Preparing to Publish

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Contents

Introduction

Preparing to Publish is an e-book that guides readers into the world of academic manuscript publication. The primary audience is graduate students and those who instruct them. The materials here build upon a tradition of English for Academic Purposes to provide clear guides to writing research reports. The text explores the communicative goals and strategies associated with successful academic writing and demonstrates the relationships between the sections of a manuscript.

For students and novice research writers and scholars, this book is intended as an important resource for navigating academic writing, specifically empirical research write-ups. It will help students identify functions of the research article as a whole and explore authors' meaning as they write each section of the research article. This book will also supply strategies for understanding research writing within students' individual disciplines and yield helpful tips for planning for, outlining, drafting, and reviewing their own research reports.

For instructors and mentors of graduate students and novice researchers, this book will serve as a valuable reference guide in helping those unfamiliar with the standards of scholarly writing to better comprehend the research writing genre. It can be used within a graduate-level class in any number of academic disciplines and/or referenced as a useful pedagogical resource for students to consult as they learn the mandatory components of the research article. Alongside research article section-specific instructional materials are real-world examples of the building blocks that make up the writing. These samples are derived from a range of authentic, published research articles from highly reputable peer-reviewed journals and were hand-selected by field-specific experts in varying academic programs.

We hope you will take time to examine the goals and strategies covered in each chapter of the book. We recommend using these elements as you explore published writing in your own field. Equipped with these new helpful tools, you will be drafting your research article with more ease, more intention, and less confusion about the type of writing you are expected to produce at this advanced academic level.

Chapter 1

What is a Scientific Argument?

When we think of the word "argument," we often envision a disagreement between two or more parties. In writing, the "argument" refers more exclusively to the case you are building and for which you have supporting information to strengthen that case. In the scientific research article, you will be constructing an argument about the legitimacy, value, and reliability of the research you have conducted. The more robust your supporting data and more well-crafted and better reasoned the interpretations of your results are, the more you will convince your audience of the acceptability of your argument.

What is a scientific argument in the context of scholarly writing?

- a claim backed up (warranted) by evidence
- not a heated disagreement

The concept of the argument can be applied to any part of the empirical research write-up, from the entire article or thesis or dissertation down to each individual sentence (Cargill & O'Connor, 2009)[1]. For this reason, it is important that research writers are intentional about what argument they want to make (or what they aim to convince their audience of) before they begin writing; this will shape not only each sentence, but also the text as a whole.

1. Cargill, M. & O'Connor, P. (2009). *Writing scientific research articles: Strategies and steps.* Wiley-Blackwell.

How to Use this E-book

Prior to delving into the book's content, it is helpful to understand how the chapters are organized and how to best exploit the instructional content and featured supplemental components. Firstly, each chapter presents detailed descriptions of the research article sections, including authors' main goals for each section and the strategies authors intentionally apply to achieve those goals, and what common elements we find in every research report, no matter the discipline. To supplement this written description, a number of callout boxes are used so you can understand how to interact with the material and use it to best process the tips and strategies provided. Make sure to read and interact with these features so you can make the most from your engagement with this book.

Featured chapter components:

- Warm-Up
- Explore and Apply
- Examples
- Key Takeaways

Learning Objectives

The learning objectives features help you understand the intent of each portion of the book. They are typically located at the start of the chapters and orient you to what you can expect to have learned after reading the given chapter.

Warm-Up

Warm-up features include interactive tasks, such as questions about your observations of writing in your discipline or short activities prompting you to reflect on your own writing process. This feature primes you to engage with the upcoming material in ways that are most relevant to you and your field.

Examples

The examples features provide real-world examples of the content being described. These examples are derived from actual peer-reviewed research publications in a variety of different disciplines and are intended to better illustrate the instructional material in the particular section covered.

Key Takeaways

The key takeaways features supply you with a quick summary of the overall message of each section. They can serve as a useful thumbnail if you need a reminder about what content is provided in that part of the book.

Explore & Apply

The explore and apply feature encourages you to investigate the writing conventions of your own discipline. Specific tasks ask you to explore quality published research in your field so you can better match the goals and strategies instructed in the chapter with what you observe occurring in that writing. Next, you are provided suggestions for how to apply these goals and strategies as you construct your own written drafts.

Note to Students

For students and novice research writers and scholars, this book is intended as an important resource for navigating academic writing, specifically empirical research write-ups. It will help students identify functions of the research article as a whole and explore authors' meaning as they write each section of the research article, in addition to supplying strategies for understanding research writing within students' individual disciplines and yielding helpful tips for planning for, outlining, drafting, and reviewing their own research reports.

We encourage you to consult the "How to Use this E-book" segment of the book prior to getting started. This page helps you navigate the book's features and primes you for using the text so that you get the most out of it. You'll learn how to use the warm-up activities to start reflecting on your own writing processes, where to find authentic examples of instructed content that are included for illustration purposes, how to best explore published writing in your own field to understand published authors' use of certain research article section-specific goals and strategies, and how to apply these concepts to successfully draft your own research article.

As you encounter interactive tasks and activities in this e-book, please complete them! They are inserted intentionally to engage you with the material and to prompt you to discover more about the academic writing standards and conventions in your own discipline. Your recognition of what makes quality research writing in your field will help you as you craft your own research writing and assist greatly with your progress as an independent academic writer.

Note to Instructors

For instructors and mentors of graduate students and novice researchers, this book will serve as a valuable reference guide in helping those unfamiliar with the standards of scholarly writing to better comprehend the research writing genre. It can be used within a graduate-level class in any number of academic disciplines and/or referenced as a useful pedagogical resource for students to consult as they learn the mandatory components of the research article. Alongside research article section-specific instructional materials are real-world examples of the building blocks that make up the writing. These samples are derived from a range of authentic, published research articles from highly reputable peer-reviewed journals and were hand-selected by field-specific experts in varying academic programs.

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Please prompt your students to take advantage of the interactive tasks and activities in this e-book. They are inserted intentionally to engage learners with the material and discover more about the academic writing standards and conventions in their own disciplines. Student recognition of what makes quality research writing in their fields will help them as they write up their own empirical research and support their growth as independent research writers.

Chapter 2

Conceptualizing the Research Article

You are probably familiar with some of the sections included in a typical research article (and if not, you're in the right place!), but even if you have read many articles, you may not have thought critically about what the writers' intentions are in various parts of it. One of the aims of this book is to help you see the purposes of academic research writing from the perspective of a writer – specifically, with regard to goal setting and strategy implementation.

Learning Objectives

After completing this chapter, you should be able to …

- explain the organizational structure of a research article (RA);
- recognize the common sections of an RA;
- apply knowledge of the structure to understand basic communicative goals;
- evaluate the organizational pattern in terms of general vs. specific information.

The first step for learning about how to do research writing is understanding the organizational structure of an RA. With that in mind, use the warm-up activity below to activate your thinking about this topic.

Warm-Up

Consider these questions as you prepare to read:

- We often visually depict a research article with the image of an hourglass. Why do you think this image is so useful for envisioning the various sections of an RA?
- What do you consider to be the major parts of a research article (RA)?
- Which ones contain more general information?
- Which ones are more specific?

Test yourself with this quick activity:

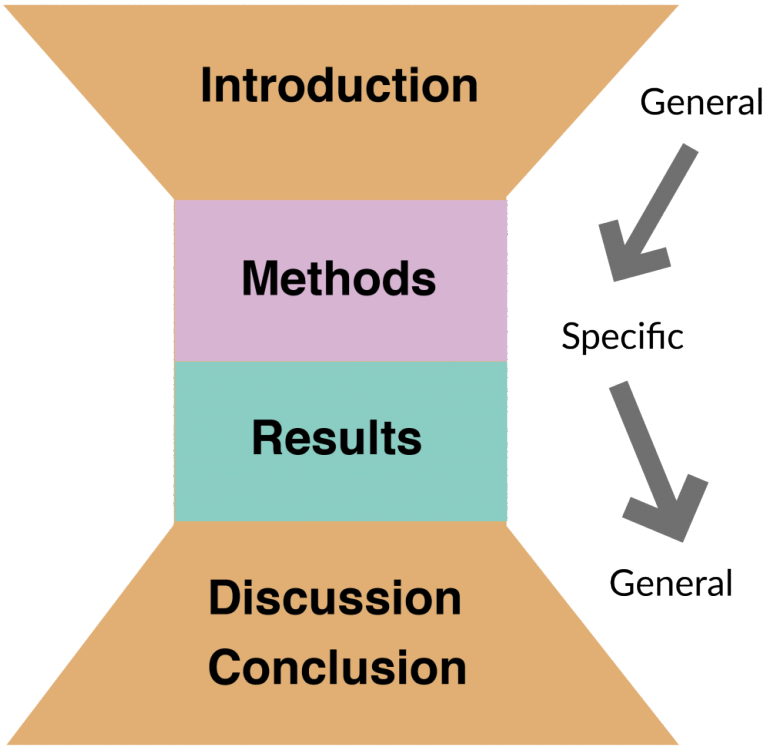
An interactive H5P element has been excluded from this version of the text. You can view it online here: https://iastate.pressbooks.pub/preparingtopublish/?p=930#h5p-11

The Sections of a Research Article

If you've ever read or written almost any type of academic document, you might have noticed that they start with introductions and end with conclusions. However, research articles – as a genre – have other consistent sections as well. The complete list of sections for research articles include the following:

- Introduction
- Methods
- Results
- Discussion/Conclusion

A common acronym for teaching the sections of a research article is IMRD/C. In this book, we will focus heavily on helping you understand each of those IMRD/C sections' various pieces, including their communicative goals and strategies you can use to achieve those goals. We will also use a visual of an hourglass to demonstrate this IMRD/C organizational structure.



We hope that this graphic along with the explanations and examples in Chapters 3-6 will allow you to deepen your understanding of research writing and become a more successful author.

Next, we'll investigate each part of a research article from a big-picture perspective, starting with an exploration of the term "research."

What is Research?

The word *research* is simple and yet at the same time quite complex. In this section, we'll explore definitions of research and narrow down which type of research will be discussed in this book. Let's start by looking at the word itself.

Research can be a noun or a verb, and as such, it is already a nuanced word. When we complicate it further by introducing the idea that different academic disciplines consider research from a variety of perspectives (and use a variety of definitions), then it seems almost impossible to define simply. As we must start somewhere, we choose to begin with dictionary definitions of this word in both of its forms (noun and verb):

research / r ɪ ˈsɜrt ʃ , ˈri sɜrt ʃ /

noun

1. diligent and systematic inquiry or investigation into a subject in order to discover or revise facts, theories, applications, etc.:recent research in medicine.
2. a particular instance or piece of research.

verb (used without object)

- to investigate carefully.

verb (used with object)

- to make an extensive investigation into; to *research* a matter thoroughly.

Other words for research include *scrutinize*, *study*, *inquire*, *examine*, *investigate*, *explore*, and many more. All of them, however, are basically denoting a serious look at some topic from some given perspective. Scholars consider many different academic activities to be "research," but typically the research that is presented in the types of articles this book discusses are considered "empirical" examinations into a topic. *Empirical* describes research that is not based solely on theory but rather is capable of being verified via experience, observation, analysis, and conclusion. Of course, the use of theory/ies is included, but the research articles we focus on in this textbook are empirical ones.

Within empirical research, there are a few predominant paradigms. These are typically labeled quantitative, qualitative, and mixed methods research studies. You probably know which type of study is the norm for

your research interests, so we will not delve into defining and describing those categories. The point to remember is that information presented in this book could be applied to any type of research manuscript.

Next, we'll introduce another term that is often applied to research writing: *GENRE*.

What is a Genre?

Like the word *research*, the word *genre* also has many definitions. At its most basic level, *genre* is the French word for "type." In the world of English for Academic Purposes, it refers to a communicative event that is widely recognized. In terms of research, some common genres include research articles, grant proposals, conference papers, posters, abstracts, and even job-related documents such as cover letters, research statements, etc. In this book, we are focused on the research article genre.

As genres have particular characteristics, one way of learning how to write better within a given genre is to explore the characteristics of it, which is one of our primary goals in this book. Before we explore the research article, however, it's important to know about genre systems, which are interrelated text types that often work together to achieve a communicative goal.

Genre chains

The concept of genre chains was first discussed in Swales (2004)[1], where he defined a "chain" as a genre that is an antecedent of another genre. When studying English for Academic Purposes, it is common to approach the learning academic writing, for example, by exploring genre chains because it helps us understand certain types of genre, like research writing, as it is systematized and chronologically organized in an order of sequences.

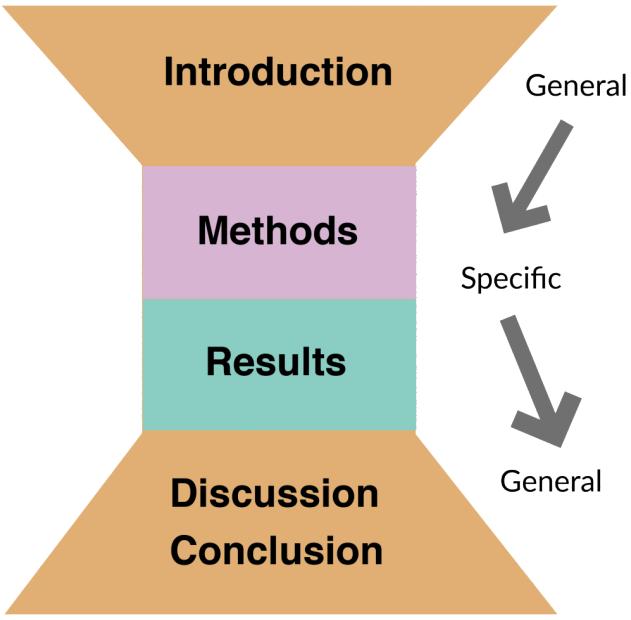
Genre ecologies

Genres are also sometimes conceptualized in terms of their ecologies, or interrelated and interacting genres Erickson (2000)[2]. In terms of the research article genre, it is helpful to envision the research write-up as only one piece of the communication that occurs between scholars. For example, lab reports, conference presentations and published conference proceedings, white papers, systematic reviews, and more are all part of ecologies that comprise a research communication genre.

1. Swales, J. M. (2004). *Research genres: Explorations and applications.* Cambridge: Cambridge University Press.
2. Erickson, T. (2000). *Making sense of computer-mediated communication (CMC): Conversations as genres, CMC systems as genre ecologies.* In *33rd Hawaii International Conference on System Sciences*, ed. R. H. Sprague, Jr. Maui: IEEE Computer Society Press.

Chapter 2 Synopsis: The Organization of a Research Article

This chapter outlined the organizational structure of a research article, which is commonly referred to as IMRD/C. Each of those sections has specific goals and strategies that writers can use to optimize their ability to communicate research successfully. One way to envision the relationships between each of the IMRD/C sections is with the image of an hourglass.



The hourglass demonstrates the generality of the Introduction and the Discussion/Conclusion sections in contrast to the more specific nature of the middle two sections — Methods and Results. In the next four chapters, you'll learn about each of those sections, respectively.

Key Takeaways

Each research article will contain distinct sections that tend to be rather consistent across disciplines, but could contain some individual variation within your discipline or even academic journal. The argument in an overall research article moves from being general to specific then back to more general again.

Chapter 3: Writing the Introduction Section

Learning Objectives

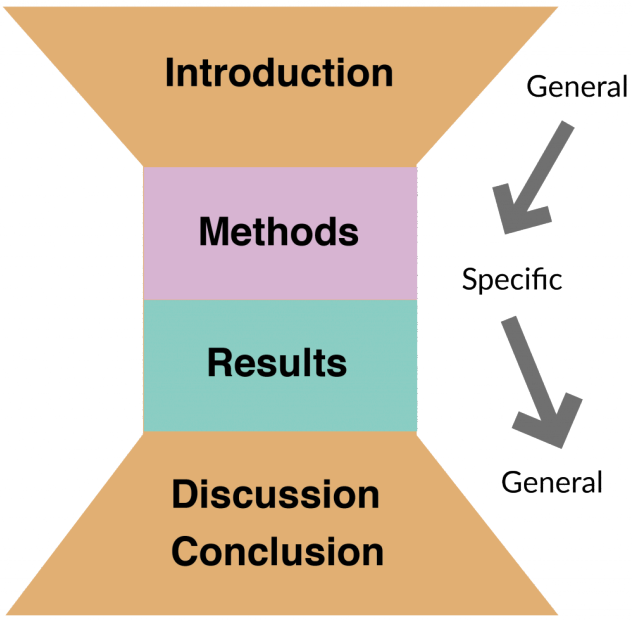
After completing this chapter, you should be able to…

- articulate the importance of Introductions,
- recognize the communicative goals of Introductions,
- strategize to achieve communicative goals,
- optimize the language for introducing your research, and
- evaluate your Introduction.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://iastate.pressbooks.pub/preparingtopublish/?p=57#h5p-1

Conceptualizing the Research Article

You may be aware that research articles have specific sections regardless of the academic discipline or journal. Generally, there are five commonly acknowledged sections of an empirical research manuscript: Introduction (including the Literature Review), Methods, Results, and Discussion/Conclusion.



Notice that the figure depicts a research article in the shape of an hourglass. That shape provides a way for us to consider which sections of a research article will be general/broad and which will be specific/narrow. The first part — the Introduction — is one of the most general or broad parts of the entire article.

Warm-Up

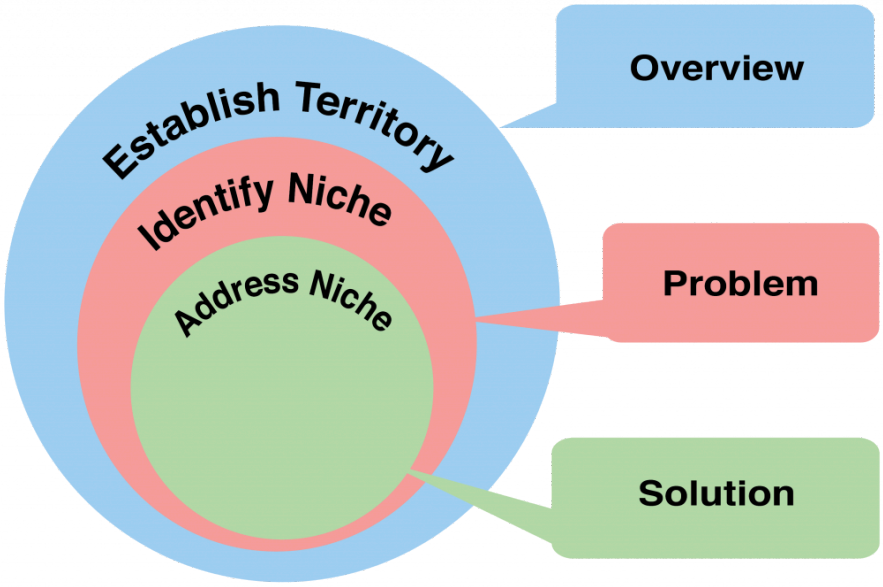
Why do you think the Introduction needs to be general (broad) and not too specific (narrow)? What aspects of an Introduction contribute to its breadth?

Goals of an Effective Introduction Section

There are three main goals for an effective Introduction:

1. Establish a research territory that fits into the existing literature;
2. Identify a niche in the literature where your study fits;
3. Address the niche by filling the "gap" in the literature.

The image below provides a visual way to understand the three goals:



These goals contribute an answer to the question of why an Introduction is considered more broad or general than other parts of a research article. By establishing a territory, identifying a niche, and addressing that niche, a writer generally needs to focus on the bigger picture, the problem, and a potential solution. As you can see in the figure, the Introduction becomes more specific with each goal; the problem is more specific than the territory, and your proposed solution to the problem will be even more specific than the problem. The concentric circles get smaller and smaller, indicating this narrowing of content into more and more specific ideas.

Next, we'll examine each of these three goals in-depth and give some examples.

Introduction Goal 1: Establishing a Knowledge Territory

The first goal of writing an Introduction is **Establishing a Knowledge Territory**, which means that you explain to your reader the big picture of where your study fits in the literature. To accomplish this goal, you must demonstrate knowledge of the topic and its relevance to the field. In other words, you are establishing how your expertise fits into an existing body of work.

Overall, Goal 1 (Establishing a Knowledge Territory) presents information, generally known background, and previous research on the topic of your research. It is the broadest part of an Introduction, so as you are writing, be sure to keep the information general.

Here are some excerpts from research articles with the key language in **bold**, because it is the best clue for linking words or phrases to a communicative goal:

Examples

- Wood pellet production is a **well-established and rapidly expanding** industry worldwide, including in the United States and Canada where the annual production is nearing 4 million metric tons. In the province of British Columbia, the industry has grown from 50,000 tons in 1996 to an expected 1,500,000 tons in 2010.[1]
- Legionellae are **widespread** in both natural and man-made aquatic habitats. Among the 51 species described so far, Legionella pneumophila is the most causative agent of legionellosis, but it is often difficult to isolate from environmental samples because of the presence of heterotrophic-associated bacteria that frequently overgrow on culture plates.[2]
- **It is well known that** having strong and supportive social relations is beneficial for several different outcomes (House et al., 1988; Call and Mortimer, 2001; Malecki and Demaray, 2003; Cohen, 2004). **We also know that** social background influences our living conditions and opportunities in several ways (Breen and Jonsson, 2005; Conger and Donnellan, 2007).[3]

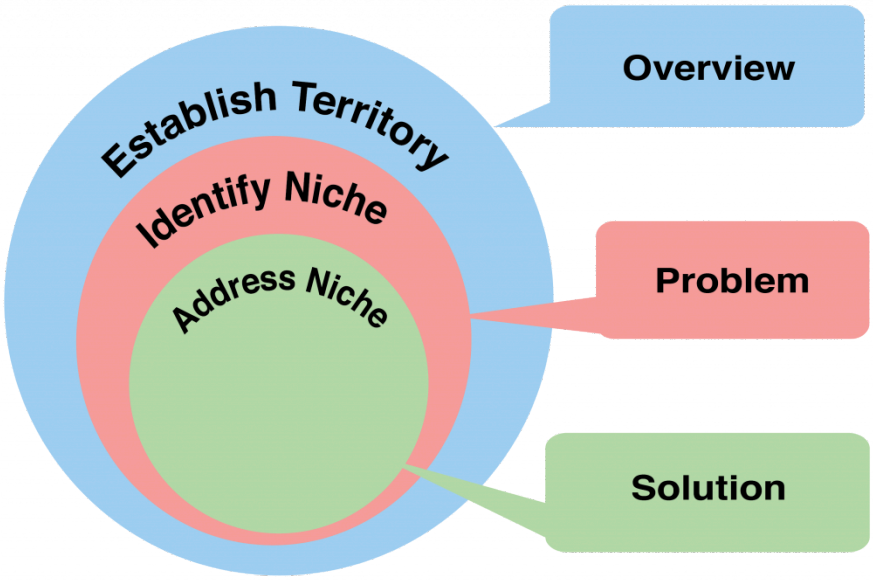
1. Tumuluru, J., Sokhansanj, S., Lim, C., Bi, X., Lau, A., Melin, S., Oveisi, E., Sowlati, T. (2010). "Quality of wood pellets produced in British Columbia for export", *Applied Engineering in Agriculture* 26(6).
2. Allegra, S., Girardot, F., Grattard, F., Berthelot, P., Helbig, J., Pozzetto, B., Riffard, S. (2011). "Evaluation of an immunomagnetic separation assay in combination with cultivation to improve Legionella pneumophila serogroup 1 recovery from environmental samples", *Journal of Applied Microbiology* 110(4):952-961.
3. Good, G., Dell, D., Mintz, L. (1989). "Male role and gender role conflict: Relations to help-seeking in men.", Journal of Counseling Psychology 36(3):295.

The **bolded** phrases in the list above are language cues demonstrating how the writers accomplish the communicative goal of establishing the territory. There are many other ways to achieve the same goal, and you can find extensive lists of such phrases by visiting Manchester's Academic Phrasebank website, which we will refer to repeatedly in this book.

Goal 1 prepares your reader to understand your research better by describing what is generally known and what has been previously researched. Imagine it as the foundation upon which you are going to build the house of your research. Unlike architectural foundations, however, the foundation of your research (as laid out in the Introduction) is on display for all to see. In fact, in this foundation, your aim as a writer is also to attract the reader, draw them into the research, and maintain their interest.

Goal 1 Strategies

Goal 1, "Establishing a Knowledge Territory," means that you demonstrate knowledge of the topic and its relevance in the field. There are three strategies that will help you to accomplish this:



Strategies for Introduction Communicative Goal 1: Establishing a Knowledge Territory

- **Claim centrality of your topic**
- **Provide relevant general background**
- **Review informative previous research**

We'll now discuss each of these and provide some examples from published journal articles.

Introduction Goal 1 Strategy: Claiming Centrality

Claiming centrality is a strategy used to focus the reader's attention on the reasons that your research belongs within the bigger picture of the topic. Centrality is also about stating the importance of your study and/or the amount of attention that other scholars have paid to the issue. You can implement this strategy by pointing out the broader scope of the interest and noting the other investigations that are related. This highlights the significance of your claims and shows the study has the potential for prominence within your discipline.

Here are two examples taken from published research articles in different disciplines. These excerpts demonstrate how to claim that there is a considerable amount of interest and importance in the topics, and the key language is in bold.

Examples

- Meat tenderness **is an important issue** in beef cattle **because it has a major impact on** consumer satisfaction. However, beef meat quality is not routinely measured, so a classical selection based on records is not feasible.[4]
- The emission from low-mass X-ray binaries in quiescence (qLMXBs) **is routinely studied to provide useful constraints on** the physical models of the interior of neutron stars (NSs). The low luminosity (1032-1033 erg s-1, 4-5 orders of magnitude lower than the outburst luminosities) of these objects was first observed in the post-outburst stages of the transient LMXBs Cen X-4 and Aql X-1 (van Paradijs et al. 1987), and initially interpreted as a thermal blackbody emission powered by some low-level mass accretion onto the NS surface (Verbunt et al. 1994).[5]

Claiming centrality generally occurs quite early in an Introduction because of its ability to establish the territory for the remainder of the Introduction. You will often see this strategy as the very first sentence of a paper; however, it is important to remember that strategies do not occur in a set order. That is, writers can use them wherever they seem most useful or relevant in a given Introduction.

Some common vocabulary that is associated with this strategy includes the following, as noted in the Academic PhraseBank website:

4. llais, S., Journaux, L., Levéziel, H., Payet-Duprat, N., Raynaud, P., Hocquette, J., Lepetit, J., Rousset, S., Denoyelle, C., Bernard-Capel, C. (2011). "Effects of polymorphisms in the calpastatin and μ-calpain genes on meat tenderness in 3 French beef breeds", *Journal of Animal Science* 89(1):1-11.
5. Guillot, S., Rutledge, R., Brown, E. (2011). "Neutron Star Radius Measurement with the Quiescent Low-mass X-ray Binary U24 in NGC 6397", *The Astrophysical Journal* 732(2):88.

pivotal	focal	fundamental
instrumental	vital	critical
essential	potent	powerful
crucial	widely-used	extensive
growing	primary	requisite

Introduction Goal 1 Strategy: Providing General Background

A second strategy for Establishing the Knowledge Territory is **providing general background.** This strategy usually combines a variety of different types of information, which may be related to theory, practice, methodology, or any other shared area of knowledge within the discipline. In other words, academics use this strategy as a tool to position the research within a framework. That could be a theoretical or conceptual framework or just an overview of the informational or conceptual frame of reference to support the reader's understanding of the study.

Below you will read some examples of this strategy being used in published research from a discipline in the human sciences and a discipline in the natural sciences. Notice how the writers are making general statements about their topics, which may include presenting information, systems, or necessities for future research by using words adverbs, such as *usually*, *typically*, *commonly*, *generally*, or *mostly*, which serve to emphasize the general nature of the statements.

Examples

- The promotion system **is mainly concerned with** the regulation of desired outcomes-people operating under a promotion focus are oriented toward opportunities and accomplishing aspired goals and **generally engage in** approach-related behaviors toward positive end states, such as acquiring or consuming desired objects.[6]
- As an opportunistic pathogen, Candida albicans is an important cause of systemic fungal infection in hospitalized patients. Routine detection of C. albicans in blood is time consuming and **typically involves** the use of blood cultures, followed by isolation on solid agar media. Definitive identification of C. albicans via commercially available automated systems may require up to 48 h.[7]

Of course, it is not a requirement for there to be an adverb in a sentence whose purpose is to present General Background. It is merely one way to accomplish the goal of establishing territory. So, while each

6. Baas, M., De Dreu, C., Nijstad, B. (2011). "When prevention promotes creativity: the role of mood, regulatory focus, and regulatory closure.", *Journal of Personality and Social Psychology* 100(5):794.
7. Bisha, B., Kim, H., Brehm-Stecher, B. (2011). "Improved DNA-FISH for cytometric detection of Candida spp", *Journal of Applied Microbiology* 110(4):881-892.

discipline has its own conventions and each author has his/her/their own personal writing style, there are many similarities and patterns in the language used. Nevertheless, these are only examples, and there is an almost infinite number of language possibilities one could choose to employ to provide the reader with a general background. Now let's examine the final strategy for Goal 1.

Introduction Goal 1 Strategy: Reviewing Previous Research

Reviewing previous research is the third strategy a writer can utilize for establishing territory in an Introduction. This strategy acknowledges the many contributions of other scholars by synthesizing and criticizing previous research. We often call this section the "literature review." This strategy additionally provides a demonstration of expertise about a topic, supporting the reader's understanding and expanding your ethos as an author and academic, which then contributes to the credibility of your research.

Although this is probably the most well-known of the strategies within an Introduction, it is also one of the more varied in terms of the language resources we can exercise. Below are several examples from high-impact journals in two varied fields. Notice the variety of phrases the writers use to introduce previous literature.

Examples

- Recent increases in the prevalence of asthma and other allergic diseases **have prompted investigators to consider the role of** the environment in the genesis of atopy **(von Mutius, 2009; Horner, 2010).** Modern public health practices have eliminated many of the microbial threats for humans.[8]
- **Recent studies (e.g., Bartell, 2005; Bickmore & Bickmore, 2010; Britton, Paine, Pimm, & Raizen, 2003; Glazerman et al., 2009; Main, 2008; New Teacher Center, 2002; Piggot-Irvine, Aitken, Ritchie, Ferguson, & McGrath, 2009; Smith & Ingersoll, 2004) affirm that** comprehensive induction comprises an array of aligned and integrated components which include: carefully selected and trained mentors; a curriculum of intensive and structured support and professional development opportunities; regular meetings with mentors; opportunities to observe experienced teachers; formative assessment tools that permit evaluation of practice; and outreach to wider educational support. **We know also, from research by Carver and Feiman-Nemser (2009), that** policy documentation which "sets conditions for how induction support is practiced by mentors, and experience by novices" (p. 314) is important, and that support should be provided across at least the first 2 years in the workplace.[9]

8. Wingender, G., Rogers, P., Batzer, G., Lee, M., Bai, D., Pei, B., Khurana, A., Kronenberg, M., Horner, A. (2011). "Invariant NKT cells are required for airway inflammation induced by environmental antigens", *The Journal of Experimental Medicine* 208(6):1151-1162.
9. Anthony, G., Haigh, M., Kane, R. (2011). "The power of the 'object' to influence teacher induction outcomes", *Teaching and*

Besides the varied language forms that can be used to execute this strategy, it is also important to note that different disciplines have many different formatting styles including, but not limited to, endnotes, footnotes, in-text citations, direct quotes, indirect quotes, parentheticals, etc. Another important point to make about the actual language that a writer might consider using is that reporting verbs (words that directly quote someone else's idea[s]) are extremely common in this strategy. Reporting verbs are quite nuanced and can provide not only a quote but also the writer's stance towards that quote (i.e., supportive, doubtful, neutral, etc.). A number of frequent reporting verbs[1011] are listed in the textbox below:

describe	demonstrate
explain	claim
mention	examine
argue	claim
state	suggest
show	indicate
note	propose
use	show
find	focus

Some other common language (noted in the box below) came from the Academic PhraseBank's section on "Referring to previous work to establish what is already known":

• Studies of X show the importance of … • Several theories on the origin of X have been proposed. • Extensive research has shown that … • It has previously been observed that … • Several attempts have been made to … • Studies over the past two decades have provided important information on … • Data from several studies suggest that …	• Previous research has found … • The existing body of research on X suggests that … • There is a growing body of literature that recognizes… • Recent evidence suggests that … • Surveys such as that conducted by X (1988) have shown that … • Factors found to be influencing X have been explored in several studies. • Recent work has established that …

Now that we've reviewed all the strategies for accomplishing Goal 1 of the Introduction section, let's try an exercise.

Teacher Education, 27.

10. Bloch, J. (2010). A concordance-based study of the use of reporting verbs as rhetorical devices in academic papers. *Journal of Writing Research*, 2(2), 219–244.
11. Liardét, C., & Black, S. (2019). "So and so" says, states and argues: A corpus-assisted engagement analysis of reporting verbs. *Journal of Second Language Writing*, 44, 37-50.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://iastate.pressbooks.pub/preparingtopublish/?p=86#h5p-3

Key Takeaways

Goal #1 of writing the Introduction section is related to Establishing a Territory. There are three strategies that you can use to accomplish this goal:

- Claim centrality
- Provide background
- Review previous research

Introduction Goal 2: Identifying a Niche

The second goal of an Introduction is to **Identify a Niche** or state the problem that your paper is trying to address. In doing this, you will call attention to an area of interest in the current research and specify weaknesses/drawbacks in existing studies. When you identify your niche, you have underscored a gap in some part of your field, and this gap is called your niche.

Accomplishing this second goal gives you the opportunity to show where you intend to make your contribution to the discipline. It also allows you to narrow the focus of the paper from a more general focus to a more specific area of the field where there is the potential for more research (*your* research).

Here are some excerpts from research articles. The **bold** language shows you the words that act as indicators that the writer is working to accomplish Goal 2: Identifying a Niche.

Examples

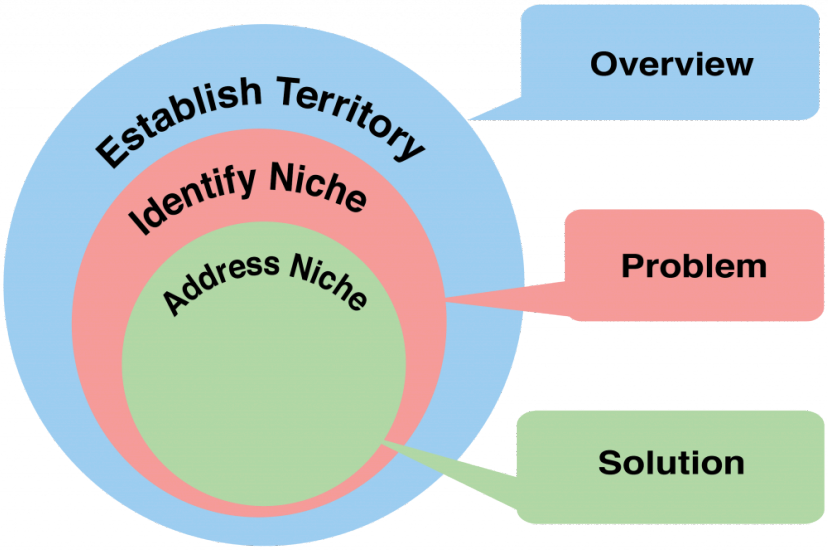
- Processed products containing OFSP **have been studied** in Kenya [7] and **it has been shown that** porridge made using OFSP flour was **widely accepted** by consumers. However, information on how well provitamin A survives processing is still patchy.[1]
- Despite the advancement in therapeutic cocktails, the outcome of chemotherapy remains unsatisfactory. The development of multidrug resistance (MDR) **has gradually become a major cause of** the failure of cancer chemotherapy [1] .[2]
- **How do** emotions arise? **Do they** arise via low-level processes that provide quick, bottom-up affective analyses of stimuli? **Or do they** arise via high-level, top-down cognitive appraisal processes that draw upon stored knowledge?[3]

As you can see in the excerpts, the authors are pointing out missing pieces in the current research trends and specifying weaknesses or drawbacks in existing research. In many cases, this starts with a word that demonstrates contrast, such as *however* or *despite*. Writers use such a word to make the transition

1. Bechoff, A., Poulaert, M., Tomlins, K., Westby, A., Menya, G., Young, S., Dhuique-Mayer, C. (2011). "Retention and bioaccessibility of β-carotene in blended foods containing orange-fleshed sweet potato flour", Journal of agricultural and food chemistry 59(18):10373-10380.
2. Zhang, P., Ling, G., Sun, J., Zhang, T., Yuan, Y., Sun, Y., Wang, Z., He, Z. (2011). "Multifunctional nanoassemblies for vincristine sulfate delivery to overcome multidrug resistance by escaping P-glycoprotein mediated efflux", Biomaterials 32(23):5524-5533.
3. Ochsner, K., Ray, R., Hughes, B., McRae, K., Cooper, J., Weber, J., Gabrieli, J., Gross, J. (2009). "Bottom-Up and Top-Down Processes in Emotion Generation Common and Distinct Neural Mechanisms", Psychological Science 20(11):1322-1331.

from establishing their territory (Goal 1) to identifying the niche (Goal 2). There are many other ways to accomplish Goal 2, so let's explore the main strategies that writers use to accomplish it.

To identify a niche, you must signal a turn from the overview of a disciplinary territory and narrow the paper down to one aspect of that territory that still needs to be addressed. This identification includes flagging limitations or incompleteness in the current research and/or practice and emphasizing the need to address the limitations. The visual below represents how the identification of the niche (signaled in red) is embedded within an establishment of territory (signaled in blue), further narrowing the scope of the argument for the necessity and value of the current research study.



Strategies for Introduction Goal 2: Identifying a Niche

- **Indicating a gap**
- **Highlighting a problem**
- **Raising general questions**
- **Proposing general hypotheses**
- **Presenting justification**

Notice that the words "and/or" follow each strategy. This is an indication that the strategies are not a checklist that must be accomplished. Each of them is one way that you can accomplish the goal of identifying a niche. However, you do not have to use all of them. In fact, some disciplines typically use certain strategies and not others; moreover, certain writing styles may prefer some over others. So, think of this as a list of options.

Authors generally utilize these strategies to further their critical analysis of previous research. After introducing the niche, the authors may choose to emphasize the need to address it by providing a

justification; thus, an Introduction's second goal usually begins with a word indicating that the following sentence is going to oppose or negate the previous sentence. Frequently, Goal 2 is initiated with words such as *however*, *nevertheless*, *yet*, *unfortunately*, *but*, etc. In addition, the function of Goal 2 can be expressed by the words/phrases:

- Negative or quasi-negative quantifiers: *no*, *little*, *none (of)*, *(very) few*, *neither… nor*
- Terminology of negation expressed by
  - verbs (e.g., *fail*, *lack*, *overlook*) and/or
  - adjectives (e.g., *inconclusive*, *misleading*, *scarce*, *elusive*, *limited*, *questionable*) and/or
  - nouns (e.g., *failure*, *limitation*, *gap*, *dearth*, *lack*) and/or
  - adverbs (e.g., *rarely*, *scarcely*, *barely*, *hardly*)

Introduction Goal 2 Strategy: Indicating a Gap

Indicating a gap is the first possible way that authors can claim a lack of research on a certain topic or area. That is, this strategy reveals a gap in the targeted research trend that needs to be filled. You can use this strategy to underscore the unknown, show connections between what is known in the field and what requires investigation, demonstrate critical evaluation of the current general research topic, and possibly connect to the goals of the present study in implicit or explicit ways.

Now, let's examine some excerpts of what these strategic options look like in real, published manuscripts. Be on the lookout for the example language noted above.

Examples

- **Although** the specific purpose of adult neurogenesis is not entirely clear, there is evidence that it has major roles in adult neuroplasticity [1,2]. Ablating aNSCs through genetic manipulation in mice or by focal irradiation leads to deficits in hippocampus-dependent learning tasks [3,8].[4]
- Adult attachment theory has made considerable progress in identifying different dimensions that produce distinctive affective responses. **A relatively unexplored issue** in attachment theory and research is the specificity or generality of affective reactivity to others' behavior. In other words, does an attachment orientation produce a generalized response to others or does an attachment orientation produce responses that are specific to the kind of relationship?[5]

4. Guo, W., Allan, A., Zong, R., Zhang, L., Johnson, E., Schaller, E., Murthy, A., Goggin, S., Eisch, A., Oostra, B. (2011). "Ablation of Fmrp in adult neural stem cells disrupts hippocampus-dependent learning," *Nature Medicine* 17(5):559-565.
5. Sadikaj, G., Moskowitz, D., Zuroff, D., (2011). "Attachment-related affective dynamics: differential reactivity to others'

If you'd like to see more examples of language that you can use to signal the use of this strategy, the Academic Phrasebank website is an excellent resource. Some of the sentence starters that are suggested there include the following:

- Previous studies of X have not dealt with ...
- Researchers have not treated X in much detail.
- Such approaches, however, have failed to address ...
- Previously published studies are limited to local surveys.
- Half of the studies evaluated failed to specify whether ...
- The existing accounts fail to resolve the contradiction between X and Y.
- However, much of the research up to now has been descriptive in nature ...

Introduction Goal 2 Strategy: Highlighting a Problem

Highlighting a problem articulates a problem that needs to be solved or an area for improvement in the research area. You can use this strategy to signal an existing issue, raise a concern about the issue, demonstrate critical evaluation of the issue, and possibly connect to the goals of the present study. Consider the following examples of how authors use this strategy to highlight a problem existing in their particular niche.

Examples

- People's tendencies to project their own opinions can alter their judgments about what others think is ethical, perhaps giving them a sense of being in the majority even when they are not. **The ramifications of this false consensus effect may be problematic**: if members of organizations erroneously assume that their actions are in line with prevailing ethical principles, they may subsequently learn of their misjudgment when it is too late to avert the consequences. In the present research, we examine whether brokers in a social network show evidence of false consensus in ethical decision making. [6]
- Unfortunately, it is very easy to overfit a model to one particular dataset (Huang et al. 2003). **This situation would probably result in biased predictions** when the model is applied to other datasets. A misspecification of the model or a poor draw of training data from the population could also lead to biased predictions. [7]

interpersonal behavior.", *Journal of Personality and Social Psychology* 100(5):905.

6. Flynn, F., Wiltermuth, S. (2010). "Who's with me? False consensus, brokerage, and ethical decision making in organizations", *Academy of Management Journal* 53(5):1074-1089.
7. aughn, N., Turnblom, E., Ritchie, M. (2010). "Bootstrap evaluation of a young Douglas-fir height growth model for the Pacific Northwest", *Forest Science* 56(6):592-602.

Introduction Goal 2 Strategy: Raising General Questions

Raising general questions is the third possible strategy. This is used to highlight questions about the current body of research on your topic. There are two ways to raise general questions: (1) asking a direct question (i.e., actually using a question mark) and/or (2) asking an indirect question (i.e., presenting the question in the form of a statement). It is important to realize that this strategy is related to questions about the *field*; these are NOT your specific research questions. Those will be discussed later.

The following examples demonstrate how published writers raise general questions in their manuscripts:

Examples

- With such a large and rapid infrastructure development programme, decision makers must balance three key factors when deciding the nature and characteristics of the treatment infrastructure developed: **what solution provides the best economic value?** [8]
- **How can the process of dynamic evaluation be studied?** The issue of potential differences in judgment **raises the methodological question of** who is in the best position to rate in-progress artworks. It might be more ecologically valid to have artists rate their own emerging works; however, in that case there is no basis for validating artists' own judgments against those of external observers. [9]

Introduction Goal 2 Strategy: Proposing General Hypotheses

When writers **propose general hypotheses,** they are predicting future findings or implications. Note that this strategy — like the previous one — includes the word *general*. These are NOT the specific hypotheses that you might have about your research. So, in order to do this, you need to use language that indicates the hypothetical nature of your claims. For example, you could use a conditional statement (e.g., if X were Y, then it would affect Z) and/or words such as *may*, *might*, *likely*, *possible*, *expected*, etc. The following are examples of how you can implement this strategy:

8. Patterson, T., Esteves, S., Dinsdale, R., Guwy, A. (2011). "Life cycle assessment of biogas infrastructure options on a regional scale", *Bioresource Technology* 102(15):7313-7323.
9. Kozbelt, A., Serafin, J. (2009). "Dynamic evaluation of high-and low-creativity drawings by artist and nonartist raters", *Creativity Research Journal* 21(4):349-360.

Examples

- Many studies on antimicrobial peptides have been carried out in an effort to elucidate the cause for this selectivity. **One hypothesis is that** the highly anionic lipids (~30 mol %) (3, 4) in the cytoplasmic membranes of bacterial and fungal cells facilitate antimicrobial action by electrostatically attracting these cationic peptides to the membrane. In contrast, the lack of negative charges in the eukaryotic membrane of higher organisms combined with the high level of cholesterol (~50 mol %) (5, 6) may reduce the extent of binding and counter the effects of these peptides on the membrane.[10]
- However, cytogenetics and comparative morphology **do not confirm this hypothesis** (Zohary and Hopf, 2000). **Therefore, plum may result from** polyploid forms arising from cherry plums, forming a "P. cerasifera-P. domestica polyploid crop complex" (Zohary and Hopf, 2000). However, the possibility of secondary hybridisation with other species, including sloe, cannot be excluded.[11]

Introduction Goal 2 Strategy: Presenting Justification

Presenting justification, the fifth and last possible strategy in Goal 2 (Identifying a Niche), usually occurs after the writer has discussed the gap, problem, question, or hypothesis. To accomplish this strategy, you can justify or motivate the need for your research. Alternately, you can demonstrate the value or worth of the research. Note how the published authors do this in the examples below:

10. Mani, R., Buffy, J., Waring, A., Lehrer, R., Hong, M. (2004). "Solid-state NMR investigation of the selective disruption of lipid membranes by protegrin-1", *Biochemistry* 43(43):13839-13848.
11. Horvath, A., Balsemin, E., Barbot, J., Christmann, H., Manzano, G., Reynet, P., Laigret, F., Mariette, S. (2011). "Phenotypic variability and genetic structure in plum (< i> Prunus domestica L.), cherry plum (< i> P. cerasifera Ehrh.) and sloe (< i> P. spinosa L.)", *Scientia Horticulturae* 129(2):283-293.

Examples

- The study of the solar hard X-ray (HXR) flare spectra **may provide some useful information for** solar flares, such as the acceleration mechanisms of energetic electrons. The solar HXR flare spectra consist of thermal and nonthermal components (Aschwanden 2004; Dennis 1985).[12]
- Empirical evidence describing the temporal development of local plastic flow is greatly desired. **Therefore, novel experimental techniques are being developed** to characterize the grain and sub-grain scale deformation fields produced during deformation of polycrystalline materials. Digital image correlation (DIC) methods that utilize optical imaging are readily available for measuring macro-scale planer 2-D, and arbitrary 3-D, motion and deformation [3].[13]

The second goal of the Introduction presents the specific background information to provide your readers with an appreciation of how the paper advances the field in some way[14]. Beware of repeating what you have read in other papers. A good research writer develops an ability "to say the same things that have been said many times before but in a different, interesting, intriguing way" (Wallwork, 2016, p. 195). When you **Identify a Niche**, you are giving the readers an orientation to how your work fits into the field.

Now let's practice identifying these strategies in context:

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https://iastate.pressbooks.pub/preparingtopublish/?p=90#h5p-5

12. Shao, C., Huang, G. (2009). "Comparative Study of Solar HXR Flare Spectra in Looptop and Footpoint Sources", *The Astrophysical Journal* 691(1):299.
13. Walley, J., Wheeler, R., Uchic, M., Mills, M. (2012). "In-situ mechanical testing for characterizing strain localization during deformation at elevated temperatures", *Experimental Mechanics* 52(4):405-416.
14. Wallwork, A. (2016). *English for writing research papers*. Springer.

Key Takeaways

The second goal of an Introduction section in a research article is **Identifying a Niche**. There are five possible ways to achieve this:

- Indicate a gap and/or
- Highlight a problem and/or
- Raise general questions and/or
- Propose general hypotheses and/or
- Present justification

Note the use of "and/or" after each strategy. This reminds you that it's not necessary to implement all of these strategies. You can choose which ones work best for your own topic, style, and discipline.

Introduction Goal 3: Addressing the Niche

This goal allows you to indicate how your work/research speaks to the niche that you have carved out for yourself. Usually, this is the last part of the Introduction – the part just before the research questions. However, please don't forget that these are not "rules." We are presenting guidelines based on linguistic research investigating published academic journal articles. As a writer, you decide how to organize your writing so that you accomplish these goals. In this last goal, you want to write directly about your purpose and values, and perhaps you'll want to outline the structure or organization of your article. Basically, you define how your present study addresses the identified niche and how it contributes to the existing research. Also, you can explain – briefly – the outcomes of the project.

We've now explored Goals 1 and 2 and their accompanying Strategies. Next, we'll introduce the strategies you can use to achieve the final Goal of an Introduction section: Addressing the Niche.

Below are some examples of Goal 3 from published research articles. Notice how the bolded parts help the writer to achieve the communicative goal of Addressing the Niche.

Examples

- **This study investigates** the construct of writing ability in English and Korean based on elementary school students' responses to two tasks. **Specifically, on the one hand, the study aims to** validate the influence of four components of writing ability across both languages: namely, content, grammar, spelling, and text length in writing. **On the other, it aims to** assess the effect of two tasks on writing performance across both languages.[1]
- **In this qualitative study**, we interviewed and observed 11 high-reputation plant managers **to find out** what made them successful. **We report** their words and actions, and rarely did those managers mention the benefits of technology or the newest analytical tools. Rather, what we saw common among the plant managers in our study – even across several industries – was the effective application of well-honed political skill.[2]
- The coupling of neutrinos to this hydrodynamically unstable matter is central to the supernova problem. **In this work, we present new, hitherto unpublished** features of the only two-dimensional multi-group, multi-angle neutrino transport calculations of core-collapse supernova evolution ever performed. Results from these simulations were first published by Ott et al. (2008).[3]

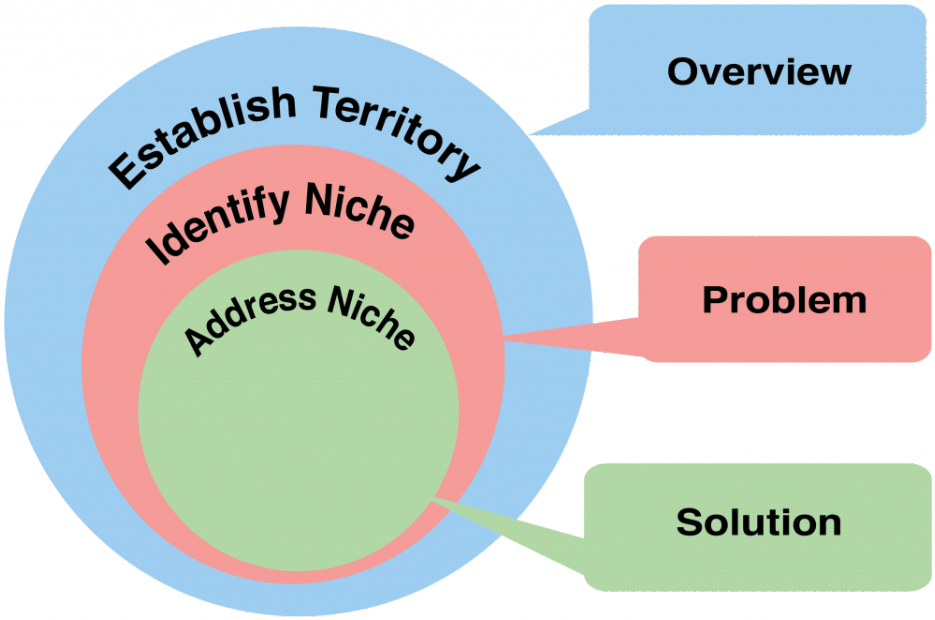
1. Bae, J., Bachman, L. (2010). "An investigation of four writing traits and two tasks across two languages", *Language Testing* 27(2):213-234.
2. Smith, A., Plowman, D., Duchon, D., Quinn, A. (2009). "A qualitative study of high-reputation plant managers: political skill and

In the Academic Phrasebank website, there are numerous examples of phrases and clauses that can be used to accomplish each of the goals we are presenting. Here are a few of them:

- The specific objective of this study was to ...
- This thesis will examine the way in which the ...
- This study set out to investigate the usefulness of ...
- This case study seeks to examine the changing nature of ...
- This research examines the emerging role of X in the context of ...
- This study systematically reviews the data for..., aiming to provide ...

We'll discuss more specific language resources (words, phrases, and clauses) that you can use to accomplish this goal at a later point in the chapter. For now, the main point is to understand that Goal 3 carves out a place for your research by pointing out how you are going to solve a problem or fill a gap.

Strategies for Introduction Goal 3



There are multiple ways you can effectively achieve the goal of addressing the niche into which your research fits:

successful outcomes", *Journal of Operations Management* 27(6):428-443.

3. randt, T., Burrows, A., Ott, C., Livne, E. (2011). "Results from core-collapse simulations with multi-dimensional, multi-angle neutrino transport", *The Astrophysical Journal* 728(1):8.

- **Introduce your research descriptively**
- **Announce the purpose of the study**
- **Present research questions**
- **Present research hypotheses**
- **Summarize methods**
- **Clarify definitions**
- **Announce principal outcomes**
- **State value**
- **Outline the structure**

Remember: You don't have to use all the strategies to accomplish a goal!

Let's get a closer look at each strategy to understand how they work.

Introduction Goal 3 Strategy: Introduce Your Research Descriptively

This strategy concerns how writers note the main characteristics of their research. They provide information that highlights their goals and intentions. The strategy also specifically outlines how the objectives of the research address the niche.

Examples

- It transforms outcomes for each alternative into a common unit with a multi-attribute value (utility) function using weights that reflect the decision makers' preferences. **We report on** an MCDA involving the 26 most important stakeholders in two Swiss cases; a general and a psychiatric hospital. Details of the MCDA methodology are given in ref 24 and of the ecotoxicological risk assessment in ref 20.[4]
- Using these data, in this article I examine the validity of the tests by analyzing what the teachers believed the tests measure and what they believed the tests' impacts are. **In essence, this paper investigates** the social consequences of a large-scale testing program and scrutinizes not only the intended outcome but also the unintended side effects of the English language tests (Messick, 1989, p. 16). Because the testing in Michigan was required by the federal government?s No Child Left Behind (NCLB) Act, I begin by summarizing that law.[5]

4. Lienert, J., Koller, M., Konrad, J., McArdell, C., Schuwirth, N. (2011). "Multiple-criteria decision analysis reveals high stakeholder preference to remove pharmaceuticals from hospital wastewater", *Environmental Science & Technology* 45(9):3848-3857.
5. Winke, P. (2011). "Evaluating the Validity of a High-Stakes ESL Test: Why Teachers' Perceptions Matter", *TESOL Quarterly* 45(4):628-660.

To accomplish this, authors will often use highly contextualized words/phrases, such as *this*, *the present study*, *we*, *I*, *now*, and *here*, which you can see in **bold** in the examples above. However, you should be aware that this is not the announcement of the goals/aims of the study. This is a more general description of the research. If you would like to be more specific about your objectives, you can implement the strategy presented next.

Introduction Goal 3 Strategy: Announce the Purpose of the Study

This strategy clearly articulates the intentions of the researcher(s) by specifying how the objectives address gaps in the research. It is common for writers to use words, such as *aim*, *purpose*, *goal*, *objective*, *target*, etc., to directly state their intentions. The examples below show how this is realized in published articles from high-impact journals:

Examples

- When this process of mutual adjustment goes well, people may remark that they are "in synch" or "on the same wavelength." **One goal of the present article is to show** that there is an important literal truth behind these colloquialisms. That is, as people converse and work together, major interpersonal issues–namely, agency and communion–come to have strongly entrained cyclical patterns, making partners' behaviors as interlocked or interdependent, as if they were dancing together.[6]
- Although Ca2+ signaling in B cells is widely assumed to be essential, the importance of SOC influx for physiological B cell functions was unclear. **To directly assess the involvement of SOC influx in B cells , we generated** mice with B cell-specific deletions of Stim1 and Stim2. We found that STIM1 and STIM2 critically regulated BCR-induced SOC influx and proliferation in vitro, and yet they were dispensable for B cell development and antibody responses in vivo.[7]

You might also note that it's common to see phrases with *to* + a verb (e.g., *to show*, *to compare*, *to evaluate*, etc.). The Academic Phrasebank website also provides some sentence starters:

6. Sadler, P., Ethier, N., Gunn, G., Duong, D., Woody, E. (2009). "Are we on the same wavelength? Interpersonal complementarity as shared cyclical patterns during interactions.", *Journal of Personality and Social Psychology* 97(6):1005.
7. Matsumoto, M., Fujii, Y., Baba, A., Hikida, M., Kurosaki, T., Baba, Y. (2011). "The calcium sensors STIM1 and STIM2 control B cell regulatory function through interleukin-10 production", *Immunity* 34(5):703-714.

- The specific objective of this study was to ...
- This study set out to investigate the usefulness of ...
- This research examines the emerging role of X in the context of ...
- This study systematically reviews the data for..., aiming to provide ...
- Drawing upon two strands of research into X, this study attempts to ...
- This study therefore set out to assess the effect of X ..., and the effect of ...
- The main aim of this study is to investigate the differences between X and Y.
- There are two primary aims of this study: 1. To investigate ... 2. To ascertain ...
- This study seeks to obtain data which will help to address these research gaps.
- One purpose of this study was to assess the extent to which these factors were ...
- The purpose of this investigation is to explore the relationship between X and Y.

Introduction Goal 3 Strategy: Present Research Questions

Presenting research questions is a strategy for directly stating what queries were made about the data. Authors do this in an effort to specify the focus of the research and to highlight main topics or words that can help the reader navigate the remainder of the manuscript.

Writers who choose to implement this step articulate their questions directly (with a question mark) or indirectly (a question in the form of a statement), both of which are shown below:

Examples

- From this perspective, strategic planning represents an inertial force that decreases the number of NPD projects. The purpose of our study is to provide empirical evidence on the debated role of strategic planning in generating NPD projects **by answering the two questions: (1) does strategic planning increase or decrease the number of NPD projects? and (2) if so, how can a firm manage controllable organizational factors to mitigate the adverse effect of strategic planning on the number of NPD projects for better performance?**[8]
- The increase in growth response due to irrigation was relatively small, with no significant increase in basal area (Albaugh et al. 2004). **In this study, the questions we attempted to answer were whether the growth gains experienced from fertilization resulted in lower SG and percent latewood, as expected from previous studies; whether SG properties were affected by irrigation, implying the importance of water availability despite limited growth gains; and whether irrigation had an impact on the wood quality of fertilized trees different from that of unfertilized trees.**[9]

8. Song, M., Im, S., Bij, H., Song, L. (2011). "Does Strategic Planning Enhance or Impede Innovation and Firm Performance?*", *Journal of Product Innovation Management* 28(4):503-520.
9. Love-Myers, K., Clark, A., Schimleck, L., Dougherty, P., Daniels, R.. (2010). "The effects of irrigation and fertilization on specific gravity of loblolly pine", *Forest Science* 56(5):484-493.

Direct questions always use question-word order and end with a question mark (?). Some common ways to start a direct question include *wh*-words such as *who*, *what when*, *where*, *how*, and *why*, but research questions can commonly begin with other phrases such as: *to what degree*, *do/did*, *have/has*, etc. Indirect questions sometimes start with words such as *whether* or *if*.

Introduction Goal 3 Strategy: Present Research Hypotheses

Presenting research hypotheses is a way for writers to share what they have found or hope to find that is directly relevant to the objectives or questions of the study. Authors utilize this step to introduce the assumptions to be tested, clarify expectations of the findings, and speculate about potential outcomes.

To present their research hypotheses, authors use verbs like *hypothesize*, *suggest*, *expect*, *predict*, etc., the subjunctive mood (e.g., would expect, could be possible), and modal verbs such as *could*, *might*, and *may*. Consider the following examples:

Examples

- We focused on school support because of the significant role of environment in influencing human behaviors (Lewin, 1936). **We believe that school support, a contextual factor, is intricately related to teacher motivation, a personal factor**.[10]
- As previous research has demonstrated that the learners' view towards a learning environment strongly influences their learning outcomes and learning process, it can be discussed whether program-defined adaptivity is not only effective because of the underlying learner models, but also because the adaptivity is perceived and experienced as such by the learners. In this study, we apply the cognitive mediational paradigm and **hypothesize that perceptions of adaptivity mediate the relation between adaptive instruction and learners' motivations and learning outcomes**.[11]

You can use the verb *hypothesize* or the noun *hypothesis*, but be careful with replacing that word with synonyms, which could carry different connotations because of their nuanced meanings.

Introduction Goal 3 Strategy: Summarize Methods

The strategy **summarizing methods** allows writers to present their procedures for the first time. However,

10. FiLam, S., Cheng, R. W., Choy, H. C. (2010). "School support and teacher motivation to implement project-based learning", *Learning and Instruction*, 20, pp. 487-497.
11. Vandewaetere, M., Vandercruysse, S., Clarebout, G., "Learners' perceptions and illusions of adaptivity in computer-based learning environments", *Education Tech Research Dev*, pp. NA.

you should note that it is a *summary* of the methods and shouldn't be too detailed. Here are some examples from published writing:

Examples

- Recently, Yu et al. (2008a, b) employed a novel EPS fractionation approach to obtain the pellets (cells) by extracting the EPS matrix. **In this study, aerobic granules seeded with activated sludge flocs and pellets, respectively, were cultivated in two sequencing batch reactors (SBRs), then these two kinds of granules were both stored at 25 +/- 1 degrees Celsius for 3 weeks.** The main purposes of this study were to investigate their responses to storage and explore the mechanism of stability loss.[12]
- We propose that HRO status can be achieved through a systematic process linked to top leadership. **We empirically test this proposition by building a model for improving patient safety in hospitals.** [13]

Note that this strategy can be implemented by using either passive or active voice. Both are correct, but the decision of whether to use one or the other is usually based on the discipline in which you do research. The Academic Phrasebank website provides other examples, and from the list below, you can see that there are a variety of forms that you can use to effectively realize this strategy:

- Data for this study were collected using …
- Five works will be examined, all of which …
- This investigation takes the form of a case-study of the …
- This study was exploratory and interpretative in nature.
- This study uses a qualitative case study approach to investigate …
- The research data in this thesis is drawn from four main sources: …
- The approach to empirical research adopted for this study was one of …
- This dissertation follows a case-study design, with in-depth analysis of …
- By employing qualitative modes of enquiry, I attempt to illuminate the …
- Qualitative and quantitative research designs were adopted to provide …
- Both qualitative and quantitative methods were used in this investigation.
- A holistic approach is utilised, integrating X, Y and Z material to establish …
- The study was conducted in the form of a survey, with data being gathered via …
- The methodological approach taken in this study is a mixed methodology based on …
- A combination of quantitative and qualitative approaches was used in the data analysis.

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12. Xu, H., He, P., Wang, G., Yu, G., Shao, L. (2010). "Enhanced storage stability of aerobic granules seeded with pellets", *Bioresource Technology* 101(21):8031-8037.
13. McFadden, K., Henagan, S., Gowen III, C. (2009). "The patient safety chain: Transformational leadership's effect on patient safety culture, initiatives, and outcomes", *Journal of Operations Management* 27(5):390-404.

Introduction Goal 3 Strategy: Clarify Definitions

Clarifying definitions is the strategy writers use when they need to inform the reader of terms or concepts as they are used in the research. By implementing this step, authors can explain the meaning of terminology, provide working definitions, and/or clarify concepts. Sometimes scholars use this strategy to demonstrate how the terms or concepts used in the paper are similar to or different from the way the terms are typically used in the field, which helps readers to avoid misinterpreting the wording. The definitions and/or terms used in the study may come from previous research, or they may be new terminology or phrasing that the author has coined. Look at the examples below to take note of how published writers make this happen in their manuscripts:

Examples

- Some organizations require great attention to preventing mistakes because errors could have serious implications to public safety. **High reliability organizations (HROs) refer to organizations or systems that operate in complex and hazardous conditions and yet consistently achieve nearly error-free performance. They are termed HROs because they seem to function in a more reliable fashion than other similar organizations.** [14]
- **Cardiovascular disease (CVD) is defined as** a group of vascular disorders that involve the heart as well as the vasculature. CVD remains the leading cause of death in developed nations and accounts for over one-third of all deaths within the United States each year [1] .[15]

If you'd like to explore more ways to clarify definitions, the Academic Phrasebank website not only provides a list of general ideas, but also includes more specific ways to define words for a variety of different communicative goals (e.g., indicating difficulties to define a term, referring to others' definitions etc.). Here are a few starter sentences that might help you to envision how writers accomplish the strategy of defining terms, which contributes to addressing the niche:

14. McFadden, K., Henagan, S., Gowen III, C. (2009). "The patient safety chain: Transformational leadership's effect on patient safety culture, initiatives, and outcomes", *Journal of Operations Management* 27(5):390-404.
15. Wood, J., Shah, N., McKee, C., Hughbanks, M., Liliensiek, S., Russell, P., Murphy, C. (2011). "The role of substratum compliance of hydrogels on vascular endothelial cell behavior", *Biomaterials* 32(22):5056-5064.

- Throughout this paper, the term 'X' will refer to ...
- The term 'X' will be used in this thesis to refer to ...
- Historically, the term 'X' has been used to describe ...
- It is necessary here to clarify exactly what is meant by ...
- The phrase 'X' will be used in this study to describe the ...
- According to Smith (2002), X can be defined as follows: ' ... '
- In this article, the abbreviation XYZ will be used to refer to ...
- Throughout this dissertation, the term 'X' will be used to refer to ...
- The term 'X' is a relatively new name for ..., commonly referred to as ...
- In this essay, the term 'X' will be used in its broadest sense to refer to all ...
- In this dissertation, the terms 'X' and 'Y' are used interchangeably to mean ...
- While a variety of definitions of the term X have been suggested, this paper will use the definition first suggested by Smith (1968) who saw it as ...

Introduction Goal 3 Strategy: Announce Principal Outcomes

Announcing principal outcomes briefly states the most important results of the study. In other words, you can think of this strategy as a preview of your full results section. Using this strategy shows which specific findings contribute to the communicative goal of Addressing the Niche while also providing a preview of the more detailed outcomes, which will be elaborated upon later in your paper.

Below are some examples of the announcing principal outcomes strategy:

Examples

- Instead, the template-bridging effect of the membrane binding to the Gla domains of both fXa and PZ, together with the specific interaction of the two Gla domains shown previously by Rezaie and co-workers (6), were the most important factors in bringing about the PZ-dependent acceleration of fXa inhibition in the presence of phospholipid and Ca2+. **Importantly, we found that** a ZPI variant with P1 arginine reacted at a diffusion-limited rate with fXa. Reaction was predominantly as a substrate, as a result of rapid acylation and deacylation, and did not depend on PZ or other cofactors.[16]
- The goal of this study was to identify and test the importance of potential drivers of agricultural land abandonment and consequent natural vegetation re-growth, using a spatially explicit statistical model, based on an economic theoretical framework. **There are three main findings of this study.** Firstly, the research area in the municipality of Ancud, Chiloe Island, in Southern Chile has been proposed by Food and Agriculture Organization of The United Nations (FAO) as a Globally Important Agricultural Heritage System (GIAHS), which sustains itself on the permanence of traditional farming practices that are threatened by land abandonment.[17]

16. Huang, X., Dementiev, A., Olson, S., Gettins, P. (2010). "Basis for the specificity and activation of the serpin protein Z-

To announce the principal outcomes of their research, authors typically use verbs such as *find*, *show*, *indicate*, *reveal*, *explain*, *demonstrate*, *determine*, *prove*, *establish*, etc. Regardless of the verb you use, however, you want to be sure that you are previewing just the most important findings. You'll have an entire section of the paper (the Results section) to provide the details.

Introduction Goal 3 Strategy: State Value

Stating the value of present research explains the significance of your research. It functions as a kind of argument that the study provides an important contribution to the field. Here are two examples:

Examples

- Therefore, this work's intent was to study the bioaccumulation of the contaminants mentioned previously in the autochthonous black pig feeding substantially on natural pastures and reared under different extensive farming systems within the preserved area of the Regional Nebrodi Park of Sicily (Italy). **The acquired information could provide answers to food safety issues for locally processed meat production and, at the same time, endorse the abovementioned sustainable farming practices, i.e., that outdoor and wild pigs be recognized as sensitive sentinels to monitor the overall quality of the environment** (36).[18]
- **The research we report here offers a possible explanation for why situational cues, such as numerical representation, might contribute to such performance outcomes.** We propose that, by triggering objective experiences of identity threat (e.g., cognitive and physiological vigilance) and subjective experiences of identity threat (e.g., a decreased sense of belonging and decreased desire to participate in the setting), subtle situational cues may have powerful and far-reaching effects for potential targets of stereotypes and stigma.[19]

Many writers implement this strategy through the use of verbs such as *can*, *could*, *might*, or *may* in combination with verbs like *offer*, *provide*, *generate*, or *contribute*. Other authors use adjectives or adverbs

dependent proteinase inhibitor (ZPI) as an inhibitor of membrane-associated factor Xa", *Journal of Biological Chemistry* 285(26): 20399-20409.

17. Díaza, G. I., Nahuelhuala, L., Echeverríad, C., Maríne, S. (2011). "Drivers of land abandonment in Southern Chile and implications for landscape planning", *Landscape and Urban Planning*, 99, pp. 207–217.
18. Brambilla, G., De Filippis, S., Iamiceli, A., Iacovella, N., Abate, V., Aronica, V., Di Marco, V., Di Domenico, A. (2010). "Bioaccumulation of dioxin-like substances and selected brominated flame retardant congeners in the fat and livers of black pigs farmed within the Nebrodi Regional Park of Sicily", *Journal of Food Protection®* 74(2): 261-269.
19. Murphy, M., Steele, C., Gross, J. (2007). "Signaling threat how situational cues affect women in math, science, and engineering settings", *Psychological Science* 18(10):879-885.

such as *possible*, *potential*, *likely*, or *probably*. The Academic Phrasebank provides the following sentence starters as suggestions:

- This is the first study to ...
- This study provides new insights into ...
- This work will generate fresh insight into ...
- The study offers some important insights into ...
- Understanding the link between X and Y will help ...
- This is the first study to undertake a longitudinal analysis of ...
- The present research explores, for the first time, the effects of ...
- The importance and originality of this study are that it explores ...
- The findings should make an important contribution to the field of ....
- Characterisation of X is important for our increased understanding of ...
- It is hoped that this research will contribute to a deeper understanding of ...
- This study aims to contribute to this growing area of research by exploring ...
- This project provided an important opportunity to advance the understanding of ...
- Therefore, this study makes a major contribution to research on X by demonstrating ...
- There are several important areas where this study makes an original contribution to ...
- The experimental work presented here provides one of the first investigations into how ...

Introduction Goal 3 Strategy: Outline the Structure

Outlining the structure of the paper is the final possible strategy that you can use to accomplish the third goal (Addressing the Niche). This strategy is a preview of the organization of the manuscript. The use of an outline gives the reader insight into how the paper is structured, thus giving an overview of each section and its content. You could consider this strategy like written directions, which provide a guide to the paper and encourage the easy location of specific content.
Consider the following examples, in which authors outline the structure of their papers:

Examples

- My results can therefore help to explain why models that treat product locations as fixed often do poorly at predicting how prices change after mergers (Peters, 2006; Whinston, 2006; Ashenfelter and Hosken, 2008) and why competitors may choose to lobby an antitrust authority to prohibit a merger even when synergies are unlikely. **The article is structured as follows. The rest of the Introduction reviews the related literature. Section 2 describes the data and how I use playlists to measure differentiation. Section 3 presents the main results.**[20]
- **This article is structured as follows. The second section describes the study** sites, the simulated cork oak silviculture models, the data collection, the private amenity valuation, and the afforestation net benefit estimation. **The third section presents the main results. The fourth section closes with discussion and conclusions.**[21]

Usually, writers who utilize this strategy begin with an overview sentence followed by a list of section-by-section content. The examples above use similar tactics to each other even though they are from very different disciplines. Additionally, the Academic Phrasebank website has a further list of ideas, as noted below:

- The first section of this paper will examine...
- This paper begins by ... It will then go on to ...
- My thesis is composed of four themed chapters.
- The essay has been organised in the following way.
- The remaining part of the paper proceeds as follows: ...
- The main issues addressed in this paper are: a), b) and c).
- This paper first gives a brief overview of the recent history of X.
- This paper has been divided into four parts. The first part deals with ...
- The third chapter is concerned with the methodology used for this study.
- The overall structure of the study takes the form of six chapters, including ...
- Chapter Four analyses the results of interviews and focus group discussions undertaken during ...
- Chapter Two begins by laying out the theoretical dimensions of the research, and looks at how ...
- The fourth section presents the findings of the research, focusing on the three key themes that ...

So, there are quite a few strategies for accomplishing the third goal. Now, you will complete an exercise to see how well you can recognize the strategies in published articles.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://iastate.pressbooks.pub/preparingtopublish/?p=91#h5p-6

20. Sweeting, A. (2010). "The effects of mergers on product positioning: evidence from the music radio industry", The RAND *Journal of Economics* 41(2): 372-397.
21. Ovando, P., Campos, P., Oviedo, J., Montero, G. (2010). "Private Net Benefits from Afforesting Marginal Cropland and Shrubland with Cork Oaks in Spain", *Forest Science* 56(6): 567-577.

Key Takeaways

The third goal of an Introduction section in a research article is Addressing a Niche. There are nine possible ways to achieve this:

- Introduce research descriptively
- Announce purpose of study
- Present research questions
- Present research hypotheses
- Summarize methods
- Clarify definitions
- Announce principal outcomes
- State value
- Outline the structure

Remember: It's not necessary to implement all of these strategies. You can choose which ones work best for your own topic, style, and discipline.

Some Other Important Points about Introductions

We have now covered the three communicative goals for writing Introductions and announced their various strategies. Here are a few other important points:

- There is no linear order for organizing your content to fulfill these communicative goals.
- Some communicative strategies are used more extensively than others.
- Different strategies can be combined to achieve a stronger communicative effect.
- The use of strategies varies depending on disciplinary conventions.
- It is up to us as academic writers to evaluate our writing intentions and assess the degree to which we accomplish our goals.

Before you write, it may benefit you to read. When you are reading, be critical and look for the goals/strategies presented in this chapter. Two important aspects of writing can help you to do this:

1. The subject matter: writers movement from general to specific. Notice how you do (or do not do) this.
2. The quality of the claims: what you say is not as important as HOW you say it. Use your ability to compose strong arguments to enhance the quality of your claims.

Let's try one final exercise to practice applying your knowledge of Introductions.

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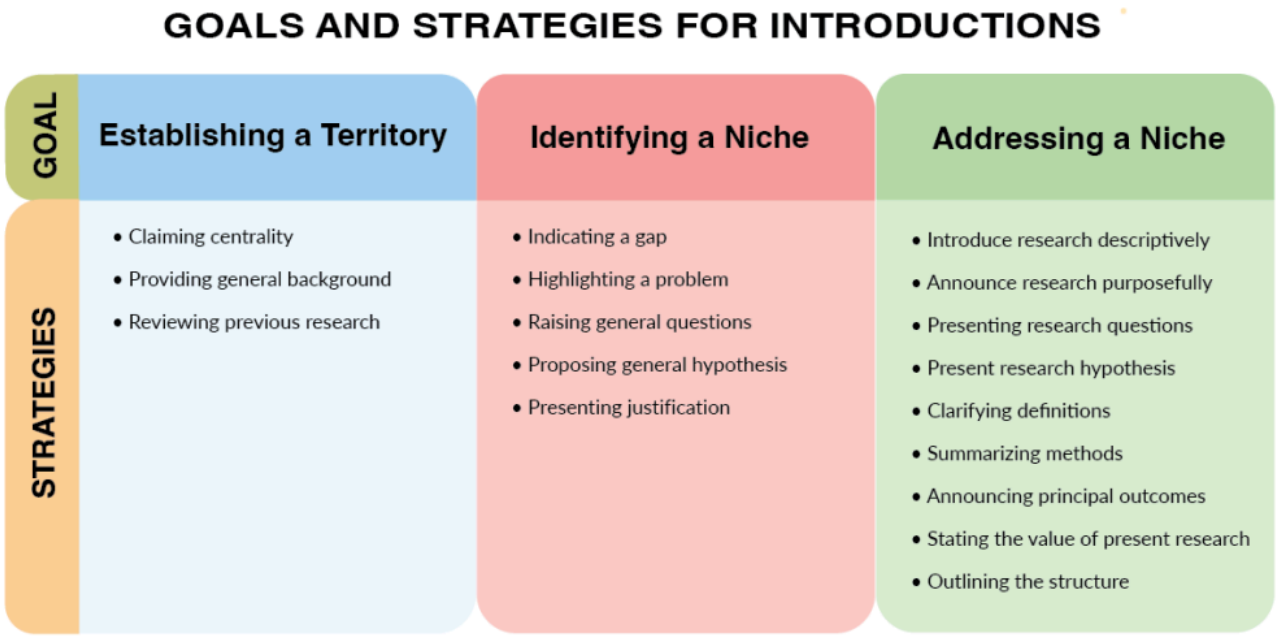
https://iastate.pressbooks.pub/preparingtopublish/?p=107#h5p-7

Chapter 3 Synopsis: Writing Introductions

We have now reviewed the three communicative goals and a variety of strategies that you can use to help write the Introduction section of a research article. The image below provides a snapshot of this chapter:



Key Takeaways

There are 3 goals for Introduction sections:

1. Establish a Knowledge Territory: Demonstrate what you know and what has already been established in the field while holding the attention of the reader so that they are interested enough to keep reading.
2. Identify a Niche: Point out exactly what is the problem or gap in the literature, which sets the reader up for the third and final communicative goal of an Introduction.
3. Address the Niche: Justify the research without being formulaic; as a writer, you have the freedom to present your research in whatever way you feel best accomplishes these communicative goals.

We'll now move on to the next section of a research article: The Methods.

Other resources:

The literature review section of the research article is commonly included in the Introduction section and regularly follows the outlined goals and strategies prominent in published Introductions. The literature review is a complicated component of the research article and requires a comprehensive synthesis of relevant research; this critique can serve as a means for authors to expose the need for the current research project based on insufficient, contradicting, or problematic findings from the past. Read more about techniques for writing a literature review from these two web resources:

- Wikihow
- Williams College

Explore + Apply

Before you begin applying what you've learned in this chapter to your Introduction section, explore published writing in your discipline or in a target journal that you've identified. Look for the goals and strategies presented here to see where you might find similarities and differences that are discipline- or journal-specific.

Chapter 4: Writing the Methods Section

Learning Objectives

After completing this chapter, you should be able to …

- articulate the importance of Methods sections,
- recognize the communicative goals of the Methods,
- strategize to achieve communicative goals,
- optimize the language for writing about your Methods, and
- evaluate your Methods section.

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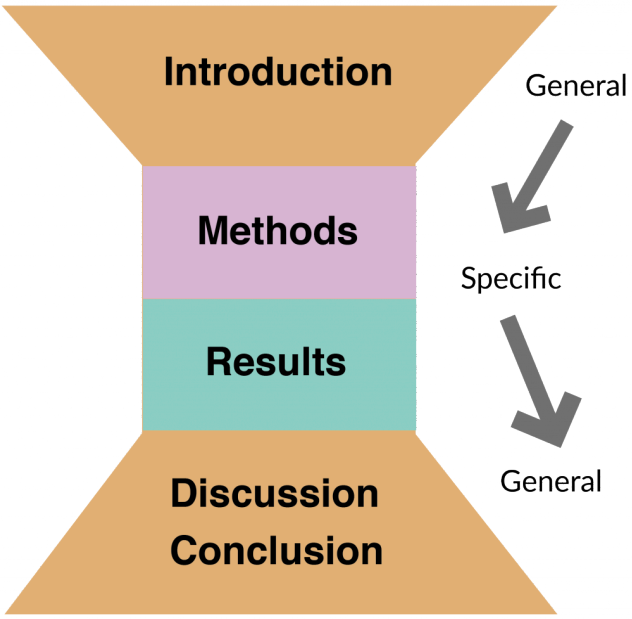
https://iastate.pressbooks.pub/preparingtopublish/?p=332#h5p-8

Conceptualizing the Research Article

You may remember from Chapter 3 that research articles have specific sections regardless of discipline or journal. Generally, there are five commonly acknowledged sections of an empirical research manuscript: Introduction (including the Literature Review), Methods, Results, and Discussion/Conclusion.



Notice that the figure depicts an article in the shape of an hourglass. That shape provides a way for us to consider which sections of a research article will be general and which will be specific. The middle part — the Methods and Results sections — are the most narrow, or specific, areas of the entire article. As you move away from the Introduction, your content will start to become more and more specific, reaching its most specific point in the Methods and Results sections. In this chapter, we will present the goals and strategies for writing the Methods.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://iastate.pressbooks.pub/preparingtopublish/?p=340#h5p-9

Warm-up

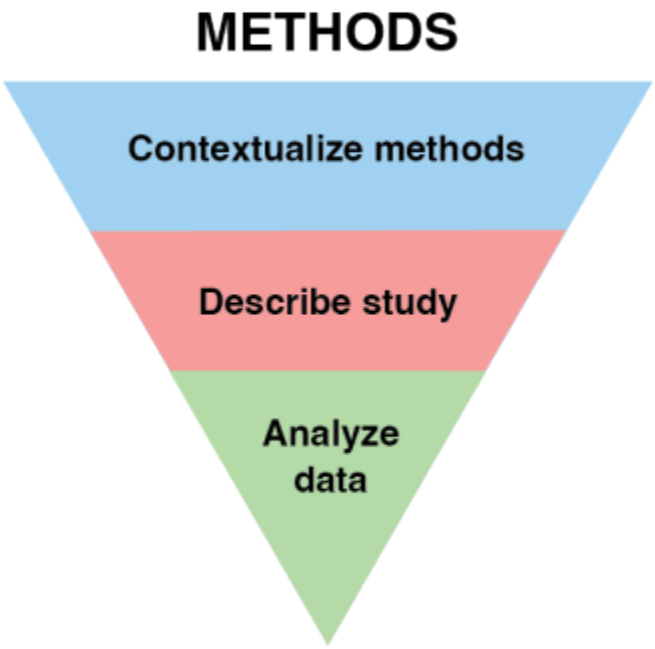
Why do you think the Methods need to be specific (narrow) and not too general (broad)? What aspects of the Methods contribute to its specificity?

Goals of an Effective Methods Section

There are three main goals for an effective Methods section:

1. Contextualize the study's methods;
2. Describe the study;
3. Analyze the data.

The image below provides a visual way to understand the three goals:



These goals attempt to explain to the reader — in a very detailed fashion — how the study was carried out. Specificity is of utmost importance in this section, and one way to think about how specific the content should be is to imagine that someone is reading your Methods section with the purpose of replicating your research. Would they be able to conduct this same study based on what you have written in this section? You want the answer to be YES. So, by contextualizing, describing, and analyzing, you can explain to the reader exactly what, when, where, and how you did what you did.

Next, we'll examine each of these three goals in a more careful way and provide some examples from published research.

Methods Goal 1: Contextualize the Study's Methods

The first goal of writing your Methods section is to contextualize (provide context or a "picture" of) the procedures you followed to conduct the research. Doing this requires attention to detail. Some of the possible ways that you can accomplish this goal will be discussed later in the chapter, but first, let's look at some examples of Methods sections from published research articles in high-impact journals (the parts of the Methods that contain Goal 1 language are **bolded**):

Examples

- **Volumetric gas concentrations obtained from the gas analyzers were converted into mass concentrations with the ideal gas law by using the mean reactor room temperature and assuming one atmosphere pressure.** Gas release is defined in this article as the process of gas transferring through the liquid manure surface into the free air stream of the reactor headspace. Gas emission is defined as the process of gas emanating from the reactor into the outdoor atmosphere. Gas release does not equal gas emission under transient conditions, although it does under steady-state conditions. **The rate of gas emission from a reactor was calculated with equation 1: Equation (1) where QGe is gas emission rate (mass min-1), CGex is exhaust gas concentration (mass L-1), CGin is inlet gas concentration (mass L-1), and Qv is reactor airflow rate (L min-1). The gas release rate was approximated with the rates of change in gas mass in the reactor headspace with equation 2: Equation (2) where QGr is gas release rate (mass min-1), CGh is gas concentration in the headspace (mass L-1), and Vh is headspace air volume (L).** In this article, we assumed that CGh was equal to CGex. **To use the sampled data obtained in this study, equation 2 was discretized to equation 3: Equation (3) where _ _delta_ _t is sampling interval (min), and k is sample number (k = 0, 1, 2, …). Gas release flux was calculated with equation 4: Equation (4) where qGr is gas release flux (mass m-2 in-1), and A is area of reactor manure surface (m2).**[1]
- **The participants were** employees of a medium-sized firm in the telecommunications industry. **The sampling frame was** the list of 3,402 potential users of the new ERP system. We received 2,794 usable responses across all points of measurement, resulting in an effective response rate of just over 82 percent. **Our sample comprised** 898 women (32 percent). **The average age of the participants was** 34.7, with a standard deviation of 6.9. All levels of the organizational hierarchy **were adequately represented in the sample** and were in proportion to the sampling frame. While ideally we would have wanted all potential participants to provide responses in all waves of the data collection, this **was particularly difficult given that** the study duration was 12 months and had multiple points of measurement. Thus, **the final sample of 2,794 was determined** after excluding those who did not respond despite follow-ups, those who had left the organization, those who provided incomplete responses, or who did not choose to participate for other reasons. Yet, we note that **the response rate was quite high for** a longitudinal field study; **this was, in large part, due to** the strong organizational support for the survey and the employees' desire to provide reactions and feedback to the new system. Although we did not have any data from the non-respondents, we found that the percentage of women, average age, and percentages of employees in various organizational levels in the sample **were consistent with those in the sampling frame. Employees were told that they would be surveyed periodically** for a year in order to help manage the new ERP system implementation. **Employees were told that the data would also be used as part of a research study and were promised confidentiality, which was strictly maintained**.[2]

1. Ni, J. Q., Heber, A. J., Kelly, D. T., & Sutton, A. L. (1998). Mechanism of gas release from liquid swine wastes. In 2001 ASAE Annual Meeting (p. 1). *American Society of Agricultural and Biological Engineers*.

So, as you can see in the excerpts above, the writers are providing lots of detailed information that contextualizes the study. To contextualize methods means that you explain all of the conditions in which the study occurred. It might be helpful for you to think of answering the questions *who*, *what*, *when*, *where*, *how*, and *why*.

Goal 1, Contextualizing the Study Methods, means that you completely describe the circumstances surrounding the research. There are several strategies you can use to help you successfully achieve this goal in a detailed manner.

Strategies for Methods Communicative Goal 1: Contextualizing the Study Methods

- **Referencing previous works**
- **Providing general information**
- **Identifying the methodological approach**
- **Describing the setting**
- **Introducing the subjects/participants**
- **Rationalizing pre-experiment decisions**

We'll now discuss each of these and provide some examples from published research.

Methods Goal 1 Strategy: Referencing Previous Works

Referencing previous works is a strategy used to relate your research to the literature. The strategy involves a direct reference to another author or an explicit mention of a study.

Here are two examples taken from published research articles:

2. Morris, M. G., & Venkatesh, V. (2010). Job characteristics and job satisfaction: Understanding the role of enterprise resource planning system implementation. *Mis Quarterly*, 143-161.

Examples

- The entire experiment consisted of six situations, and each situation was tested employing one advertisement. **The balanced Latin-square method proposed by Edwards (1951) was used to arrange the six experimental situations.** To simplify the respondents' choices with regard to order and sequence, all of the print advertisements tested were appropriately arranged in the experimental design.[3]
- The Eulerian-granular model in ANSYS 12.0 was used to model the interactions between three phases: one gaseous phase and two granular particle phases within a fluidized bed **taken from the literature** [32] . This model was chosen over the Eulerian-Lagrangian models as it is computationally more efficient with regards to time and memory.[4]

Some common vocabulary that is associated with this strategy includes the following, as noted in the Academic Phrasebank website:

- Many researchers have utilised X to measure ...
- One of the most well-known tools for assessing ...
- Traditionally, X has been assessed by measuring ...
- A number of techniques have been developed to ...
- Different methods have been proposed to classify ...
- X is the main non-invasive method used to determine ...
- Different authors have measured X in a variety of ways.
- Several methods currently exist for the measurement of X.
- Previous studies have based their criteria for selection on ...
- X is one of the most common procedures for determining ...
- There are three main types of study design used to identify ...
- The use of life story data has a relatively long tradition within X.
- Recent advances in X methods have facilitated investigation of ...
- There are a number of instruments available for measuring the ...
- X and Y are currently the most popular methods for investigating ...
- Recently, simpler and more rapid tests of X have been developed.
- In most recent studies, X has been measured in four different ways.
- The use of qualitative case studies is a well-established approach in ...
- Xs have been used in the past to investigate the mechanical properties of ...

Referencing previous works can occur almost anywhere in the Methods section because it can be used to validate or justify decisions about any of the data collected, procedures used, and analyses carried out.

3. Lin, P. C., & Yang, C. M. (2010). Impact of product pictures and brand names on memory of Chinese metaphorical advertisements. *International Journal of Design*, 4(1).
4. Armstrong, L. M., Gu, S., & Luo, K. H. (2011). Effects of limestone calcination on the gasification processes in a BFB coal gasifier. *Chemical Engineering Journal*, 168(2), 848-860.

Methods Goal 1 Strategy: Providing General Information

Providing general information allows a writer to give the background that is specific to the methods. This can be theoretical, empirical, informational, or experiential background to the methodology of the study. You can use this strategy to build a bridge for the reader. The bridge should connect your study to other studies that have utilized the same or similar methodology. This strategy also encompasses any preliminary hypotheses or interpretations that you may want to make.

Here are two examples taken from published research articles:

Examples

- The animals used during this study were slaughtered in accredited slaughterhouses according to the rules on animal protection defined by French law (Code Rural, articles R214-64 to R214-71, http://www.legifrance.gouv.fr). **The Qualvigene program, described in detail elsewhere (Allais et al., 2010), was a collaborative research program involving AI companies, INRA (the French National Institute for Agricultural Research) and the Institut de l'Elevage (Breeding Institute) in France.** The program was initiated to study the genetic determinism of beef and meat quality traits (Malafosse et al., 2007).[5]
- **This study focused on stemwood when examining alternative woody biomass management regimes for loblolly pine.** PTAEDA3.1, developed with data from a wide range of loblolly pine plantations in the southern United States, was used to simulate growth as well as competition and mortality effects and predict yields of various management scenarios (Bullock and Burkhart 2003, Burkhart et al. 2004).[6]

Providing general information is a strategy that helps to provide context for an author's explanation of methodological steps. By including more information, you are adding to the specificity and level of detail, which is one of the most important aspects of the Methods section.

Methods Goal 1 Strategy: Identifying the Methodological Approach

Identifying the methodological approach allows a writer to pinpoint the exact method that was adopted to accomplish the study's goals. This is a strategy you would use if there was a specific set of procedures for your approach or, in some cases, even a predetermined framework for how to carry out the study. The main purpose of this step is to introduce the methodological approach or experimental design used for the

5. Allais, S., Journaux, L., Levéziel, H., Payet-Duprat, N., Raynaud, P., Hocquette, J. F., ... & Renand, G. (2011). Effects of polymorphisms in the calpastatin and μ-calpain genes on meat tenderness in 3 French beef breeds. *Journal of Animal Science*, 89(1), 1-11.
6. Guo, Z., Grebner, D., Sun, C., & Grado, S. (2010). Evaluation of Loblolly pine management regimes in Mississippi for biomass supplies: a simulation approach. *Southern Journal of Applied Forestry*, 34(2), 65-71.

current study to inform the reader of the selected approach, announce credible research practices known in the field, and possibly transition to describing the experimental procedures.

Consider the following examples:

Examples

- **In both seasons, the experiments were arranged in a complete randomized block design with four replications, using a plot size of 3.45m x 15m each containing 114 plants.** Three levels of organic supplementation [0 kgm-2 (S0), 0.35 kgm-2 (S0.35) and 0.70 kgm-2 (S0.70)] were incorporated into the soil 2 days before solarization.[7]
- **To address these hypotheses rigorously, we conducted a randomized controlled trial with children clustered within schools.** All three interventions were delivered by the same teaching assistant in each school.[8]

The Academic Phrasebank website provides a list of sentence starters that would indicate the use of this strategy. Here are a few examples:

- The solution was then assayed for X using the Y method.
- X was prepared according to the procedure used by Jones *et al.* (1957).
- The synthesis of X was done according to the procedure of Smith (1973).
- X was synthesised using the same method that was detailed for Y, using ...
- Samples were analysed for X as previously reported by Smith et al. (2012).
- Analysis was based on the conceptual framework proposed by Smith et al. (2002).
- This compound was prepared by adapting the procedure used by Jones *et al.* (1990)...

Identifying the methodological approach is a strategy that supplies a frame for a description of experimental steps and methodological decisions. By describing the new methods you developed or explaining how you employed an established methodology, you are helping the reader to understand exactly what you did and when, why, where, and how you did it.

Methods Goal 1 Strategy: Describing the Setting

Describing the setting of the study is simply telling the reader about where or under what conditions the study happened. The *setting* is all about the *place*, *conditions*, and *surroundings*. In other words, this strategy

7. Mauromicale, G., Longo, A. M. G., & Monaco, A. L. (2011). The effect of organic supplementation of solarized soil on the quality of tomato fruit. *Scientia Horticulturae*, *129*(2), 189-196.
8. Clarke, P. J., Snowling, M. J., Truelove, E., & Hulme, C. (2010). Ameliorating children's reading-comprehension difficulties: A randomized controlled trial. *Psychological Science*, *21*(8), 1106-1116.

details the characteristics of the environment in which the research was conducted, which often answers the "where" and "when" questions. Information may include details about the place and temperature; it may also include some temporal (or time-related) descriptors such as the time of the year. It should be noted that this step may overlap with some steps in Goal 2 (which describes the tools used or the experimental procedures conducted), but it remains distinct from them in that describing the setting specifically references the inherent characteristics of the context or environment in which the study took place, and not the characteristics of the materials used to accomplish the experiment or to affect some change in the subject that is being examined. You'll read more about this in the next chapter.

Here are two examples taken from published research articles:

Examples

- The mares were admitted at day 310 of pregnancy, **housed in wide straw bedding boxes** and fed with hay and concentrates twice a day.[9]
- All three studies were performed **in the eastern half of the SRS in the RCW management area** (*US Department of Energy* 2005).[10]

So, describing the setting helps the reader to picture the situation and the conditions in which the experiment was completed.

Methods Goal 1 Strategy: Introducing the Subjects/Participants

Introducing the subjects or participants in your study helps you to describe the characteristics of your sample. Whether you have human, animal, or inanimate participants or subjects, you will still need to provide the reader with a careful description of them. For a study involving humans, this answers the "who" question. For studies without humans, this often answers the "what" question. It should be noted, however, that not all disciplines have subjects/participants, but when subjects/participants can be identified, this step helps to describe subjects/participants and their original/pre-experimental characteristics, properties, origin, number, composition/construction, etc. The step also details the process by which subjects/participants were recruited/selected.

Below are a couple of examples excerpted from published reports of research with the relevant language in

9. Castagnetti, C., Mariella, J., Serrazanetti, G. P., Grandis, A., Merlo, B., Fabbri, M., & Mari, G. (2007). Evaluation of lung maturity by amniotic fluid analysis in equine neonate. *Theriogenology*, 67(9), 1455-1462.
10. Goodrick, S. L., Shea, D., & Blake, J. (2010). Estimating fuel consumption for the upper coastal plain of South Carolina. *Southern Journal of Applied Forestry*, 34(1), 5-12.

bold to illustrate how the words/phrases work to implement the strategy, which then works to accomplish the goal:

Examples

- **Participants in this study included 10 TAs** enrolled in this French doctoral program.[11]
- The Mexican populations, Chetumal and Tulum **(Mex-1 and Mex-2, respectively),** have large resin-producing glands, while the Venezuelan populations, Tovar and Caracas **(Ven-1 and Ven-2, respectively)**, have smaller glands.[12]

The Academic Phrasebank website provides a list of sentence starters that would indicate the use of this strategy. Here are a few examples:

- The cohort was divided into two groups according to ...
- A random sample of patients with ... was recruited from ...
- Articles were searched from January 1965 until April 2014.
- The sample was representative with respect to gender and ...
- Forty-seven students studying X were recruited for this study.
- A systematic literature review was conducted of studies that ...
- Just over half the sample (53%) was female, of whom 69% were ...
- Of the initial cohort of 123 students, 66 were female and 57 male.
- Eligible women who matched the selection criteria were identified by ...
- Only children aged between 10 and 15 years were included in the study.
- The participants were divided into two groups based on their performance on ...
- Two groups of subjects were interviewed, namely X and Y. The first group was...
- The project used a convenience sample of 32 first-year modern languages students.
- All of the participants were aged between 18 and 19 at the beginning of the study...
- All studies described as using some sort of X procedure were included in the analysis.
- Participants were recruited from 15 clinics across ..., covering urban and rural areas ...
- The initial sample consisted of 200 students, 75 of whom belonged to minority groups.
- Semi-structured interviews were conducted with 17 male offenders with a mean age of 38 years.

Introducing your subjects/participants is key because of the important role that a sample plays in the design of the study. Think of this strategy as a way to make an argument for the value of your sample.

11. Mills, N. (2011). Teaching assistants' self-efficacy in teaching literature: Sources, personal assessments, and consequences. *The Modern Language Journal*, 95(1), 61-80.
12. Pélabon, C., Carlson, M. L., Hansen, T. F., Yoccoz, N. G., & Armbruster, W. S. (2004). Consequences of inter-population crosses on developmental stability and canalization of floral traits in Dalechampia scandens (Euphorbiaceae). *Journal of Evolutionary Biology*, 17(1), 19-32.

Methods Goal 1 Strategy: Rationalizing Pre-Experiment Conditions

Rationalizing pre-experiment conditions is a way to show the reader how you attained your specific sample or how you decided about the methods you chose prior to actually carrying out the experimental procedures of the study.

Here are two examples taken from published research articles:

Examples

- **The literature review presented above leads us to formulate our research questions more precisely.** First, we ask whether there is a difference in well-being between the unemployed and those currently employed.[13]
- We defined two sub-samples of LAEs split at R = 25.5. **The continuum-bright (UV-bright hereafter) sub-sample of 118 LAEs enables a direct comparison with the SED parameters of R less than 25.5 "BX," star-forming galaxies in the same range of redshift** (Steidel et al. 2004). The remaining 98 LAEs are classified as UV-faint.[14]

On the Academic Phrasebank website, sentence starters are provided for indicating the inclusion or exclusion criteria you may have used in your study.

- Criteria for selecting the subjects were as follows:
- Publications were only included in the analysis if...
- The participants in this study were recruited from ...
- To identify X, the following parameters were used: ...
- The area of study was chosen for its relatively small ...
- Primary inclusion criteria for the X participants were ...
- Eligibility criteria required individuals to have received ...
- Five individuals were excluded from the study on the basis of ...
- A small sample was chosen because of the expected difficulty in obtaining ...
- The subjects were selected on the basis of the degree of homogeneity of their ...
- A comparison group of 12 male subjects without any history of X was drawn from a pool of ...

Keep in mind that the Methods section is very important. Even if readers are skimming a published article, they typically read the methods with careful attention to the details provided. Because Methods sections are often rote narratives of procedures, there are several frequently adopted words or phrases that are

13. Ervasti, H., & Venetoklis, T. (2010). Unemployment and subjective well-being: An empirical test of deprivation theory, incentive paradigm and financial strain approach. *Acta Sociologica*, 53(2), 119-139.
14. Guaita, L., Acquaviva, V., Padilla, N., Gawiser, E., Bond, N. A., Ciardullo, R., ... & Schawinski, K. (2011). Lyα-emitting galaxies at z= 2.1: Stellar masses, dust, and star formation histories from spectral energy distribution fitting. *The Astrophysical Journal*, 733(2), 114.

standard. The Academic Phrasebank website provides a list of these, which are summarized in the table below:

Type of Language	Example
Infinitive of purpose (*to* + base form verb)	To measure X, we ... To establish X, the participants were ...
Expressing purpose with "for"	For the questions in the interview, we adapted ... For the purpose of analysis, X was ...
Sequence words (related to timing)	Prior to After
Passive voice verbs (*be* + past participle)	All participants were sent ... The data were normalized using ...
Adverbs of manner	A sample was then carefully injected into ... The mixture was then gradually heated ...
"Using" + instruments	Data were collected using Xs ... The subjects were recruited using email ...

Overall, there is a lot of example language that you may use to incorporate as you write the Methods section. Using the goals and strategies as a guide, you can choose the words and phrases suggested to ensure that your methods are appropriately detailed and clear.

Key Takeaways

Goal #1 of writing the Methods section is related to Contextualizing the Study's Methods. There are six possible strategies that you can use to accomplish this goal:

- Referencing previous works and/or
- Providing general information and/or
- Identifying the methodological approach and/or
- Describing the setting and/or
- Introducing the subjects/participants and/or
- Rationalizing pre-experiment decisions

Remember: You do not need to include all of these strategies — they are simply possibilities for reaching the goal of Contextualizing the Study's Methods.

Methods Goal 2: Describe the Study

The second goal of writing your Methods section is to Describe the Study. This is the primary portion of the Methods section and is the place for you to include details of what you actually did to conduct the research. To accomplish this goal, you will need to explain how, when, and where you obtained the data, and you should describe that data. If your study involves the use of variables, then part of the objective for this goal is to highlight their purpose. Usually, authors explain why they did or did not include certain variables along with detailing their experimental procedures and noting tools, instruments, materials, or equipment that may have been used. Finally, another purpose of this goal is to provide a rationale for the decisions that were made along the way of collecting, analyzing, and interpreting the data.

Now let's look at some examples from published studies, where Goal 2 is **bolded**:

Examples

- The sulfur atom is located in a bridging position between two paired Mo atoms. **Besides, each Mo atom is surrounded by one Ni atom. Oxygenated molecules can thus interact either with the sulfur-deficient Mo sites (Fig. 1a and b) or with the Ni sites, while hydrogen atoms can interact either with metal centers to form hydridic species or with the S atom to form protonic species. The following parameters, x = 12.29 A, y = 12.80 A and z = 27.01 A, are used for the supercell, which ensures a vacuum interlayer of 15.00 A (in z direction) and is sufficient to avoid spurious interactions between two edges belonging to neighboring supercells . In this work, we focus on the metallic edge (M-edge) for both systems.** We complementarily used the DMol3 package [34] to determine Hirshfeld charges [35] of relevant active sites and atoms in studied molecules.[1]
- **A phenomenological approach was used to map out** people's experiences of pleasantness on different levels of bodily functioning. Phenomenology as a distinct method of inquiry is based upon the classic philosophical works of Husserl and Heidegger (Moustakas, 1994). It provides a structured approach to investigate subjective experience, **allowing the discovery of** shared ideas and common experiences among people (Maggs-Rapport, 2008). A traditional data collection method for phenomenological inquiry is the qualitative, in-depth interview (Lopez & Willis, 2004). **Since this method can be time-intensive**, interviews are often semi-structured, hereby maximizing researcher efficiency while still allowing people's freedom of expression (Barriball & While, 1994). **In order to increase the scientific rigor of phenomenological research,** balanced integration is promoted (de Witt & Ploeg, 2006). Balanced integration relates to "...the general philosophical theme and its fit with the researcher and the research topic, in depth intertwining of philosophical concepts with the study methods and findings, and a balance between the voice of the participants and the philosophical explanation..." (p. 224). Our inquiry goals were to investigate the pleasantness of everyday activities experienced within the human body in relation to the aesthetics of interaction paradigm, **using a biological perspective on human functioning. In order to reach these goals,** we set out to obtain in-depth understanding of a large variety of pleasant, everyday experiences. **During the recruitment of participants, we tried to maximize diversity in responses by** searching for people **who used different sensory modalities in their professional work and who had different demographic characteristics**. **Participants were** 12 Dutch citizens **varying in age, background, income, and level of education**. **Their occupations were:** Disk jockey, music conductor, preacher, psychology student, Reichian body worker, physiotherapist, maitre/sommelier, manager in the perfumery industry, architecture student, dance teacher, fashion design student and secretarial worker. **Participants were selected through** professional listing services and through our social networks. **Care was given that interviewers were not personally acquainted with any of the participants. Participants' ages ranged from** 20 to 72 years. **Six participants were women and six were men**.[2]

1. Dupont, C., Lemeur, R., Daudin, A., & Raybaud, P. (2011). Hydrodeoxygenation pathways catalyzed by MoS2 and NiMoS active phases: A DFT study. *Journal of Catalysis*, 279(2), 276-286.
2. Rozendaal, M. C., & Schifferstein, H. N. (2010). Pleasantness in bodily experience: A phenomenological inquiry. *International*

So, Goal 2 paints a picture of the data and the tools/resources/materials used in the study. Most of your Methods section will be used to accomplish this goal. As such, Goal 2, Describing the Study, includes outlining all the processes you (the researcher) used from start to finish. There are several strategies you can implement that will allow you to accomplish this goal.

Strategies for Writing about Methods Goal 2: Describing the Study

- **Acquiring the data**
- **Describing the data**
- **Identifying variables**
- **Describing experimental/study procedures**
- **Describing tools/instruments/materials/equipment**
- **Rationalizing experiment decisions**
- **Reporting incrementals**

We'll now discuss each of these and provide some examples from published research.

Methods Goal 2 Strategy: Acquiring the Data

Acquiring the data refers to a writer's description of the collection and data-recording process. This strategy enables an author to illustrate how the data were obtained (e.g., via sampling, selecting, or measuring processes) and also what was done to the data (including, but not limited to, preparing, tabulating, or estimating the data).
Here are two examples taken from published research articles:

Journal of Design, 4(2), 55-63.

Examples

- In the present study, 12 Australian university students of Japanese were recruited, who in turn invited their Japanese contacts to participate. **In total, data was collected from 30 participants, and some Japanese participants were contacts of more than one Australian participant.** In contrast to many previous studies, volunteers were not paired with NSs in order to complete tasks, but instead data was collected from participants in existing relationships. [3]
- The high-quality fluorescent particles, typically used in microfluidics, generally provide high-quality particle images, with acceptable SNR up to high levels of defocusing, and are particularly well suited for this type of application. **In figure 2 the peak intensities and particle image diameters, obtained from different types of tracer particles, are shown as a function of their distance z from the in-focus plane.** The tracer particles are polystyrene latex spheres with diameters of dp = 1, 2, 5 and 10 __mu__m, fabricated by Microparticles GmbH.[4]

Overall, this strategy illustrates the process of collecting and/or recording data that comes from any source — primary or secondary. It answers the questions: when, where, and how did you acquire the samples that you are using. It can also include your basic measurement strategies and what you did to the data to prepare it for analysis. At the end of the chapter, we'll provide examples of some common language that can be used to implement this strategy.

Methods Goal 2 Strategy: Describing the Data

Describing the data typically follows the previous strategy of explaining how the data were acquired. When you describe data, you elaborate on features such as measurement units, scales, qualities, or quantities.
Consider these excerpts from published research articles:

3. Pasfield-Neofitou, S. (2011). Online domains of language use: Second language learners' experiences of virtual community and foreignness. *Language Learning & Technology*, 15(2), 92-108.
4. Cierpka, C., Rossi, M., Segura, R., & Kähler, C. J. (2010). On the calibration of astigmatism particle tracking velocimetry for microflows. *Measurement Science and Technology*, *22*(1), 015401.

Examples

- The relative quantification of the samples was determined using the Bio-Rad CFX Manager software, integrating primer efficiencies calculated from a standard curve. For the gene, the sample showing the highest intensity level was used as reference with a value of 1. **The final data result from averages of three biological replicates and at least two technical repetitions.**[5]
- **Age was weakly and typically not significantly related to performance on outcome measures at pre- and posttest and, therefore, was not included in analyses. Table 1 presents demographic and screening data, arranged by study condition and MD subtype. (We note that we conducted supplementary analyses to determine whether adding ESL, IQ, or WRAT Arithmetic altered the nature of the findings. Because none did, we did not include these variables as covariates in the analyses** described below.)[6]

Overall, the use of this strategy enables researchers to fully illustrate their data sample for the reader. This strategy is particularly important as a means of justifying the quality of your sample, so be sure to pay close attention to detail at this stage of your writing.

Methods Goal 2 Strategy: Identifying Variables

The strategy of **identifying variables** distinguishes which parts of your data were manipulated or used to influence the findings. Some common labels include constant versus subject-to-change conditions or factors during the time the experiment was carried out. Here are two examples taken from published research articles:

5. Tian, J., Shen, H., Zhang, J., Song, T., & Yao, Y. (2011). Characteristics of chalcone synthase promoters from different leaf-color Malus crabapple cultivars. *Scientia Horticulturae*, 129(3), 449-458.
6. Powell, S. R., Fuchs, L. S., Fuchs, D., Cirino, P. T., & Fletcher, J. M. (2009). Effects of fact retrieval tutoring on third-grade students with math difficulties with and without reading difficulties. *Learning Disabilities Research & Practice*, 24(1), 1-11.

Examples

- In a typical experiment, a range of 0.01-10.0 mL of ZnO NCs (1.22 x 10-11 to 1.22 x 10-8 mol) were added to 10 vials each containing 3.8 x 10-6 M (4.2 x 10-8 mol) 1-CO2H in ethanol. **A control vial had the same amount of 1-CO2H as the other vials but contained 5 _ _mu_ _L of 0.100 M NMe4OH5H2O to deprotonate the molecule.** Ethanol was added until all vials contained 11.0 mL.[7]
- Because of the marked differences between **nurture group and control samples** in the very few reported studies that have included control groups, this study adopted a highly formalised procedure for selecting controls. While this did not eliminate the almost unavoidable differences between experimentals and controls in a quasi-experimental study, it was successful in significantly reducing any differences.[8]

Now that you have sufficiently identified and described your variables, you can move on to explaining what you actually did to conduct the experiment: the methods/procedures.

Methods Goal 2 Strategy: Describing Experimental Study Procedures

Describing experimental study procedures describes what you did to cause an outcome related to or leading to specific results. It also illustrates the steps you used and provides a description that is detailed enough for future replication of the study. You can accomplish this strategy by outlining what was done for the actual study or experiment in step-by-step actions.
Here are two examples taken from published research articles:

Examples

- At the initial login, **participants were asked to record** their steps for 4 days over the following week.[9]
- The mold was then **attached** to the bottom pedestal of the test cell, the membrane **stretched** over the bottom end platen and **sealed** using two o-rings.[10]

7. Rossini, J. E., Huss, A. S., Bohnsack, J. N., Blank, D. A., Mann, K. R., & Gladfelter, W. L. (2011). Binding and static quenching behavior of a terthiophene carboxylate on monodispersed zinc oxide nanocrystals. *The Journal of Physical Chemistry C*, 115(1), 11-17.
8. Reynolds, S., MacKay, T., & Kearney, M. (2009). RESEARCH SECTION: Nurture groups: a large-scale, controlled study of effects on development and academic attainment. *British Journal of Special Education*, 36(4), 204-212.
9. Booth, A. O., Nowson, C. A., & Matters, H. (2008). Evaluation of an interactive, Internet-based weight loss program: a pilot study. *Health Education Research*, 23(3), 371-381.
10. Alshibli, K. A., Batiste, S. N., & Sture, S. (2003). Strain localization in sand: plane strain versus triaxial compression. *Journal of*

When describing procedures in the Methods section, authors use both active and passive voice. Very frequently, the verbs in the active and passive voice are used in the past tense (as in the examples above). However, in some disciplines, authors may choose to use the present simple tense to describe the experimental steps of their study (e.g., I exclude small state-owned banks from the sample).

Methods Goal 2 Strategy: Describing Tools / Instruments / Materials / Equipment

Describing tools/instruments/materials/equipment explains the materials (physical or abstract) used in data acquisition or experimental procedures. This information is useful for the reader in case the study may be replicated by another researcher. Sometimes the overall goal of a sentence is to describe tools, but other times there are overarching goals. It must be noted that while the origin or nature of the tools/instruments/materials/equipment may be described, this strategy does not include the process of obtaining or creating them, nor does it explain how they were used or what specific actions were taken with them in the course of the study.

It is also worth mentioning that this description of tools/instruments/materials/equipment may not only appear in the description of experimental procedures, but also when you are discussing other parts of the data acquisition or analysis process.

Examples of this strategy are in the box below:

Examples

- **The basic liquid medium (BLM) used for the activation of the cultures consisted of** chicken feather meal 20; NaCl, 0.5; KH2PO4, 1.0 and K2HPO4, 6.0 at pH 7.5.[11]
- **The MLAT (Modern Language Aptitude Test) is** usually administered in two versions–full and short. Since **the short version contains** all sections relevant to vocabulary learning, it was the version selected for the current research.[12]

Note that in the first example, the past tense is used to describe materials specifically designed or chosen for the study and that may not be familiar to the readers. However, the present tense (used in the second

Geotechnical and Geoenvironmental Engineering, 129(6), 483-494.

11. Liang, J. D., Han, Y. F., Zhang, J. W., Du, W., Liang, Z. Q., & Li, Z. Z. (2011). Optimal culture conditions for keratinase production by a novel thermophilic Myceliophthora thermophila strain GZUIFR-H49-1. *Journal of Applied Microbiology*, 110(4), 871-880.
12. Nikolova, O. R. (2002). Effects of students' participation in authoring of multimedia materials on student acquisition of vocabulary. *Language Learning & Technology*, 6(1), 100-122.

example) can be used to describe standard or conventional tools or equipment that are likely to be familiar to the readers.

Once the variables, procedures, and materials have been sufficiently explained, you will need to justify the decisions you made that contributed to the selection of them.

Methods Goal 2 Strategy: Rationalizing Experiment Decisions

Rationalizing experiment decisions provides reasoning or explanation for choices made in the experimental process (e.g., in data collection or preparation, experimentation, or tool selection). This strategy is useful for justifying choices, connecting choices to research purposes and questions, establishing credibility, and indicating the objective for certain experimental steps.

The following examples illustrate this step:

Examples

- Moreover, **since** one aim of the study was to investigate students' impressions regarding the process enacted during the Role Play, **it was decided** that the same dimensions and indicators could be used to address this issue.[13]
- Yield was not determined by combine harvesting **because of** the wide range of harvest maturity dates within the study.[14]

This strategy of providing a justification or rationale for your decisions is extremely important in making the research process transparent for your readers.

Methods Goal 2 Strategy: Reporting Incrementals

Reporting incrementals, the last potential strategy in Goal 2, reports the preliminary findings, results of observations, and/or measurements. It may serve as a way for the author to promote understanding of the next steps taken or choices made in the experiment. These incremental reports can clarify your methods and/or justify the use of a particular technique or procedure. This strategy results in a brief reporting of what occurred in the experimental process. It helps your readers understand why you completed the experimental procedures or made certain choices in a particular way.

13. Pozzi, F. (2011). The impact of scripted roles on online collaborative learning processes. *International Journal of Computer-Supported Collaborative Learning*, 6(3), 471-484.
14. Kahlon, C. S., Board, J. E., & Kang, M. S. (2011). An analysis of yield component changes for new vs. old soybean cultivars. *Agronomy Journal*, 103(1), 13-22.

Examples of the reporting incrementals strategy are as follows:

Examples

- The final R- and R-free **values after data refinement** (details in the Supplementary Methods) were 21.6% and 28.7%, respectively.[15]
- Although the same amounts of reactants were used to produce the 508 and 625 nm particles, slight differences in stirring speed **likely contributed to** the size variations.[16]

There is one important caveat for reporting incrementals; this strategy should not be confused with actual study results. This strategy is simply a small mention of incremental findings or observations that you believe to be noteworthy, and they may or may not be directly connected to the final study results.

Language Suggestions for Goal 2 Strategies

Some common vocabulary that is associated with this strategy includes the following, as noted in the Academic Phrasebank website:

15. Masterson, L. R., Cheng, C., Yu, T., Tonelli, M., Kornev, A., Taylor, S. S., & Veglia, G. (2010). Dynamics connect substrate recognition to catalysis in protein kinase A. *Nature Chemical Biology*, 6(11), 821-828.
16. Kramb, R. C., & Zukoski, C. F. (2008). A metastable van der Waals gel: Transitioning from weak to strong attractions. *Langmuir*, 24(14), 7565-7572.

Sequence phrases

- *To begin* this process, …
- *The first step* in this process was to …
- *The second method* used to identify X involved …

Passive voice verbs

- All participants *were sent* …
- The data *were normalized* using …
- Ethical approval *was obtained* from …

Expressing purpose with *for*

- *For* the attitude questions, a Likert scale was used.
- *For* the purpose of analysis, two segments were extracted from each …
- *For* the estimation of protein concentration, 100 µL of protein sample was mixed with …

Adverbs of manner

- The medium was then *aseptically* transferred to a conical flask.
- A sample of the concentrate was then *carefully* extracted from …
- The tubes were *methodically* collected by …

***Using* + instruments**

- Data were collected *using* two high spectral resolution Xs.
- Semi-automated genotyping was carried out *using* X software and …
- *Using* the X-ray and looking at the actual X, it was possible to identify …

Linguistic research on language structure and use in Methods sections of research articles has shown common trends in the forms and structure of the section across disciplines. There is a predominant use of the present and present perfect tenses, verbs in the past passive and past active voice, and modifiers such as adjectives and adverbs. These common characteristics may work together to strengthen the author's claims by calling attention to the contributions of the current work and downplaying uncertainty perhaps arising in the attainment and analysis of data. Writers also may choose how to represent themselves in their writing. The personification of the authors is sometimes seen by the use of the pronouns "we," or "I," though the context and rationale for its use seem inconsistent among the disciplines.

Key Takeaways

Goal 2 of writing the Methods section is related to Describing the Study. There are seven possible strategies that you can use to accomplish this goal:

- Acquiring the data and/or
- Describing the data and/or
- Identifying variables and/or
- Describing experimental/study procedures and/or
- Describing tools/instruments/materials/equipment and/or
- Rationalizing experiment decisions and/or
- Reporting incrementals

Remember: You do not need to include all of these strategies — they are simply possibilities for reaching the goal of Describing the Study.

Methods Goal 3: Analyzing the Data

The third goal of writing your Methods section, Analyzing the Data, is to overview the data analysis. To do this, the author explains *how* the data have been analyzed (without describing the results of that analysis). Accomplishing this goal provides a preview of the central pieces of the research, including, but not limited to, objectives, questions/hypotheses, procedures/methods, and main results. Authors also make arguments about the value of the reported work in an effort to justify the need for addressing the niche and any previous attempts to provide solutions to problems or gaps in the literature.

Sometimes writers outline their papers to help the reader understand the structure of what's to come. In addition to describing the specific actions taken during the analysis of the data, this goal contains explanations of actions taken prior to the analysis, during which researchers prepare the data for analysis and interpretation. This goal might also include a description of measures taken to establish the credibility of the investigation (e.g., reporting reliability, noting limitations, or mentioning follow-up work).

Turn your attention to these excerpts from published writing. The **bolded** parts demonstrate the writer's attempt to accomplish Goal 3 by explaining how the data was analyzed.

Examples

- **Initially, all main effects (year, planting date, cultivar, and harvest date), as well as all of their associated interactive combinations, were included within the statistical model.** Based on previous experience (Gunsaulis et al., 2008; Coblentz and Walgenbach 2010), management main effects (planting date, cultivar, and harvest date) were likely to interact with each other, and also to interact strongly with year. This hypothesis proved to be correct; regardless of the response variable (canopy height, growth stage, DM concentration, and yields of DM), nearly all interactive combinations of main effects were highly significant (P less than 0.01). **To properly assess the DM yield potential of fall grown oat cultivars, an understanding these interactions was imperative, particularly those with environment (year); therefore, year was considered to be a fixed, rather than random effect. Furthermore, some compromises were necessary to maintain a concise presentation of results. For yields of DM, interaction means were sorted by planting date within year and reanalyzed as a split-plot design with cultivars as whole plots and harvest dates as subplots using PROC MIXED (SAS Institute, Cary, NC).** For most of the nine combinations of year and planting date, the cultivar x harvest date interaction was significant; therefore, these interaction means are presented and discussed.[1]
- **This count is regressed on country-year variables that control for a country's changing export capabilities, including country dummy variables, time dummy variables, a vector of time-varying characteristics of country j, and the Post Reform Dummy.** The country characteristics included in the vector Hjt are the same as those used in the specifications presented in Table 3. **Because the data cover only an 11 year time frame, as explained below, country-specific time trends are not included. For data, we utilize the U.S. trade database created by Feenstra et al. (2001).**[2]

As noted above, this strategy is all about the analytical procedures used to carry out the research. So, the previous Goal (Methods Goal 2: Describing the Study) is more about what happened during the data collection, while this goal explains to the reader what happened AFTER the data were collected.

The purpose of Goal 3, Analyzing the Data, is to persuade your reader about the quality of the data analysis and make a claim that the study's procedures have led to valid and credible findings. As a reminder, this communicative goal allows the writer to explain *how* the data have been analyzed (without describing the results of that analysis).

Strategies for Writing about Methods Goal 3: Analyzing the

1. Coblentz, W. K., Bertram, M. G., & Martin, N. P. (2011). Planting date effects on fall forage production of oat cultivars in Wisconsin. *Agronomy Journal*, *103*(1), 145-155.
2. Branstetter, L., Fisman, R., Foley, C. F., & Saggi, K. (2011). Does intellectual property rights reform spur industrial development?. *Journal of International Economics*, *83*(1), 27-36.

Data

- **Preparing the data**
- **Describing the data analysis**
- **Establishing credibility**

We'll now discuss each of these and provide some examples from published research.

Methods Goal 3 Strategy: Preparing the Data

Preparing the data describes what was done to the data and how the data were prepared for analysis. That is, this strategy is used to explain data selection, collection, and preparation (e.g., sampling, screening, cleaning, inclusion/exclusion, correction). You will also mention any tools that you used to accomplish these processes. Also, you need to explain data manipulation (e.g., transforming, coding, tabulating, estimating) along with any tools you used. Below are two examples of the utilization of this strategy in published research:

Examples

- **For all variables, least squares means were generated and, when significant (P < 0.05) F values were observed, least squares means were separated with pairwise t-test (PDIFF option).**[3]
- Each electronic nose measurement was associated with the average (one representative value) of the eight human panelists assessments. **The determination of the average pleasantness rating also involved trimming the data**. The data were scanned for values that did not support the general consensus.[4]

Although the examples show data that were *included* in the research, you may also mention which data were excluded from the analysis. The following are some examples from the Academic Phrasebank website that you might consider using as sentence starters:

3. Sawyer, J. T., Apple, J. K., Johnson, Z. B., Baublits, R. T., & Yancey, J. W. S. Color Stability of Dark-cutting Beef Enhanced with Lactic Acid. *Arkansas*, 87.
4. Williams, A. L., Heinemann, P. H., Wysocki, C. J., Beyer, D. M., & Graves, R. E. (2010). Prediction of hedonic tone using an electronic nose and artificial neural networks. *Applied Engineering in Agriculture*, *26*(2), 343-350.

- Criteria for selecting the subjects were as follows:
- Publications were only included in the analysis if...
- The participants in this study were recruited from ...
- To identify X, the following parameters were used: ...
- The area of study was chosen for its relatively small ...
- Primary inclusion criteria for the X participants were ...
- Eligibility criteria required individuals to have received ...
- Five individuals were excluded from the study on the basis of ...
- A small sample was chosen because of the expected difficulty in obtaining ...
- The subjects were selected on the basis of the degree of homogeneity of their ...
- A comparison group of 12 male subjects without any history of X was drawn from a pool of ...

Methods Goal 3 Strategy: Describing the Data Analysis

Describing the data analysis provides a description of the actual analysis (with/without certain tools) in terms of how the data analysis was done and what procedures were used for analysis (e.g., statistical techniques, coding schemes, etc.).
Consider the following examples from published research:

Examples

- For all variables, **least squares means were generated and, when significant (P < 0.05) F values were observed, least squares means were separated with pairwise t-test (**PDIFF option). [5]
- Our paired survey from buyers and suppliers significantly reduces the single-side, single-informant related common method variance bias. **Before computing the average score from both sides, we also took steps recommended by Podsakoff and Organ (1986) and conducted a global factor analysis on items related to all predicting and criterion variables for each side.** No single factor emerges from the analysis and no one factor accounts for most of the covariance for all predicting and criterion variables, confirming the absence of the common method bias. [6]

Methods Goal 3 Strategy: Establishing Credibility

Establishing credibility means that you provide a rationale for the analysis and/or data processing and indicates statistical or other procedures employed to ensure credibility (e.g., reliability calculations). The

5. Sawyer, J. T., Apple, J. K., & Johnson, Z. B. (2007). The impact of acidic marination concentration and sodium chloride on sensory and ınstrumental color characteristics of dark-cutting beef. *Arkansas Animal Science Department Report*, 92-95.
6. Liu, Y., Luo, Y., & Liu, T. (2009). Governing buyer–supplier relationships through transactional and relational mechanisms: Evidence from China. *Journal of Operations Management*, *27*(4), 294-309.

implementation of this strategy gives recognition to existing and/or pre-existing limitations and/or explains or interprets certain observations or measurements.
Here are two examples taken from published research articles:

Examples

- **We only tentatively interpret** the A mar data here, as its determination **is complicated by uncertainties** associated with the partitioning of marine and terrestrial deposits in the macrostratigraphy database (**a subject of ongoing work**).[7]
- Lastly, MM5 is intended to be **a very conservative dissonance indicator, preventing potential misclassification of residents as mismatched as much as possible.**[8]

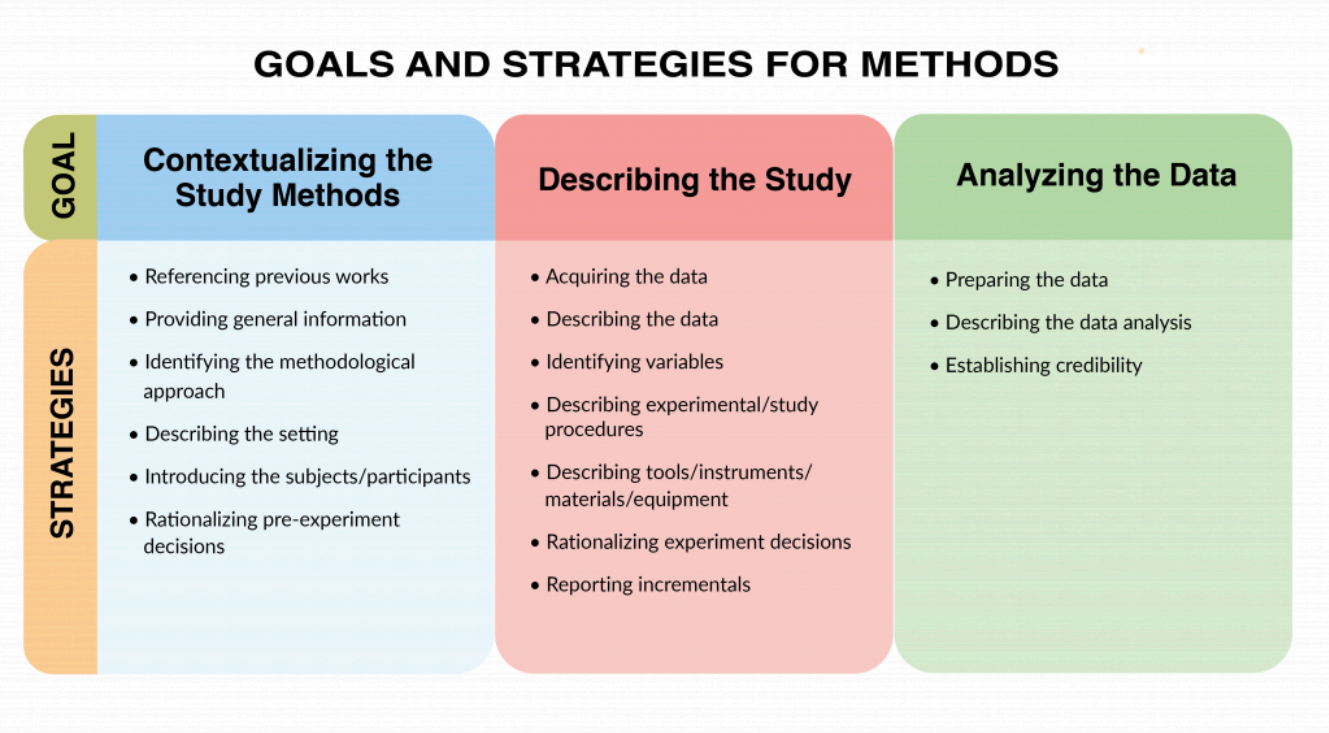
Key Takeaway

Overall, this goal provides information about how the researchers collected, manipulated, screened, cleaned, coded, and analyzed their data.

7. Meyers, S. R., & Peters, S. E. (2011). A 56 million year rhythm in North American sedimentation during the Phanerozoic. *Earth and Planetary Science Letters*, *303*(3-4), 174-180.
8. Schwanen, T., & Mokhtarian, P. L. (2005). What affects commute mode choice: neighborhood physical structure or preferences toward neighborhoods? *Journal of Transport Geography*, *13*(1), 83-99.

Chapter 4 Synopsis: Writing Methods Sections

We have now reviewed the three communicative goals and a variety of strategies that you can use to help write the Methods section of a research article. The image below provides a snapshot of this chapter:



Key Takeaways

There are three main goals of the Methods section that can be used to provide necessary detail about the study procedures:

- Contextualizing the study methods
- Describing the study
- Analyzing the data

Explore + Apply

Before you begin applying what you've learned in this chapter to your Methods section, explore published writing in your discipline or in a target journal that you've identified. Look for the goals and strategies presented here to see where you might find similarities and differences that are discipline- or journal-specific.

Chapter 5: Writing the Results Section

Learning Objectives

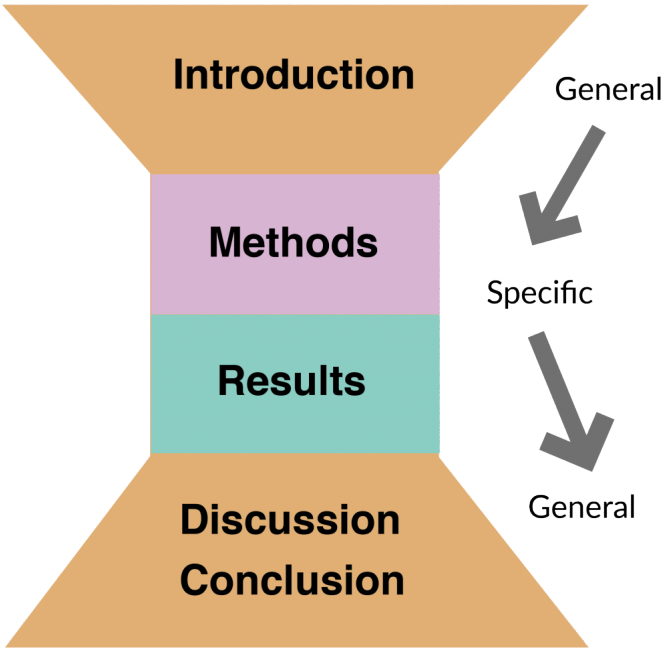
After completing this chapter, you should be able to ...

- articulate the importance of Results sections,
- recognize the communicative goals of the Results,
- strategize to achieve communicative goals,
- optimize the language for writing about your Results, and
- evaluate your Results section.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://iastate.pressbooks.pub/preparingtopublish/?p=450#h5p-10

Conceptualizing the Research Article: Review

You may remember from Chapters 3 and 4 that research articles have specific sections regardless of discipline or journal. Generally, there are five commonly acknowledged sections of an empirical research manuscript: Introduction (including the Literature Review), Methods, Results, Discussion/Conclusion.



Notice that the figure depicts an article in the shape of an hourglass. That shape provides a way for us to consider whether the content of the sections of a research article will be general or specific. The middle parts — the Methods and Results sections — are the most specific pieces of the entire article. As you learned in Chapter 4 (Methods), the move toward the middle of your research manuscript allows you to really hone in on your exact study's parts, so the content will necessarily narrow in scope. In this chapter, we will present the goals and strategies for writing the Results.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://iastate.pressbooks.pub/preparingtopublish/?p=505#h5p-9

Warm-Up

Why do you think the Results need to be specific (narrow) and not too general (broad)? What aspects of the Results section contribute to its specificity?

Goals of an Effective Results Section

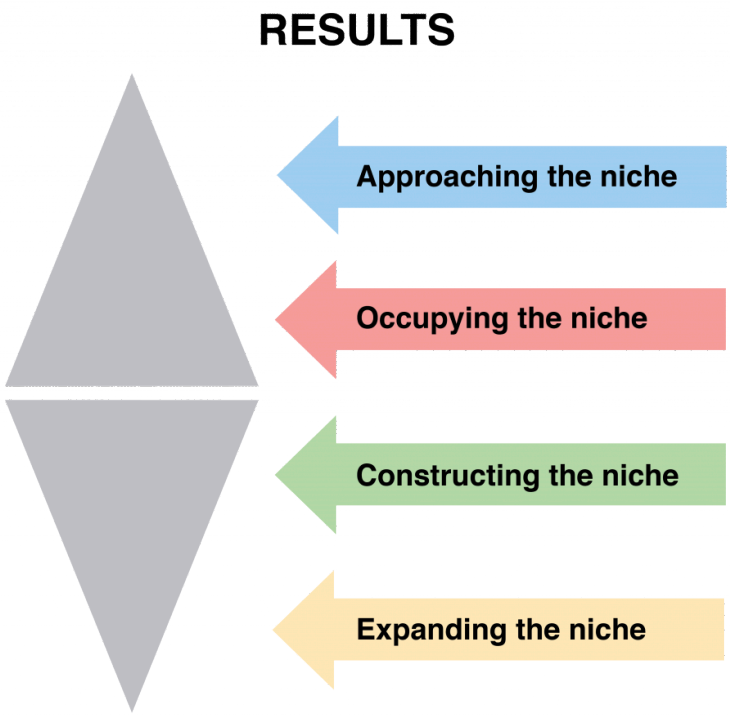
The use of a separate Results section varies by discipline (field) and journal. Some disciplines utilize a section for presenting results and another section for discussing those results while others integrate the findings with an interpretation of those findings, which is called the "Discussion." In this book, we have separated those two sections so that the goals and strategies can be more easily explained, clarified, and exemplified.

As Wallwork (2011) points out, when the two sections are separate, the Results section tends to be one of the shorter sections of the paper. This is because successful research writers present only the findings that are the most representative. Those findings are then organized according to the research questions or hypotheses outlined in previous sections of the manuscript. Results can be reported as text, tables, figures, or all three.

The Results section aims at achieving four main communicative goals:

1. Approaching the niche
2. Occupying the niche
3. Construing the niche
4. Expanding the niche

The use of the word niche probably seems familiar to you because you learned about it in Chapter 3: The Introduction Section. The meaning of that word is exactly the same in this chapter as it was earlier in the book. The niche is the area of the research where you have identified a need, problem, or gap. Your Introduction identified and addressed the niche, your Methods section provided the procedures for investigating that niche, and now, in the Results section, you're going to provide the answers to your questions by reporting your findings.



We'll now review these four goals in a little more depth and look at some examples.

Key Takeaways

To sum up, depending on the organizational pattern you have chosen for your results section, you may have 2-4 goals to accomplish in your Results section:

1. Approaching the niche
2. Occupying the niche
3. Construing the niche
4. Expanding the niche

The first two of these will definitely be a part of your Results section, whether or not it is combined with the Discussion of your findings. However, Goals 3 and 4 will only be present if you have a combined Results/ Discussion section. It is still important to accomplish these goals in your paper — the only question is where your reader will find them.

Results Goal 1: Approaching the Niche

The first goal in the Results section is called Approaching the Niche. The major aim is to show a progression from all the other preceding parts (i.e., Introduction and Methods) to the Results, or findings. The progression here carries a lot of meaning. It means that your findings are valid in that they have a logical connection to general information from the field. It means that the findings are connected with your methods and that your methods were valid. This connection is often made by repeating relevant information to give a preview of your results. The connection of your results to the field is also important because it reiterates and further validates the information and processes/procedures that you wrote about in the Methods section. So, as you are writing this part of the research report, you'll be considering what you've already written about in the literature review in the Introduction (specifically, the niche) while also emphasizing the choices you made regarding methodology. The similarity in the names of the goals in the Introduction section and the Results section is no coincidence. It is very important that you avoid simply reporting the results without linking them to the niche that you established at the very beginning of the paper.

Goal 1, Approaching the Niche, means that you articulate the progression from the start of your manuscript up to this point. In other words, you need to show how the gap is being filled with your results. This is not a place to dump your findings into the paper; on the contrary, you need to demonstrate the connection between the general information from the field to the specific methods you chose and finally here, to the results. This is often accomplished by re-emphasizing some particular aspects of what you wrote in both the Introduction and the Methods sections. There are several strategies you can use to help you successfully achieve this goal in a detailed manner.

Strategies for Results Communicative Goal 1: Approaching the Niche

- **Providing general information**
- **Restating study specifics**
- **Justifying study specifics**

We'll now discuss each of these and provide some examples from published research.

Results Goal 1 Strategy: Providing General Information

Providing general information is a strategy used to show the reader your thinking about how the results may be understood or confused. This is your opportunity to reiterate any information that the reader may have forgotten (or may not have read at all). This is how you link the information back to your Introduction,

where you justified the need for the study in the first place. In other words, you can use this strategy to provide context for the study and the results inside a specific "territory" (knowledge space). You may refer back to methods, techniques, processes, or practices used in your field. This strategy thus allows you to orient your readers in a way that makes it easier for them to navigate your results. You do this by indicating the order of information you are presenting as results or by highlighting noteworthy aspects on which they should focus.

Here are two examples taken from published research articles:

Examples

- Monitoring **results are presented by station in the following section**. The monitoring **data are divided into** pre-, during-, and post-construction periods. **These periods were determined by observation** and are somewhat arbitrary, as construction projects are a continuum with no distinct breaks.[1]
- **This section presents results for** our various test corpora and classifiers. **We will first verify Wagner et al.'s (2007) finding that** combining features of different methods helps.[2]

It might be helpful to think of this strategy like road signs when you are driving. The signs along the way help you determine where you are going, and likewise, this strategy helps your reader to know your intentions about organizing the Results section.

Results Goal 1 Strategy: Restating Study Specifics

Restating study specifics is a common strategy that you can use to restate various characteristics of your methodology, such as the overall approach, research questions, and/or hypotheses. The purpose of restating study specifics is to connect them to the respective results. Don't forget, the reader needs to be able to understand the results, and reminding the reader briefly of how those results were obtained can be a good strategy to accomplish this goal. Sometimes this strategy is accomplished by pointing to visual representations of procedures or approaches (for example, graphs or tables).

Here are two examples taken from published research articles:

1. Line, D. E., Shaffer, M. B., & Blackwell, J. D. (2011). Sediment export from a highway construction site in central North Carolina. *Transactions of the* ASABE, 54(1), 105-111.
2. Wagner, J., Foster, J., & van Genabith, J. (2009). Judging grammaticality: Experiments in sentence classification. *Calico Journal*, 26(3), 474-490.

Examples

- **We hypothesized that** JM6 acts as a prodrug and would be metabolized under acidic conditions in the gut to slowly release Ro 61-8048 and thereby provide long-lasting inhibition of KMO (Figures 2A and 2B). **To investigate** the pharmacokinetic properties of JM6, **we treated wild-type (WT) mice with** a single high dose of JM6 (300 mg/kg p.o.) **and measured** JM6 and Ro 61-8048 in plasma, brain, muscle, and liver by liquid chromatography/mass spectrometry (LC/MS) 5 hr after administration.[3]
- In Table 2, **we test for the effects of** culture on individual preferences for redistribution and explore the effects of traditional economic determinants of preferences . **A one unit increase in the mean preference for redistribution in the individual's country of birth, calculated on a 1 to 5 scale, is associated with** a 0.36 unit increase in the individual's own preference for redistribution (column 1). This effect is highly statistically significant (t=4.08).[4]

So, restating the study specifics helps the reader to situate your findings within the larger "territory" or body of literature that is already available. It also clarifies the connections between the motivations, methods, and results.

Results Goal 1 Strategy: Justifying Study Specifics

Justifying study specifics is the final strategy that provides the reader with an understanding of how you have progressed from the literature to the justification of the study, to the research questions, to the methods, and now, finally, to your results. You can provide justifications for study-related choices as a way of increasing the credibility of your results. If you remember back to the Methods section, authors try to anticipate criticism with the purpose of making the methods credible. In the Results section, criticism is also anticipated; thus, providing sound reasoning or rationale for certain study choices and reiterating the importance of decisions made along the way is like answering questions from your readers before they are asked.

Below are a few examples excerpted from published reports of research with the relevant language **bolded** to illustrate how the words/phrases work to implement the strategy, which then works to accomplish the goal:

3. Zwilling, D., Huang, S. Y., Sathyasaikumar, K. V., Notarangelo, F. M., Guidetti, P., Wu, H. Q., ... & Muchowski, P. J. (2011). Kynurenine 3-monooxygenase inhibition in blood ameliorates neurodegeneration. *Cell*, 145(6), 863-874.
4. Luttmer, E. F., & Singhal, M. (2011). Culture, context, and the taste for redistribution. *American Economic Journal: Economic Policy*, 3(1), 157-79.

Examples

- **This flow was chosen because** it has a streamwise component, in the x-direction, that varies over the cross section but does not provide flow in the y- or z-directions.[5]
- Previous studies results showed that 25.0 mu M NAA was the lowest concentration among the three auxins tested that resulted in 100% rooting. **Thus, 25.0 _ _mu_ _M NAA was selected as the most effective treatment and used in all further experiments**.[6]

The use of this strategy is key because of the connection it provides from the beginning of your manuscript to the point where you realize the main objective: the Results! If a reader has indeed read all of your report up to this point, then they have probably forgotten some important information that they might need to fully understand your findings. On the other hand, some readers only skim research articles, and so they may arrive at the Results section with only a vague understanding of what you set out to accomplish. So, employing this strategy is a way to guide your reader to a better comprehension of the study from an overarching perspective.

Key Takeaways

In order to accomplish the communicative goal of **approaching the niche** in your Results section, you'll need to employ these techniques:

- Providing general information and/or
- Restating study specifics
- Justifying study specifics

5. Cierpka, C., Rossi, M., Segura, R., & Kähler, C. J. (2010). On the calibration of astigmatism particle tracking velocimetry for microflows. *Measurement Science and Technology*, *22*(1), 015401.
6. Bag, N., & Palni, M. (2010). A two-step procedure for in vitro rooting of micropropagated tea [Camellia sinensis L.(O) Kuntze] microshoots. *The Journal of Horticultural Science and Biotechnology*, 85(3), 197-204.

Results Goal 2: Occupying the Niche

Another goal of the Results section is to introduce new information about the niche (the specialty area or territory that you established in the Introduction and that you are now returning to in the Results section). This new knowledge represents information that was previously insufficient or lacking in the research area. Authors accomplish Goal 2 by presenting the results of their research in explicit and informative ways. Relevant supporting evidence for your findings may also be presented. Results from your study may be presented in the text or in graphical or pictorial form in charts, tables, equations, images, and/or diagrams that act as visual aids. Presenting the study's results in multiple formats may help your readers understand your study's findings in multiple ways (e.g., visual, spatial, textual).

It is important to clarify that for this goal, you are simply presenting the results as information rather than writing your beliefs, interpretations, or evaluations of them. You should not comment on or discuss the findings as you work to accomplish Goal 2. All evaluative comments occur either later in the Results section (if Results and Discussion sections are combined) or in the Discussion section.

Goal 2, Occupying the Niche, is the place for you to introduce your readers to the new knowledge that has been gained from your research. Since you have already established a gap in the introduction, you will use this opportunity to progress from pointing out a gap to *filling* that gap. There are several strategies you can use to help you successfully achieve this goal.

Strategies for Results Communicative Goal 2: Occupying the Niche

- **Reporting specific results**
- **Indicating alternative presentation of results**

We'll now discuss each of these and provide some examples from published research.

Results Goal 2 Strategy: Reporting Specific Results

Reporting specific results is a strategy used to introduce the quantitative or qualitative results of your study. Employing this strategy well also includes making connections between the results and your original goals, research questions, and/or hypotheses as written about in your Introduction. You can report specific results in narrative form (i.e., in sentences within paragraphs), in numerical form (e.g., tables and equations), or in graphic form (e.g., figures).

Here are two examples taken from published research articles:

Examples

- The emission spectra of the ZnO NCs **displayed** the characteristic green emission (?max ~520 nm). [1]
- Concurrently, **a significant increase in crop phytotoxicity was observed** for both glyphosate- susceptible maize and soybean plants at 72 and 192 HAT. [2]

Although these examples are both relatively short, the decision about how much detail to provide can depend on a number of factors including common practices within an individual writer, journal, or discipline.

Some common sentence starters that can be used with this strategy include, but are not limited to, the following, as noted in the Academic Phrasebank website:

- The first set of questions aimed to ...
- To compare the difference between ...
- The purpose of Experiment 3 was to ...
- Simple statistical analysis was used to ...
- The next question asked the informants ...
- To assess X, the Y questionnaire was used

Results Goal 2 Strategy: Indicating an Alternative Presentation of Results

Indicating an alternative presentation of results allows a writer to point out and/or summarize the results in a more visual form. When you use this strategy, you'll refer to the visuals to help guide the reader to a more complex view of the results. This strategy encourages a better understanding of the results as they are presented in alternative form as a supplement to the report itself, which relies on text (words, phrases, sentences, etc.).

Here are two examples taken from published research articles:

1. Rossini, J. E., Huss, A. S., Bohnsack, J. N., Blank, D. A., Mann, K. R., & Gladfelter, W. L. (2011). Binding and static quenching behavior of a terthiophene carboxylate on monodispersed zinc oxide nanocrystals. *The Journal of Physical Chemistry C*, 115(1), 11-17.
2. Zelaya, I. A., Anderson, J. A., Owen, M. D., & Landes, R. D. (2011). Evaluation of spectrophotometric and HPLC methods for shikimic acid determination in plants: models in glyphosate-resistant and-susceptible crops. *Journal of Agricultural and Food Chemistry*, 59(6), 2202-2212.

Examples

- Similarly, **Figure 5B represents** the log10 of the ratio between the gene expression levels at T2idl, T4idl, or T6idl and the expression of the genes at T0idl. [3]
- **Figure 3 illustrates** the Hybrid tom and hen turkey growth performance during the one-year monitoring period.[4]

Indicating an alternative presentation of results provides a means for authors to showcase their findings outside of the written content of the article. By including additional forms of the findings, you are adding to the specificity and level of detail of the results, which helps readers more accurately comprehend your findings.

The Academic Phrasebank website provides a list of sentence starters that would indicate the use of this strategy. Here are a few examples:

- Table 1 shows/compares/presents/provides ...
  - an overview of ...
  - the experimental data on X.
  - the summary statistics for ...
- Figure 1 illustrates/presents/compares/summarizes ...
  - some of the main characteristics of ...
  - the difference in the two groups of ...
  - the results of ...

---

3. Keech, O., Pesquet, E., Gutierrez, L., Ahad, A., Bellini, C., Smith, S. M., & Gardeström, P. (2010). Leaf senescence is accompanied by an early disruption of the microtubule network in Arabidopsis. *Plant Physiology*, 154(4), 1710-1720.
4. Li, H., Xin, H., Burns, R. T., Jacobson, L. D., Noll, S., Hoff, S. J., Harmon, J. D., Koziel, J. A., & Hetchler, B. P. (2011). Air emissions from tom and hen turkey houses in the US Midwest. *Transactions of the* ASABE, 54(1), 305-314.

Key Takeaways

Although this goal has only two strategies, they are both very important. This is where you finally get to show the world what you found through your study, so be sure to employ these two strategies in an effort to construe your findings as clearly as possible:

- Reporting specific results and/or
- Indicating alternative presentation of results.

Results Goal 3: Construing the Niche

The next goal in the Results section is called Construing the Niche. The main aim of Goal 3 is to comment on and frame the results of the current study. This commentary on the results helps to explain the findings and develop a reader's understanding of how the findings relate to the other literature in the discipline. You would typically use this goal *after* a report of findings because it is a prime opportunity to evaluate how the presented results fit in the pre-existing literature. While in most other sections, we have pointed out that there is no set order to the goals and strategies, in the case of Results Goals 2 and 3, it is the norm to find them in a particular order. In Goal 2, you first simply report the results, and then in Goal 3, you follow that report with attempts to interpret the results in relation to what has occurred in the study and what has been reported in other relevant research in the discipline. To sum up, Construing the Niche allows authors to describe *and* evaluate the reported results.

It must be noted that Goal 3 may or may not appear in the Results section of a research manuscript. If the manuscript is organized with the Results and Discussion sections combined, then Goal 3 will be included. However, if the Results section and Discussion section are separate, the author may discuss the results in later sections of the manuscript, meaning Goal 3 may not be present in the Results section at all.

Strategies for Results Communicative Goal 3: Construing the Niche

- **Comparing results with literature review**
- **Accounting for results**
- **Explicating results**
- **Relating to expectations**
- **Acknowledging limitations**

We'll now discuss each of these and provide some examples from published research.

Results Goal 3 Strategy: Comparing Results with the Literature Review

Comparing results with the literature review is a strategy where authors compare the results of their current study with reported findings, theoretical beliefs, and/or previously stated assumptions or predictions in their discipline. In other words, authors must attempt to match what they wrote about in the Introduction in order to underscore similarities and/or differences between their research findings and previous research findings. This strategy is also an opportunity to support explanations and/or claims with what is known from previous research, show how the results relate to the body of existing knowledge

on the topic of current research and strengthen the credibility of your findings. Here are two examples of how you can accomplish this step, with the specific language **bolded** to show how language can be used to realize this strategy:

Examples

- **These observations are consistent with previous researchers' findings that** bond order is independent of the d18O of water and the d13C of dissolved inorganic carbon (Schauble et al., 2006). 10.[1]
- The short action time of 0.4s estimated based on the micro-PIV measurements **was found to agree well with the value reported by Demuren et al. (2009)**. 10.[2]

Note that both examples have cited relevant literature with which the authors are comparing their findings.

Results Goal 3 Strategy: Accounting for Results

Accounting for results reflects on the nature of your study's results to point out what may have contributed to your results or outcomes and suggest reasons for, hypotheses about, speculations for, and/or assumptions that may account for certain findings. By using this strategy, you are working to justify the basis of the results.

Consider the following examples of how you can accomplish this strategy, with the specific language **bolded** to highlight important language:

Examples

- Thus, **it is likely that the in vivo visualization of the polymerized MTs was unbiased**, despite the construct being driven by a strong promoter. [3]
- The discrepancy of the downtime NH3 ER (0.14 vs. 0.88 g d-1 bird-1) **may have been a result of** differences in litter source (rye hull vs. shavings) and clean-out practices, such as the extent of caked litter removal, tilling, and rebedding.[4]

1. Tripati, A. K., Thiagarajan, N., Eagle, R., Gagnon, A. C., Eiler, J. M., & Bauch, H. A. (2009, December). Equilibrium 13C-18O Isotope Signatures and 'Clumped Isotope'Thermometry in Foraminifera and Coccoliths. In *AGU Fall Meeting Abstracts* (Vol. 2009, pp. PP31B-1340).
2. Wang, B., Demuren, A., Gyuricsko, E., & Hu, H. (2011). An experimental study of pulsed micro-flows pertinent to continuous subcutaneous insulin infusion therapy. *Experiments in Fluids*, 51(1), 65-74.

There are two important points to note about the examples: (1) This step can be completed with or without referencing previous research; (2) Writers will often use hedging techniques.

What is hedging? Hedging refers to how a writer expresses certainty or uncertainty. Often in academic writing, a writer may not be sure of the claims that are being made, or perhaps the ideas are good, but the evidence is not very strong. It is common, therefore, to use cautious language that indicates uncertainty (known as hedging language).[5]

There are two primary language "tools" that writer's use to indicate they are hedging:

1. Adjectives and adverbs of likelihood as in the first example (e.g., *likely*)
2. Modal verbs as in the second (e.g., *may have been*)

The University of Bristol's website (noted above) provides a list of these tools and even has an exercise where you can test yourself on how well you understand them.

Results Goal 3 Strategy: Explicating Results

Explicating results is another strategy that helps to explain the reported results in the context of the study. Writers accomplish this by interpreting, inferencing, and possibly citing literature in order to give meaning to the results, make immediate deductions from the results, provide logical interpretations, and prepare for further discussion of the results outside the context of their study.

Let's examine some examples of how you can realize this strategy in your writing (specific language **bolded**):

3. Keech, O., Pesquet, E., Gutierrez, L., Ahad, A., Bellini, C., Smith, S. M., & Gardeström, P. (2010). Leaf senescence is accompanied by an early disruption of the microtubule network in Arabidopsis. *Plant Physiology*, 154(4), 1710-1720.
4. Li, H., Xin, H., Burns, R. T., Jacobson, L. D., Noll, S., Hoff, S. J., ... & Hetchler, B. P. (2011). Air emissions from tom and hen turkey houses in the US Midwest. *Transactions of the ASABE*, 54(1), 305-314.
5. University of Bristol website. (http://www.bristol.ac.uk/academic-language/media/BEAP/5.4/index.html)

Examples

- Indeed, **this finding suggests that** strength of ties, per se makes little difference, at least in our context, in the extent to which bridging promotes individual innovativeness.[6]
- **These results indicated that** SsoPox immobilized on nanoalumina membranes **can indeed attenuate the production of** P. aeruginosa quorum- sensing-associated virulence factors.[7]

Results Goal 3 Strategy: Relating to Expectations

Relating to expectations is used to reason about the anticipated or unanticipated research findings and/or observations. This step is typical when you want to point out expected or unexpected results, express attitudes about findings (often with regards to surprising or unsatisfactory results), or connect the findings to original hypotheses, possibly stating whether or not they are confirmed or supported.

Below are two examples of writing that uses this strategy to accomplish Goal 3 in the Results section:

Examples

- **One of the most striking findings is that** all participants spent some time on both kinds of problems (i.e., there were neither floor nor ceiling effects), **and there was considerable variability in** time spent on both types of problems.[8]
- **Perhaps the most intriguing finding** of our single-crystal X-ray analyses comes from the location of the protons in compound.[9]

The Academic Phrasebank website provides a list of sentence starters that would indicate the use of this strategy. Here are a few examples:

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6. Tortoriello, M., & Krackhardt, D. (2010). Activating cross-boundary knowledge: The role of Simmelian ties in the generation of innovations. *Academy of Management Journal*, 53(1), 167-181..
7. Ng, F. S., Wright, D. M., & Seah, S. Y. (2011). Characterization of a phosphotriesterase-like lactonase from Sulfolobus solfataricus and its immobilization for disruption of quorum sensing. *Applied and Environmental Microbiology*, 77(4), 1181-1186.
8. Forbes, C. E., & Schmader, T. (2010). Retraining attitudes and stereotypes to affect motivation and cognitive capacity under stereotype threat. *Journal of Personality and Social Psychology*, 99(5), 740.
9. Richards, G. J., Hill, J. P., Subbaiyan, N. K., D'Souza, F., Karr, P. A., Elsegood, M. R., ... & Ariga, K. (2009). Pyrazinacenes: aza analogues of acenes. *The Journal of Organic Chemistry*, 74(23), 8914-8923.

- Interestingly, the X was observed to …
- This result is somewhat counterintuitive.
- Interestingly, this correlation is related to …
- The more surprising correlation is with the …
- Surprisingly, only a minority of respondents …
- The most surprising aspect of the data is in the …
- The correlation between X and Y is interesting because …
- The most striking result to emerge from the data is that …
- Interestingly, there were also differences in the ratios of …
- The single most striking observation to emerge from the data comparison was …

This is a/an (rather)	surprising significant interesting remarkable unexpected disappointing	result. outcome.

Results Goal 3 Strategy: Acknowledging Limitations

Acknowledging limitations is important in any study in order to justify what went wrong in the study, avoid over-generalizations about the study's findings, anticipate potential criticism from other scholars in the field, and possibly transition to recommendations for future research.

Examples

- **It was not possible, however, to conclude** from the derived s-value what the molar mass of this species is due to uncertainties of hydrodynamic shape and because the reaction boundary of a rapidly interacting system always sediments slower than the sedimentation coefficient of the complex species.[10]
- **Due to the unexpected low bird number (an inadvertent error** during bird transfer from the brooder barn to the grower barn) and considerable bird number changes of flock 1 at the tom site, **data for one entire investigated flock had to be excluded** from the ER assessment, **as they were not representative** of natural flocking patterns.[11]

10. Barda-Saad, M., Shirasu, N., Pauker, M. H., Hassan, N., Perl, O., Balbo, A., … & Samelson, L. E. (2010). Cooperative interactions at the SLP-76 complex are critical for actin polymerization. *The EMBO Journal*, *29*(14), 2315-2328.

Because the presentation of results can become quite complex, you will need to distinguish between what you have accomplished (your methods) and what you found (your findings). As you are moving between your various findings, you might find it useful to use some of these suggestions from the Academic Phrasebank website:

- If we now turn to ...
- A comparison of the two results reveals ...
- Turning now to the experimental evidence on ...
- Comparing the two results, it can be seen that ...
- The next section of the survey was concerned with ...
- In the final part of the survey, respondents were asked ...

Key Takeaways

These strategies for Construing the Niche can help you to consider which aspects of your results to focus on. More than likely, all readers will choose to read this portion of your paper, even if they don't read other sections. Here are the strategies again:

- Comparing results with literature review, and/or
- Accounting for results, and/or
- Explicating results, and/or
- Relating to expectations, and/or
- Acknowledging limitations.

11. Li, H., Xin, H., Burns, R. T., Jacobson, L. D., Noll, S., Hoff, S. J., ... & Hetchler, B. P. (2011). Air emissions from tom and hen turkey houses in the US Midwest. *Transactions of the* ASABE, 54(1), 305-314.

Results Goal 4: Expanding the Niche

The final goal in the Results section is called Expanding the Niche. The main aim of Goal 4 is to further develop the evaluations of the results that come from Goal 3. This expanded commentary helps to relate your current study to the broader context of the discipline.

Like Goal 3, this particular objective (Goal 4) may or may not appear in the Results section. If your paper is organized with the Results and Discussion sections combined, Goal 4 is more likely to appear. Nevertheless, if the Results section and Discussion section are separate, Goal 4 may not appear in the Results but would be in the Discussion section instead.

Strategies for Results Communicative Goal 4: Expanding the Niche

- **Generalizing results**
- **Stating the value**
- **Noting implications**
- **Proposing directions**

We'll now discuss each of these and provide some examples from published research.

Results Goal 4 Strategy: Generalizing Results

Generalizing results infers, or deduces meaning, from results and develops general claims or conclusions. Authors typically generalize results by summarizing or synthesizing major findings or making deductions from the findings to broaden the scope of specific results, expand the meaning of the principle findings outside the framework of the study, or deliberate on (consider) the generalizability, transferability, and/or validity of the results.

Here are two examples of how you can accomplish this step:

Examples

- In conclusion, **through the separate experiments, we determined that** the addition of 1-CO2H to an ethanol solution of zinc acetate **does not result in** quenching of the emission.[1]
- **Because of their disabilities, combat veterans have trouble working, which leads them to stop looking for work and leave the labor force. This is further evidence that** combat veterans experience direct cumulative disadvantage. Figure 3 presents predicted probabilities of disability by age and combat status, demonstrating that combat veterans were somewhat more likely than non-veterans and much more likely than non-combat veterans to be disabled throughout the work life.[2]

Results Goal 4 Strategy: Stating the Value

Stating the value is another important strategy in Goal 4. You can use this strategy to demonstrate the noteworthiness, or importance, of your study by pointing out the most relevant findings. By employing this strategy, authors can advocate for the importance of their results and/or the study as a whole and can highlight their specific contribution[s] to the discipline.

Consider the following examples:

Examples

- In an historical context, **these findings are especially significant in that** local governments were the most vehement opponents of CAMA, and especially its local planning requirements, when the statute was enacted some 25 years ago (Heath, 1974).[3]
- **The most noteworthy finding is that** GEB24 a variety well known for all filled spikelets and Jaya—also known for good grain filling, exhibited high AGPase activity until 20 dpa. In contrast, in the hybrid CoRH2, known to have high number of spikelets but a significant number being unfilled, the AGPase activity was lower and dropped after 15 dpa.[4]

1. Rossini, J. E., Huss, A. S., Bohnsack, J. N., Blank, D. A., Mann, K. R., & Gladfelter, W. L. (2011). Binding and static quenching behavior of a terthiophene carboxylate on monodispersed zinc oxide nanocrystals. *The Journal of Physical Chemistry C*, 115(1), 11-17.
2. MacLean, A. (2010). The things they carry: Combat, disability, and unemployment among US men. *American Sociological Review*, 75(4), 563-585.
3. Norton, R. K. (2005). More and better local planning: State-mandated local planning in coastal North Carolina. *Journal of the American Planning Association*, 71(1), 55-71.

Following are some examples from the Academic Phrasebank website that you might consider using as sentence starters:

- What stands out in the results is …
- It is apparent from these results that …
- The most interesting aspect of the findings is …
- What is striking about the results is …
- What is interesting about the outcomes is that …
- This finding is quite revealing in several ways.

Results Goal 4 Strategy: Noting Implications

Noting implications informs readers of the potential implications and/or application of the results and/or the entire study. This strategy helps you explain how your results could be applied more broadly to research, practice, theory, etc. in the discipline, show the larger impact of the results and/or study beyond the current work, and point out possible consequences of either the findings or of the study itself.

The examples below illustrate this strategy in use.

Examples

- With the added advantage of inclusion of only those lines maturing in the target area of its use, **this panel will be an excellent resource for future association studies**.[5]
- In summary, the micro-PIV measurements suggest that **the theoretical solution** for a fully developed laminar channel flow expressed in Eq. 1 **can be used to effectively** estimate the flow velocity distribution inside the square microchannel even though the micro-flow was in transient state during the flow decay process.[6]

4. Devi, T. A., Sarla, N., Siddiq, E. A., & Sirdeshmukh, R. (2010). Activity and expression of adenosine diphosphate glucose pyrophosphorylase in developing rice grains: Varietal differences and implications on grain filling. *Plant Science*, 178(2), 123-129.
5. Hansey, C. N., Johnson, J. M., Sekhon, R. S., Kaeppler, S. M., & De Leon, N. (2011). Genetic diversity of a maize association population with restricted phenology. *Crop Science*, 51(2), 704-715.
6. Wang, B., Demuren, A., Gyuricsko, E., & Hu, H. (2011). An experimental study of pulsed micro-flows pertinent to continuous subcutaneous insulin infusion therapy. *Experiments in Fluids*, 51(1), 65-74.

Following are some examples from the Academic Phrasebank website that you might consider using as sentence starters:

- It can therefore be assumed that the ...
- It can therefore be assumed that the ...
- An implication of this is the possibility that ...
- The present study raises the possibility that ...
- One of the issues that emerges from these findings is ...
- Some of the issues emerging from this finding relate specifically to ...
- These findings may help us to understand ...
- This finding, while preliminary, suggests that ....
- This finding has important implications for developing ...
- This observational study suggests that a diet rich in X may help prevent ...
- These findings raise intriguing questions regarding the nature and extent of ...
- This combination of findings provides some support for the conceptual premise that ...

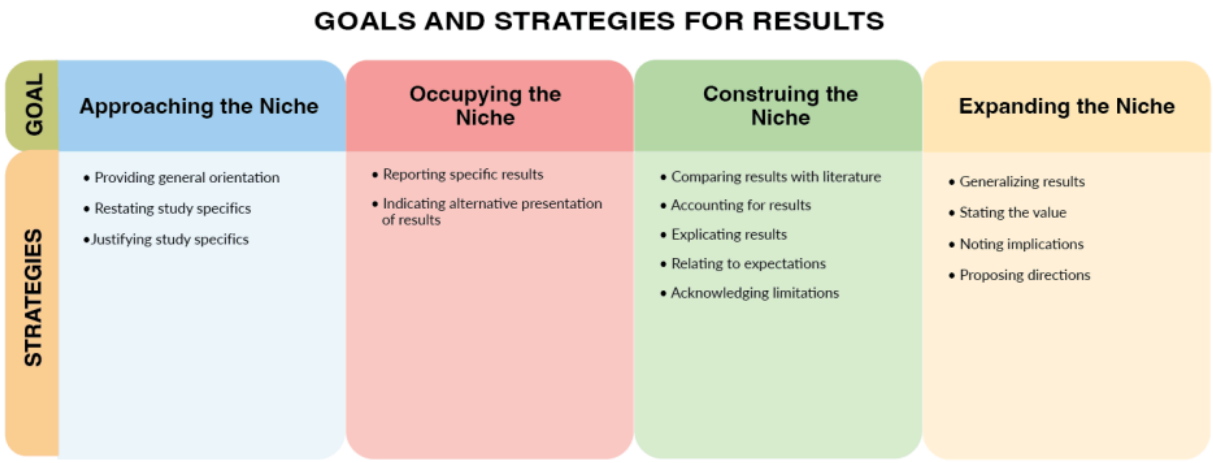
Key Takeaways

There are four strategies that can help you attain the objective of Goal 4: Expanding the Niche:

- Generalizing results, and/or
- Stating the value, and/or
- Noting implications, and/or
- Proposing directions

Chapter 5 Synopsis: Writing Results Sections

We have now reviewed the four communicative goals for writing a Results section and explained a variety of strategies that you can use to help. The image below provides a snapshot of this chapter:



Key Takeaways

The Results section has more communicative goals (four) than the preceding sections. This doesn't necessarily mean that the Results section will be longer, but it does mean that you need to be careful to attend to all four of these goals. Remember: Goals should ALL be accomplished like a checklist. Strategies are simply options for completing the goals (i.e., you probably will not employ all of them).

Other resources:

We have now reviewed the four communicative goals for writing a Results section and explained a variety of strategies that you can use to help. Consult the following free, online resources for additional tips on reporting results in a clear and concise manner:

- Tips on Writing Results for a Scientific Paper
- Ten Simple Rules for Better Figures

Explore + Apply

Before you begin applying what you've learned in this chapter to your Results section, explore published writing in your discipline or in a target journal that you've identified. Look for the goals and strategies presented here to see where you might find similarities and differences that are discipline- or journal-specific. When you have located them, determine how you will incorporate similar patterns into your own Results as you outline the section.

Chapter 6: Discussion/Conclusion Section(s)

Learning Objectives

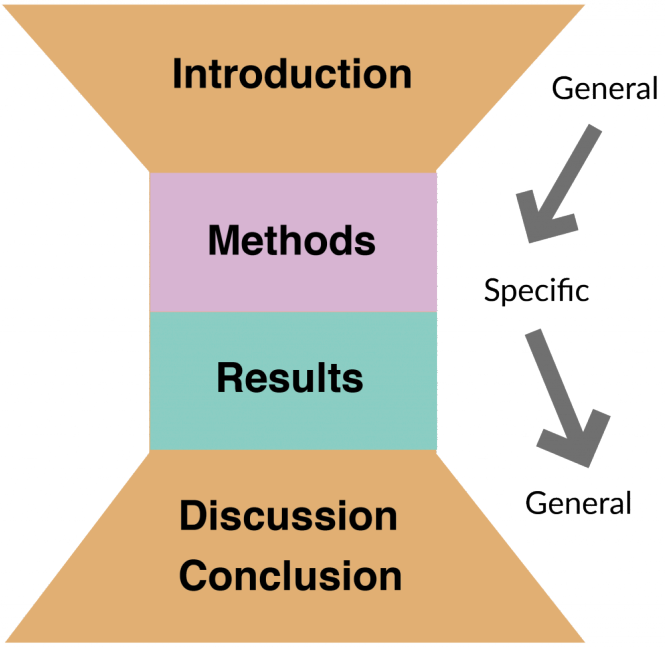
After completing this chapter, you should be able to …

- articulate the distinction between the Results and Discussion sections,
- recognize the communicative goals of the Discussion and Conclusion sections,
- strategize to achieve communicative goals,
- optimize the language for writing about your Discussion and Conclusion, and
- understand how to conclude your argument efficiently and effectively.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://iastate.pressbooks.pub/preparingtopublish/?p=617#h5p-10

Conceptualizing the Research Article

You may remember from Chapters 3-5 that research articles have specific sections regardless of discipline or journal. Generally, there are five commonly acknowledged sections of an empirical research manuscript: Introduction (including the Literature Review), Methods, Results, Discussion/Conclusion.



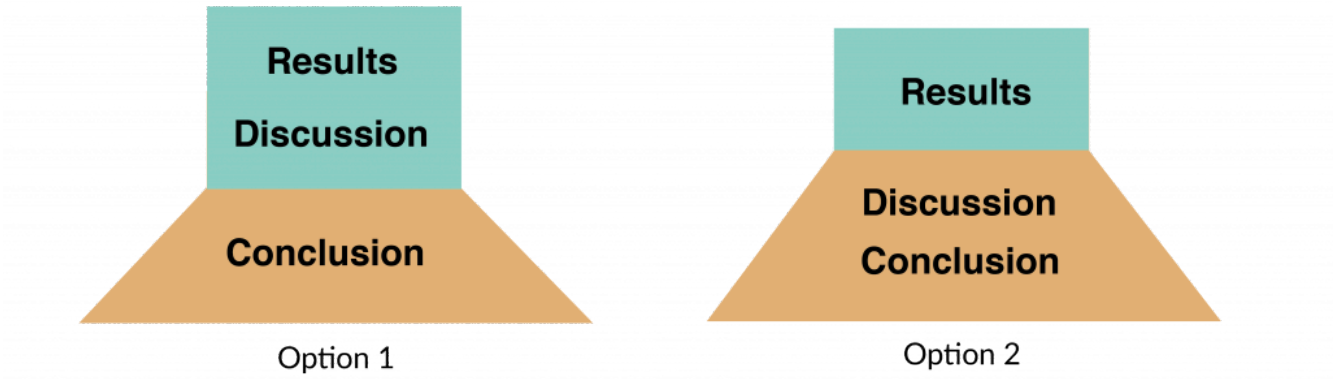
Notice that the figure depicts an article in the shape of an hourglass. That shape provides a way for us to consider which sections of a research article will be general and which will be specific. The final part — the Discussion/Conclusion — is one of the most general or broad parts of the entire article. You started out from a broad/general perspective, then as you moved toward the middle of your research manuscript, your content became more and more specific, reaching its most specific point in the Methods and Results section. In this chapter, we will present the goals and strategies for writing the Discussion/Conclusion.

Warm-Up

Why do you think the Discussion/Conclusion section needs to be more general than Methods and Results, which are more narrow/specific. What aspects of the Discussion/Conclusion contribute to its generality?

Goals of an Effective Discussion/Conclusion Section

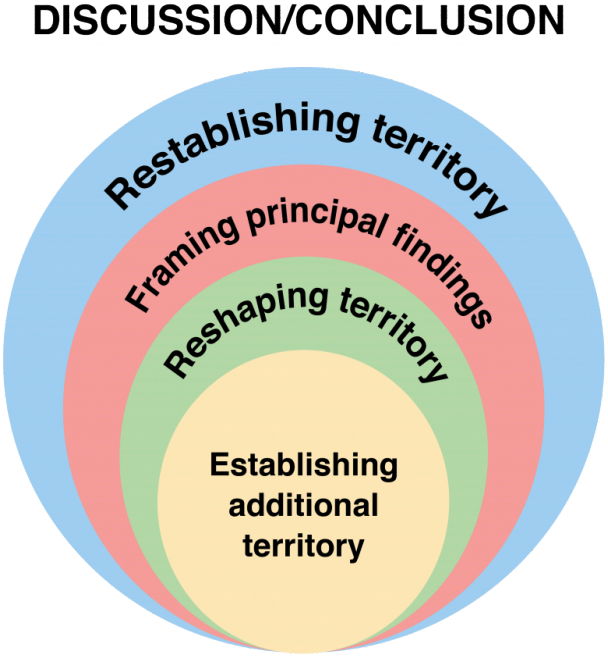
As noted in the previous chapter, there is variation in how writers, journals, and disciplines choose to organize/structure a manuscript. In some cases, the Results and Discussion sections are combined and the Conclusion stands alone. In other cases, the Results stand alone, and the Discussion and Conclusion section is combined.



Sometimes the research itself (the topic/content) drives a writer's decision to adopt one structural pattern or the other. Moreover, there are times when the discipline or the journal tends toward one or the other. It's your job as a writer/researcher to know which option is the best by taking into account all of the stakeholders as well as your own style preferences. This chapter will help you think through some of those issues.

The main point of this chapter is to understand the five objectives of the final section of a research article. The following is a list of the goals for finalizing your article:

1. Re-establish the territory
2. Frame the principal findings
3. Reshape the territory
4. Establish additional territory



You'll notice that the names of these goals are familiar because they echo the names of the goals in other parts of a manuscript. Given that review is a primary focus of the final section of a paper, it makes sense that there would be some overlap in the naming of these goals. Wallwork (2016) notes that many novice researchers find the Discussion section to be the most challenging section to write. The key to overcoming this is to learn what goals successful writers use when composing this section. Wallwork (2016, p. 311) also gives two other general pieces of advice:

- be "positive about your own limitations, and constructive when discussing what you believe to be the limitations of others."
- "... interpret your results without repeating them."

The Academic Phrasebank website also notes that many writers find the final section of their manuscript to be the most difficult to write because of their complexity and the need to use cautious language. Throughout this chapter, we'll refer to the complex nature of this ultimate part of the research article, and give you some language suggestions to help you get started implementing the strategies you need to reach the goals.

On the next pages, we'll review each goal and its accompanying strategies in the format that you should be very familiar with by now.

Discussion/Conclusion Goal 1: Re-establishing the Territory

The first goal in the Discussion and Conclusion section is called Re-establishing the Territory. The name of this goal should sound familiar to you if you think back to Chapter 3 and our discussion of the goals for the Introduction section, where the first aim is to Establish the Knowledge Territory. Now that you have come to the final section of your manuscript, you will revisit this idea of "territory," as the functions of these two sections' goals are similar. The Discussion/Conclusion Goal 1 (Re-establish the Territory) functions to remind the reader how your research fits into the bigger picture, or territory, of the field. Effective writers use this goal to provide a foundation for the Discussion and better contextualize the argument that follows.

Strategies for Discussion/Conclusion Communicative Goal 1: Re-establishing the Territory

- **Drawing on general background**
- **Drawing on study-specific background**
- **Announcing principal findings**
- **Previewing content**

Next, we'll explore each of these strategies and examine some examples from published articles in high-impact journals.

Discussion/Conclusion Goal 1 Strategy: Drawing on General Background

Drawing on general background means that a writer prepares the reader for the upcoming discussion of the research results in broader/more general terms. To do this, you must incorporate your understanding of the theories and frameworks that underlie your study. You can do this with information from your own background knowledge, with citations, or with a combination of both tactics to provide needed informational background and a conceptual frame of reference for the reader, to remind the reader of the problem, issue, gap, etc. that motivated the study, and to show how the current study fits in the targeted knowledge/research space.

Remember: This is the part of the article where the writing becomes general again, signifying a shift from the narrow/detailed nature of the middle two sections (Methods and Results), and a return to a more expansive picture of how the study fits into the literature.

Here are two examples of how you can accomplish this strategy:

Examples

- It is not inconceivable, then, that whilst the sector perhaps rightly distinguishes a wide variety of professional tasks, the homogeneous nature of its personnel places too heavy a burden on all their shoulders – and hence on the sole training program for the job. **The fact is that in countries like the theUnited Kingdom (see Peeters, 2008) and the United States (Hyson &Biggar, 2006),** which have long had a variety of training schemes leading to a variety of qualifications – associate, foundation, Bachelor's, and Master's degrees, at both initial licensure and advanced level – **there is clearly greater differentiation in the nature and level of content standards (see also Busch-Rossnagel & Worman, 1985)**[1]
- A relationship between carbohydrates and rooting of cuttings has been reported (Bartolini et al. 1996, 2000; Murai et al. 1999), but high carbohydrate content has not always been associated with high rooting and sprouting potential, as this study showed. **Hansen et al. (1978) and Veierskov et al. (1982) observed a negative correlation between carbohydrates and rooting (when light was given to alter stock plant carbohydrate content).**[2]

If you are referring back to literature (whether it is in the literature review in your Introduction, or not), you can use specific wording (sentence starters) to indicate to your reader that you are re-establishing the territory. Here are some suggestions from the Academic Phrasebank website:

- Several reports have shown that …
- As mentioned in the literature review, …
- Prior studies that have noted the importance of …
- Very little was found in the literature on the question of …
- Previous studies evaluating X observed inconsistent results on whether …
- A strong relationship between X and Y has been reported in the literature.
- In reviewing the literature, no data was found on the association between X and Y.

If your goal is to note a similarity or contrast to previous findings, Academic Phrasebank provides separate lists for each of those communicative purposes:

1. Fukkink, R. G. (2010). Missing pages? A study of textbooks for Dutch early childhood teacher education. *Teaching and Teacher Education*, *26*(3), 371-376.
2. Tsipouridis, G., Thomidis, T., & Bladenopoulou, S. (2006). Seasonal variation in sprouting of GF677 peach× almond (Prunus persica× Prunus aygdalus) hybrid root cuttings. *New Zealand Journal of Crop and Horticultural Science*, 34(1), 45-50.

	Support Previous Findings	Contradict Previous Findings
These results …	• further support the idea of … • confirm the association between … • are consistent with data obtained in … • match those observed in earlier studies. • are in line with those of previous studies. • are in agreement with those obtained by … • are in accord with recent studies indicating that … • seem to be consistent with other research which found … • support previous research into this brain area which links X and Y. • corroborate the ideas of Smith and Jones (2008), who suggested that …	• are contrary to those of Smith et al. (2001) who found … • are in opposition to previous studies which have suggested that … • are higher/lower compared to those of other studies. • do not support the previous research. • differ from the findings elsewhere. • are far below those observed by Smith *et al.* (2007). • differ from X (2003), but they are broadly consistent with … • are inconsistent with other research. • seem inconsistent with other studies. • call into question the results of others.

Another way to accomplish this strategy is to contribute background information by making reference back to the research question or aim/objective, as exemplified in these sentence starters from the Academic Phrasebank website:

- The third question in this research was …
- An initial objective of the project was to identify …
- The first question in this study sought to determine …
- It was hypothesized that participants with a history of …
- The present study was designed to determine the effect of …
- With respect to the first research question, it was found that …
- This study set out with the aim of assessing the importance of X in …

Discussion/Conclusion Goal 1 Strategy: Drawing on Study-Specific Background

Drawing on study-specific background is similar to the previous strategy in that it attempts to justify and further reflect on the results. This strategy reiterates relevant study specifics (e.g., methods, approaches, experimentation, procedures, analysis, hypotheses/research questions, etc.) to help the reader understand how the results were obtained, remind the reader of study specifics relevant to the results, and/or claims discussed further, clarify the connection between certain study specifics and respective results, and/or re-emphasize the reliability of discussed findings.

Consider the following examples:

Examples

- **This analysis considered the efficacy of a suite of even- and uneven-aged treatments to address fire hazard in Colorado based on their ability to reduce crown fire initiation and spread.** The treatment simulations were performed over a broad area using available forest inventory data and consistent assumptions about surface fuels and weather conditions. [3]
- **Since we consider sinusoidal bottom contours we describe the hydraulic jumps in terms of the Froude number at the inclination angle of the channel.** This results in hydraulic jumps at Froude numbers smaller than 1 in the fit of Fig. 10.[4]

The Academic Phrasebank website offers a few suggestions for sentence starters useful to employing this strategy:

- This study has identified ...
- This study has shown that ...
- The research has also shown that ...
- The second major finding was that ...
- These experiments confirmed that ...
- X made no significant difference to ...
- This study has found that generally ...
- The investigation of X has shown that ...
- The results of this investigation show that ...
- X, Y, and Z emerged as reliable predictors of ...
- Multiple regression analysis revealed that the ...
- The most obvious finding to emerge from this study is that ...
- The relevance of X is clearly supported by the current findings.
- One of the more significant findings to emerge from this study is that ...

Discussion/Conclusion Goal 1 Strategy: Announcing Principal Findings

Announcing principal findings is a way to highlight results by explaining, synthesizing, and/or reviewing what you discovered. The purpose is to emphasize takeaways, show how you've accomplished the objectives of the research, and/or demonstrate which specific discoveries occupy the identified niche in the sub-area of your discipline or field.

3. Huggett Jr, R. J., Abt, K. L., & Shepperd, W. (2008). Efficacy of mechanical fuel treatments for reducing wildfire hazard. *Forest Policy and Economics*, 10(6), 408-414.
4. Wierschem, A., & Aksel, N. (2004). Hydraulic jumps and standing waves in gravity-driven flows of viscous liquids in wavy open channels. *Physics of Fluids*, 16(11), 3868-3877.

Examples

- The processes involved in aerial pathogen movement can be divided into five stages of (i) preconditioning in a source area, (ii) release, (iii) horizontal transport, (iv) deposition, and (v) impact at the receptor area (Isard and Gage, 2001). Ecological and environmental factors that influence organisms during each stage of the dispersal process **are important for understanding the movement of plant pathogens and the development of plant disease epidemics** (Aylor, 1986; Madden, 1992). However, there is limited information about some of these processes, especially for the deposition of plant pathogen propagules from the atmosphere onto susceptible host plant tissues.[5]
- **A major finding of this study is that** short and long-term androstenedione supplementation did not increase the serum testosterone concentration in young men with normal serum testosterone levels.[6]

The Academic Phrasebank website provides these suggestions for starting out sentences in which you plan to discuss or draw conclusions about your findings:

- One interesting finding is …
- The current study found that …
- Another important finding was that …
- The most interesting finding was that …
- In this study, Xs were found to cause …
- The results of this study show/indicate that …
- On the question of X, this study found that …
- This experiment did not detect any evidence for …
- The most important clinically relevant finding was …
- X provided the largest set of significant clusters of …
- It is interesting to note that in all seven cases of this study …
- The most obvious finding to emerge from the analysis is that …
- In the current study, comparing X with Y showed that the mean degree of …
- The results of this study did not show that …/did not show any significant increase in …

Discussion/Conclusion Goal 1 Strategy: Previewing Content

Previewing content designates the organization of your writing. This helps to guide the reader through your

5. Dufault, N., Isard, S., "A portable rainfall simulator for evaluating the wet deposition of plant pathogens", *Applied Engineering in Agriculture* 26(1):71-78, 2010
6. King, D. S., Sharp, R. L., Vukovich, M. D., Brown, G. A., Reifenrath, T. A., Uhl, N. L., & Parsons, K. A. (1999). Effect of oral androstenedione on serum testosterone and adaptations to resistance training in young men: a randomized controlled trial. *Jama*, 281(21), 2020-2028.

ideas, clarify how you envision the content fulfilling your communicative goals, and point out noteworthy features of the research.

The following are examples of how you can realize this strategy:

Examples

- **Next, we provide evidence that** AAP2 functions in xylem-phloem transfer of amino acids.[7]
- Results underscore the promise of the WG vocabulary intervention for LM learners. **There are multiple implications and discussion points – practical and theoretical – to address when interpreting the results of this pilot study.** WG was implemented for only 15-20 min a day, and yet the treatment group students, more of whom were formerly identified as limited English proficient, gained knowledge of a substantially larger number of words than the contrast group.[8]

Key Takeaways

The first communicative goal in the Discussion and Conclusion section is called Re-establishing the Territory, and there are four strategies that can be used to successfully accomplish this goal:

1. Drawing on general background, and/or
2. Drawing on study-specific background, and/or
3. Announcing principal findings, and/or
4. Previewing content.

Note the use of *and/or* at the end of each strategy, an indication — as in other chapters — that it is not always necessary to utilize each individual strategy as these are variable by writer, discipline, and journal.

7. Zhang, L., Tan, Q., Lee, R., Trethewy, A., Lee, Y. H., & Tegeder, M. (2010). Altered xylem-phloem transfer of amino acids affects metabolism and leads to increased seed yield and oil content in Arabidopsis. *The Plant Cell*, 22(11), 3603-3620.
8. Mancilla-Martinez, Jeannette. (2010). Word meanings matter: Cultivating English vocabulary knowledge in fifth-grade Spanish-speaking language minority learners. *TESOL Quarterly*, 44(4), 669-699.

Discussion/Conclusion Goal 2: Framing Principal Findings

The next goal in the Discussion and Conclusion section is Framing Principal Findings. The function of this goal is to discuss and establish the meaning of your research results. The name Framing Principal Findings comes from the aim of positioning the outcomes of your study in a way that the reader can understand — typically, within the already existing literature on the topic.

There are four strategies that can be used to achieve the communicative aims of Goal 2. Note that these are primarily associated with discussion of results rather than drawing conclusions about the entirety of the research.

Strategies for Discussion/Conclusion Communicative Goal 2: Framing Principal Findings

- **Accounting for results**
- **Explicating results**
- **Relating to expectations**
- **Addressing limitations**

Now we'll delve deeper into each of the strategies you can use to achieve this goal in your own writing.

Discussion/Conclusion Goal 2 Strategy: Accounting for Results

Accounting for results is a way for you to reflect on or further consider the findings of your study. This could be accomplished with or without referencing previous works. You can use this strategy to clarify what may have contributed to, caused, or otherwise affected the results or outcomes. You may also want to suggest reasons or hypotheses that could account for certain findings, and justify the nature of results.

Here are two examples of how you can accomplish this strategy, with strategy-specific language in **bold**:

Examples

- These changes **are most probably related to** modifications in N uptake into aap2 mesophyll cells, as suggested by upregulation of amino acid importer LHT1 (Figure 7A) and increased uptake of 14C-label.[1]
- That multiple genes in this pathway are underexpressed in hybrids of both species pairs **perhaps is a cause or consequence of** their sterility.[2]

The Academic Phrasebank website offers a wealth of sentence starters useful to writers in this stage of reporting their research:

General comments and explanations:

- A possible explanation for this might be that …
- Another possible explanation for this is that …
- This result may be explained by the fact that …
- There are, however, other possible explanations.
- These relationships may partly be explained by …
- There are several possible explanations for this result.
- These results are likely to be related to …
- It seems possible that these results are due to …

Reporting inconsistent, counterintuitive, or contradictory findings:

- These differences can be explained in part by …
- This inconsistency may be due to …
- This discrepancy could be attributed to …
- This rather contradictory result may be due to …
- The observed increase in X could be attributed to …
- It is difficult to explain this result, but it might be related to …

1. Zhang, L., Tan, Q., Lee, R., Trethewy, A., Lee, Y. H., & Tegeder, M. (2010). Altered xylem-phloem transfer of amino acids affects metabolism and leads to increased seed yield and oil content in Arabidopsis. *The Plant Cell*, 22(11), 3603-3620.
2. Noor, M. A. (2005). Patterns of evolution of genes disrupted in expression in Drosophila species hybrids. *Genetics Research*, 85(2), 119-125.

- The possible interference of X cannot be ruled out.
- Differences between X and Y may have influenced …
- These possible sources of error could have affected …
- There are two likely causes for the differences between …
- The reason for this is not clear but it may have something to do with …
- Since this difference has not been found elsewhere it is probably not due to …

Discussion/Conclusion Goal 2 Strategy: Explicating Results

The **explicating results** strategy explains the reported results in the context of the study and/or in a broader context of the discipline. Here is where you consider your results and their implications. Your readers, of course, will develop their own interpretations or explanations for *why* the findings turned out as they did; however, you will want to guide their views as you make an argument explaining your own reasoning.

Here are a couple of examples from published articles in high-impact journals:

Examples

- **We must therefore conclude**, to use the terminology of Goodlad et al. (1979), that the content standards, as formulated by the relevant official bodies, have not been properly incorporated into the formal curriculum, despite their authoritative national status.[3]
- **This research also showed that** the effectiveness of rotations at reducing the weed seedbank was dependent on the specific crop that initiated the rotations (Fig. 1-3).[4]

The Academic Phrasebank website provides this list of suggested ways to report findings that are related to previous research:

Reporting findings in line with previous research:

3. Fukkink, R. G. (2010). Missing pages? A study of textbooks for Dutch early childhood teacher education. *Teaching and Teacher Education*, *26*(3), 371-376.
4. Teasdale, J. R., Mangum, R. W., Radhakrishnan, J., & Cavigelli, M. A. (2004). Weed seedbank dynamics in three organic farming crop rotations. *Agronomy Journal*, *96*(5), 1429-1435.

- Several reports have shown that …
- As mentioned in the literature review, …
- Prior studies that have noted the importance of …
- Very little was found in the literature on the question of …
- Previous studies evaluating X observed inconsistent results on whether …
- A strong relationship between X and Y has been reported in the literature.
- In reviewing the literature, no data was found on the association between X and Y.
- These factors may explain the relatively good correlation between X and Y.
- It may be that these participants benefitted from …
- The observed correlation between X and Y might be explained in this way: …

Discussion/Conclusion Goal 2 Strategy: Relating to Expectations

Relating to expectations reasons about the researchers' anticipated or unanticipated findings and/or observations. You can use this strategy to point out expected or unexpected results, express your attitudes about the results, often concerning surprise or unsatisfactory findings, and connect findings to initial hypotheses (i.e., to describe how findings were or were not confirmed, as seen in the following examples):

Examples

- **Hypothesis 1 is verified by** unchanged oil content values in rain-fed plot. [5]
- Interestingly, **relative to** inulin the dimer **exhibited higher activity than** the tetramer [35]. [6]

The Academic Phrasebank website recommends these phrases that are in line with using this strategy:

- Surprisingly, X was found to …
- What is surprising is that …

5. Bedbabis, S., Rouina, B. B., & Boukhris, M. (2010). The effect of waste water irrigation on the extra virgin olive oil quality from the Tunisian cultivar Chemlali. *Scientia Horticulturae*, *125*(4), 556-561..
6. Artyukhov, V. G., Kovaleva, T. A., Kholyavka, M. G., Bityutskaya, L. A., Grechkina, M. V., & Obraztsova, T. B. (2009). Study of the oligomeric structure and some physicochemical properties of inulinase from Kluyveromyces marxianus Y-303. *Biophysics*, 54(6), 675-680.

- One unanticipated finding was that …
- Surprisingly, no differences were found in …
- This finding was unexpected and suggests that …
- It is somewhat surprising that no X was noted in this condition …
- Contrary to expectations, this study did not find a significant difference between …
- However, the observed difference between X and Y in this study was not significant.
- However, the ANOVA (one way) showed that these results were not statistically significant.

Discussion/Conclusion Goal 2 Strategy: Addressing Limitations

Addressing limitations is used to evaluate the study by pointing out shortcomings and/or minimizing deficiencies in the research.

The following are examples of how you can realize this strategy, with specific language for expressing these limitations in **bold**.

Examples

- **However, the study area spans an overly large region** encompassing several climatic zones, **which calls into question whether** chronologies can simply be averaged.[7]
- **Our study was not free of problems, however**. For instance, the overall rate of participation in sending feedback by e-mail was just over 50% of all participants (23 corrective feedback e-mails to 44 transcripts in English sessions and 23 corrective feedback e-mails to 43 transcripts in Japanese sessions).[8]

It's important to note that research reports do not provide information without taking a stance toward that information. Researchers may indicate more or less certainty about their interpretations, and this is especially true of Addressing Limitations. While it's important, of course, to point to the shortcomings of your study (as no study is perfect), it's important not to over-emphasize the deficiencies in your research. So, you may want to highlight a contribution that your study makes while simultaneously acknowledging

7. Black, B. A., Copenheaver, C. A., Frank, D. C., Stuckey, M. J., & Kormanyos, R. E. (2009). Multi-proxy reconstructions of northeastern Pacific sea surface temperature data from trees and Pacific geoduck. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 278(1-4), 40-47.
8. Bower, J., & Kawaguchi, S. (2011). Negotiation of meaning and corrective feedback in Japanese/English eTandem. *Language Learning & Technology*, 15(1), 41-71.

some aspect that was less than ideal. In that case, you would want to hedge or boost accordingly, as showing in these sentence starters from theAcademic Phrasebank website:

Hedging	Boosting
• These findings **may** be **somewhat** limited by ... • These findings **cannot** be extrapolated to all patients. • These data **must** be interpreted with caution because ... • These results, therefore, **need to be** interpreted with caution. • In observational studies, there is a **potential** for bias from ... • These results **should** be interpreted with caution.	• In spite of its limitations, the study **certainly** adds to our understanding of the ... • Notwithstanding the relatively limited sample, this work offers **valuable** insights into ... • Obviously, caution must be advised, but we want to **emphasize** ... • Regardless of the imperfect design, there are **definite** benefits to the study's methodology, and those benefits contribute to the value of the results by ...

Sometimes it isn't necessary to hedge or boost, but rather to simply present the information as neutrally as possible.

- It could be argued that the positive results were due to ...
- Although the current study is based on a small sample of participants, the findings suggest ...
- While this study did not confirm X, it did ...
- Notwithstanding these limitations, the study suggests that ...
- Despite its exploratory nature, this study offers some insight into ...
- A note of caution is due here since ...
- Another source of uncertainty is ...
- These results, therefore, need to be interpreted with caution.
- In observational studies, there is a potential for bias from ...
- It is important to bear in mind the possible bias in these responses.

Key Takeaways

Goal 2 of writing the Discussion/Conclusion section is related to **Frame Principal Findings**. There are four possible strategies that you can use to accomplish this goal:

1. Accounting for results, and/or
2. Explicating results, and/or
3. Relating to expectations, and/or
4. Addressing limitations.

Remember: It isn't necessary to include all of these strategies — they are simply possibilities for reaching the goal.

Discussion/Conclusion Goal 3: Reshaping the Territory

The next goal in the Discussion and Conclusion sections is Reshaping the Territory. The primary function of Goal 3 is to redefine the research area based on what your study contributes to the literature. This goal's name reflects the dual role of generating new knowledge and connecting it to prior knowledge from previous studies about the research territory. In this way, Goal 3 gives an update on the topic within your field.

Strategies for Discussion/Conclusion Communicative Goal 3: Reshaping the Territory

- **Supporting with evidence**
- **Countering with evidence**

Discussion/Conclusion Goal 3 Strategy: Supporting with Evidence

Supporting with evidence explains how the research findings reiterate findings from other studies. You can use this strategy to highlight the complementary or supplementary contribution your results make. This strategy confirms or supports the assertions made by other researchers and/or your assertions based on the findings.

Here are two examples of how you can accomplish this step:

Examples

- This difference in outcome between the treatment groups did not reach statistical significance, but an overall survival rate of 80% **was very similar to that reported in the recent literature** [13].[1]
- **This supports previous findings that** early and late growth in mice occur under different genetic regulation (Cheverud et al., 1996; Vaughn et al., 1999; Rocha et al., 2004).[2]

The Academic Phrasebank website recommends these phrases that are in line with using this strategy, including statements about one particular finding:

- This finding was also reported by Smith et al. (1989).
- This finding is consistent with that of Smith (2000) who …
- Comparison of this result with those of other studies confirms …
- This also accords with our earlier observations, which showed that …
- This finding broadly supports the work of other studies in this area linking X with Y.
- It is encouraging to compare this figure with that found by Jones (1993) who found that …
- There are similarities between the attitudes expressed by X in this study and those described by …

Below are statements from Academic Phrasebank about the results as a whole:

These results:

- further support the idea of …
- confirm the association between …
- are consistent with data obtained in …
- match those observed in earlier studies.
- are in line with those of previous studies.
- are in agreement with those obtained by …
- are in accord with recent studies indicating that …
- seem to be consistent with other research which found …
- are consistent with those of Smith and Jones (2015) who …
- are in agreement with Smith's (1999) findings which showed …
- support previous research into this brain area which links X and Y.
- corroborate the ideas of Smith and Jones (2008), who suggested that …

---

1. Atherton, R. P., Furr, M. O., McKenzie, H. C., & Desrochers, A. M. (2011). Efficacy of Hyperimmunized Plasma in the Treatment of Horses with Acute Colitis. *Journal of Equine Veterinary Science*, 31(1), 19-25.
2. Ishikawa, A., Hatada, S., Nagamine, Y., & Namikawa, T. (2005). Further mapping of quantitative trait loci for postnatal growth in an intersubspecific backcross of wild Mus musculus castaneus and C57BL/6J mice. *Genetics Research*, 85(2), 127-137.

Discussion/Conclusion Goal 3 Strategy: Countering with Evidence

Countering with evidence is used when some or all of your results are contrary to those in previous research studies.

The following are examples of how you can realize this strategy:

Examples

- Bontozoglou found a nonlinear resonance at a waviness smaller than ours [26]. **However, the one he found numerically for the capillary-gravity regime in rather thick films is quite different from our observations**.[3]
- The molecular mass of deglycosylated inulinase from Aspergillus awamori var. 2250 constitutes 69 kDa[18]; from Aspergillus niger 12, 81 kDa [38]; from aspergillus candida, 54 kDa [39]; from Aspergillus ficuum, 74 kDa [40]; from Aspergillus fumigatus, 62 kDa[41], **which differ strongly from the results obtained for** exoinulinase from Aspergillus versicolor, 230 ±20kDa [42].[4]

The Academic Phrasebank website proposes the following sentence starters as ways for advising cautious interpretation of the findings:

- This study has been unable to demonstrate that …
- However, this result has not previously been described.
- This outcome is contrary to that of Smith et al. (2001) who found …
- This finding is contrary to previous studies which have suggested that …
- In contrast to earlier findings, however, no evidence of X was detected.
- The yields in this investigation were higher compared to those of other studies.
- However, the findings of the current study do not support the previous research.
- Smith et al. (1999) showed that … This differs from the findings presented here …
- The overall level was found to be 15%, lower than that of previously reported levels.
- It has been suggested that … (Smith et al., 2002). This does not appear to be the case.

3. Wierschem, A., & Aksel, N. (2004). Hydraulic jumps and standing waves in gravity-driven flows of viscous liquids in wavy open channels. *Physics of Fluids*, 16(11), 3868-3877.
4. Artyukhov, V. G., Kovaleva, T. A., Kholyavka, M. G., Bityutskaya, L. A., Grechkina, M. V., & Obraztsova, T. B. (2009). Study of the oligomeric structure and some physicochemical properties of inulinase from Kluyveromyces marxianus Y-303. *Biophysics*, 54(6), 675-680.

- The levels observed in this investigation are far below those observed by Smith et al. (2007).
- These results differ from X's 2003 estimate of Y, but they are broadly consistent with earlier …

Key Takeaways

Goal 3 of writing the Discussion/Conclusion section is related to **Reshape the Territory**. There are two possible strategies that you can use to accomplish this goal:

1. Confirming with Evidence and/or
2. Countering with Evidence

Remember: It isn't necessary to include both of these strategies — you should only use both of them, in fact, if some of your findings are in line with previous research and other aspects present contradictory evidence to what has been done in the field. As you probably know well as a researcher, nothing about research is simple, neat, or uncomplicated. Most research is somewhat messy, meaning that you may have results that lend themselves to incongruous, inconsistent, or even conflicting implications. This is the nature of scientific discovery, and we can use the writing goals and strategies from this book to keep us on track when reporting such issues.

Discussion/Conclusion Goal 4: Establishing Additional Territory

The fourth goal in the Discussion and Conclusion section is called Establishing Additional Territory. Goal 4 is accomplished when the writer expands the conversation beyond the results of their research and presents the bigger picture of how the findings fit into the literature. Goal 4 is entitled Establishing Additional Territory, because enlarging the focus demonstrates the expansion of the research space for the issue and the discipline. It is within this additional space that future research is able to extend the knowledge generated in your study.

Strategies for Discussion/Conclusion Communicative Goal 4: Establishing Additional Territory

- **Generalizing results**
- **Stating the value**
- **Noting implications**
- **Proposing directions**

Discussion/Conclusion Goal 4 Strategy: Generalizing Results

Writers are **generalizing results** when they draw inferences to bolster their overall arguments and conclusions. To use this strategy, it is often useful to summarize or synthesize your findings.

Remember that one main purpose of the research report is to demonstrate how your work fits into the existing body of literature in the field. So, this strategy is a way for you to enhance the value of your findings by generalizing and pointing out how the results transfer and compare and/or contrast to previous conclusions. This is also a chance for you to highlight the reliability and/or validity of your study, thus allowing your findings to be more generalizable.

Here are two examples of how you can accomplish this strategy:

Examples

- **The results of this study thereby show that** the choice of the best model depends on the error measurement which depends on the ultimate purpose of the forecasting procedure.[1]
- **To summarize, the results from this study suggest that** high calpastatin activity results in decreased calpain activity **and, thus,** decreased tenderness.[2]

Discussion/Conclusion Goal 4 Strategy: Stating the Value

Stating the value shows the centrality of the study within the field by characterizing the most salient results. Essentially, this strategy enables you to advocate for the significance of your work within your discipline. It's a chance for you to label your exact contribution.

Consider the language in **bold** in the following examples:

Examples

- **Therefore, the findings on** QTLs contributing to naturally occurring variations in postnatal growth **are expected to be novel.**[3]
- **The finding that** TAF7 functions independently of a TAF1/TFIID complex **significantly extends the growing body of evidence that** TAFs contribute to transcriptional regulation outside of their assembly in the intact TFIID complex.[4]

1. Corredor, P., & Santamaría, R. (2004). Forecasting volatility in the Spanish option market. *Applied Financial Economics*, 14(1), 1-11.
2. Boehm, M. L., Kendall, T. L., Thompson, V. F., & Goll, D. E. (1998). Changes in the calpains and calpastatin during postmortem storage of bovine muscle. *Journal of Animal Science*, 76(9), 2415-2434.
3. Ishikawa, A., Hatada, S., Nagamine, Y., & Namikawa, T. (2005). Further mapping of quantitative trait loci for postnatal growth in an intersubspecific backcross of wild Mus musculus castaneus and C57BL/6J mice. *Genetics Research*, 85(2), 127-137.
4. Devaiah, B. N., Lu, H., Gegonne, A., Sercan, Z., Zhang, H., Clifford, R. J., ... & Singer, D. S. (2010). Novel functions for TAF7, a regulator of TAF1-independent transcription. *Journal of Biological Chemistry*, 285(50), 38772-38780.

Discussion/Conclusion Goal 4 Strategy: Noting Implications

Noting implications is a strategy that allows you to highlight the potential implications of the results and/or the study as a whole. You can use this strategy to explain how the findings could be applied to future research, practice, the development of theory in the discipline. Also, this shows the larger impact of the results and/or study in the discipline, and notifies the reader of possible consequences of the study and/or results (note the examples below).

Examples

- Notably, even callers claiming to have a privately insured child faced an average wait time of 20 days when urgently requesting an appointment. **These findings signal a need to consider refining specialty care delivery processes to more efficiently use the specialist workforce** [28,29]. Two previous audit studies of pediatric specialty care have shown even lower Medicaid acceptance rates: 4% [13] and 8% [7].[5]
- Soldiers exposed to combat were more likely than non-combat veterans to be disabled and unemployed in their mid-20s and to remain so throughout their work life. **Policymakers and citizens should note these long-term consequences of war as U.S. soldiers continue to fight in Iraq and Afghanistan**. As these wars continue, future combat veterans who sustain mental and physical injuries in battle will likely suffer, as did past combat veterans, in their socioeconomic attainment.[6]

Discussion/Conclusion Goal 4 Strategy: Proposing Directions

Proposing directions is a way to make recommendations or suggestions about the next step of either your research or further research within the same area. This is also a means of proposing practical applications of the results. You can employ this strategy to make an argument for the need for future research or the opportunity to expand the niche by contributing new information/knowledge.

The following are examples of how you can realize this step:

5. Bednarek, P., Creinin, M., Reeves, M., Cwiak, C., Espey, E., Jensen, J. (2011). "Immediate versus delayed IUD insertion after uterine aspiration", *New England Journal of Medicine* 364(23):2208-2217.
6. MacLean, A. (2010). The things they carry: Combat, disability, and unemployment among US men. *American sociological review*, 75(4), 563-585.

Examples

- **It would be interesting to design** breeding experiments to explore if high AGPase activity late in grain filling stage cosegregates with enhanced seed weight in population segregating for grain weight so that cause/effect relationship could be established.[7]
- **Further research is recommended to confirm the efficacy of** the product, to ascertain an optimal dosage for the hyperimmune plasma used in this study, and to clarify whether enteral or parenteral administration is more beneficial to the patient.[8]

The Academic Phrasebank website has a large number of sentence starters that serve to recommend further work. These are divided into two categories as noted in the table:

7. Devi, T. A., Sarla, N., Siddiq, E. A., & Sirdeshmukh, R. (2010). Activity and expression of adenosine diphosphate glucose pyrophosphorylase in developing rice grains: Varietal differences and implications on grain filling. *Plant science*, 178(2), 123-129.
8. Atherton, R. P., Furr, M. O., McKenzie, H. C., & Desrochers, A. M. (2011). Efficacy of Hyperimmunized Plasma in the Treatment of Horses with Acute Colitis. *Journal of Equine Veterinary Science*, 31(1), 19-25.

Recommendations for future research	Recommendations for practice or policy
• The study should be repeated using … • This would be a fruitful area for further work. • Several questions still remain to be answered. • A natural progression of this work is to analyze… • More research using controlled trials is needed to … • More broadly, research is also needed to determine … • A further study could assess the long-term effects of … • What is now needed is a cross-national study involving … • Considerably more work will need to be done to determine … • The precise mechanism of X in insects remains to be elucidated. • These findings provide the following insights for future research: … • Large randomized controlled trials could provide more definitive evidence. • This research has thrown up many questions in need of further investigation. • A greater focus on X could produce interesting findings that account more for … • The issue of X is an intriguing one that could be usefully explored in further research.	• There is, therefore, a definite need for … • Greater efforts are needed to ensure … • Another important practical implication is that … • Moreover, more X should be made available to … • Unless governments adopt X, Y will not be attained. • These findings suggest several courses of action for … • A reasonable approach to tackle this issue could be to … • Continued efforts are needed to make X more accessible to … • The findings of this study have a number of practical implications. • There are a number of important changes which need to be made. • Management to enhance bumble-bee populations might involve … • This study suggests that X should be avoided by people who are prone to … • A key policy priority should therefore be to plan for the long-term care of … • This information can be used to develop targeted interventions aimed at … • Taken together, these findings do not support strong recommendations to … • Ensuring appropriate systems, services, and support for X should be a priority for …

Other important points about language

Discussion and Conclusion sections of research articles — as noted — are more general than the middle sections (Methods and Results). As a result, the final sections of a research article typically employ language to highlight that generality (e.g., *Overall*, *In general*, *On the whole*, etc.). It's also common for writers to use overt transitional expressions to highlight their communicative goals. Some examples of this include the following:

- "Our major aim has been attained by …"
- "Some limitations of this study include …"
- "Future work will need to explore …"

Writers tend to use a more positive tone, present-tense verbs to denote confidence and language that highlights a level of certainty to demonstrate their belief in the validity, reliability, and strength of their design, findings, and conclusions. It is also common to find past simple verbs, which review background information, reiterate the study's objectives, or remind readers about the procedures, methodology, hypotheses, and/or research questions.

Key Takeaways

Goal 4 of the Discussion/Conclusion section is **Establishing additional territory.** This allows you to expand on your comments and to really broaden the topic so that you can:

- Draw conclusions or make generalizations, and/or
- Assert the value of your work and/or
- Remark on implications and/or
- Suggest directions for future work.

Chapter 6 Synopsis: Writing the Discussion/ Conclusion

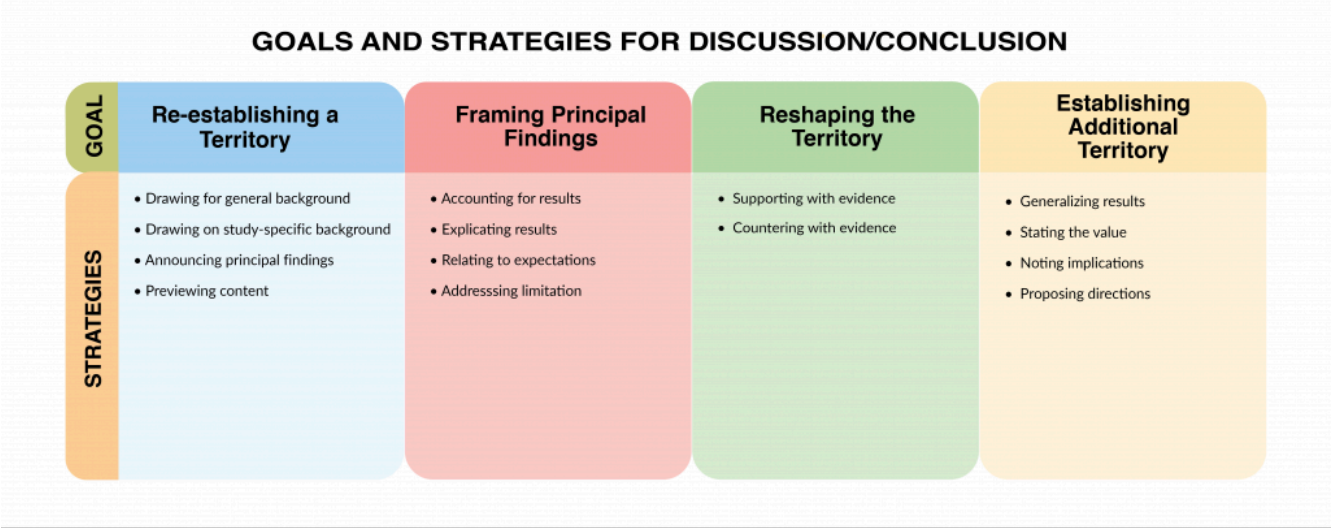
In this chapter, we learned how to finalize a research article. The four main goals and their strategies were discussed and exemplified along with some advice about what language you can use. To review, let's look again at the four goals:

1. Re-establish the territory
2. Frame the principal findings
3. Reshape the territory
4. Establish additional territory

Through these goals, writers provide readers with extended analyses and interpretations of the results by evaluating their implications and situating them within the existing literature. While the two specific middle sections of a research paper focus mainly on what's happening inside the research project, the Discussion/ Conclusion section tends to expand the meaning beyond or outside of the research at hand. In other words, writers must indicate how the results add or relate to existing knowledge within the discipline, which points out the value of the work. The final section of the manuscript is also the last aspect of your work that your readers will examine, so it must convincingly finalize the scientific argument that has been unfolding through each section.

According to the Phrasebank website, Discussions/Conclusions usually carry the following functions:

1. To review and compile ideas and arguments, which may include a kind of retrospective view of the main areas covered in the writing;
2. To evaluate the research overall, which could also involve recommending improvements and considering coming trends.



Key Takeaways

There are many ways to think about how to go about your task; however, as with other sections, you should remember that each writer, discipline, and journal has a unique set of stylistic norms. As you've probably deduced by now, there is no one "correct" way but rather many different best practices to keep in mind.

Explore + Apply

Before you begin applying what you've learned in this chapter to your Discussion/Conclusion section, explore published writing in your discipline or in a target journal that you've identified. Look for the goals and strategies presented here to see where you might find similarities and differences that are discipline- or journal-specific. Next, try outlining your next Discussion/Conclusion section using the structuring and placement of those goals and strategies as a model.

Chapter 7: Writing Abstracts

Many academic fields utilize short summaries of scholarly work that are commonly referred to as abstracts. However, abstracts vary in both form and function, and novice researchers often struggle to compose succinct versions of their work. This chapter will provide an overview of the various uses and pieces of an abstract and will give you some tips on how to compose one successfully and efficiently.

Learning Objectives

After exploring this chapter, you will be able to ...

- Understand the fundamental concept of an abstract;
- Articulate the various uses of an abstract;
- Identify the parts of an abstract;
- Connect those parts to the goals and strategies of the sections of a research article;
- Design your own abstract based on best practices presented in this chapter.

Before moving on to our presentation of this aspect of research writing, spend a bit of time thinking about your own conception of an abstract.

Warm-up

What kind of information goes into an abstract? What should be excluded?

Defining Abstracts

A recent handbook on academic writing defines *abstract* as "a short form, or synopsis, of a larger text or project, describing work that is proposed, in development, or completed"[1]. This definition underscores the chronology of an abstract's use – future work, current work, or finished products. These varied uses of an abstract contribute to its diverse forms because what is included in an abstract is heavily influenced by its intended function. Basically, a good abstract should have the following features: accurate, self-contained, concise and specific, non-evaluative, and coherent and readable (American Psychological Association, 2001).Other scholars have defined *abstracts* in other ways, including, but not limited to, the following:

- a description or factual summary of the much longer report, and is meant to give the reader an exact and concise knowledge of the full article[2]
- an abbreviated, accurate representation of the contents of a document[3]

Still others have noted what an abstract should contain, including descriptors such as *accurate*, *concise*, *non-evaluative*, *coherent* and *readable*[4] by categorizing them into sub-types[5] or functional purposes[6]. Categories of abstracts include:

1. Informative (summary of an article)
2. Indicative/descriptive (explains general information but usually excludes results)
3. Structured (summary that uses headings for each section of the RA)

As the first type (informative abstract) is the most common form of abstract[7], and the one most closely associated with the topic of this book (research articles), we will focus our attention on this type. Nevertheless, it is important to point out that the third type (structured abstracts) could be a sub-classification for either the informative or indicative type. In other words, either type 1 or type 2 could be presented in a structured format.

So, now that we have narrowed down the type of abstract that we are referring to, let's examine the purpose

1. Curry, M. J., He, F., Weijia, L., Zhang, T., Zuo, Y., Altalouli, M., and Ayesh, J. (2021). *An A to W of Academic Literacy: Key Concepts and Practices for Graduate Students.* Ann Arbor: University of Michigan Press.
2. Bhatia, V. K. (1993). *Analyzing genre: Language use in professional settings.* London: Longman.
3. ANSI. (1979). *The American standard for writing abstracts.* New York: ANSI Publication.
4. American Psychological Association. (2010). *Publication manual of the American psychological association* (6th ed.). https://www. apa.org/pubs/books/4200066
5. Gladon, R. J., Graves, W. R., & Kelly, J. M. (2011). *Getting published in the life sciences*. John Wiley & Sons.
6. Swales, J. M., & Feak, C. B. (2004). *Academic writing for graduate students: Essential tasks and skills* (Vol. 1). Ann Arbor, MI: University of Michigan Press.
7. Gladon, R. J., Graves, W. R., & Kelly, J. M. (2011). *Getting published in the life sciences*. John Wiley & Sons.

of that type. In their seminal book on academic writing, Swales and Feak (2009) note two major functions of this particular kind of abstract:

- Previewing or summarizing academic work
- Proposing academic work

That work may be a research article, a thesis or dissertation, a conference presentation, or a chapter of a book. In order to determine what is included in your abstract, you'll need to first answer some ***wh*-questions**:

- **Who** is the audience for the abstract and what is their level of expertise on the topic or within the discipline?
- **Why** was the research undertaken (e.g., **what** is the motivation/justification for the study)?
- **What** are the research questions or hypotheses?
- **What** methods were used?
- **What** were the general findings/conclusions?
- **What** are the implications for the subject matter or field?
- **Where** will the abstract be published?
- **How** should the abstract be formatted?

A successful abstract answers these questions as a way of becoming a stand-alone document [8].

Now that we've explored the basic definition of an abstract and explained what it contains, we'll divide our discussion into two parts:

1. Functions of an abstract (examining the purposes and goals for writing one); and
2. Forms of an abstract (emphasizing the various language issues that might arise as you're writing).

8. Gladon, R. J., Graves, W. R., & Kelly, J. M. (2011). *Getting published in the life sciences*. John Wiley & Sons.

Goals of an Abstract

As noted in previous sections, abstracts serve many purposes. Abstracts may be used to apply for conferences or to scaffold the presentation of theses/dissertations, but the particular type we will focus on in this book is the informative abstract, which appears at the beginning of a research article and serves to provide "a miniature version, or microcosm, of the manuscript" [1]. Because publication of research article manuscripts is highly competitive, and because acceptance of the manuscript is often predicated on the reading of the abstract alone[2], the function of an abstract is extremely important in the life of an academic. The American Psychological Association[3] notes the significance of abstracts by claiming, "A well-prepared abstract can be the most important single paragraph in an article" (p. 26).So, what exactly are the purposes of an abstract? How do they function to meet the needs of readers?Based on reviews of several sources[4][5][6] that specifically outline the functions of abstracts, we would like to highlight four main purposes that coincide with the goals of this textbook:

1. To serve as stand-alone miniature versions of an article, summarizing the topic, motivation, methodology, and main results;
2. To act as screening devices, aiding choices about reading an article (or not);
3. To preview and contribute to a reader's navigation of the whole article;
4. To give reviewers a roadmap of the paper that they are reviewing.

That's a big job for such a small amount of text! However, there are a few helpful and specific goals and some guiding questions[7] that can help you to get started.[8] These goals/strategies coincide with each section (IMRD/C) of the article, so you may also want to review the various goals/strategies in chapters 3-6.

1. Gladon, R. J., Graves, W. R., & Kelly, J. M. (2011). *Getting published in the life sciences*. John Wiley & Sons.
2. Swales, J., & Feak, C. (2009). *Abstracts and the writing of abstracts* / John M. Swales, Christine B. Feak. (*Michigan Series in English for Academic & Professional Purposes*).
3. American Psychological Association. (2010). *Publication manual of the American psychological association* (6th ed.). https://www. apa.org/pubs/books/4200066
4. Bordage, G., & McCaghie. W. C. (2001). Title, authors, and abstracts. *Academic Medicine*, 76(9), 945-947.
5. Huckin, T. N. (2001). Abstracting from abstracts. In M. Hewings (Ed.), *Academic writing in context*, Birmingham, UK: University of Birmingham Press.
6. Swales, J., & Feak, C. (2009). *Abstracts and the writing of abstracts* / John M. Swales, Christine B. Feak. (*Michigan Series in English for Academic & Professional Purposes*).
7. Swales, J., & Feak, C. (2009). *Abstracts and the writing of abstracts* / John M. Swales, Christine B. Feak. (*Michigan Series in English for Academic & Professional Purposes*).
8. null

Goal	Guiding Question(s)
Goal 1: Introduce the topic by providing background information and briefly motivating the study.	What is already known about the topic? Why is the topic important?
Goal 2: Present the purpose/goals of the research.	What is this study about?
Goal 3: Explain the methods, materials, participants, and techniques used in the study.	How was the study carried out?
Goal 4: Highlight the most important results.	What was discovered as a result?
Goal 5: Provide an overview of your conclusions by pointing out any implications or recommendations.	What do the findings mean?

Swales & Feak (2009) claim that Goals 2 and 4 are the most common and note that Goal 5 is the least likely to appear in an abstract. This is probably because many researchers write abstracts prior to completing their studies; consequently, it's difficult to explain what the findings mean if the abstract is written ahead of the study's completion.

Formal Features of Abstracts: Length, Word Choice, and Grammar

This section of the chapter will examine the formal features of abstracts, including length, word choice, and some grammatical issues. Please note that this is not a comprehensive guide but rather a few highlights of issues that we feel are particularly relevant to novice researchers.

Length

In their book-length work on abstracts, Swales & Feak (2009)[1] suggest that the first step to writing an abstract is to find out the word or character limit. Indeed, word/character limits are an especially noteworthy aspect of abstracts because they are so often used as a gateway into acceptance — especially for conferences. Swales and Feak present several guidelines for writing abstracts, and the ones relevant to our discussion are as follows:

1. Abstracts in journals are usually between 150-200 words without subheadings (unstructured) or a bit longer (~250 words) if structured (with headings).
2. Disciplinary differences may allow for longer (~500 words or more) abstracts; specifically, those for conference submission are generally longer.
3. The IEEE[2] uses shorter abstracts (~50 words) for "short communications," which is a type of article in many of the journals that it publishes.

Although length is often a challenging component of writing an abstract because it's difficult to summarize an entire study in only a few hundred words, it is a fairly straightforward aspect of this section of a research article. Each journal has a requirement, so you can look up their maximum word lengths on their website.

Word Choice

The primary determinant of the language used in an abstract is its function/purpose. The purpose drives the decisions you will make about what kinds of words and information to use or avoid. Prescriptive guidelines for abstracts are usually dictated by either the discipline or the journal/editor, and, as Swales

1. Swales, J., & Feak, C. (2009). *Abstracts and the writing of abstracts* / John M. Swales, Christine B. Feak. (*Michigan Series in English for Academic & Professional Purposes*).
2. Institute of Electrical and Electronics Engineers

& Feak (2012) note, there are often "not rules to follow, but rather choices you can make"[3] about what language to include or exclude. The next sections provide some guidance to help you make those choices, and although we are including these in the chapter on Abstracts, the information can be applied to any aspect of research writing. However, as the abstract is a prominent way for others to be introduced to your research[4], it is particularly important that the language be clear and appropriate. Several research writing guide books claim that because of the heavy reading requirements that researchers face, they must be extremely selective about what they choose to read. Many choose to read abstracts as a summary of an article either as a preview or a replacement. [56]One way to begin drafting your abstract is to consider that both its placement and function within an RA is to bridge the title and the text of the manuscript. Therefore, one best practice is to include every important word from the title in the abstract[7]. This will help you consider the content of the abstract, but there are other considerations as well. For instance, generally abstracts present information in the same order as the research article: IMRD/C. As noted previously, the final section may or may not be included based on what stage the research is in, but regardless, the abstract will flow in this general order/pattern.

Next, we'll explore some particular word/grammatical categories in an effort to provide you with some ideas. These are not rules, but rather, are suggestions based on linguistic research and general academic writing standards.

Pronouns

The use of personal pronouns (e.g., I, *me*, *my*, *you*, *s/he*, *you*, *they*, etc.) in academic writing are a common source of confusion for many graduate students and other novice academic writers. Are pronouns acceptable in formal academic writing? Should they be avoided? If you are writing about someone else's work, the third person "they" or "s/he" is widely accepted. In contrast, the use of the second person "you" is typically avoided [8].

In general, there is much variation in the use of personal pronouns in academic writing even among expert writers[9]. Most writing style guides advise against the use of first and second pronouns and the use of the singular masculine he [10]. Often the suggestions about alternative structures include the use of passive voice,

3. Swales, J. M., & Feak, C. B. (2004). *Academic writing for graduate students: Essential tasks and skills* (Vol. 1). Ann Arbor, MI: University of Michigan Press.
4. Day, R. A., & Gastel, B. (2006). *How to write and publish a scientific article*, 3rd ed. Cambridge: Cambridge University Press.
5. Gladon, R. J., Graves, W. R., & Kelly, J. M. (2011). *Getting published in the life sciences*. John Wiley & Sons.
6. Swales, J., & Feak, C. (2009). *Abstracts and the writing of abstracts* / John M. Swales, Christine B. Feak. (*Michigan Series in English for Academic & Professional Purposes*).
7. Lebrun, J. L. (2007). *Scientific writing. A reader and writer's guide.* World Scientific Publishing Co., Singapore.
8. Hyland, K., & Jiang, F. K. (2017). Is academic writing becoming more informal?. *English for Specific Purposes*, 45, 40-51.
9. Harwood, N. (2006). (In)appropriate personal pronoun use in political science: A qualitative study and a proposed heuristic for future research. *Written Communication*, 23, 242-250.
10. Paterson, L. (2014). *British pronoun use, prescription, and processing: Linguistic and social influences affecting 'they' and 'he'*. Springer.

the combined *s/he* (which can be formed as *she/he*, *he/she*, or with the conjunction *and* between the two), or *they* regardless of gender and number. In fact, studies show that the singular pronoun *they* is the most frequent personal pronoun, and has been for at least two decades[11][12][13].

Given this information, we suggest that the use of they is very likely the best choice regardless of the number (singular or plural) or gender. That is, the pronoun they can have antecedents that are male, female, singular, or plural.

Verbs

Tense

Generally, the use of verb tenses varies by section within an abstract. Swales and Feak's comprehensive guide to academic writing[14] asserts that abstracts tend to begin and end in the present tense but vary significantly in their mid-sections. While there has not been a large, cross-disciplinary study of verb tenses in research article abstracts, there have been some studies about specific disciplines such as applied linguistics[15] and medical research[16]. The latter study found that past tense is often used to write about the purpose/background of the article, to explain the Methods, and to highlight the most significant Results. However, that study also notes that when a writer wants to focus on the generalizability or boost the significance of the findings, authors will often opt for present tense. Note the difference in the strength of these two sentences:

1. Our results showed that there were significant differences between the two types of X.
2. Our results show that there are significant differences in the two types of X.

The second sentence presents a stronger stance simply because it is in the present tense, which is typically used for facts, general truths, or fixed circumstances. Simple past tense is used for actions started and finished in the past but not necessarily continuing into the present. Therefore, choose your tense carefully because it can be indirect evidence of your stance.

11. Baranowski, M. (2002). The most recent APA guidelines (7th edition) similar support the use of *they* as a third person singular pronoun. Current usage of the epicene pronoun in written English. *Journal of Sociolinguistics*, 6(3), 378-397.
12. LaScotte, D. K. (2016). Singular they: An empirical study of generic pronoun use. *American Speech*, 91(1), 62-80.
13. Newman, M. (1992). Pronominal disagreements: The stubborn problem of singular epicene antecedents1. *Language in Society*, 21(3), 447-475.
14. Swales, J. M., & Feak, C. B. (2004). *Academic writing for graduate students: Essential tasks and skills* (Vol. 1). Ann Arbor, MI: University of Michigan Press.
15. Tseng, F. (2011). Analyses of Move Structure and Verb Tense of Research Article Abstracts in Applied Linguistics. International Journal of English Linguistics, 1(2), 27.
16. Salager-Meyer, F. (1992). A text-type and move analysis study of verb tense and modality distribution in medical English abstracts. *English for Specific Purposes*, 11(2), 93-113.

Modality

Modal verbs indicate stance; in other words, they allow the writer to strengthen or weaken a claim. In English, there are nine modal verbs as shown in the table:

can	could	may
might	should	must
had better	ought to	will/shall[17]

It's important to note that each verb carries a level of certainty or doubt that is a really useful way to hedge or boost your claims about findings. Since the abstract is such an important part of representing your work, the careful use of modals is essential to striking the right tone in terms of your level of confidence. Of course, there are other words you can use that also indicate the tentative nature of your work (e.g., adverbs and adjectives such as *possibly/possibly*, *obviously/obvious*, etc.). You can explore those on your own as they are outside the scope of this book. The important point to remember is that you always have a choice about presenting your level of certainty, and modal verbs are important tools in your writing toolbox.

Clauses with *that*

In 2005, linguistic researchers did a study of over 200 abstracts from six disciplines. The most important finding from the study was that writers tended to use *that* clauses when writing about their results. For example, "The study's results indicate that …" or "The findings confirm that …". In the full research article, you'll probably be using these clauses in the Introduction to review literature (e.g., "Other studies have shown that …") as well as to report the findings in the Results section. However, in an abstract, you will not be reviewing literature at such a fine level of detail, so it's more likely that you'll use such a clause to highlight your findings.

Reporting verbs are often used with the word *that* to form such clauses. So, it's important for you to familiarize yourself with some of the more common reporting verbs. A few highly-frequent verbs of this type are presented in the table below:

17. The modal "shall" is not typically used in American English, but is somewhat common in British English to make suggestions or offer help in either statement or question form.

describe	show	reveal
study	demonstrate	note
point out	indicate	report
observe	assume	claim
assert	examine	state
believe	mention	reveal
argue	discuss	find
suggest	focus	provide
propose	reveal	write

Each verb has a level of certainty of its own (e.g., *assert* is more confident than *indicate*), so be sure that you are familiar with the exact meaning of each verb. On top of that inherent meaning, such verbs can be combined with adverbs (e.g., *possibly*, *certainly*, etc.) and/or modal verbs that can strengthen or weaken the claim as well.

Citations in Abstracts

To cite or not to cite, that is the question. If you do a Google search "Can I cite sources in my abstract?" you'll find an overwhelming number of negative responses (i.e., No, you should not.). However, as we've noted in other sections, academic writing is often not black and white, wrong or right, no or yes. So, while the internet majority may have very sure opinions, it's less clear than it seems.People provide several reasons why citations in abstracts should be avoided, namely the following:

- To focus on your work, not someone else's.
- To present a self-contained work without the need for outside reference.
- To reduce unnecessary words contributing to the small word count limit.

On the other hand, there may be some instances in which it is incumbent upon you to cite the work of others. When you are doing research that is a direct response to another researchers' findings, theories, or claims, then it's important to cite them. Likewise, if you are using a little-known term that was coined by someone in particular, then it's important to reference that person. And undoubtedly, when you are doing a replication study or some meta-analyses, it's necessary to have citations.

On the whole, though, the best practice is not to cite sources in an abstract unless it is absolutely necessary[18]. As with other topics in this book, there are different approaches within disciplines, journals, and writers, who may all have variable stylistic approaches to this issue, so read the Instructions for Authors for

18. Belcher, W. L. (2009). *Writing your journal article in 12 weeks: A guide to academic publishing success.* Thousand Oaks, CA: Sage.

your target journal. If there are no guidelines, then examine the abstracts of previously published papers in that journal to see what the common rule seems to be. If all else fails, you can contact the editor.

Chapter 7 Synopsis: Writing the Abstract

In this chapter, we learned how to write an abstract for a research article. Five goals were presented as a way to envision the communicative functions of the abstract.

Goal 1: Introduce the topic by providing background information and briefly motivating the study.

Goal 2: Present the purpose/goals of the research.

Goal 3: Explain the methods, materials, participants, and techniques used in the study.

Goal 4: Highlight the most important results.

Goal 5: Provide an overview of your conclusions by pointing out any implications or recommendations.

By using knowledge of these goals along with their guiding questions, research writers have a target for achieving a concise yet clear summary of their work. As with so many other aspects of a journal manuscript, there are variations at the level of writer, journal, and discipline, so we cannot provide prescriptive rules about what should or should not be included. Pay attention to the Author Instructions for the journal to which you are submitting, and notice what other writers in your field and in your target journal do.

Key Takeaways

- By using knowledge of these goals along with their guiding questions, research writers have a target for achieving a concise yet clear summary of their work.
- As with so many other aspects of a journal manuscript, there are variations at the level of writer, journal, and discipline, so we cannot provide prescriptive rules about what should or should not be included.
- Pay attention to the Author Instructions for the journal to which you are submitting, and notice what other writers in your field and in your target journal do.

Explore + Apply

Make a list of the journals that are ideal publication venues for your research. Explore their author guidelines to see what kinds of standards they set for writing abstracts. Note the length, format (structured or unstructured), and any other suggestions or requirements they have for writing this very short yet crucial piece of the research writing puzzle. Using this information, model your own abstract on the functions and language you see used in such writing in your field.

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