2018 Institute on Project-Based Learning

PBL Assessment & Feedback (Handout 2)

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June 2018

Nantucket Project Center 2017
Guidelines on Final Reports[1]

The following are guidelines to help you put together your final report. Please note these are guidelines, however, and not rigid instructions. Often, there are good reasons to diverge a little from particular guidelines given the nature of your project, but the overall structure should remain the same.

Contents and Structure of a Typical IQP Report

A full IQP report usually has the sequence of sections shown in Table 1; these are similar to those you use in most scientific writing. The components in **bold** font are the chapters that comprise the main body of the report; those chapters could be titled or arranged differently based on the nature of your project. The rest is standard content.

For the main section of the report we have included length guidelines. Our purposes in specifying a limit to the number of pages are to emphasize quality over quantity, and ideally, to lessen the time students spend on writing. That said, it is often more challenging to write concisely! The range in length for some of the chapters reflects the fact that each project is unique

TABLE 1: SEQUENTIAL CONTENTS OF A TYPICAL IQP REPORT

Section / Chapter	***Typical page length (1.5 spacing)***
Title Page	1
Abstract	1 (800 characters)
Acknowledgements	1
Executive Summary	< 5
Authorship	1
Table of Contents	1
List of Figures	1
List of Tables*	1
Introduction	1.5-2
Literature Review (Background)	10-20
Methods	< 10
Findings	< 20
Conclusions & Recommendations	< 5
References	As necessary
Appendix A**	As necessary
Appendix B… etc.	As necessary

*Everything up to and including the List of Tables is "fore matter" and is numbered with lower case Roman numerals, beginning with "i" after the title page (no number on title page). Arabic numbering (1, 2, 3, . . .) begins with the Introduction.

**Each Appendix should have a descriptive title (e.g., Appendix A: Interview Protocols).

Report Submission: WPI requires electronic submission of project reports. The process is described at www.wpi.edu/Pubs/E-project/.

[1] Based on guidelines developed by Chrys Demetry and Rick Vaz

General Writing Tips

Following are some general tips that will help throughout the report:

- ***Use active voice and a variety of verbs.*** Almost all effective writers write with VERBS. Some less effective writers use mostly nouns; often over 50 percent of their verbs are some form of the verb "to be." As a result, actors fall out of the picture and the real action of the story gets lost. This issue is not one of style; it is a content issue. Look for examples that we provide in the subsequent sections (particularly Methodology) regarding how to transform from passive to active voice by making better use of verbs.
- ***Make your references clear***. Avoid using "this" as a noun without a clear referent; be precise. Sometimes you can solve the problem by adding a noun after "this"; other times you can combine the two adjacent sentences to good effect.
- ***Use helpful, clear formatting***. Be mindful of "document design," and use white space, headings, lists, figures, etc. in judicious ways to make the report as readable as possible. Do not have too many sub-sections or sub-sub-sections (no 3.1.4.2!) Use words, rather than structure, to connect one section to the next. One or two paragraphs are generally not sufficient to warrant their own section.

The Introduction Chapter: Five Moves to Set Up Your Project

The *Introduction* chapter of an IQP report serves to introduce the reader to your general area of inquiry, clarify the specific challenge you will address, and explain why the work is worthwhile. The Introduction is usually no more than two pages and may follow a set of "rhetorical moves" that you may have seen when reading experimental or research papers. The five moves, in order, are to:

1. Establish the general topic, problem, or field that your project addresses
2. Introduce the specific problem or issue;
3. Define the scope of problem or issue by summarizing previous work, what is already known, and/or what has already been done;
4. Create a research space by identifying a gap in previous work or opportunities for extension or new work (motivating but not quite declaring your particular project by establishing a specific need)
5. Establish your project by explicitly stating its goal, how it was achieved (objectives), and briefly summarizing your main findings and conclusions.

The precise rhetorical moves fit some projects better than others, so use your discretion. Since the report will be read in the future, you will typically need to use past tense to describe your specific efforts, e.g., "The goal of this project *was* to…" Check the wording of your goal statement to make sure it is *specific, measurable (in 7 weeks), attainable (in 7 weeks), realistic, and tangible.*

The Literature Review (Background) Chapter: Elaborating on the Problem, the Stakeholders, the Debates, the Place

The *Background*, also sometimes called the *Literature Review*, can be thought of as a longer and more detailed version of the first four moves of the Introduction. It presents facts and interprets previous related research—some drawn from articles and books you read and interviews you conducted—to help the reader understand the problem at hand and what others have done. By the end of this chapter, the reader should find your project important, should understand how your work relates to previous work, and should have a sense of how you are likely to proceed (even though you will not have stated that directly yet.) By drawing on evidence from *credible sources*, you will lead the reader up to the point at which your own work will begin.

Features of an Effective Background Chapter

- Starts with an introductory paragraph
- Uses descriptive headings
- Synthesizes multiple sources of information (vs. merely transferring information) and explains its meaning and relevance
- Calls upon authoritative sources while also distinguishing between facts and qualified assertions

Content: You should be able to draw on background research from the preparation period and may use some of your writing from the proposal. At the same time, you will definitely want to incorporate new material that you discover when in Nantucket and cut some that is no longer directly relevant. We strongly encourage you to be open to adjusting your conception of the project.

Remember: The background chapter is for readers, not for you. When deciding on content for this chapter, consider what readers need to know to understand you project. Here are some useful questions:

- Where is the setting for the project? What is its history and geographical context?
- Who are the major stakeholders (people who have a "stake" in the subject you are studying)?
- What is the 'gap' or problem you are hoping to help with?
- What are the causes of the problem?
- What approaches have been or could be taken to address the problem?
- What are the major points of consensus or debate on the subject of your project?
- What have others learned elsewhere about these problems? What are the criteria for a successful project in your field of work?

The Relevance Test: One weakness we see frequently is when student writers do not distinguish between what is *vaguely relevant* to their project and what is *directly relevant.* If it's not directly relevant, *cut it.* A related problem is when writers don't explain or show the relevance of even relevant information. A relevant detail that appears irrelevant because you haven't explained its relevance *is irrelevant* as far as your reader is concerned; this will undermine your effectiveness.

Structure

- Make sure there is a logical "storyline" and sequencing of topics. Proceed from the general to the specific, and follow the order of the first four moves in your Introduction chapter. The final sections of your Background chapter should lead the reader "up to the brink" of your work.
- Prepare readers for your storyline with a short introductory paragraph at the start of the chapter. The purpose of the introductory paragraph is to introduce and motivate—but not to summarize at length—the chapter (or section). Following is an abbreviated example:

  In this chapter, we begin with a brief overview of the general problem of X and debates about its sources and possible solutions. Next we will synthesize best practices related to Y that are agreed upon by experts in this field. We conclude by introducing the [Name of Sponsoring Organization] and its specific needs for Z.
- Use section headings that are descriptive and specific to your project. (This tip applies throughout the entire report AND in your presentations!)

  Example: *Mission and Programs of the Maria Mitchell Association* is descriptive and specific. Something like *Sponsor Background* is NOT and conveys no useful information to readers.
- Create smooth transitions and logical connections between sections using transitional phrases and words.
- Start each major section with a short introductory paragraph explaining what is in that section and stating your main point.
- Check each paragraph and every paragraph: Is there a topic sentence that conveys the main point of the paragraph, and is all information in the paragraph related to that theme?

How to Acknowledge and Discuss Source Materials[2]

Often the greatest challenge in writing a Background chapter is to develop a "research voice" that presents evidence and arguments in a factual, unbiased way. You should have no claims that might cause a reader to wonder *"Says who?"* That means you need to explain and back up any knowledge claim you make and show where you are getting your information. Remember that just providing a

[2] Note that all of the material and sources used as examples in this section have been fabricated. Normally, you will cite sources using APA citations to your list of referenced works, but here we'll use footnotes for convenience.

reference is not enough. The source must be reliable and even then you should never treat any source as "The Truth." Writing the Background section effectively requires an understanding not only of how to cite reference materials, but also of when and how to discuss them.

First, carefully read the relevant sections of the writing textbook from ID 2050. Note that the only parts of a research report that do not require acknowledgement are *common knowledge, facts available in a variety of sources, and your own findings*. That implies that everything else requires acknowledgement! However, certain types of material require more than a reference; they require explicit discussion of the source in the text, to establish the nature of the authority behind the quote or assertion. Only then can readers decide whether they can trust your information.

Direct quotations should be used very sparingly; rarely should an entire sentence be quoted. In general, you should be summarizing and interpreting source materials (see the writing text for help on doing this). However, sometimes the actual wording itself, or the person who said it, will be of interest to the reader. In that case, it is typically appropriate to *explicitly acknowledge the source in the text* as well as providing a citation:

> Thai food is very complex; experienced world traveler Rob Krueger has referred to it as "a party in your mouth."[3]

Facts not widely known or easily available are cited in the normal way. Because they are facts, there is typically *no need for you to identify the source explicitly* in the text:

> Pad Thai is a noodle dish with origins in both Chinese and Indian cuisines[4].

Judgments, opinions, claims, and arguable assertions are by far the most challenging type of content to properly acknowledge, since they fall on a continuum. The findings of previous researchers often fall into this category. *The more controversial, extreme, or subjective the content, the more necessary it is to explicitly indicate or discuss the source.* Some examples follow.

Although the following statement is not a fact, it is a *mild assertion* that few would argue with, and you could probably get away with stating it as long as it was followed by some evidence:

> Thai food is considered one of the great cuisines of the world.

However, note that you can actually *turn the statement into a fact* by attributing it:

> Several renowned critics have identified Thai cuisine as one of the world's greatest cuisines[5,6].

As the assertion, judgment, or opinion gets more controversial or subjective, *the writer must get more careful*. The following is one researcher's conclusion, and probably not agreed on by all:

> Demetry concluded that Thais have developed the world's most complex and interesting cuisine[5].

Extreme positions require *great care, and perhaps some balance*. The following is one writer's claim, presented in a way that makes clear its extreme nature:

> Vaz has gone so far as to claim that Thai food can bring diners total consciousness[6]; however, most authors have been content with praising the food's physiological effects.

When you find a particularly relevant piece of previous research, you will want to help the reader understand both that research and its findings, and to tie those findings to the authors by *explicitly discussing the source*. Note how each sentence of the following paragraph makes clear where the information came from:

> A 2003 study by Krueger described an attempt to categorize the varieties of *Tom Yum* by analyzing over 100 versions of the soup in terms of ingredients, preparation, and subjective effect on tasters. Krueger concluded that no matter how it's prepared the soup is "damn fine stuff," but was able to define three distinct categories based on the extent to which foreign palates were accommodated. The study also developed a useful scale of spiciness based on volumetric measurement of forehead perspiration.[7]

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[3] Krueger, J. Robert. *Slow Food Around the World.* Achewood Press, 1995.
[4] Tantayanon, Supawan. *Eat Like Me!* Chula House, 1998.
[5] *Ibid*.
[6] Vaz, Richard. *Meals and Mysticism.* Prentice-Hall, 2001.
[7] Krueger, J. Robert. "Tom Yum Deconstructed," *Journal of Tasty Things*, February 2003.

When proofreading your background chapter, if you find yourself (or anticipate us) asking "Says who?" or "Is this a credible source?" then you probably need to provide an explanation of the nature of the source.

Remember to use APA format for your citations, although the examples above are in footnote style. For specifics about how to cite both published sources and conversations or interviews, see the APA Publications manual.

The Methodology Chapter: Justifying the "What" and the "How"

The Methodology chapter is often the most challenging to write. The chapter needs to state how you broke down your project into analytical components and the process you used to achieve your goal. Typically, the chapter is organized in terms of a set of ***project objectives*** that lead toward the goal. Objectives, in turn, typically involve answering certain ***research questions***. ***Research questions*** are different from ***methods*** and are different from ***deliverables***.

This chapter should not read like a diary or timeline of what you did – rather, it should make clear ***what*** you set out to learn, ***why*** this information was important, and ***how*** you got it, ***why*** the methods you chose were a reasonable choice, ***how*** you overcame challenges and what limitations remain. The focus is on information: what you wanted to learn, and how that knowledge was subsequently used.

After you have clearly identified the ***what***, discuss the ***how***. Researchers can choose from, or combine, many methods to answer research questions and achieve objectives, so your job is not to present your approach as the only correct one. However, the reader should conclude that everything you did was *intentional, purposeful, planned ahead of time, and based on good practices*.

The Best Methodology Sections

- Don't confuse research questions, methods, and deliverables
- Describe and analyze the limitations of the methodology/research
- Describe and analyze the challenges to learning what you needed to learn (without drama or complaints)
- Describe and analyze the cultural barriers to conducting the research
- Develop issues raised in the background section in a consistent and systematic fashion

Content

- ***Start with the purpose of all the steps***—the overall goal of the project.
- ***Provide the purpose of each objective.*** This is not what you did but what information you intended to learn. Readers will not be able to assess your methods unless they know what you are looking for. Explain *WHY* you needed this information. Make sure each purpose is clear before jumping into details of technique--the "how."
- ***Describe HOW you got the information you needed.***
- ***After describing the HOW, justify your choice of methods (another type of WHY).*** Drawing upon best practices for methods in the literature gives you more credibility as researchers. Provide enough, but not too much detail. Someone should be able to repeat your work using information provided in this chapter and in associated Appendices. (For example, a general idea of the nature of interview questions should be evident in this chapter, but you could put the actual schedule of interview questions in an Appendix.) It is often appropriate to list alternative methods you considered and the justification for the methods you chose.
- ***Include a discussion of analysis methods***– that is, describe not only how you collected information, but also *how you planned to use that information to achieve your goal*. Wherever possible, think in terms of *CRITERIA* that you will use to find meaning in your data or to make decisions using data. Sometimes lists or tables or charts are helpful for laying out criteria and judging options with respect to them. Discuss how the results of your analysis were used to refine your methods.
- ***Acknowledge and discuss problems, challenges, limitations, and flaws of your study.*** Your work will not be credible unless you recognize its limitations. Proficient researchers are not advocates. They describe the problems they had in gathering and analyzing information, and

avoid overstated claims of validity. Rather than judging your work to be successful, provide enough evidence for the reader to make the judgment.

- ***Keep in mind the overall report:*** Ideally, readers will see an issue raised in the background chapter, see it turned into a research question in the methodology chapter, see a conclusion drawn about that question based on evidence in the findings section, and then see a related recommendation. Let your writing reflect this parallel structure of these different chapters. This process would happen for each of several issues. Work to create and weave together these kinds of thematic threads in a logical and consistent fashion.

Structure

- As in the Background chapter, provide a short introductory paragraph, positioned between the Methodology heading and the first section heading (for objective 1), providing a preview of the chapter for the reader. Often an exact restatement of your Move 5 (from the overall Introduction) is a great introduction. Number your objectives.
- Here is a good sample introductory paragraph:

  The goal of our project was to assess EGAT's current environmental communication strategies and make recommendations for improvement specific to Mae Moh's information needs. In order to achieve this goal, we developed the following research objectives:

  1. Build trust with EGAT employees and the Mae Moh communities to learn about their perspectives regarding EGAT's impacts on local residents.
  2. Identify EGAT's communication strategies in terms of content, presentation and accessibility and identify villagers' information needs regarding pollution and other environmental concerns.
  3. Develop recommendations by comparing EGAT's strategies with villagers' needs to determine gaps.

  In this chapter, we will describe the methods we developed to gather and analyze input from key stakeholders, and how the results of that analysis were drawn upon to develop recommendations for EGAT and the Mae Moh villagers.

- Typically, the chapter should be organized by objective and research question, not method or chronology. This chapter is not a diary of your project; don't give a timeline of what you did, but rather establish what you set out to do and why. This is a subtle issue of voice. Following is an exaggerated example of the voice to avoid: "First we contacted key government officials who had knowledge about building regulations…. After speaking to government officials we met with representatives of advocacy groups for the hearing impaired…. Then we…" See how that sounds like a diary? Getting rid of the "time stamps" in this passage would help a lot. Keep the focus on types of information you sought.
- Use the past tense, even for steps that you haven't yet completed. For example, "We will accomplish our goal by…" should be changed to "We accomplished our goal by…."
- Avoid use of "We *needed* to interview.." or "It was *necessary* to find information on…." or "It was *important* to…" There is no single way to do any project, so these are not very convincing phrases. Just say what you did. You can state things much more clearly in *active voice*: "We interviewed…in order to…." "We sought information on…for the purpose of…"
- Although the passive voice is common for writing scientific methodologies, we encourage you to write this chapter in the active voice. For example, use "we interviewed three people" instead of "three people were interviewed." For more examples, consult a writing manual.

Example: The following segments from a Methodology chapter illustrate some of the key points described above. This example shows a strong "research voice."

3.1 Objective 1

Build trust with EGAT employees and Mae Moh communities to learn about their perspectives regarding EGAT's impacts on local residents.

Studies show that outside researchers must overcome obstacles when becoming involved with and researching a culturally unfamiliar community. Some even believe that outside researchers cannot understand or represent the experience of the community (Bridges, 2001). Because of this…

As outsiders in Thailand, the biggest challenge that we faced was establishing trust and credibility with Mae Moh and EGAT. Gaining trust from the villagers was especially difficult because…

As outsiders with little credibility in the Mae Moh and EGAT communities, we adopted strategies recommended in our research for achieving open and trusting relationships with both. These strategies required….

(There was much more to this objective. The team went on to describe and defend their strategies for gaining trust with each of the stakeholders.)

3.2 Objective 2

Identify EGAT's communication strategies in terms of content and accessibility and identify Mae Moh's information needs regarding pollution and other environmental concerns.

We set out to learn about EGAT's current communication techniques and Mae Moh's environmental information needs as a foundation for developing recommendations. To evaluate communication in Mae Moh, we focused on two particularly important components of risk communication model development: informational content and accessibility. Knowing these components from both perspectives allowed us to compare EGAT's efforts with the community's needs and determine disparities. To determine the problems with content, and accessibility, we chose historical research and semi-standardized interviews due to limited information on interviewees. The historical research mentioned earlier allowed us to discover previous efforts in environmental safety and communication. Interviews at EGAT and informal discussion with communities helped to bridge the gaps in the literature. Interview and discussion questions were based on the following research questions used to establish our information needs:

- What informational content does EGAT communicate?
- What do Mae Moh villagers want to know?
- What is the presentation of information?
- Who presents this information?
- How does the community receive information?
- How does the relationship between EGAT and the community influence reception?

Using our research questions, we formed interview and discussion questions specific to the interviewees' responsibilities and knowledge. We were also careful to avoid offensive and unprofessional language.

We directed interview questions at EGAT employees. In total, we interviewed 18 EGAT employees in several departments (see Table 1 for details.) Each group member undertook a task during the interview process….

For interviewing community members, we faced similar language concerns. A translator minimized such communication problems to the extent possible. Our translator, Hatarat Poomkachar, is a social science researcher from Chulalongkorn University. She facilitated communication between our team and the community. She has had experience…We intended to present our research findings back to the community at the end of our research process to allow for corrections and feedback. However, due to time limitations and lack of a translator in our final week in Mae Moh, we could not implement this feedback process….

With these difficulties in mind, we spoke with villagers to determine their understanding of EGAT's operations and their awareness of communication efforts. In total, we spoke with 22 villagers, generally in a group discussion format (see Table 2 for details). Personal interviews usually lasted about one hour while group discussions lasted longer, about 1.5-2 hours. We visited Pong Chai and Na Sak once, each for approximately 4-6 hours. We visited Hua Fai twice due to villagers' eagerness to speak to us and share their opinions. We also spoke with teachers and students from the local high school, all of which are residents of villages in Mae Moh district. We gathered general community knowledge of EGAT's operations and pollution through informal discussion. We discussed EGAT's efforts in order to assess the public's comprehension of and access to environmental information. The data collected provided insight into possible communication improvements. It indicated what informational content the people are concerned about, which presentation methods best suit their needs, and who they trust to communicate the information.

The Findings & Analysis Chapter: Making Meaning from Your Data

The *Findings* chapter presents what you have found—the key discoveries and/or creations you have made while following your project methodology. It is sometimes called *Findings and Analysis*, or you can give it an even more informational title specific to your project.

This chapter is the most important section of your entire project! It is where you tell what you learned about the big questions that the previous three chapters set us up for.

To think about what to include in this chapter, it is helpful to make a list of the two or three big questions at the heart of your project. Think about the goals of the IQP: to examine the relations between science, technology, and society. What does your project tell us about these relations? Also, reread your introduction and background. What is this project all about?

Features of Effective Findings Chapters

- Move directly to stating claims, rather than rehashing methods all over again.
- Avoid data dumping (present new knowledge, not raw data)
- Contain in-depth analysis
- Have firm but appropriately qualified claims rather than overstated claims
- Refer and utilize the literature wherever possible
- Are consistent with what you said you would do in the Methodology chapter

Content: This chapter should *not* be a wholesale information dump of all of your "raw data" organized by technique (e.g., with section headings of "Interview Results", "Questionnaire Results", etc.), but rather it should tell the reader what your data mean. You need to process the data and decide what key findings or patterns have emerged. In this chapter, your readers will want a SUMMARY of where you ended up and why, not every step along the way. "Conclusions" may be a better word than "findings" to describe this chapter. Data to support your results may be included in an Appendix or other supporting documents and cited from within the Findings chapter.

Note that a finding would not be the following, "The average yearly wind speed at the Princeton wind farm is 13.5 mph." This would be a piece of data. The finding goes deeper and is supported by data. For example, the finding might be, "An expansion of the Princeton wind farm to two 750 kW turbines would pay for itself in eight years."

Some good questions to think about:

- What were your research questions?
- How did different groups of people respond to the situation you are describing?
- What explains why things turned out the way they did? What evidence can you call upon?
- What surprised you about the information you found? How does what you found confirm, contradict, or supplement your sources in the Background chapter? (Be sure to bring up these sources.)
- Who will be interested in your findings and why?
- What do your findings tell us about the relations between technology and society?

It is critically important to weave in discussion about the *limitations* of your findings—to distinguish between what you can and can't claim—and to acknowledge alternative interpretations and alternative viewpoints. Although it may seem counterintuitive, your work will seem *more* credible if you acknowledge limitations and concede some uncertainty. Your job is not to "sell" any particular results—your job is to help the reader understand how well the results are supported by evidence.

A common question, related to interview results in particular, is **"What belongs in the Background chapter and what belongs in the Findings chapter?"** It depends, and often there is no clear answer, but you do want to avoid repetition. If the information from the interviews provides additional background information that helps readers understand the problem your project addresses, then you probably want to include it in the Background chapter. This approach is especially common for interviews done in the first week or two of the project that provide context about local issues. However, if the information from your interviews is directly aligned with a research question posed in your Methodology chapter, then that information should be presented as evidence in the Findings chapter

Structure

- Prepare the reader for your approach by writing an **introductory paragraph** to the chapter, prior to the first section. The introduction of this chapter would be an overview of your findings, setting up the rest of the chapter to support those findings.
- Often you can **follow the same sequence of objectives** or moves that you laid out in the Methodology chapter.
- Depending on your findings and the nature of your project, **other organizational strategies might be more effective**. For example, in a project that gathers opinions from various stakeholder groups, you could arrange results according to stakeholder group if you want to emphasize those different perspectives, or you could identify themes in the results and then present the views of each stakeholder group within each of those themes.
- An effective format is to **state a finding in an introductory paragraph or topic sentence and then support it**. It is often tempting to do the reverse, but we find that stating the finding first generally works best for a reader. (See the sample below.)
- **Be careful about the amount of detail you provide**. While you should not present all of your raw data, you also need to support your claims; be sure to draw upon your data as *evidence* for any claims that you make. For example, you could include some quotations from interviews and present summaries of your data in tables or figures.
- Remember that when you include **Figures and Tables**, you do so to *reinforce* points you're making in the narrative, not to replace narrative. Never present a figure or table unless you refer to it in the text and interpret it for the reader. For example: "Table 2 (*not* 'The table below') shows a summary of the results of interviews with the various stakeholder groups, divided into the areas of Strengths, Weaknesses, Opportunities, and Threats. Note that grass-roots contacts and interpersonal connections were a theme among strengths identified by both groups A and B…, whereas …" Then Table 2 should be included in the next available space following this paragraph, and the table should have a fully descriptive caption that is also included in the List of Tables and Figures following the Table of Contents at the front of the report.
- If you are producing some stand-alone documents as part of your work (manual, website, or other materials), start planning those, but plan on placing them in an appendix. In this chapter, you would describe the findings and principles that guided the development of those documents, and point the reader to them. The audience for those stand-alone documents is whoever will be using them. The audience for the report is other researchers.

Example: Following is a sample organization for a Findings chapter that illustrates some of the points above.

By analyzing the information gathered from our site visits and interviews, we developed the following findings concerning the tree planting projects in Heredia province, and the various stakeholders and principles which affect their success:

1. Most of the thirteen tree planting sites we visited contained trees that were correctly placed and watered, but were harmed by pests or other isolated incidents
   Summary of evidence, explanation, and analysis
2. Tree maintenance programs varied among the sites and the quality of tree maintenance in the private planting sites was superior to the quality of tree maintenance in the public planting sites
   Summary of evidence, explanation, and analysis
3. Participation was low among business owners, developers, and the ordinary community members but was high among community leaders and schools
   Summary of evidence, explanation, and analysis
4. Community members do not participate in their community's tree planting projects because there is no confidence in the national government's reforestation efforts, sense of ownership, or opportunity for social interactions
   Summary of evidence, explanation, and analysis

5. There were three cases where community members were being empowered, but it appears this is not a widespread occurrence
   Summary of evidence, explanation, and analysis

The Conclusions and Recommendations Chapter

Often a reader will want to skim through this final chapter and be able to pick out quickly your specific conclusions and recommendations, so this chapter should be persuasive on its own.

***Content*:** *Conclusions* can be thought of as a summary of the key findings of your project. In this sense, it may seem a bit repetitive from your Findings chapter. That's OK, because sometimes people read only this chapter and not the Findings chapter. This chapter, however, should be MUCH MORE SUCCINCT. Instead of giving complete evidence to back up your findings, just suggest the nature of the evidence.

Almost all projects will also deliver *Recommendations* appropriate to your work. Make sure the nature of this chapter is consistent with what you said you would produce in your goal statement. Generally, very little in this chapter should come as a complete surprise to the reader since findings have already been presented; recommendations should fall out naturally from that discussion. Note that there are two types of recommendations, those made to address the problem you studied, and those made on next steps of study. Depending on the nature of your project, you might emphasize recommendations more than conclusions or vice versa.

Features of Effective Conclusions & Recommendations Chapters

- Provide a succinct summary of findings
- Have directly-stated recommendations that stand out at the beginning of each paragraph or section
- Use formatting that makes it easy for readers to quickly find specific conclusions and recommendations
- Make clear who the recommendations are directed toward
- Show consistency with Background, Methodology, and Findings chapters
- Do more than recommend something; they provide a roadmap for implementation: What methods? What criteria should be used? What sources should be consulted? What obstacles might come up?

Structure

- Start with a good **introductory paragraph**.
- Often you can make this chapter more readable by using formatting like **bold**, *italic*, or <u>underlining</u>. You have different options for organizing and formatting this chapter. Sometimes it can be effective to present conclusions and recommendations separately. In other cases, it may work well to present "pairs" of conclusions and recommendations. For example, you could say, *"Our results showed that…. In order to address this problem, we recommend that …"*
- In a similar manner as the Executive Summary and Findings chapter, **make strategic use of formatted lists** in this chapter so that readers can easily identify specific conclusions and recommendations. (See example given with Executive Summary.)
- As always, **choose your words VERY carefully**. A common mistake for recommendations—both in writing and in presentations—is to use statements like *"We feel that the Patent and Trademark Office should change its prior art search services by…"* No one should take an action based on how you <u>*feel*</u>. Rather, you should make clear that your conclusions and recommendations are based on evidence. Therefore, use wording like *"We recommend that…"* and then accompany that with evidence and justification: *"Our results showed that …. Moreover, there was broad support for… Therefore, we conclude…"* Keep an objective tone throughout and focus on developing persuasive arguments. Be careful with the word "should."
- **Use active voice, and make clear the audience for each recommendation:** "*We recommend that Organization X…*" Use words that convey an appropriate level of confidence in your results and recommendations.

- **Point out any limitations of your project, and be careful not to make the scope of your claims more broad than is justified by your results**. Your argument will be more persuasive if you acknowledge limitations and alternatives you considered.
- Often it is difficult to figure out how to conclude this chapter, and a concept that may be helpful is to think of it as an inverse funnel. The whole report up to that point has been funneling down to the specific findings and the accomplishment of your goal, but then you want to funnel back out and point out things like the long-term implications of your work, who will benefit from your work, possible uses of your findings and recommendations by individuals or groups other than your project sponsor, and/or interesting questions that your work raises that could be pursued by others in the future. You'd like the reader to be thinking "WOW!" at the end of this chapter, which you can only accomplish with meaningful rather than superficial concluding remarks.

The Abstract

The *Abstract* is one of the last portions of your project to be written. It should mention the sponsor, describe the problem and goal of the project, perhaps give an overview of the methods, and give a sense of the nature of the findings, conclusions, and recommendations. It needs to fit in the box on the CDR form (i.e., 800 characters or approximately 80 words). Typically that's 4-6 sentences: perhaps one describing the problem, one stating your goal, one giving a sense of the methods, and two or so suggesting the nature of conclusions and/or recommendations. Your IQP abstract will appear on your WPI transcript, so try to convey the significance of your work, and perhaps make clear that it was completed in Nantucket.

The Executive Summary

As the name implies, the *Executive Summary* is intended for the busy executive who does not have time to read your whole report but may make some decisions based on your work. Therefore, the Executive Summary should be able to stand alone, independent of the report, and be succinct and persuasive. The Executive Summary may be more widely read than the report, and you are likely to write many such documents with very similar purposes throughout your professional careers.

You can think of the Executive Summary as a microcosm of your entire report. You should convey an understanding of the problem succinctly and state your project goal and objectives such that its importance and relevance is clear; provide an overview of the methods at a level that makes it obvious that you have used established and valid methods (such that the executive will trust your conclusions); highlight key findings; compare alternatives where relevant, and present and justify your recommendations.

Executive Summaries generally end up being in the range of 3-5 pages. The summary begins with introductory material including the problem or issues your project addresses, your project goal, objectives, and methods. This part is often between 1- 1.5 pages. (Of course, that varies by project.) Often you can "borrow" from parts of your report to put together the Executive Summary, using a subset of the same rhetorical moves. Don't worry about repetition since it's meant to be a stand-alone document. The bulk of the document should be Findings, Conclusions, and/or Recommendations. Sometimes they can be combined in creative ways.

Consider carefully the **visual design** of the Executive Summary. It is often helpful to include headings and lists to aid understanding and readability. An example follows:

> **Recommendations**
>
> Based on our findings from X, Y, and Z, we recommend that the Royal Botanical Gardens Education Division include the following materials in the packet it sends to teachers in advance of field trips:
>
> - *A site map.* Teachers requested that parking areas, toilets, and the meeting place be clearly identified.
> - *Suggestions for pre-trip activities.* These activities should introduce key terminology that will be used during the excursion. Three example activities have been developed and are presented in Appendix C.

Authorship

By vote of the WPI Faculty, an authorship page is required for all team project reports. What do you do when so many drafts and so many revisions have involved all team members? Following are some possibilities:

1. Identify one or two (or however many) people who took the lead role in drafting each chapter, even if the chapter ended up being quite different. Then identify people who participated in revisions or edits (which could be "All" in some cases) for each chapter.

2. If something like #1 is very difficult or impossible to do, describe your team's collaborative writing process, including which team members typically took which roles (drafting, editing, etc.)

We do not suggest a statement of "all team members contributed equally to the writing of this project" since that seems oversimplified given the complexity of collaborative writing.