members, partners, evaluators and advisory board members. Next to their names, list their areas of expertise and skill sets related to your meta-synthesis project.

Note that you may also be required to supply separate resumes or biographical sketches as supplemental documents for many, or all, persons listed above. However, reviewers do not always read the supplemental documents carefully, so this section is your chance to impress them with how you and your team are uniquely qualified to carry out your proposed meta-synthesis.

Here are two examples of key personnel descriptions from our team's engineering and computing proposals:

Example 8d.1. Personnel descriptions

Maria (Mia) Ong, Ph.D., Senior Research Scientist at TERC, will serve on the project as PI. For over 20 years, Dr. Ong has conducted research focused on intersections of gender and race/ethnicity in STEM education and careers, including six NSF-sponsored projects, two of which have included syntheses. Dr. Ong's work has appeared in numerous journals, including *Harvard Educational Review* and *The Journal of Diversity in Higher Education*. She has been an invited speaker at numerous international and national STEM education meetings, including those hosted at the White House and the National Academies. Dr. Ong's former work with students underrepresented in STEM higher education was recognized with a U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. She has been a member of several national advisory boards, including the Committee on Equal Opportunities in Science Engineering (2008-2014). Currently, Dr. Ong serves as an advisor to the Center for Gender Equity in Science and Technology. Responsibility on this project: Dr. Ong will oversee the research team, participate in data collection, communicate regularly with the Advisory Board, and lead dissemination of findings.

Nuria Jaumot-Pascual, M.L.A., Senior Research Associate at TERC, will participate on the project as Co-PI. For 10 years, Ms. Jaumot-Pascual has engaged in research and evaluation related to STEM education in and out of school with a special focus on gender and marginalized populations. She is part of a TERC research team, *EBDB*, that explores barriers and success to the participation of women of color in engineering education and careers. Additionally, she has 20 years of experience as an education practitioner in school and out-of-school environments. Her writing has been published in the *Teaching for Excellence and Equity in Mathematics Journal* and *Afterschool Matters*. Ms. Jaumot-Pascual is currently a doctoral candidate in Qualitative Research and Evaluation Methodologies at the University of Georgia and a member of TERC's IRB. Responsibility on this project: Ms. Jaumot-Pascual will lead the data collection and analysis and participate in dissemination tasks.

Activity 8d.2.

Take 30-40 minutes to draft your bio that would be part of the "Key Personnel" section in your proposal.

External Oversight

Our team recommends that you consult with your **program officer** or the funding provider to determine whether you need an **external evaluator**, an **advisory board**, or both. An external evaluator's primary goal is to ensure that your activities are consistently aligned with your project goals and objectives. They assist you in making mid-course changes in your project and help you assess to what extent you are meeting project milestones and meeting your goals and objectives by the end of the project. Funding agencies often require external evaluators to be external to your institution (i.e., not in another department on your campus). If you choose to work with an evaluator, their evaluation plan should be included in the proposal.

An *advisory board* has a more expansive role. Members of the advisory board can fill in knowledge or methodological gaps in your team, and they may **help your team carry out different tasks throughout the project.** For example, with the methods, they can identify search engines, suggest search terms, and provide literature. In terms of analysis, they can give feedback on early coding, early thematic analysis, and early drafts of manuscripts. The **advisory board may also have an evaluative capacity**, such as conducting process evaluation. Advisors are usually senior in their field and can be internal or external to your institution. You should invite onto your advisory board people who have complementary skills to those of your team, such as content knowledge, library science expertise, and synthesis methods skills. In your proposal, you should describe your external evaluator and/or advisory board members using similar details to what is listed above under Key Personnel (e.g., title, role and current organization, area of expertise).

There may or may not be a cost difference between an external evaluator and an advisory board. Factors include your project needs, daily rates of these external consultants, and how many people you are working with. Evaluators and AB members are accustomed to negotiating rates and tasks. Your program officer may be able to help you decide whether your project needs an evaluator, advisory board, or both. The officer can also help you set the budget total for external oversight; it will be an approximate percentage of the total budget.

Here is an abbreviated example of descriptions and complementarity in expertise of advisors from our computing proposal:

Example 8d.2. Advisor descriptions

Enobong Hannah Branch, Ph.D., is Associate Chancellor for Equity and Inclusion and Associate Professor of Sociology at the University of Massachusetts at Amherst. Dr. Branch's expertise includes gender, race, racism, inequality, intersectionality of gender and race, work, and diversity in STEM. Dr. Branch will bring to the project theoretical insights about intersectionality and STEM from a sociological standpoint, as well as advice for dissemination and real-world implementation of solutions.

Patricia Garcia, Ph.D., is Assistant Professor of Information and Research Investigator at the University of Michigan. Dr. Garcia studies how the use of culturally responsive computing practices can increase Black and Brown girls' and young women's participation in STEM activities. Drawing on her background as an information specialist in the field of equity and inclusion in STEM, Dr. Garcia will serve as the project's methodology advisor.

Quincy K. Brown, Ph.D., is Director of STEM Education Research at the American Association for the Advancement of Science (AAAS). For six years, she was an Assistant Professor in the Computer Science Department at Bowie State University, where she taught and conducted research in Human Computer Interaction (HCI). Dr. Brown will provide experiential knowledge about technology and computing environments as a Black woman in computing, and she will advise about recommendations and actions regarding policy. *A Letter of Collaboration from each Advisory Board member is provided.*

If you choose to have an external evaluator and an advisory board, you will need to have clear, non-overlapping roles for each. The evaluator would be in charge of formative, process, and/or summative evaluation, while the advisors would complement the team's skills and networks. Some examples of the types of tasks that they could fulfill include providing access to literature that the team did not find through the meta-synthesis process, providing feedback to manuscript drafts, and supporting project dissemination activities.

Activity 8d.3.

Take 10-20 minutes to create an ideal list of evaluators and/or advisory board members. Next to their names list their areas of expertise and skill sets related to your meta-synthesis project.

Institutional Capacity

Finally, be sure to include a few sentences about the capacity of your institution to support your proposed meta-synthesis. This information can be obtained by speaking to administrative staff such as grant coordinators or other researchers with experience with grants in your organization or university who may be more knowledgeable or can direct you to staff who can assist you. Some elements of your institutional capacity might include:

- Accessible office space and conference rooms
- Infrastructure to support the project (e.g., HR, finance and payroll, grants administration, a fully staffed communications department)
- Relevant technology support:
    - A full-staged development/test/production web environment
    - State-of-the-art computing facilities; high-speed internet
    - Secure digital (local and cloud) and physical storage for project materials
    - Personalized conference bridge lines (such as Zoom) for webinars or online meetings
    - Data management databases such as FileMaker
    - Bibliographical management tools such as EndNote or Zotero
    - Data analysis tools such as NVivo or Atlas.ti
    - Audiovisual technology and presentation tools
- University library access that includes extensive physical collection and access to a vast digital network
- An institutional review board to provide ethical overview of the project

Most of the elements in the list above will likely be part of the proposal. NSF proposals contain a section called "Facilities, Equipment, and Other Resources" where the relevant elements in the list are included.

Activity 8d.4.

Take 1-2 hours to research resources at your institution that might support your meta-synthesis project and create a detailed list.

Additional Resources

These resources will help individuals with identifying an external evaluator:

- American Evaluation Association: https://my.eval.org/find-an-evaluator?reload=timezone
- Greater Boston Evaluators' Network (GBEN): https://greaterbostoneval.org
- Evaluation Association of St. Louis (EASL): https://easl.wildapricot.org/
- Strengthening Capacity for Equity in New England Evaluation (SCENE) collaboration: Contact person Emily Gates emily.gates@bc.edu

These resources will help individuals understand the steps to formalize their partnerships within their meta-synthesis project proposal as they build their project team and expertise.

- Geraghty, L., & Feeney, L. (2021, March). *Formalize research partnership and establish roles and expectations*. The Abdul Latif Jameel Poverty Action Lab (JPAL). https://www.povertyactionlab.org/resource/formalize-research-partnership-and-establish-roles-and-expectations
- Keesler, V.A. (2015). *Building productive research partnerships*. Building State Capacity and Productivity (BSCP) Center. http://www.bscpcenter.org/resources/publications/building%20productive%20research%20partnerships.pdf

These resources will help individuals with drafting their biographical sketches for their meta-synthesis project proposal to NIH and NSF.

- National Institutes of Health. (2021). Biographical Sketch format pages, instructions, and samples: https://grants.nih.gov/grants/forms/biosketch.htm
- National Science Foundation. (2021). Biographical Sketch formats and guidelines: https://www.nsf.gov/bfa/dias/policy/biosketch.jsp

This resource will help individuals with organizing their proposal submission timeline up to 25 days before the submission deadline.

- San Jose State University (SJSU) Research Foundation. (2021, September 7). Proposal submission timeline. https://www.sjsu.edu/researchfoundation/principal-investigators/submitting-proposals/proposal-submission-timeline/index.php

Institute for Meta-Synthesis

Sub-Module 8e:
Dissemination Plan, Timelines, and Other Proposal Elements

Objectives

In this sub-module you will learn:

- To convey a strong dissemination and communication plan and why it's important.
- To communicate a project timeline in two different ways.
- To consider and develop other proposal elements for a strong proposal.

Main Concepts

In this sub-module, you will be introduced to two main sections that often appear towards the end of the proposal: (1) the dissemination and communication plan, and (2) the timeline. The **dissemination and communication plan** will give reviewers a sense of how you will share what you have learned from the meta-synthesis project. The **timeline** shows, at a glance, your plan for getting all parts of the project done within a specific amount of time. Below the timeline section is a list of additional elements that may be required by the funder. The sub-module ends with some reflections on the time and effort it takes to get a proposal for meta-synthesis funded.

Dissemination and Communication Plan

Your proposal should have a strong dissemination and communication plan. As stated above, this plan shows reviewers the breadth and depth of how you will share your knowledge gained from your project. Increasingly, funders want to see a mix of **traditional** dissemination and **non-traditional** dissemination. Traditional dissemination includes outlets in your academic field(s), such as:

- Academic conferences
- Publications in peer-reviewed, academic journals
- Academic books and book chapters

Non-traditional dissemination includes outlets where your findings might "move the needle" in terms of practices, policies, or public understanding. Such venues include:

- Policy briefs
- Community sharing
- Practitioner reports or publications
- Blog posts and other social media
- Communication via national organization websites
- Joint presentations and collaborations with community partners

Activity 8e.1.

Take 10-20 minutes to research and select 1-2 specific possibilities for **traditional** dissemination (e.g., name of a journal or conference) and 1-2 possibilities for **non-traditional** dissemination for your meta-synthesis findings.

Additionally, if your organization has a communications department, consider meeting with the director to ask what resources they have – such as in-house publications with a wide audience base or regularly maintained social media channels – that can feature your project once you begin to have results. These should be described in your proposal.

Below is an example of a request for information for the proposal about available dissemination and communication resources addressed to your organization's Communications Department:

Example 8e.1. Email request

Hi Communications,

Would you be able to help us with our NSF proposal? We are missing some information for our Dissemination section. Can you please fill out the paragraph below (see **XX***s) about TERC's reach? Also, a brief description of all the ways TERC reaches people would be extremely helpful. Thanks so much!*

"The recorded webinars will be available on TERC's website. They will be featured in TERC's quarterly publication Hands On!, which reaches **XX** people interested and active in STEM education throughout the U.S. They will also be featured in TERC's social media (LinkedIn, Twitter, Facebook), which are followed by **XX** people, which will drive traffic to the recorded webinars."

Once you obtain the appropriate information from your organization's Communications Department, the specific section of your proposal about dissemination may read as follows:

Example 8e.2. Dissemination section

"The recorded webinars will be available on TERC's website. They will be featured in TERC's quarterly publication *Hands On!*, which reaches **2,500 people through the post and 2,000 through email** who are interested and active in STEM education throughout the U.S. They will also be featured in TERC's social media which are followed by a total of nearly **3,000 people (LinkedIn = 1,107; Twitter = 1,227; Facebook = 640)**, which will drive traffic to the recorded webinars. **X TERC also hosts promotional booths each year at the NSTA National Conference, NCTM National Conference, Mass STEM Summit, and the STEM Expo and Forum where they advertise staff members' work, such as recorded webinars."**

Activity 8e.2.

Take 15-30 minutes to check if your institution or school has a communications department. If it does, reach out to see if they have resources or social media channels that are potential avenues to share your meta-synthesis findings. Get specific data (e.g., number of Twitter followers, email listserv recipients) to report in your proposal.

Timelines

Timelines are a succinct way of conveying your plan for getting the work done on schedule. The elements of a timeline include the activities and the timeframe for doing the work; they may also include the names or roles of people leading the activities. The timeline should be descriptive, listing detailed activities between the start of the project through to dissemination at the end. Finally, the activities listed in the timeline should align with your description in your methods section and dissemination plan.

Our team has been successful with two types of timelines – Gantt charts and tables. Most proposals use **Gantt charts**, which illustrate a project schedule, the dependency relationships between activities, and the current schedule status. Some also include who is responsible for the work at each stage. These charts are easy for reviewers to follow because they show the overlapping, simultaneous progress of the different parts of the project and take up less valuable space in the proposal. Tables, however, may contain more details about the project work and thus be harder to follow and take more valuable space. Below, we include modified examples below from our project, *EBDB* (NSF-1427129).

Here is a Gantt chart of our activities for a two-year project. The first column shows a list of all of the major activities that will take place during the project. The second column lists the sub-tasks/activities for each major activity. The following columns are related to the time period (by season) during which each of the major activities and sub-tasks will be completed.

Table 8e.1. Gantt chart example

ACTIVITIES		YEAR 1				YEAR 2			
		SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER	FALL	WINTER
PRE-SEARCH AND START SET	CONDUCT PRE-SEARCH ACTIVITIES								
	ESTABLISH LITERATURE SET								
CONDUCTING LITERATURE SEARCHES	SEARCH AND FILTER LITERATURE								
HYBRID CODING AND ANALYSIS	ESTABLISH HYBRID CODEBOOK								
	WRITE, IMPLEMENT ANALYTIC INSTRUMENT								
WRITING	WRITE SYNTHESIS MANUSCRIPT								
	WRITE POLICY, COMMUNITY PIECES								
DISSEMINATION AND OTHER ACTIVITIES	PRESENT AT CONFERENCES								
	PUBLISH FINDINGS								
	SUBMIT REPORT TO FUNDER								
	CHECK-IN WITH ADVISORY BOARD								

In this second example we see how the table includes many more details compared to the Gantt chart. Depending on your proposal space limitations, this can help you determine which chart type to use.

Table 8e.2. Table example

Pre-Search & Start Set	Lead	Timeframe
Conduct pre-search activities	PI	**2 mths: April – May 2014**
Establish search & selection criteria		April 2014
Select search engines and search terms		April – May 2014
Solicit feedback from Advisory Board (AB), revise		May 2014
Establish the start set	Team	**3 mths: June – August 2014**
Conduct literature searches		June 2014
Sift through literature: Apply Filters 1 & 2		July – August 2014
Track & catalogue literature & filtering decisions		June – August 2014
Conducting Literature Searches	**Lead**	**Timeframe**
Search and filter literature	Co-PI	**5 mths: Sept 2014 – Jan 2015**
Conduct full data collection & filtering		Sept – Dec 2014
Track & catalogue literature & filtering decisions		Sept – Dec 2014
Share methods, solicit feedback from AB		Dec 2014
Make corrections, changes per AB feedback		Dec 2014 - Jan 2015

Hybrid Coding & Analysis	Lead	Timeframe
Establish hybrid codebook	Co-PI	**1 mth: Jan 2015**
Write, implement analytic instrument	Co-PI	**3 mths: Jan – Mar 2015**
Establish template for analytic instrument		Jan 2015
Share codes, instrument drafts with AB		Jan 2015
Refine codes, instrument per AB feedback		Jan 2015
Write analysis for each lit. piece		Jan - Mar 2015
Enter codes and analyses into NVivo		Mar 2015
Writing	**Lead**	**Timeframe**
Write meta-synthesis methods manuscript	Co-PI	**4 mths: Jan - April 2015**
Write blog entries re: early, ongoing findings	RA	**12 mths: April 2015 - Mar 2016**
Write policy briefs, community pieces re: findings	PI, Team	**12 mths: April 2015 - Mar 2016**
Get AB feedback, make revisions		April 2015 - Mar 2016
Draft full meta-synthesis manuscript	AB,Team	**5 mths: May – Sept 2015**
Draft sections by themes arising from analysis; revise		May – Sept 2015
Re-write, edit full manuscript	PI, Team	**6 mths: Oct 2015 – Mar 2016**
Share revised draft with AB		Oct 2015
Advisory Board meeting, get ms feedback		Nov 2015
Revisions based on AB feedback		Nov 2015 – Jan 2016
Edit, finalize synthesis		Feb – Mar 2016
Other Activities, Dissemination	**Lead**	**Timeframe**
Other Activities	PI	**24 mths: Apr 2014 – Mar 2016**
Build and oversee Team, IRB requirements		April 2014 – Mar 2016
Write and submit NSF annual, final reports		Feb 2015, Mar 2016
Disseminate project findings	Team	**12 mths: Apr 2015 – Mar 2016**
Post findings on blog, virtual outlets		April 2015 – Mar 2016
Share briefs w/STEM leaders, policy orgs, industry, HR orgs		April 2015 – Mar 2016
Present at conferences		April 2015 – Mar 2016
Submit synthesis ms to peer-reviewed journal		Mar 2016

In this sub-module's section for Materials and Resources (below), you can go to websites where you can find free templates and other information to help you create Gantt charts or use other project management tools.

Activity 8e.3.

Take about an hour to develop a Gantt or table timeline for the completion of your meta-synthesis project.

Other Elements for the Proposal

Depending on the funder you are writing your proposal for, you may need to include additional elements in your submission. These elements may include:

- Budget and budget justification (i.e., an explanation of how the funds will be spent)
- Letters of support/collaboration from partners, consultants, evaluators, or advisors

- Other documents required by the funder, such as:
    - **Resume or biographical sketch**
      This document outlines your qualifications to successfully conduct the proposed project. Funders may have page limits, specific information they require, or templates for you to follow.
    - **Current and pending funding**
      This document declares current projects you have that are currently funded and/or other proposals you have submitted and are awaiting funding decisions. This document helps funders determine whether you have time to successfully conduct your proposed project.
    - **A list of current and previous collaborators**
      This list – typically of your advisors, co-authors, fellow researchers, and editors – helps program officers avoid conflicts of interest when selecting reviewers.
    - **A data management plan for storing and sharing project data**
      This plan shows how you will ensure that sensitive physical and digital data you collect will be kept safely. Synthesis projects typically use published data, which are not confidential (the way interview or survey data may be), but some funders nonetheless require a statement of data management.
    - **A facilities and resources statement confirming the capacity of your institution to support the project**
      This document declares the spaces and resources provided by your institution to support the success of your proposed project. For example, as explained in **«Sub-Module 8d»**, you want to describe how your institution has access to online libraries or other resources, which will support your meta-synthesis searches.

Final Thoughts on Proposal Development

As you may have gleaned from reading the full Proposal module and doing the activities, preparing a strong proposal takes a great deal of time. Our team often spends eight to ten weeks (working 10-20 hours per week) to develop a winning proposal from start to finish. (For an alternative proposal timeline of 25 days, see the SJSU Resource Foundation's guide below.) Be sure to build in time for colleagues to give feedback on a draft of your narrative and for your finance director to review and approve your budget documents.

Even when team members are not actively writing a proposal, members of our team are always developing our professional networks – with the roles of future advisors, consultants, and partners in mind – or reading theory to support future frameworks for our proposed studies. Finally, if you are entering your proposal to a competitive program, expect to submit more than once. Rejection and disappointment are routine parts of being a proposal writer. Build and learn from rejected proposals. Practice kindness to yourself. Give yourself permission to take a long break (several days) after receiving a rejection before you read reviews and start the process again. Be willing to learn from your program officer's and reviewers' comments to improve your proposal for the next time and be patient! Good luck.

Additional Resources

Project Management & Gantt Chart Resources

These resources will help individuals with organizing their timelines and managing their projects as they work on their meta-synthesis project proposal.

- Free project management templates: https://www.projectmanager.com/pm-templates
- Gantt chart templates: http://teamgantt.com
- Projectmanagement.com YouTube channel: https://www.youtube.com/watch?v=d8_gaRIrrUw&list=PLF1064CD7B0A98261
- Mike Clayton project management YouTube channel: https://www.youtube.com/watch?v=XT-wb6b64_E